

# UVC Measurement Methods & UVC Documentary Standard Development

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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.



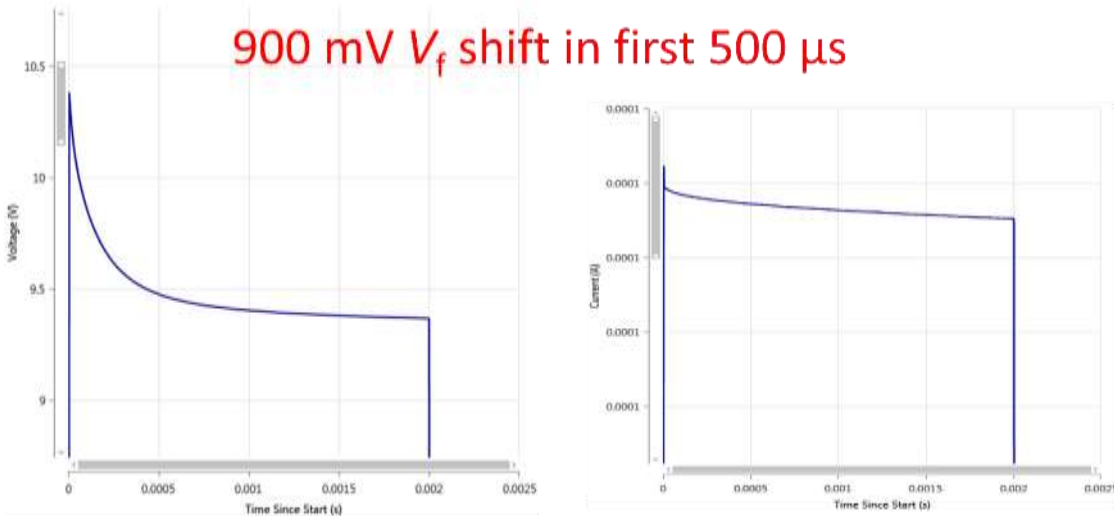
- 1 – Low-Pressure Mercury Sources
- 2 – Light Emitting Diodes (LEDs)
- 3 – Excimer Sources (Far UVC)
- 4 – Pulsed Xenon
- 5 – Calibration & characterization of UVC Detectors
- 6 – UVC Disinfection Products

# BSR/IES/IUVA LM-92

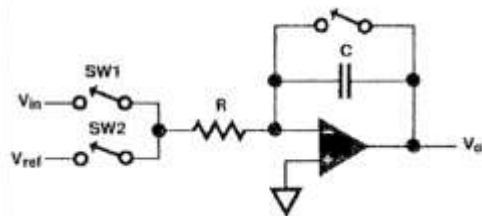
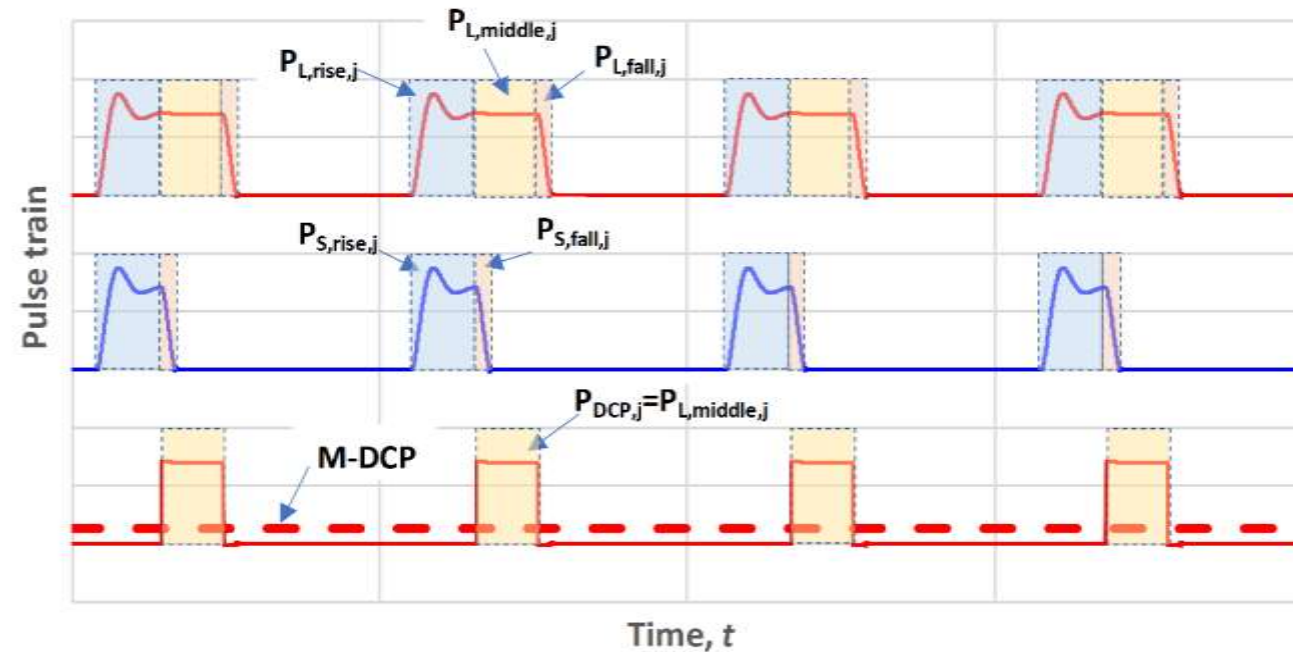
## BSR/IES/IUVA LM-92 - Approved Method for Electrical and Ultraviolet Measurement of Light Emitting Diodes



