Optical Radiation News

Published by the COUNCIL for OPTICAL RADIATION MEASUREMENTS (www.cormusa.org) to report items of interest in optical radiation measurements. Inquiries may be directed to the Editor, John D. Bullough, Light and Health Research Center, Icahn School of Medicine at Mount Sinai, Suite 560, Albany, NY 12205. Tel: 518-368-5418, e-mail: John.Bullough@mountsinai.org.

NUMBER 109 SUMMER/FALL 2022

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CORM NEWS

NEWS FROM NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

NATIONAL RESEARCH COUNCIL (NRC) OF CANADA LIAISON REPORT

CORM NEWS

Joint CORM / U.S. CIE National Committee Conference – Call for Abstracts

The Council for Optical Radiation Measurements (CORM) and the US National Committee of CIE (USNC) solicits abstracts for oral presentations at their joint annual meeting and conference, to be held virtually Monday, November 14, 2022 through Wednesday, November 16, 2022.

Due Date for Abstracts: September 16, 2022

This is a call for abstracts in the areas of light, vision, optical properties of materials and metrology, including, but not limited to the following topics:

Current Research at the NMIs Luke Sandilands, NRC Canada, chair
Research at National Metrology Institutes, international intercomparisons, new programs, emerging challenges, and improvements to services used by the optical radiation community.

UV & IR Radiation - Measurements, Concerns & Applications Rob Vest, NIST, chair
Metrology of UV and IR sources (e.g. lamps) and detectors, challenges in UV-C and UV germicidal source evaluation, and UV and IR measurements for specialized applications.

Advances and Applications in Spectrophotometry Thomas Germer, NIST, chair
Measurement and applications of optical properties of materials, including hyperspectral and multispectral imaging, remote sensing, materials characterization, and optical metrology.

LED Applications and Metrology Jeff Hulett, Vektrex, chair
Spectral and electrical LED measurement and test methods, new LED sources especially in the UV and IR spectral regions, and specialized industrial applications.

Light and Health: Measuring the Stimulus and Response Andrea Wilkerson, PNNL, chair
Tools and methods for measuring light stimulus and response, including temporal light artifact, glare and ipRGC-mediated responses (circadian, neuroendocrine, and neurobehavioural).

Vision & Color Yoshi Ohno, NIST, chair
Color perception, color metrics, and advances in vision research.

Presentations will be 15-20 minutes. Abstracts should be 250 words or less. Abstracts should be submitted to secretary@cormusa.org. More details about the conference will be posted when available on the CORM website (www.cormusa.org).

NIST

NEWS FROM THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Report on the SIM Photometry and Radiometry Key Comparison of Spectral Regular Transmittance

Catherine C. Cooksey and Blaza Toman

https://doi.org/10.1088/0026-1394/58/1A/02004

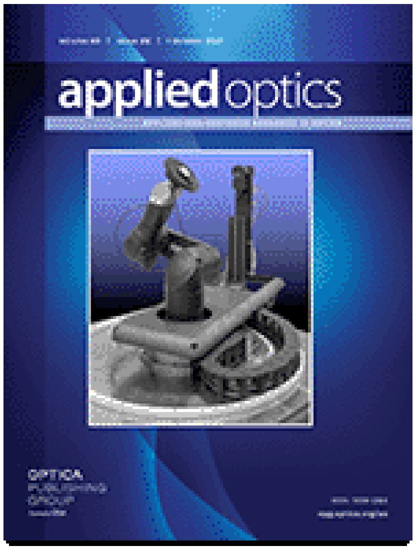
This report details the results of the Inter-American Metrology System (SIM) key comparison on regular spectral transmittance (SIM.PR-K6.2010). Eight national metrology institutes participated in the comparison, which covered the spectral range from 380 nm to 1000 nm and the nominal transmittance range from 0.1 % to 90 % transmittance. The protocol mirrored that of the key comparison conducted by the Consultative Committee on Photometry and Radiometry (CCPR-K6.2010). The National Institute of Standards and Technology (NIST) served as the pilot. Each participant received a single set of 5 comparison (neutral density) filters to measure. The pilot measured all sets before and after the participant measurements. All measurements were completed between December 2016 and February 2018. The results of this comparison were linked to the key comparison reference value (KCRV) of the CCPR comparison and are expressed in terms of degrees of equivalence. While most of the participants can adequately measure spectral regular transmittance and evaluate its uncertainty, there are some cases of non-equivalence that will require further investigation on the part of the participants.

Bidirectional Reflectance Capabilities of the NIST Robotic Optical Scattering Instrument

Heather J. Patrick, Catherine C. Cooksey, Thomas A. Germer, Maria E. Nadal, and Clarence J. Zarobila

https://doi.org/10.1364/AO.435117

The National Institute of Standards and Technology (NIST) RoboticOptical Scattering Instrument (ROSI) serves as the national reference instrument for specular and diffuse bidirectional reflectance measurements in the ultraviolet to short-wave infrared wavelength regions. This paper gives a comprehensive overview of the design, operation, and capabilities of ROSI. We describe measurement methods for diffuse and specular reflectance, identify and quantify the elements of the uncertainty budget, and validate the reflectance scale through comparison with NIST's previous reference instrument, the Spectral Tri-function Automated Reference Reflectometer. Examples of the range of ROSI's capabilities, including the limits for low-reflectance measurements and a research application using out-of-plane measurements of bidirectional reflectance for remote sensing reference reflectors, are also covered.



