

Optical Radiation News

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(www.cormusa.org) to report items of interest in optical radiation
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CORM ANNOUNCEMENTS

CORM 2015 Annual Conference and Business Meeting Held

The University of Colorado-Boulder campus was the scene of CORM's 2015 Annual Conference and Business Meeting held on May 12-15, 2015. Following a networking welcome reception on Tuesday evening at the University Memorial Center, which provided a wonderful view of the City of Boulder and the surrounding Rocky Mountains, the technical sessions began in earnest on Wednesday, May 13 in the Engineering Center. After a welcome from CORM President James Leland and updates on the forthcoming CORM Eighth Report and CORM's committees, the initial session on Solid State Lighting featured presentations from the National Institute of Standards and Technologies (NIST), Rensselaer Polytechnic Institute's Lighting Research Center, Acuity Brands Lighting and OSRAM SYLVANIA. The next session on Wednesday included presentations on Advances in Radiometry from the National Research Council (NRC) of Canada, NIST and the University of Colorado.

Thursday's sessions began with a session on Uncertainty Analysis that included presentations from NIST, Rolf Bergman Consulting and Labsphere. A subsequent session on Optical Properties of Materials featured presentations from NIST, Surface Optics, the University of Colorado and LTI Optics. This year's conference also included a special session featuring students and recent alumni from the University of Colorado describing work on Photometry Applications at the University of Colorado.

Thursday evening, CORM met for the Grum Memorial Banquet and Lecture and heard from previous ORN editor and CORM president, Daryl Myers, who recently retired from the National Renewable Energy Laboratory. Daryl's keynote lecture, entitled "A Baby Boomer's Career in Optical Radiometry," was an entertaining and insightful look at how one person's career developed over nearly forty years.

Friday's closing sessions included an overview of content to be included in the CORM Eighth Report, which will serve as CORM's input to national metrology institutes like NIST, NRC Canada and the National Center for Metrology of Mexico (CENAM), followed by CORM's annual business meeting, and tours of photometric and radiometric laboratories at the University of Colorado and NIST.

Copies of the Program/Abstract Book and conference presentations can be downloaded from the CORM website at www.cormusa.org, under "Downloads."

CORM 2016 Annual Technical Conference

Preliminary Announcement and Call for Presentation Abstracts

May 16 - 18, 2016

The CORM 2016 Annual Technical Conference and Business Meeting will be held in Gaithersburg, MD – in cooperation with the National Institute of Standards and Technology (NIST). The conference themes include:

Solid State Lighting (SSL)
Optical Properties of Materials
Display Metrology
UV Radiometry
Current Research Activities at NIST, NRC & CENAM
*and a special session for **Emerging Professionals****.

The 2016 Annual CORM Technical Conference is structured to provide interaction between the optical radiation industry and National Metrology Institutes (NMI's) such as the National Institute of Standards and Technology (NIST), National Research Council (NRC) of Canada, and National Center for Metrology (CENAM) of Mexico.

**The Emerging Professionals session is open to students and professionals with less than 5 years' experience in the field of Optical Radiation Measurement, Measurement with Optical Radiation and other topics within the scope of CORM.*

Deadline for abstracts is February 22, 2016;
Presentation materials are due by April 18, 2016.
Please contact the conference coordinators for details.

Conference Coordinators

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NEWS FROM THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

New Facility for Optical Property Metrology of Materials at High Temperatures

TEMPS (Temperature and Emittance of Melts, Powders and Solids) is a new testbed facility under construction at NIST, through a collaboration of the NIST Physical Measurement Laboratory and the NIST Engineering Laboratory, to address a critical measurement problem in powder-based additive manufacturing. TEMPS is designed for the accurate measurement of material emittance, reflectance and true surface temperature and is aimed at the establishment of measurement traceability and best practices for non-contact thermometry in additive manufacturing. This will enable improvements in the reproducibility and control of manufacturing processes.