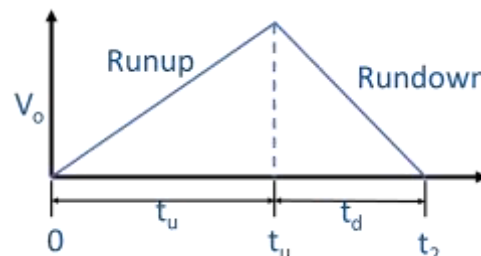
900 mV  $V_f$  shift in first 500  $\mu$ s



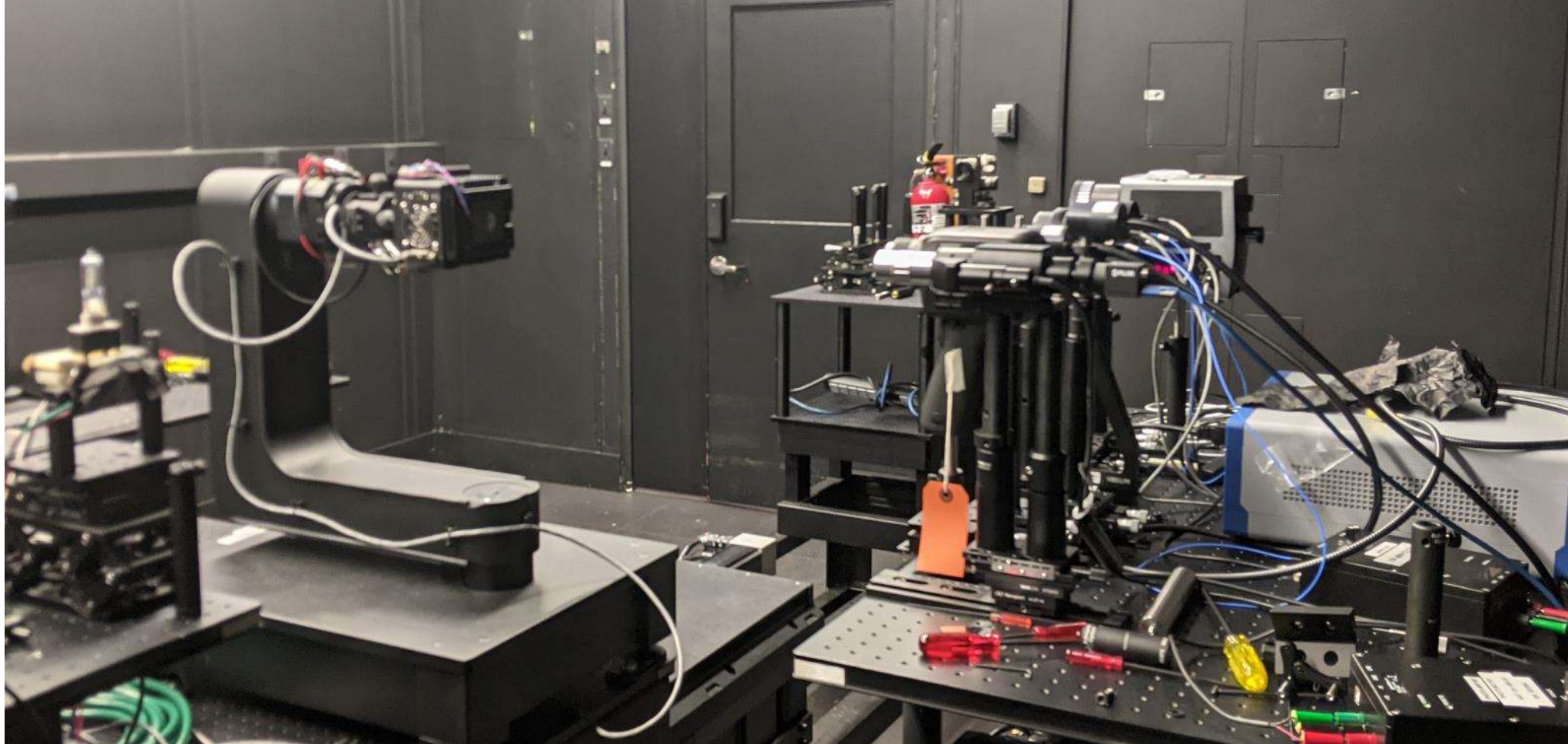
Voltage anomaly effect distorts  $V_f$ , causing large errors in the determination of the optical output at a given junction temperature