Incandescent Lamp-Based Facility for Measuring the Long-Term Radiometric Stability of Spectrographs

Ping-Shine Shaw, John T. Woodward, B. Carol Johnson, Steven W. Brown, and Howard W. Yoon

https://doi.org/10.1364/AO.444568

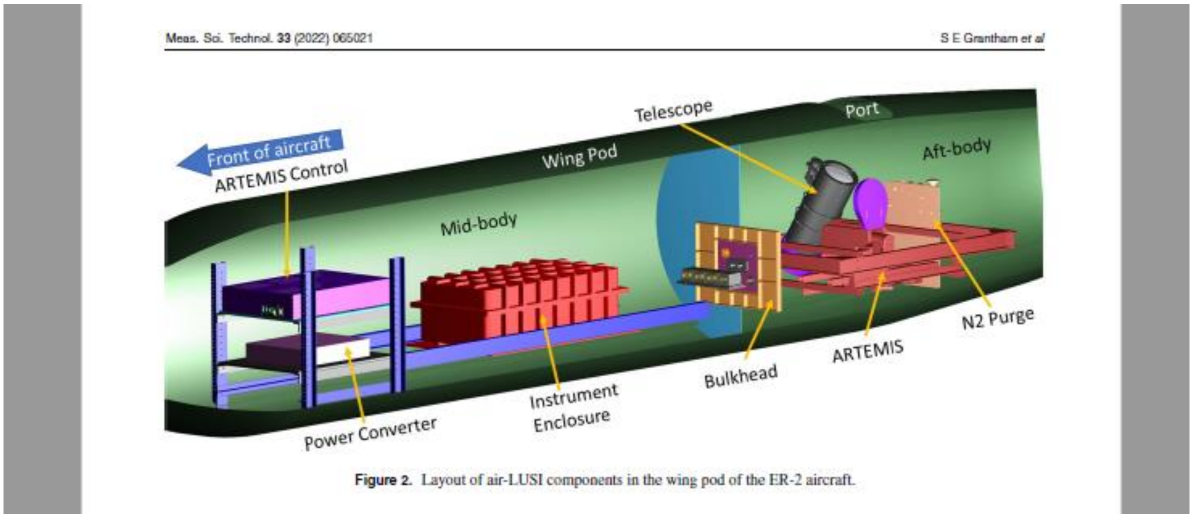
The long-term temporal stability of a spectrograph is one of the most important characteristics affecting the spectrograph's radiometric performance. For many applications, from monitoring ocean color and lunar irradiance to laboratory irradiance measurement standards, the stability of a spectrograph is a primary factor in the overall measurement uncertainty and therefore is the major criterion for the suitability of the spectrograph as an optical-scale transfer standard. Here we report a facility built for testing the long-term radiometric stability of commercial, fiber-coupled spectrographs. The facility uses tungsten quartz-halogen irradiance standard lamps, type "FEL," of the National Institute of Standards and Technology (NIST) as light sources. To ensure the highest stability of these lamps during spectrograph tests, parameters such as lamp current, lamp voltage, and signals from an independent filter radiometer were continuously recorded to monitor any possible instability caused by such effects as lamp aging. Using this facility, we report the stability study of four spectrographs with spectral coverage from the UV to short-wave infrared over an interval of two months during which the lamp irradiance was stable to better than 0.02%. The tested spectrographs show good stability in general, ranging from 0.02% to 0.1% in the visible over a span of 11 days. For a longer two-month test, the variation in spectrograph responses increases by less than 0.1% with no discernable long-term drifts. In addition, we measured the response variation of two of the test spectrographs before and after they were sent to remote field locations and subjected to adverse environmental conditions. In this case, a larger response variation of up to 1.0% dependence on the wavelength was observed. We discuss the performance of the facility and the implications for using these spectrographs for several of NIST's remote sensing projects as radiometric transfer standards based on these stability measurements.

The Irradiance Instrument Subsystem (IRIS) on the Airborne-Lunar Spectral Irradiance (Air-LUSI) Instrument

Steven E Grantham, Kevin R Turpie, Thomas C Stone, S Andrew Gadsden, Thomas C Larason, Clarence J Zarobila, Stephen E Maxwell, John T Woodward, and Steven W Brown

https://doi.org/10.1088/1361-6501/ac5875

The objective of the airborne lunar spectral irradiance (air-LUSI; see figure below) project is to make low uncertainty, SI-traceable measurements of the LUSI in the visible to near-infrared region from an aircraft above most of the optically absorbing components of the atmosphere. The measurements are made from a NASA ER-2 aircraft, which can fly at altitudes of approximately 20 km above sea level. Air-LUSI measurements, corrected for residual atmospheric attenuation, are designed to provide a matrix of low uncertainty top-of-the-atmosphere lunar irradiances at known lunar phase and libration angles to be compared and combined with other lunar irradiance data sets to constrain the uncertainties in models of lunar irradiance and reflectance. The measurements are also expected to provide insight into the differences between models and satellite sensor measurements of lunar irradiance. This paper describes the development and characterization of the air-LUSI subsystem for acquiring lunar measurements, called the irradiance instrument subsystem, prior to flight.



