

MOU-UTB-2022024 (ESS Ref. No. ESS-4969962)

MEMORANDUM OF UNDERSTANDING

BETWEEN

EUROPEAN SPALLATION SOURCE ERIC

AND

UT-BATTELLE, LLC

Management and Operating Contractor for
OAK RIDGE NATIONAL LABORATORY

CONCERNING

**DEVELOPMENT OF METHODS FOR
PULSED NEUTRON SOURCES**

BACKGROUND

This Memorandum of Understanding (MOU) is by and between European Spallation Source ERIC (ESS), Sweden and UT-Battelle, LLC (UT-Battelle), the management and operating contractor for the U.S. Department of Energy's (DOE) Oak Ridge National Laboratory (ORNL), hereinafter jointly referred to as the "Participants." UT-Battelle enters this MOU pursuant to Prime Contract No. DE-AC05-00OR22725 with DOE. UT-Battelle's activities pursuant to this MOU are limited to those that are authorized by and consistent with the terms and conditions of its contract with DOE.

The Participants

- Recognizing the long-term benefits of developing mutual support and the scientific opportunities of joint efforts on accelerator and target issues, as well as instrument developments,
- Wishing to work together on matters of mutual scientific and technical interest, and
- Desiring to promote cooperative research in the exploitation and development of pulsed neutron sources and related infrastructure and to work toward enhanced coordination between neutron research center's worldwide, have reached an understanding on the follow points:

Section 1 - Purpose

UT-Battelle and ESS have a common interest in the development of various technologies which support the design and construction of new generation pulsed neutron sources. The Participants understand that the sharing of related development tasks allows the most efficient use of resources made available. Cooperation between the two Participants shall be on the basis of mutual benefit, equality, and reciprocity.

Section 2 - Cooperative Research Programs

UT-Battelle and ESS will establish Cooperative Research Programs to develop particular areas of expertise. The scope of these Cooperative Research Programs may comprise exchange of scientific and technical information, exchange of research and technical staff, and related cooperation on specific research areas of common interest.

Such Programs would include:

Machine Learning/Large datasets topics related to the accelerators:

1. Precursors to errant beam pulses: ORNL's Spallation Neutron Source (SNS) has already a system implemented for testing while ESS is looking at implementing protection functions on their FPGA platform to prevent bad pulses and to acquire interesting data for further analysis.
2. Data exchange between labs: NeXuS format and Python tools for measurements and some simulation results.
3. ML Platform for accelerators: General collaboration to down select large datasets using techniques that are relevant for Superconducting Linacs and high-power targets.

High Power Target Diagnostics:

1. Development of longer lasting target luminescent coatings to visualize the proton beam on target, both for the First Target Station (FTS) and Second Target Station (STS), as well as for the ESS target.
2. Work on developing an independent chain supply for the coating components.
3. Investigate whether $Al_2O_3:Cr$ coating works if the STS target temperature goes up to 300C (ESS currently has data up to 200C and already sees 50-70% reduced light output and expects total quench of light at 400C).
4. Collaboration on additional diagnostics relevant to STS.

High Power accelerator diagnostics:

1. Collaboration on integration and commissioning of bunch shape monitors at ESS.
2. Beam studies of wire scanner detectors and readouts at SNS
3. Collaboration on loss monitor detectors and protection functions

Moderator and reflector assemblies development:

1. Collaboration on development of advanced moderator and reflector assemblies
2. Planning and performing experiments with novel moderator designs
3. Collaborating on development on advanced neutronics analyses methods in particular in relation to moderator analyses

The Participants should each designate a "Coordinator" responsible for the detailed management of each Cooperative Research Program including technical progress reviews, fair distribution of tasks, and definition of scope.

For ESS

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For UT-Battelle

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Section 3 - Finance

Except when the Participants otherwise agree in writing, each Participant is to bear the costs of its own participation in the activities under this MOU. If the Parties agree to proceed with specific activities, financing of such activities shall be organized in accordance with Section 5 below.

Section 4 - Responsibilities for Performance of Work

Each Participant intends to ensure that suitably qualified staff is selected to perform the activities covered by this MOU. In the case of assignments of staff to the other Participant, the assigning Participant is to be responsible for the salaries, insurance, and allowances of its own staff. The assigning Participant is to also pay for travel and living expenses of its staff while on assignment to the receiving Participant unless otherwise agreed to in writing. Assigned staff intends to adhere to the general rules of work and safety regulations in force at the receiving Participant's establishment.

Section 5 - Validity and Intellectual Property

The Participants acknowledge that this MOU should only be construed as an expression of their desire to accomplish the objectives described herein, recognizing that it is not intended to constitute a legally binding document, nor does it commit any funds of either Participant. Therefore, specific activities defined in the Cooperative Research Programs should be negotiated in separate written agreements that are mutually acceptable to both Participants. These separate agreements should establish the respective rights and responsibilities of the Participants in regard to such matters as rights in information and intellectual property (including inventions and discoveries, patents, copyrights and technical data), confidentiality, liability for injuries, damages, and other technical, legal, and/or administrative (including financial, where applicable) requirements or other commitments.

Section 6 - Export Control

Each Participant acknowledges that it is responsible for its own compliance with all U.S. export control laws and regulations and any applicable laws of the foreign Country of origin (Sweden); and each Participant acknowledges it does intend to not knowingly export directly or indirectly, through its affiliates, licensees, or subsidiaries, and export-controlled hardware, software, or

technical data in the performance of the MOU without a required license/authority which should be obtained by the responsible Participant from the appropriate U.S. Authority and the foreign Country of origin (Sweden).

Section 7- Conflicts

Conflicts or issues may arise which cannot be resolved between project personnel at UT - Battelle and ESS. Such conflicts or issues should be raised to supervisory or managerial personnel for direct communication between the Participants to seek resolution through mutual consent. If a satisfactory resolution cannot be obtained at this level, the designated Points-of-Contact intend to take the issues to their respective organizational leaders for guidance in seeking a mutually agreeable resolution.

Section 8 - Environmental, Safety, Health and Security

For activities and operations conducted at ORNL, ESS's employees, staff and assignees intend to comply with UT-Battelle's environment, safety, health, and security requirements and procedures. Research activities should be performed under a Research Safety Summary approved by UT-Battelle.

For activities and operations conducted at ESS, ORNL's employees, staff and assignees intend to comply with local environment, safety, health, and security requirements and procedures.

Section 9 - Compliance with Laws.

The Participants intend to comply with all applicable national, federal, state, and local laws and ordinances, and pertinent DOE Orders, applicable for operations and activities performed in the respective country.

Section 10 - Effective Date and Termination


Cooperation under this MOU may commence upon signature and continue for a period of five years. If either Participant wishes to make a modification to this MOU, the subject may be discussed by UT-Battelle and ESS and may be made valid through mutual consent of the two Participants. Either Participant may discontinue participation in this MOU, but will endeavor to provide thirty (30) days written notice to the other Participant.

Section 11 - Authorized Signatures

Those individuals whose signatures appear below hereby certify that they are authorized to sign on behalf of the respective Participants to this MOU.

Signed in duplicate.

Kevin Jones
Technical Director
European Spallation Source ERIC



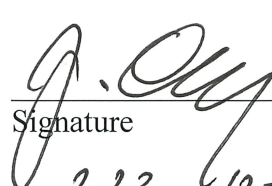
Signature

2023.10.11

Date

Kevin Jones
Technical Director

Jens Dilling
Associate Laboratory Director
Neutron Sciences Directorate
Oak Ridge National Laboratory



Signature

2023-10-31

Date