Dual-slope Integrating ADC Circuit



Yuqin Z, Hulett J, Koide N, Yamaji Y, Miller CC (2021) Mean Differential Continuous Pulse Method for Accurate Optical Measurements of Light-Emitting Diodes and Laser Diodes. J Res Natl Inst Stan 126:126034. <https://doi.org/10.6028/jres.126.034>

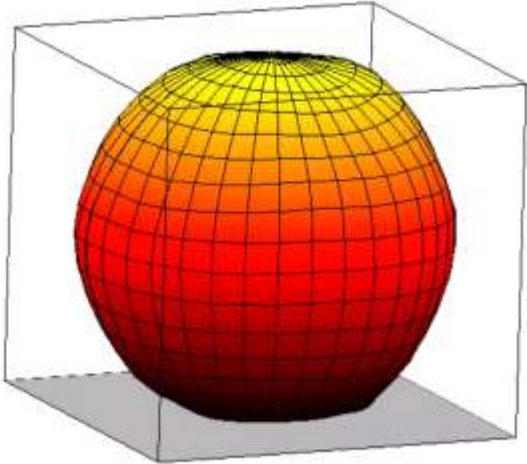


210 nm –  
1700 nm

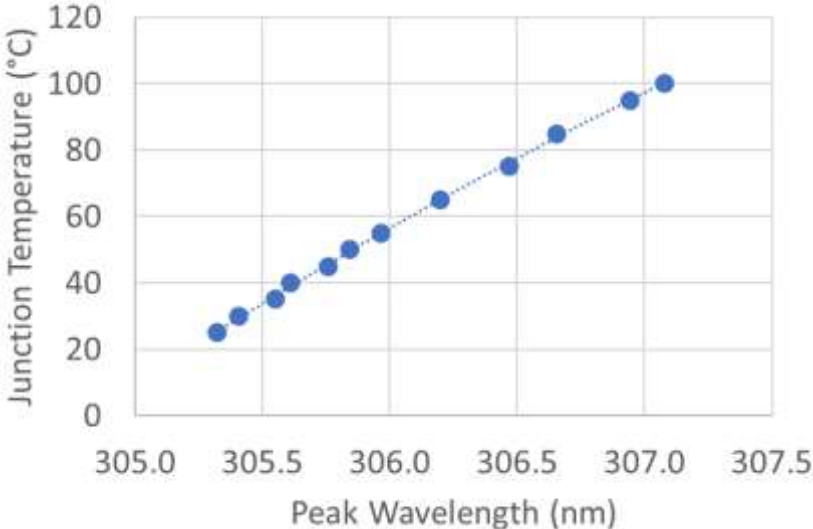
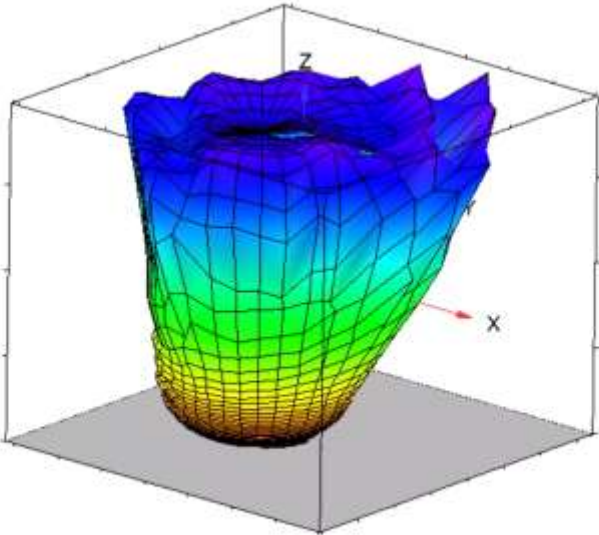
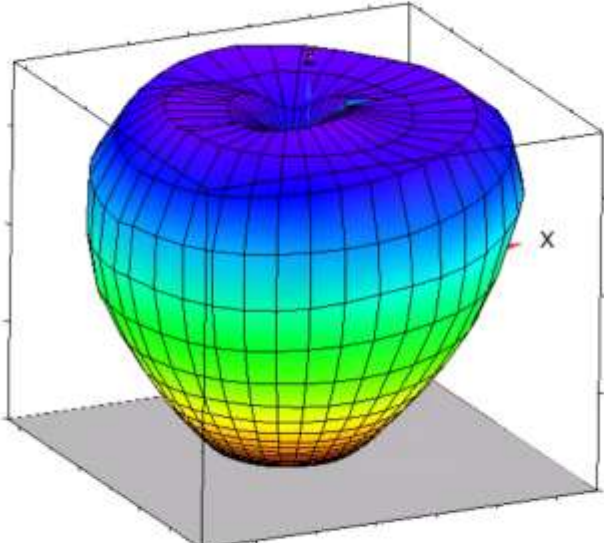
LM-92  
LM-85