Meas. Sci. Technol. 33 (2022) 065021 S E Grantham et al

Figure 2. Layout of air-LUSI components in the wing pod of the ER-2 aircraft.

Direct Method of Extracting Broadband Complex Refractive Index from Spectrophotometric Measurements: An Application to Polydimethylsiloxane for Passive Radiative Cooling

Braden Czapla and Leonard Hanssen

https://doi.org/10.1117/1.JPE.11.032105

We describe an algorithm to extract the complex refractive index of a material from broadband reflectance and transmittance measurements taken by spectrophotometers. The algorithm combines Kramers-Kronig analysis with an inversion of Fresnel’s equations to provide a direct method of solving for the refractive index which is accurate, even for weakly absorbing materials, and easily applicable to radiative heat transfer calculations. The algorithm is validated by extracting the complex refractive index of polydimethylsiloxane between 0:25 µm and 100 µm and comparing against existing literature. We also discuss the importance of broadband optical properties to passive radiative cooling and details of the uncertainty analysis of the algorithm.

Mean Differential Continuous Pulse Method for Accurate Optical Measurements of Light-Emitting Diodes and Laser Diodes

Yuqin Zong, Jeff Hulett, Naomasa Koide, Yoshiki Yamaji, and C. Cameron Miller

https://doi.org/10.6028/jres.126.034

Limited sources exist for the application of germicidal ultraviolet (GUV) radiation. Ultraviolet light-emitting diodes (UV-LEDs) have significantly improved in efficiency and are becoming another viable source for GUV. We have developed a mean differential continuous pulse method (M-DCP method; see figure below) for optical measurements of light-emitting diodes (LEDs) and laser diodes (LDs). The new M-DCP method provides an improvement on measurement uncertainty by one order of magnitude compared to the unpublished differential continuous pulse method (DCP method). The DCP method was already a significant improvement of the continuous pulse method (CP method) commonly used in the LED industry. The new M-DCP method also makes it possible to measure UV-LEDs with high accuracy. Here, we present the DCP method, discuss the potential systematic error sources in it, and present the M-DCP method along with its reduced systematic errors. This paper also presents the results of validation measurement of LEDs using the M-DCP method and common test instruments.

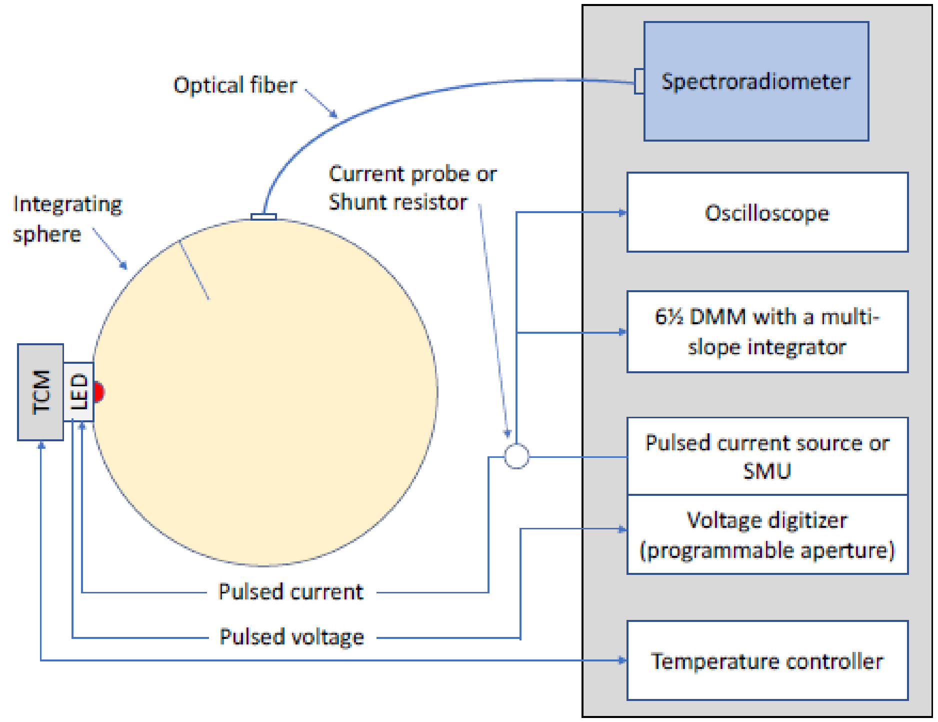


Fig. 3. Example measurement setup using the M-DCP method.

