UVC Measurement Methods & UVC Documentary Standard Development

C. Cameron Miller
NIST, Sensor Science Division
May 2020
Illuminating Engineering Society (IES) & International Ultraviolet Association (IUVA) sign a memorandum of understanding (MOU) to assemble experts in the measurement of ultraviolet C-band (UV-C) emissions to develop American National Standards (ANSI Standards) for the measurement and characterization of UV-C device performance.

1 – Low-Pressure Mercury Sources
2 – Light Emitting Diodes (LEDs)
3 – Excimer Sources (Far UVC)
4 – Pulsed Xenon
5 – Calibration & characterization of UVC Detectors
6 – UVC Disinfection Products
Voltage anomaly effect distorts $V_p$, causing large errors in the determination of the optical output at a given junction temperature.
Established a calibration service for radiant intensity angular intensity distribution

NIST Calibration Service

210 nm – 1700 nm

LM-92
LM-85
10% decrease in flux
50 °C -> 55 °C
BSR/IES/IUVA LM-93

Excimer Lamps Measurement

Filtered: 235 nm – 340 nm – 0.12 % of peak

Unfiltered: 14 %

Source: USHIO
UV Device Irradiance

BSR/IES LM-91-2x Application Distance Radiometry

This document describes the method for measuring illuminance, irradiance, and/or photon irradiance (i.e., photon flux density) at multiple points on a plane at a specific application distance.
Detector Calibration/Characterization

Barry Hunt, Prescient

Collimated

2π Illumination
Detector Calibration/Characterization

UV ‘Microwave’ measurement

Zarobila, Litorja - NIST

x2.9!
Photobiology Committee

ANSI/IES RP-44-21 – Recommended Practice: Ultraviolet Germicidal Irradiation (UVGI)

Definitions
Types of UV Radiation
GUV Technologies – Equipment and Sources
Applications – In-Duct, Upper-Room, Mobile, Handheld
Effects of Ultraviolet Radiation – Efficacy, Safety, Environmental
Design of Systems
Maintaining and Verifying
Safety in Applications
Additional Efforts

Standard Inactivation Rates
Ultrasound Radiation and Visible Light
Dependent on Wavelength and Sample Matrix

IUVA Task Groups:
- UVC LEDs
- Far UVC
- Labelling


ASHRAE:
Upper Room Implementation

IEEE-IAS-PEDCC:
- UVC LEDs Specification Sheet

Thank you,
C. Cameron Miller
c.miller@nist.gov