Established a calibration service for radiant intensity angular intensity distribution





10 % decrease in flux  
50 °C -> 55 °C

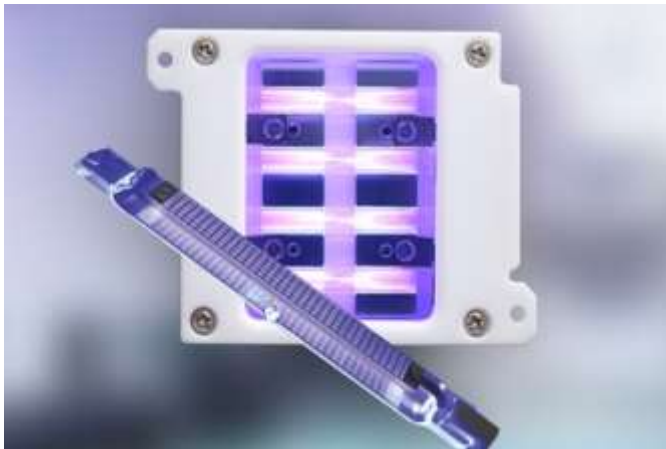


# BSR/IES/IUVA LM-93

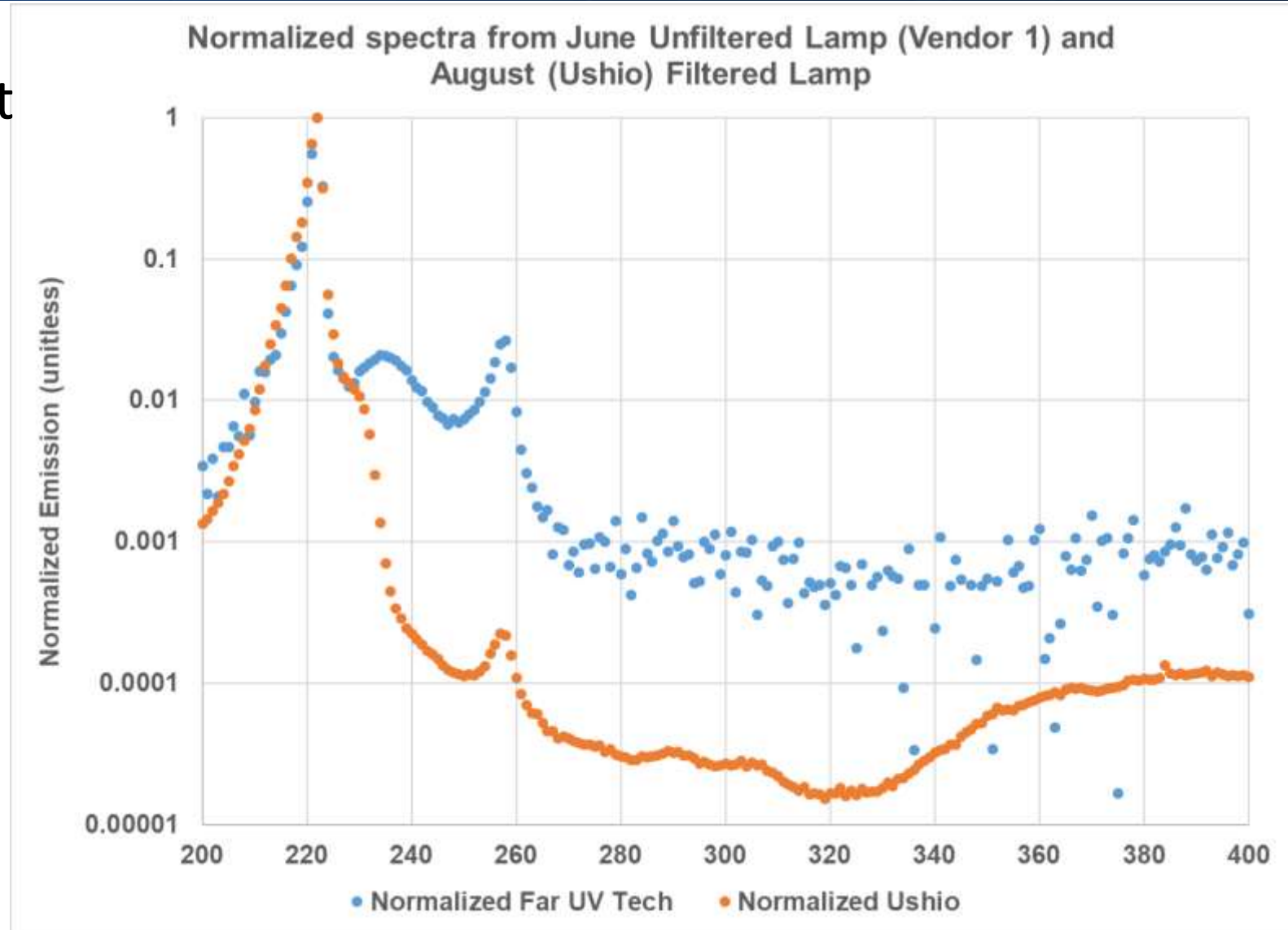