Improved Shadow correction for the Marine Optical BuoY, MOBY

Kenneth Voss, Edouard Leymarie, Stephanie Flora, B. Carol Johnson, Arthur Gleason, Mark Yarbrough, Michael Feinholz, And Terrance Houlihan

https://doi.org/10.1364/OE.440479

A 3-D instrument self-shading correction has been developed for the MOBY upwelling radiance measurements. This correction was tested using the 23 year time series of MOBY measurements, at the Lanai, Hawaii site. The correction is small (less than 2 %) except when the sun and collectors are aligned within 20° azimuth on opposite sides of the main MOBY structure. Estimates of the correction uncertainty were made with a Monte-Carlo method and the variation of the model input parameters at this site. The correction uncertainty was generally less than 1 %, but increased to 30 % of the correction in the strongest shadow region.

A Pyroelectric Detector-Based Method for Low Uncertainty Spectral Irradiance and Radiance Responsivity Calibrations in the Infrared Using Tunable Lasers

Brian G. Alberding, John T. Woodward Iv, Ping-Shine Shaw, Leonard M. Hanssen, Catherine C. Cooksey, And Joseph P. Rice

https://doi.org/10.1364/AO.455412

The standard uncertainty of detector-based radiance and irradiance responsivity calibrations in the short-wave infrared (SWIR) traditionally has been limited to around 1 % or higher by the poor spatial uniformity of detectors used to transfer the scale from radiant power. Pyroelectric detectors offer a solution that avoids the spatial uniformity uncertainty, but also introduces additional complications due to alternating current (AC) measurement techniques. Herein, a new method for low uncertainty irradiance responsivity calibrations in the SWIR is presented. An absolute spectral irradiance responsivity scale was placed on two pyroelectric detectors (PED) at wavelengths, λ, from 500 nm to 3400 nm. The total combined uncertainty (k=1) was ≈ 0.28 % (> 1000 nm), 0.44 % (900 nm), and 0.36 % (≈ 950 nm and < 900 nm) for PED #1 and 0.34 % (> 1000 nm), 0.48 % (900 nm), and 0.42 % (≈ 950 nm and < 900 nm) for PED #2. This was done by utilizing a demodulation technique to digitally analyze the time-dependent, AC, waveforms, which obviates the use of lock-in amplifiers and avoids associated 20 additional uncertainty components.

NATIONAL RESEARCH COUNCIL OF CANADA

National Research Council Canada Conseil national de recherches Canada

RECENT PUBLICATIONS FROM NRC CANADA

Frequency Shift Method: A Technique for 3-D Shape Acquisition in the Presence of Strong Interreflections

Djupkep Dizeu, Frank Billy; Boisvert, Jonathan; Drouin, Marc-Antoine; Godin, Guy; Rivard, Maxime; Lamouche, Guy
DOI: https://doi.org/10.1109/TIM.2022.3181936

This article presents a structured light codification technique called frequency shift method which is especially designed for scenes containing strong interreflections. The method works by projecting multiple sine wave patterns having different frequencies. While the phase shift method associates a phase to each column of the projector, in the proposed codification, each column of the projector is uniquely encoded by the frequencies used and explicitly decoded using the discrete Fourier transform. This encoding allows the method to recover all the projector columns that contribute to a camera pixel's observed intensity. An energy minimization is then used to separate direct and indirect illuminations. Objects presenting diffuse and specular interreflections are considered, and our experimental results illustrate the efficiency of our method compared with previously proposed methods.

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Correspondence: On the State of Knowledge Concerning the Effects of Temporal Light Modulation

Veitch, Jennifer A.; Martinsons, Christophe; Coyne, Steve; Dam-Hansen, Carsten
DOI: https://doi.org/10.1177%2F1477153520959182

Temporal light modulation (TLM) is a change in the luminous quantity or spectral distribution of light with respect to time of either a light source or a lighting system. These changes arise because of the device or system design, including drivers and control gear, and because of fluctuations in the electrical supply. In former times, families of lighting products all exhibited the same (or approximately the same) TLM characteristics: For example, AC-powered incandescent lamps shared the property of TLM in a sinusoidal wave at twice the mains frequency and 4%–10% modulation depth. T8 fluorescent lighting systems with electronic ballasts operated with a dominant frequency between 20 kHz and 40 kHz and little modulation depth. Previously, knowing the lighting technology provided sufficient information about the TLM properties of a lighting system; today, this is impossible without measuring the system directly.

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EXPECTED ACGIH EYE EXPOSURE WHEN USING 222 nm CEILING MOUNTED SOURCES

Holger Claus, Ushio America Inc.

Abstract: In December 2021 ACGIH published new TLV for UVC radiation exposure (1; 2). The previous ACGIH versions contained one table for actinic exposure. The 2022 TLV book introduced two tables. Table 1 contains TLV (and relative spectral sensitivity) that are considered safe for eye exposure. Table 2 contains TLV that can be applied to the skin if the eyes are protected (aka eye exposure is below TLV of Table 1). The measurement and verification of the two TLVs is fundamentally different, which creates questions, but also certain challenges in modeling and predicting the related irradiance levels in existing lighting design programs. This article explains the process of evaluation according to ACGIH and provides a model to predict and calculate eye level irradiance and the related dose that shall be lower than the TLV.

Measurement of Eye and Skin Related Irradiance

The predominant application of 222 nm modules is in fixed ceiling mounted fixtures – pointing downward. This is also called whole room irradiation, and also sometimes referred to as DIBEL (Direct Irradiation Below Exposure Limits). Since the position and direction of the source is determined, and the radiant intensity distribution of the source is known, the irradiance and therefore dose can be planned and calculated in a specific application setting.