Knowledge of the optical properties of materials such as spectral emittance and reflectance is essential for non-contact thermometry, heat transfer modeling, and prediction of directed energy source coupling with targets (for example, in laser-based material processing and manufacturing). Even the common “emissivity-free” multi-spectral methods of radiation thermometry, which do require absolute knowledge of emittance, can greatly benefit from validation using well-characterized materials of interest along with accurate absolute temperature measurements of the surface. (Contacts: Sergey Mekhontsev snm@nist.gov, Leonard Hanssen hanssen@nist.gov, and Steven Grantham grantham@nist.gov.)

New PML Facility for the Calibration of Infrared Detectors

A new facility, called the NIST Infrared Spectral Comparator Facility (IR-SCF), has been developed for the calibration of infrared detectors. Once the quality system is completed, this capability, developed with funding from the Air Force, will be made available to customers through NIST Measurement Services. The IR-SCF facility extends present ultraviolet and visible calibration services, performed using UV-SCF and VIS-SCF, respectively, into the infrared to wavelengths



as long as 25 microns (micrometers). A wavelength of 25 microns corresponds to approximately 12 THz. The 25 micron limit is at the edge of the far-infrared region of the spectrum, defined as 25 microns to 300 microns by astronomers. This best in the world detector calibration capability is made possible by low-noise pyroelectric detectors that were specially developed for this application. The calibration service is expected to draw customers from DOD, NASA, detector

manufacturers, and calibration laboratories. [POC: George Eppeldauer, george.eppeldauer@nist.gov, x2338; Vyacheslav Podobedov, Vyacheslav.podobedov@nist.gov, x4253]

PML Staff Members Attend International Year of Light Celebration at the National Academies

The National Academies of Sciences, Engineering, and Medicine hosted a celebration of the *International Year of Light and Light-based Technologies* at their Washington, DC headquarters on Saturday, September 12th. Jerry Fraser and Charles Clark were in attendance from PML. Talks were presented by recent Nobel Laureates, Shuji Nakamura and Eric Betzig, the Manager of GE Lighting, Gerald Duffy, and the CEO of AIM Photonics, Michael Liehr. Two of the four talks highlighted the rapid advances being realized in solid-state lighting made possible by LEDs, and the potential use of LEDs as communications devices in a wide range of applications, including to advance the concept of smart cities [Note: The White House announced a Smart Cities Initiative on Monday, September 14, 2015. See <https://www.whitehouse.gov/the-press-office/2015/09/14/fact-sheet-administration-announces-new-%E2%80%9Csmart-cities%E2%80%9D-initiative-help>]

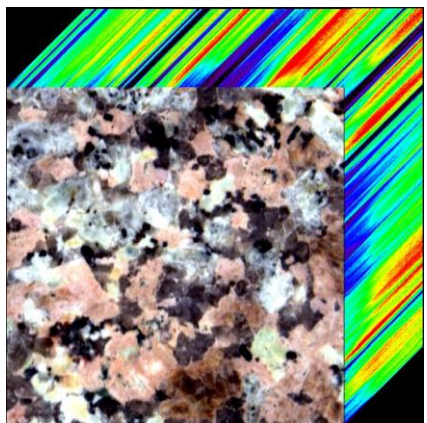
The PML has been a leader in developing the underlying measurement science and standards that have helped enable the rapid development and commercialization of solid state lighting products. [POC: Gerald Fraser, x3797, gerald.fraser@nist.gov]

PML Division Chief Presents at the Optical Society Incubator Meeting on Label-Free Optical Medical Imaging