## Excimer Lamps Measurement

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

Unfiltered: 14 %



Source: USHIO



# UV Device Irradiance



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

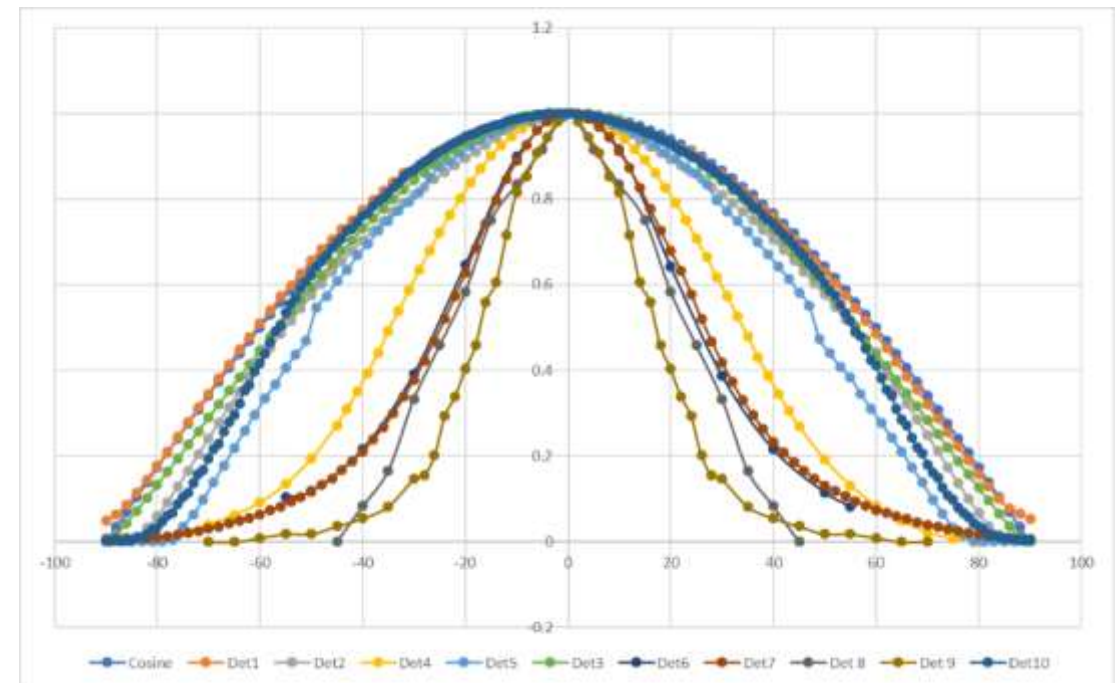
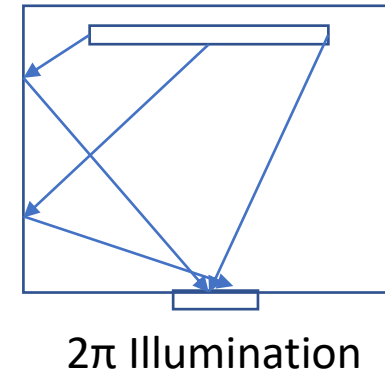