Skin Irradiation

The irradiation is measured or modeled as the horizontal irradiance, where a radiometer (or spectrometer) is pointed straight up, typically on axis with the source since this is the location where the highest irradiance values will be measured. In applications, the measurement height (also called assessment height) from the floor is one very important design parameter. Currently the assessment height is set at 2.1 m above the floor, which was originally chosen for upper air applications and is wrongly being applied to whole room (222 nm ceiling mount) applications. There are efforts to change it to a much more reasonable 1.8 m assessment height. The dose limit according to ACGIH at this height for a narrowband (filtered) 222 nm source is 479 mJ/cm^2 over an 8 hour period. It should be noted that this TLV value does not apply for unfiltered 222 nm lamps.

Eye Irradiation

Although the measurement concept has been used and applied to upper air GUV applications for years (3), it has typically not been used for whole room ceiling mounted fixtures. The main reason is/was, that the vertical irradiance (measured horizontally across the room) from a ceiling mounted fixture is much lower than the horizontal irradiance and was therefore not a concern. In addition, the typically applied IEC62471 does not require or describe an application specific assessment of eye hazards. The measurement is taken with a radiometer (or spectrometer) in horizontal direction. However, one very important modification to the radiometer detector is being done.

The acceptance angle (FOV- field of view) of the radiometer is limited to +-40 degrees (=80 degrees full angle) to duplicate the angular sensitivity of the eye in practical applications. That assumes that people are standing or sitting, and not looking upward for extended times. The introduction of new ACGIH limits for eye, which are 1/3 of those for skin (160 mJ/cm^2 for a narrow band filtered 222 nm source) raises the question if one should be concerned about exceeding these limits when designing an application based on skin TLV (and horizontal irradiance).

It should be noted that currently used lighting planning programs usually do not provide easy means to determine the vertical irradiance across a room, limited to a 80 degree FOV.

Simple Irradiance Model

The restriction of having a fixed 80 degree limiting acceptance angle for measurement provides a simple model and also provides guidance where to measure irradiances in a room later in relation to a downlight fixture.

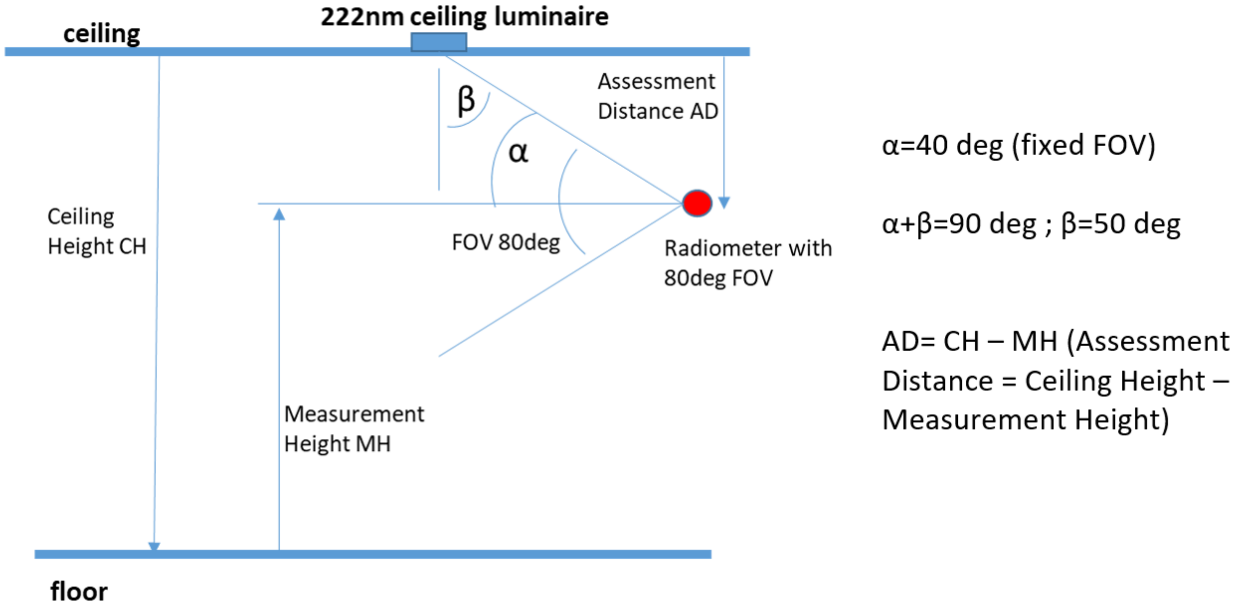

Figure 1. Model.