The Optical Society (OSA) sponsored a workshop on *Label-free Optical Techniques for Biomedical Diagnostics & Imaging: Challenges and Opportunities for Clinical Translation* at their Washington, DC headquarters on September 17 and 18. The goal of the workshop “is to evaluate the main bottlenecks for clinical translation of label-free optical techniques including technological and regulatory challenges, to identify potential solutions and to develop prioritized list of recommendations.” Label-free optical imaging refers to the use of intrinsic optical properties of human tissue to assess patient disease status, rather than using dyes or other exogenous agents to improve the performance of the imaging system, for example, through contrast enhancement. The use of exogenous agents requires a more extensive and expensive approval process through the FDA due to the potentially increased risk to patient health from the use of dyes or other agents. Gerald Fraser, Chief of the PML Sensor Science Division, spoke on *Standards and Traceability in Label Free Imaging*. [POC: Gerald Fraser, x3797, gerald.fraser@nist.gov]

Sensor Science Division Sees Growing Interest in Standards for Hyperspectral Imaging

Growing interest in applying hyperspectral imaging to measurement problems in remote sensing, defense, and healthcare has led to increasing demand for standards to improve measurement quality. Hyperspectral imaging combines high spatial imaging and high spectral resolution spectroscopy to allow the acquisition of images in which a high-resolution spectrum has been recorded for each pixel of the scene. Image processing of such images allows chemical mapping of the scene, improved contrast for objects of interest, and identification of objects that are less than a pixel in size. Organizations seeking NIST help in this area include Blue Water



Satellite, Inc. which recently signed a Cooperative Research and Development Agreement (CRADA) to develop standards for use of hyperspectral remote sensing in environmental measurements; the United States Geological Survey (USGS), which has signed an interagency agreement with NIST/PML to collaborate on addressing hyperspectral imaging calibration and standards needs; and the Night Vision and Electronic Sensors Directorate of the Department of Defense, which is seeking NIST help in hyperspectral imaging sensor calibration. The NIST contributions to these efforts leverage PML expertise in hyperspectral imaging obtained from projects in satellite sensor calibration and optical medical

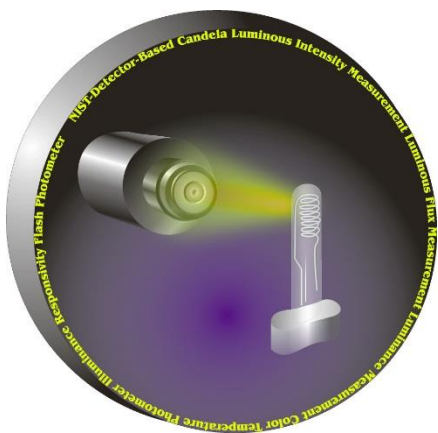
imaging standards. [POC: David Allen, david.allen@nist.gov; x3680]

Society of Automotive Engineers Seeks PML Expertise on Solid State Lighting Measurements for Automotive Applications

Sensor Science Division staff members have been asked to participate in the Society of Automotive Engineers (SAE) Lighting Committee Standards Development Meeting to be held September 14 - 17, 2015. Solid-state lighting applications are expanding beyond general-purpose lighting to include automotive applications. The SAE asked PML experts to participate in a forum at their meeting on “Testing: Interpretation and analysis of results” to provide feedback on their planning in this area. [POC: Cameron Miller, c.miller@nist.gov, x4713]

11th NIST Photometry Short Course Sold Out

The 11th NIST Photometry Short Course, held September 22 - 25, 2015 continued the tradition of meeting its full attendance limit, as all 11 short courses have been sold out over the last 15 years. The NIST Photometry Short Course is now offered by the Sensor Science Division every two years and covers fundamentals in photometry, radiometry, and colorimetry, and practical aspects of measurements of luminous flux, luminous intensity, illuminance, luminance, color temperature, and chromaticity of light sources. The course is continually updated by the Division and currently provides experimental and theoretical training in state-of-the-art photometric measurement of solid state lighting sources. The course is intended for photometry engineers and technicians involved in the lighting, photography, avionics, and transportation industries; calibration and testing laboratories (including other National Metrology Institutes); and instrument manufacturers. [POC: Cameron Miller, c.miller@nist.gov, x4713]



PML Solid-State Lighting Expert Invited to Present at Meeting of Agricultural and Biological Engineers