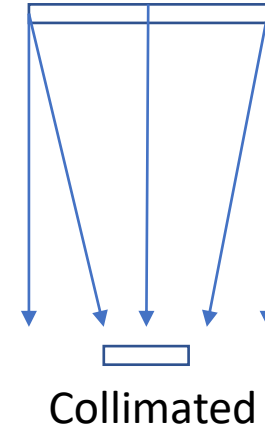
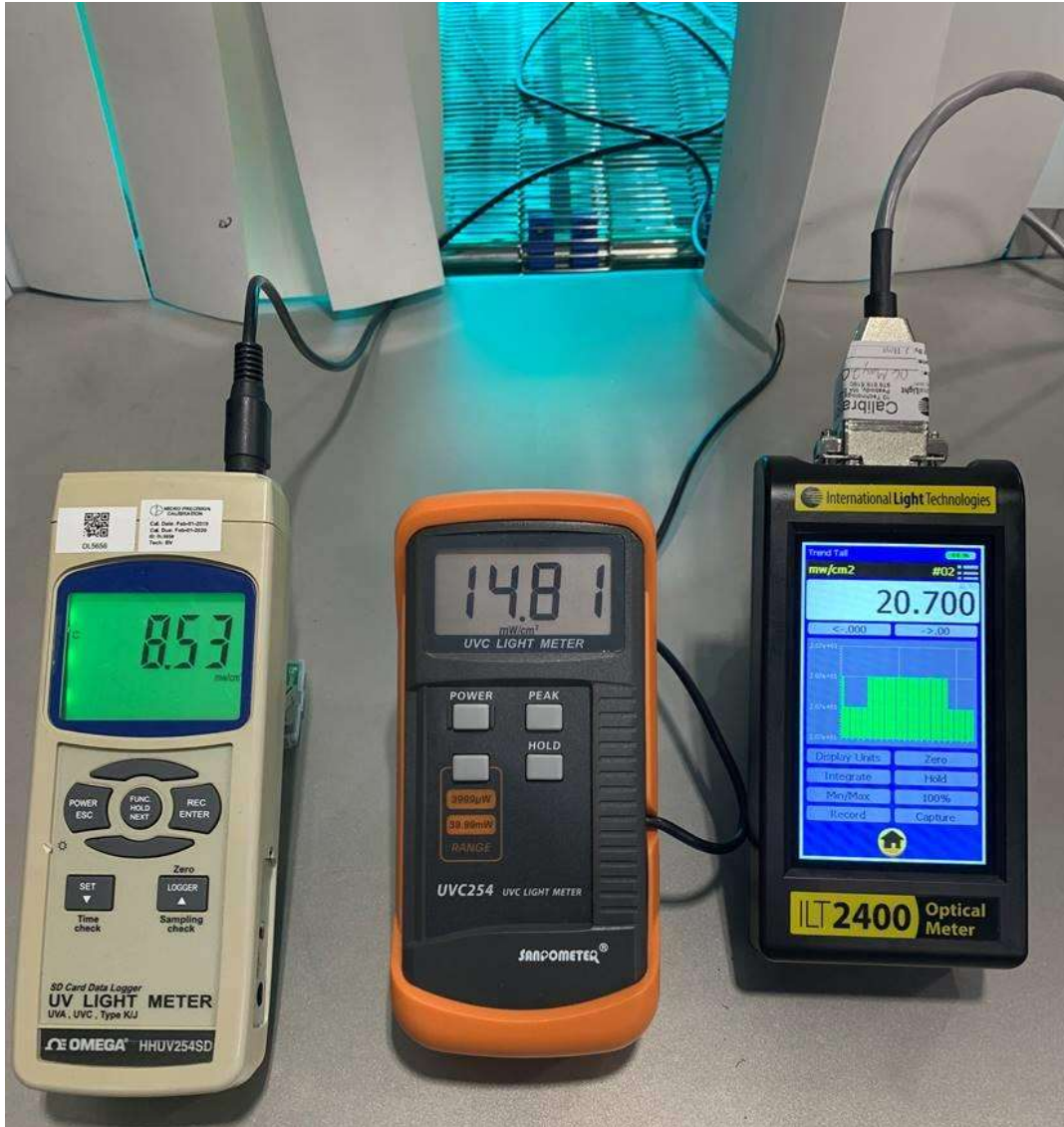
This document describes the method for measuring illuminance, irradiance, and/or photon irradiance (i.e., photon flux density) at multiple points on a plane at a specific application distance.