Eye (vertical) irradiance can be calculated:

$$E_e = \frac{I(\beta)}{R^2} * \cos(\alpha)$$

where:

$$R = \frac{AD}{\sin(\alpha)}$$

$$E_e = \frac{I(\beta)}{AD^2} \sin(a)^2 * \cos(a)$$

The horizontal (skin) irradiance is:

$$E_s = \frac{I(0deg)}{AD^2}$$

E_S is the horizontal irradiance below the fixture at the assessment distance. This is the value that will be used to determine the dose in an application, which has to be less than the TLV (for skin) Knowing (or measuring) the angle dependent radiant intensity distribution I(β) of the source, one can calculate the horizontal and vertical irradiance (at 40 degrees limiting angle). Since the maximal horizontal irradiance with typical sources and room arrangements will be right below the source, using the ratio of vertical irradiance at 40 degrees to the zero degree irradiance (straight down) allows further simplification and gives the ratio of vertical (eye) irradiation to maximum horizontal (skin) irradiation.

The angular distributions of two filtered Ushio Care222 modules have been measured. One module has an angular characteristic as shown in Fig. 2. The other module has an isotropic (lambertian) distribution as shown in Fig. 3, where the radiant intensity very closely follows cos(β).

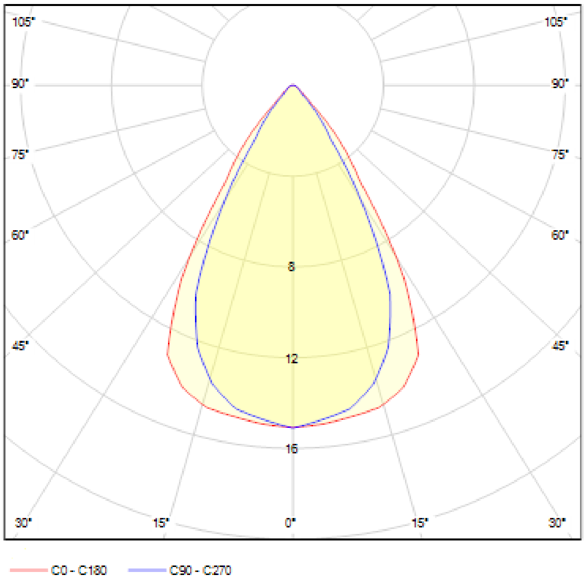

Figure 2. Non isotropic B1 module.

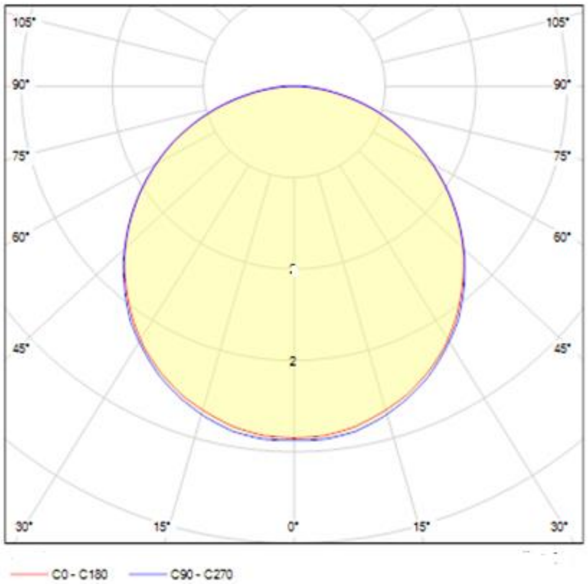

Figure 3. Isotropic module.

Since the angles are fixed at α=40 deg and β=50 deg, the following relative irradiance values at I(50 deg) vs. I(0 deg) beam angle can be used:

The ratios $\frac{I(50deg)}{I(0)}$ have been evaluated as follows:

Non isotropic module:	0.037823
isotropic module:	0.615183

The following formula calculates the ratio of vertical to maximal horizontal irradiance (aka eye to skin irradiance/dose):

$$Ratio = \frac{E_e}{E_s} = \frac{I(\beta)}{I(0)} \sin(a)^2 * \cos(a)$$

And gives fixed results for:

Non isotropic module:	**Ratio = 0.0119713**
isotropic module:	**Ratio = 0.19471225**

The ratio of eye vs. skin TLV according to ACGIH is 160/479=0.33.

The conclusion is that in an application where the dose levels at measurement height have been designed to be below the skin TLV, the eye level TLV at measurement height will not be exceeded. It must be emphasized that this only applies to fixtures that are not tilted and where the irradiance is highest below the fixture.

Whereas measurements of upper air GUV devices in rooms require typically to lay out a grid and require multiple measurements, measurements points of the vertical irradiance of filtered 222nm fixtures in application settings can be reduced to specific points in the room. The vertical irradiance measurements (with a 80 deg FOV attachment) should be taken at a distance of:

$$D = AD/\tan(40\ \text{deg}) = 1.19 * AD$$

For example, a fixture mounted on a 10 ft (3 m) ceiling at an measurement height of 7 ft (2.1 m) should be measured at 7 ft height at a distance of 3 ft*1.19=3.6 ft (1.1 m) to the center of the source. Since the sources have rotational symmetry, one measurement point per fixture will be sufficient.

Since typical reflections of wall paint at 222 nm are below 10% (4) and irradiance of walls in typically settings is minimized, reflection effects can be ignored.

It should be emphasized that the measurements must be taken in horizontal direction and the detector must not be pointed to the fixture.