Solid-state lighting products based on light-emitting diodes (LEDs) are rapidly dropping in price and increasing in quality opening up new applications beyond general purpose lighting, including in horticulture and agriculture. As noted in LEDs Magazine, “LED horticultural

lighting is a fast-growing market, yet there are uncertainties as to how LED lighting products should be measured, compared, and qualified in regard to energy savings, performance, and safety.” In recognizing the potential for solid-state lighting in horticultural and agricultural lighting and the need for new measurement science and standards to achieve this potential the American Society of Agricultural and Biological Engineers (ASABE) invited PML Scientist Yuqin Zong to provide a presentation on “Optical metrology of LED radiation sources for horticultural applications” and participate in a panel discussion on this subject within the Committee for Plant Growth LED Lighting (ES-311) in New Orleans on July 30, 2015. Solid-state/LED lighting allows the spectrum of the light source to be tuned to the specific plants being grown, reducing energy costs for greenhouses dependent on artificial lighting, such as high-rise greenhouses, or that desire light exposure both day and night. [POC: Yuqin Zong, yuqin.zong@nist.gov, x2332; Cameron Miller, c.miller@nist.gov, x4713]

PML Hosts Workshop with NOAA and NASA on Satellite Sensor Calibration

The Sensor Science Division hosted NOAA and NASA personnel to a one-day informal workshop at NIST to review the present state-of-the-art in measurement science and standards for the calibration and characterization of optical instruments used in satellite remote sensing. More than 45 people attended the workshop. The workshop consisted of morning presentations by NIST and NOAA personnel and afternoon laboratory tours. Presentations were provided on the NIST hyperspectral image projector, on a NIST proposal to establish lunar and solar Observatory at the NOAA Mauna Loa Observatory, on the use of LED-based ground targets for the calibration of the day-night band of the Visible-Infrared Imaging and Radiometry Suite (VIIRS) satellite sensor, on the characterization of the degradation of solar diffusers due to radiation and high-energy particle exposure, and on preparations being made to validate measurements made by the soon to be launched GOES-R Geostationary Orbiting Environmental Satellite system. [POC: Jerry Fraser, x3797, gerald.fraser@nist.gov]

PML Physicists Joe Rice and Eric Shirley Share the NASA Langley Reid Best Paper Award with CLARREO Team Members

Sensor Science Division Physicists Joe Rice and Eric Shirley shared in the NASA Langley Reid Best Paper Award for co-authorship of a paper titled, “Achieving Climate Change Absolute Accuracy in Orbit,” published in the *Bulletin of the American Meteorological Society* (BAMS) in October, 2013. “The Reid Award annually recognizes the best scientific or technical paper. Once a year the Langley Science Council judges papers submitted for the Award based on judges scores for Importance of the Problem, Significance of the Contribution, Originality of the Concept, and Quality of the Reporting.” The paper had previously been recognized with the Lawrence Award for best earth science paper at NASA Langley for the year. The award-winning paper highlights the measurements to be performed by the proposed Climate Absolute Radiance and Refractivity Observatory (CLARREO) mission. The paper notes that CLARREO “will provide a calibration laboratory in orbit for the purpose of accurately measuring and attributing climate change. CLARREO measurements establish new climate change benchmarks with high absolute radiometric accuracy and high statistical confidence across a wide range of essential climate variables. CLARREO's inherently high absolute accuracy will be verified and traceable on orbit to Système Internationale (SI) units....The mission has the ability to provide new spectral fingerprints of climate change, as well as to provide the first orbiting radiometer with accuracy sufficient to serve as the reference transfer standard for other space sensors, in essence serving as a “NIST [National Institute of Standards and Technology] in orbit.”

CLARREO will greatly improve the accuracy and relevance of a wide range of space-borne instruments for decadal climate change. Finally, CLARREO has developed new metrics and methods for determining the accuracy requirements of climate observations for a wide range of climate variables and uncertainty sources. These methods should be useful for improving our understanding of observing requirements for most climate change observations.”