# Detector Calibration/Characterization

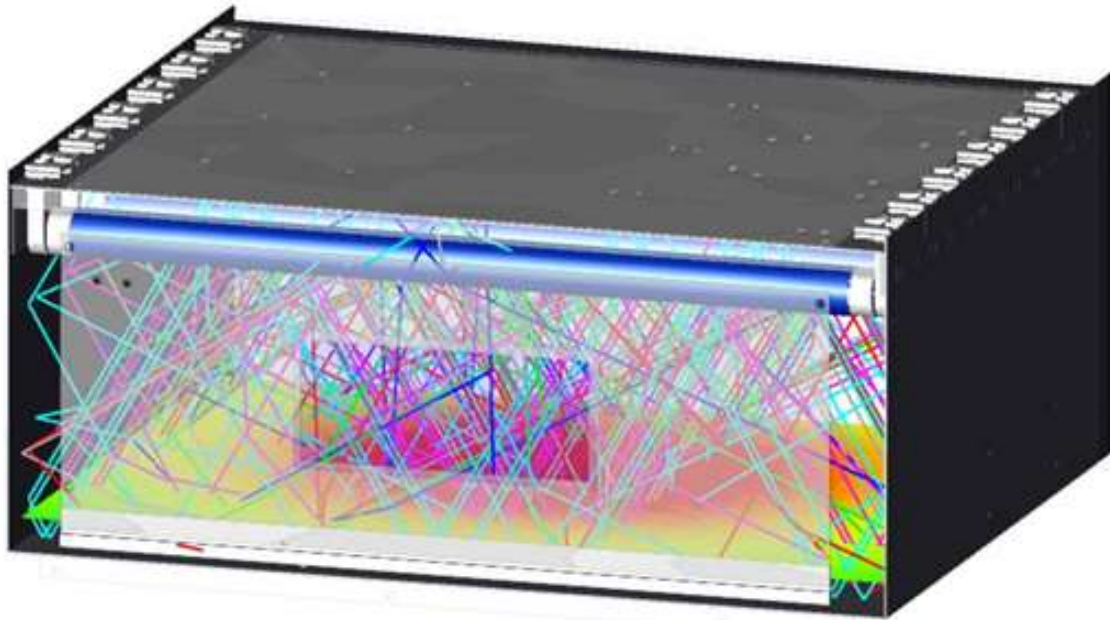
Barry Hunt, Prescient<sup>x</sup>



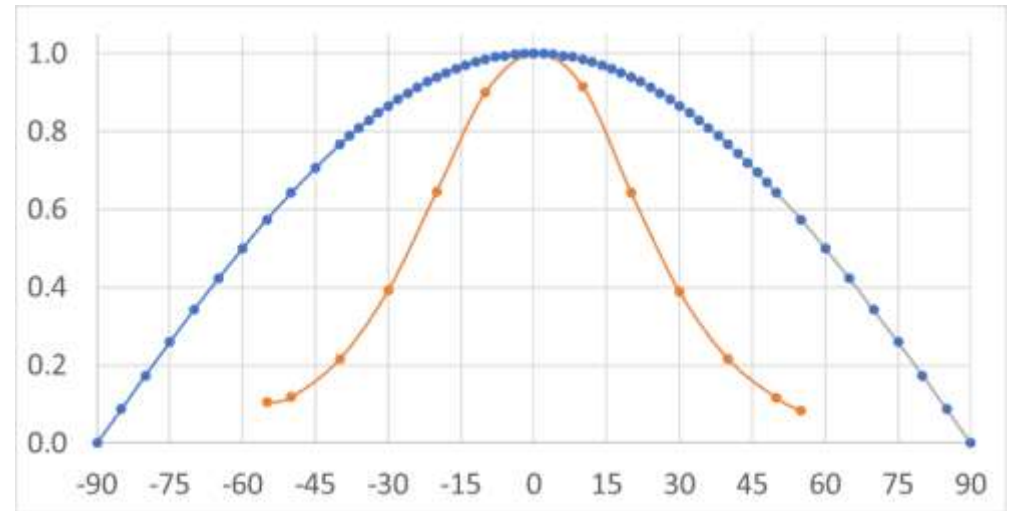


# Detector Calibration/Characterization

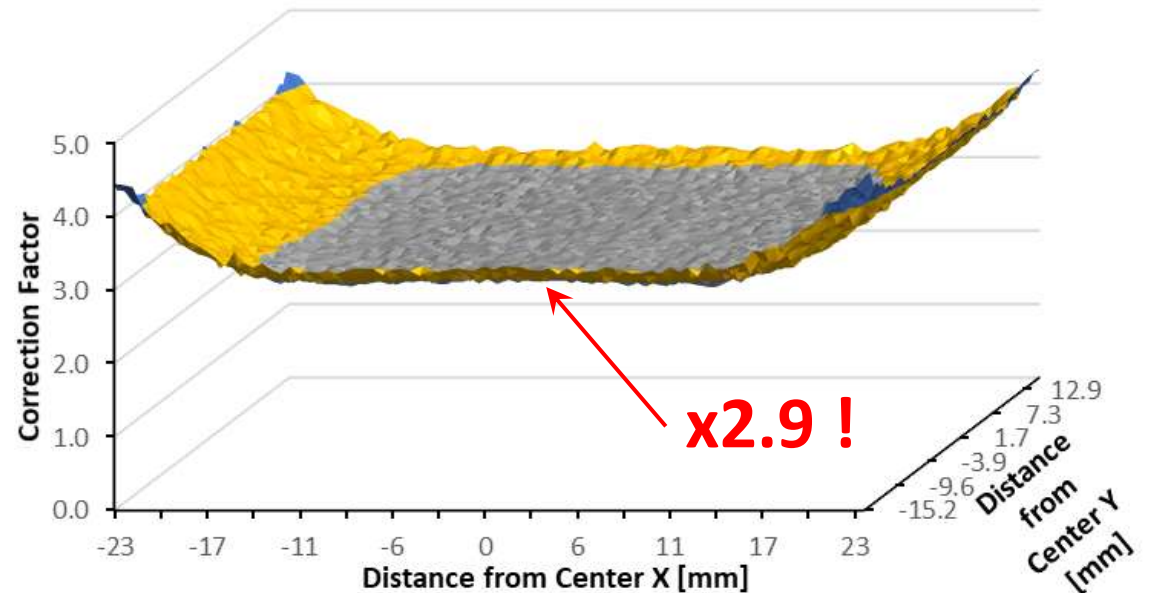
## UV 'Microwave' measurement



Zarobila, Litorja - NIST



Sensor Correction Factor



**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

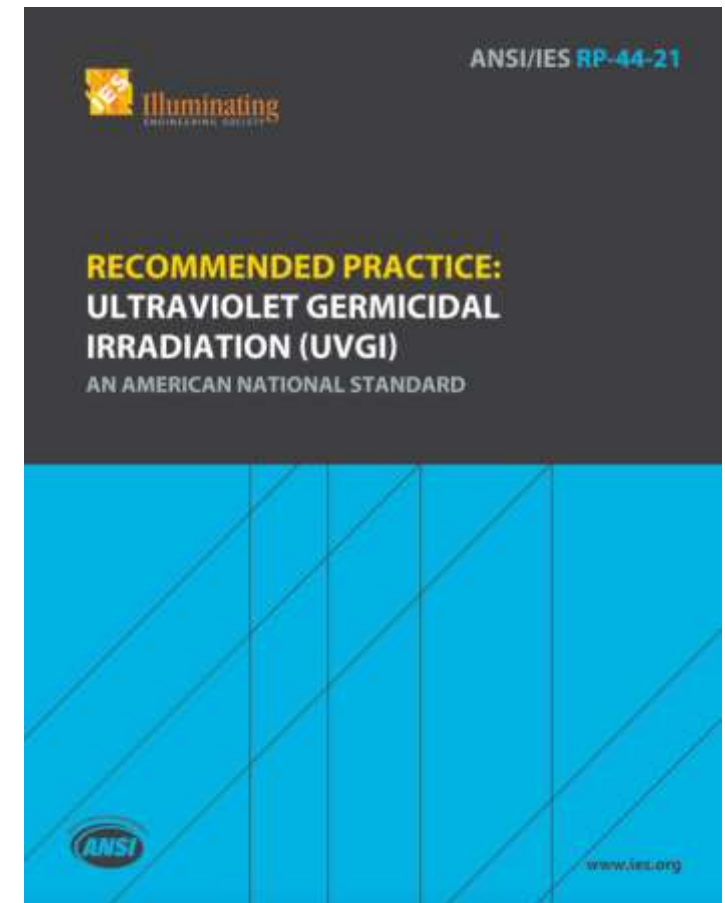
Applications – In-Duct, Upper-Room, Mobile, Handheld

Effects of Ultraviolet Radiation – Efficacy, Safety, Environmental

Design of Systems

Maintaining and Verifying

Safety in Applications



# Additional Efforts

IUVA Task Groups:  
UVC LEDs  
Far UVC  
Labelling