Verification

Lighting simulations have been performed to verify the above calculations. The lighting design program Visual (Provider Acuity Brands) allows simulations of vertical irradiance with a 80 deg FOV. The simulations were performed with the isotropic module in a room of 10 x 10 x 10 ft where the module was placed at 10 ft height, in the center of the room and the assessment height was 7 ft.

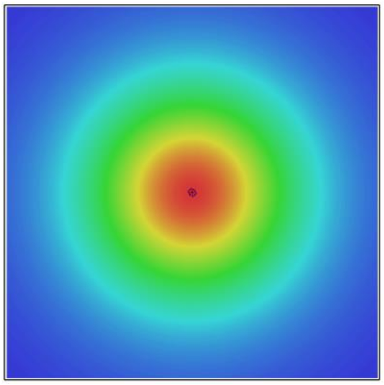

Figure 4. Horizontal irradiance distribution.

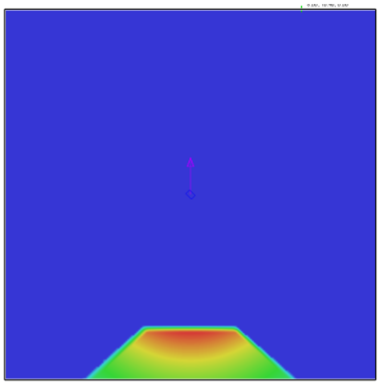

Figure 5 vertical irradiance distribution with 80 deg FOV.

	Calculated ratio	Simulated ratio	Simulated ratio with 25% wall reflectance
Isotropic module	**0.195**	0.158	0.162

As can be seen from the simulation results, the calculated ratio is a bit higher than the simulated. The reasons are not fully understood but may be related to the size of the module in the simulations, whereas a point source is assumed in the formula. Moreover the grid size that is being used to determine the maximum irradiation values in the simulation might have been too large for this purpose.

As can be seen, wall reflectivity in this scenario did not change the results in any significant way, even at high reflectance of 25%.

Nevertheless, the conclusion is that with the above mentioned filtered 222 nm modules, there is essentially no risk that eye level TLV will be exceeded if skin level doses are below ACGIH TLV.

Simulations of Tilting 222 nm Modules

In some applications it might be beneficial to tilt 222 nm modules in a room. The same simulation setup was used to determine the ratio of eye vs. skin dose for various tilting angles of the source.

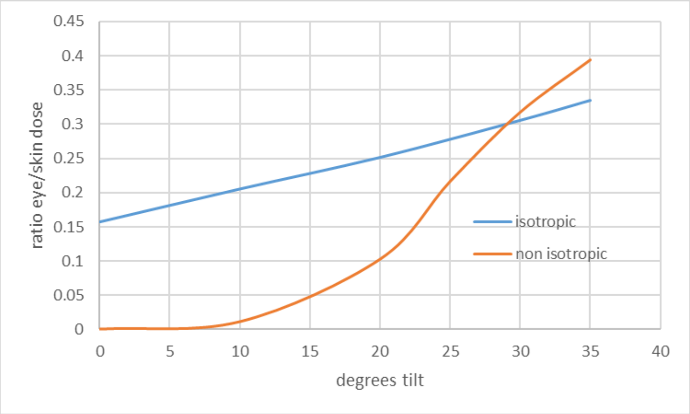

Figure 6. Eye/skin dose ratio depending on tilt angle.

Since the ACGIH TLV ratio is 0.33, the results indicate that eye dose levels will not be exceeded up to approximately 30 degrees tilting angle for both modules. It must be noted that the location of the maximum horizontal irradiance moves away from the center of the source, whereas the maximum of the 80 FOV vertical irradiance remains at approximately the same position.

Conclusion

Considerations of the eye level exposure with ceiling mounted 222 nm modules are an important part of design verification. The results indicate that under no reasonable scenario eye level TLV will be exceeded with a ceiling downward pointing filtered 222 nm source if the dose levels at assessment height are below the skin TLV.

Since the acceptance angle of the radiometer is fixed to 80 degrees FOV, the (horizontal) measurement distance, where the highest vertical irradiance is expected, can easily be calculated and is equal to $AD/\tan(40\text{ deg})$.

It must be noted that the simple model only applies to ceiling fixtures that radiate perpendicular to the ceiling.

If fixtures can be tilted, significantly higher eye exposures must be expected and more detailed design considerations need to be performed.

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2. Sliney, David H. and Stuck, Bruce E. 2021. A Need to Revise Human Exposure Limits for Ultraviolet UV-C Radiation. Photochem Photobiol, Vol. 97, pp. 485–492. ISSN: 0031-8655.
3. Milonova, Sonya, et al. 2016. Occupant UV Exposure Measurements for Upper-room Ultraviolet Germicidal Irradiation. J Photochem Photobiol B: Biology, Vol. 159, pp. 88–92. ISSN: 1011-1344.
4. Wengraitis, Stephen and Reed, Nicholas G. 2012. Ultraviolet Spectral Reflectance of Ceiling Tiles, and Implications for the Safe Use of Upper-Room Ultraviolet Germicidal Irradiation. Photochem Photobiol, Vol. 88, pp. 1480–1488. ISSN: 0031-8655.