Wide-Field-of-View Fisheye Camera Advances the Application of Integrating Spheres in Photometry & Radiometry

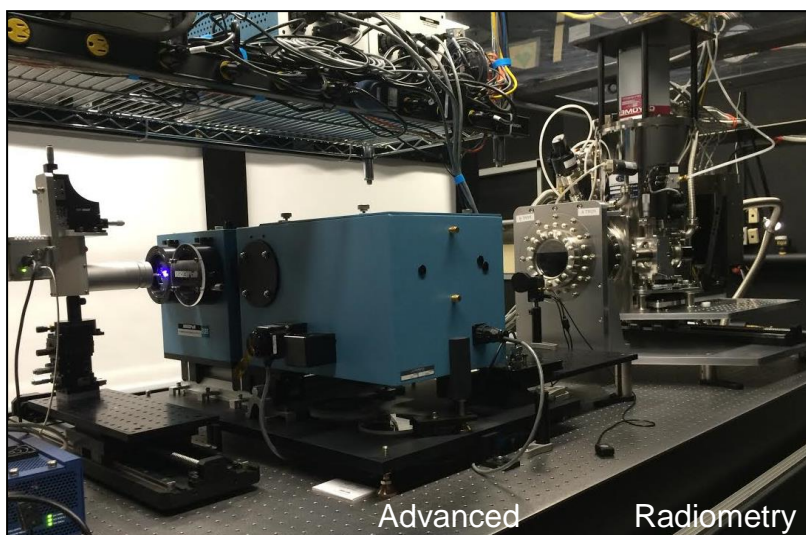
Integrating spheres are widely used in radiometry and photometry to make optical radiation measurements. Integrating spheres are hollow spheres that are coated on the inside with a highly reflective, highly scattering material such as barium sulfate, and have one or more apertures for coupling light into or out of the sphere. A properly designed integrating sphere when illuminated by the light from a lamp or a laser will provide a spatially uniform source of light at its exit apertures due to the many reflections that the light undergoes before it exits the sphere.

This uniform source of light can be used to calibrate radiometers and photometers. By installing an inward-looking, wide-field-of-view fisheye camera into the wall of the sphere, Zong demonstrated a new approach to measure the non-uniformity of the integrating sphere, an often dominant source of uncertainty for many optical radiation measurements. He also demonstrated a new approach to measure the absolute angular intensity distribution of the light source, an important measurement in photometry, particularly for solid-state lighting components. [POC: Yuqin Zong, yuqin.zong@nist.gov, x2332]

NRC LIAISON REPORT

NRC's New Advanced Radiometry Facility: Update

In the spring of 2014, NRC started work on developing an updated, higher-performance absolute radiometry facility. This new facility will take over as NRC's primary realization of optical radiant power, which is the SI traceability for standards in photometry, radiometry and associated NRC measurement services. NRC's first monochromator-based cryogenic radiometer facility was established in the early 1990s. Now, two decades later, the cryogenic radiometer in this original facility is at the end of its service life and is being replaced. Continuing with the monochromator-based calibration of transfer standard detectors, NRC's new advanced radiometry facility incorporates a state-of-the-art cryogenic radiometer, leading-edge broadband light sources and customized apparatus allowing for increased measurement capability and improved measurement uncertainty. After the completion of equipment and software integration, the degree of equivalence between the new and existing NRC optical power scales will be established (spring of 2016).



For further information, contact: Angela Gamouras, 613- 993-2489 (angela.gamouras@nrc-cnrc.gc.ca)