## Standard Inactivation Rates

Ultraviolet Radiation and Visible Light  
Dependent on Wavelength and Sample Matrix

Masjoudi M, Mohseni M, Bolton JR (2021) Sensitivity of Bacteria, Protozoa, Viruses, and Other Microorganisms to Ultraviolet Radiation. J Res Natl Inst Stan 126:126021. <https://doi.org/10.6028/jres.126.021>

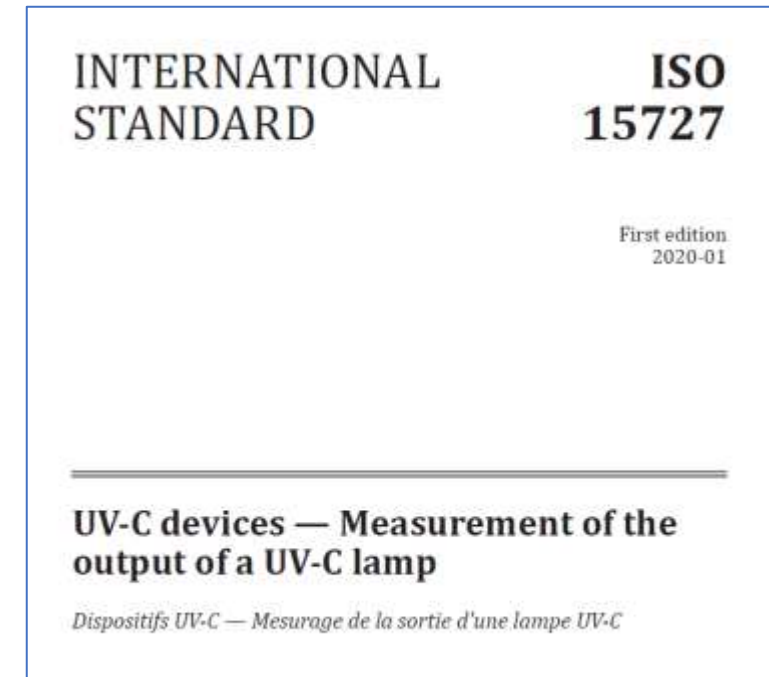
ASHRAE:  
Upper Room Implementation



**Method of Testing UV-C Lights  
for Use in Air-Handling Units or  
Air Ducts to Inactivate  
Airborne Microorganisms**

IEEE-IAS-PEDCC:  
UVC LEDs Specification Sheet

CIE 220:2016 Technical Report –  
Characterization and Calibration Methods of UV Radiometers





Thank you,  
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