UPCOMING IES MEETINGS CALENDAR

The Illuminating Engineering Society (IES) is sponsoring the following meetings and conferences in the coming months (specific details are subject to change during the ongoing pandemic):

IES Annual Conference
New Orleans, LA
August 18-20, 2022
https://www.ies.org/events/annual-conference/

IES Street and Area Lighting Conference
Dallas, TX
October 10-13
https://www.ies.org/events/street-area-lighting-conference/

LightFair
New York, NY
May 21-25, 2023
http://www.lightfair.com

NEWS FROM THE CIE

International Commission on Illumination
Commission Internationale de l'Eclairage
Internationale Beleuchtungskommission

Upcoming Events

8th Light Symposium 2022 - LS2022
Aalborg University, Copenhagen, Denmark
September 21-23, 2022

9th International Lighting Design Workshop - ILDW
Tsagkarada (Mount Pelion), Greece
September 26-30, 2022

CIE Expert Tutorial and Symposium on the Measurement of Temporal Light Modulation
National Technical University of Athens, Greece
October 10-11, 2022
https://cie.co.at/news/cie-expert-tutorial-and-symposium-measurement-temporal-light-modulation

CIE 2023 - 30th Quadrennial Session of the CIE
Ljubljana, Slovenia
September 15-23, 2023
https://cie.co.at/news/cie-2023-30th-quadrennial-session-cie

Other CIE News

CIE issued the following publications in 2022:

- CIE 250:2022, Spectroradiometric Measurement of Optical Radiation Sources
- CIE 249:2022, Visual Aspects of Time-Modulated Lighting Systems
- CIE 248:2022, CIE 2016 Colour Appearance Model for Colour Management Systems: CIECAM16
- CIE TN 013:2022, Terms Related to Planckian Radiation Temperature for Light Sources

Visit http://www.cie.co.at for additional information.

OTHER NEWS…

Online Professional Certificate Course in Lighting Design

September 8, 2022 – November 10, 2022

The Light and Health Research Center (LHRC) at Mount Sinai is offering a 10-week, online professional certificate course in lighting design. The course is designed to provide the knowledge and skills needed to help those in professions related to lighting to begin or improve their practice in lighting design. For more information please visit: https://icahn.mssm.edu/research/light-health/education/professional-certificate-lighting-design

Online Certificate Course in Light and Human Health

September 28, 2022 – November 16, 2022

The effect of light on human health and wellbeing is one of the most often discussed topics in lighting today, but also often one the least understood. With the COVID-19 pandemic, people have a heightened awareness of environmental factors that can positively, or negatively, affect their health. The Light and Health Research Center at Mount Sinai is offering an 8-week online certificate course on these concepts. For more information please visit: https://icahn.mssm.edu/research/light-health/education/online-certificate-light-and-human-health

Purpose of the Council for Optical Radiation Measurements (CORM)

The Council for Optical Radiation Measurements is a non-profit organization with the following aims:

1. To establish and publish consensus among interested parties on national, industrial and academic requirements for physical standards, calibration services, and inter-laboratory collaboration programs in the fields of optical radiation measurement, including measurement of the transmittance and reflectance properties of materials, measurement of radiant sources, and characterization of optical detectors used for the measurement of these properties.
2. To establish national consensus on the priorities for these requirements.
3. To maintain liaison with the National Institute of Standards and Technology (NIST) and The National Research Council Canada (NRC) and to advise the Institute(s) of requirements and priorities.
4. To cooperate with other organizations, both public and private, to accomplish these objectives for the direct and indirect benefit of the public at large.
5. To assure that information on existing or proposed standards, calibration services, collaboration programs, and its own activities is widely disseminated to interested parties.
6. To answer inquiries about such standards activities or to forward such inquiries to the appropriate agencies.

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Optical Radiation News (ORN) is published semi-annually each year. ORN reports upcoming technical meetings and news from NIST and other national metrology laboratories. News relating to the status and progress in optical radiation metrology from affiliated organizations, including, but not limited to, the *Commission International De Éclairage* (International Commission on Illumination, CIE), Inter-Society Color Council (ISCC), Lamp Testing Engineers Conference (LTEC), etc., is welcome. No commercial advertising, endorsements, or contributions with commercial content are included in ORN. Unsolicited contributions are subject to review and approval by the editor, CORM publications committee, and /or executive board prior to publication. Anonymous contributions will not be accepted. Contact information for a submission is required and will be published. ORN is included free with CORM membership.

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ORN is published in English. Deadlines for submission of News items and announcements concerning optical radiation metrology are 1 March and 1 September. Items may be submitted to the editor in via fax or e-mail attachments in plain ASCII text or common electronic word processing file formats, preferably Microsoft Word® or Corel WordPerfect®. Contributions should be in 12 point Times New Roman font with simple formatting, e.g., the “Normal” style and template in Word. *Use of complex style templates and formatting is strongly discouraged*. Submissions with high quality pertinent electronic graphics are welcome, however digital photographs and graphics will be reproduced in black-and-white or grayscale. Graphics included in hardcopy submissions via fax will not be reproduced. Submissions are credited to organizations, rather than individuals.

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