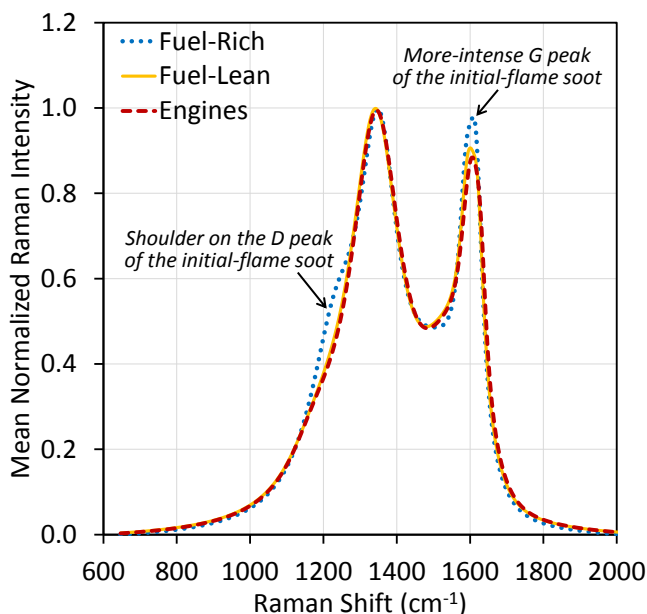
Raman Spectroscopic Characterization of Black Carbon

Black Carbon (BC) is another term for the nanoscale carbonaceous particles emitted from combustion process and often referred to as soot. BC poses significant health and environmental concerns for every Canadian. Transportation is considered the largest anthropogenic sources of black Carbon in Canada, and this includes emissions from aviation aircraft. The optical instruments that are commonly used to measure BC mass concentration have a strong dependence on the optical properties of the BC particles. To ensure reliable measurement of BC mass concentration from these optical instruments, it is essential that the BC used for instrument calibration has the same optical properties as the BC emitted from the aviation engines.

Raman spectroscopy has been applied extensively to study of many different allotropes of carbon nanostructures such as graphite, graphene, carbon nanotubes and fullerene compounds. Raman spectra from carbon materials provide extraordinary insight into the nanostructures, molecular bonding, morphology, ranges of order and crystallinity of the materials. Recently, we have applied Raman spectroscopy to study BC nanoparticles produced from a laboratory BC generator and those from different gas-turbine engines. Our preliminary results found that the laboratory flame generated soot nanoparticles showed a very distinctive shoulder on the D-band (defect-band) compared to the spectral signature of the gas-turbine generated nanoparticles. (See spectra below) This study allows us to tweak the flame condition in our laboratory BC-generator to produce BC particles that bear more resemblance to the aviation engine emission.

The project is contributing to a multi-partner effort to develop a new civil aviation aircraft engine emission certification standard proposed by the United Nation's international Civil Aviation Organization (ICAO). This project involves external partners from Transport Canada, Rolls-Royce and Empa (Swiss Federal Lab for Materials Science).

For further information, contact: Li-Lin Tay, 613-993-3919 (lilin.tay@nrc-cnrc.gc.ca), Meghdad Saffaripour (meghdad.saffaripour@nrc-cnrc.gc.ca) or NRC program managers: Kevin Thomson (kevin.thomson@nrc-cnrc.gc.ca) and Greg Smallwood (greg.smallwood@nrc-cnrc.gc.ca).



10th Biennial Joint CNC/CIE and CIE/USA Technical Conference, 18-20 October 2015: Summary

The Canadian and US National Committees of the CIE (CNC/CIE and CIE/USA) held their 10th biennial joint meeting on 18-20 October 2015 at the University of Toronto in Toronto, ON. This included not only the traditional Technical Day and Business meetings, but also special events in celebration of the International Year of Light (IYL) 2015. The Technical Day on October 19th started with a conference, Co-Chaired by Joanne Zwinkels (NRC) and Cameron Miller (NIST). The conference featured 14 oral presentations and 9 poster presentations by leading North American researchers and practitioners in the science and art of light and lighting, as well as young professionals entering this field. This session also included a presentation by the recipient

of the CNC/CIE IYL Student Paper award, who reported on his independent science study in Grade 9 on “*Dimming Light Bulbs Saves Energy, but Light Quality May Suffer*”. In the evening, a public lecture was given by Professor George Brainard of Jefferson Medical College on “*Celebrating the International Year of Light: The power to influence human health*”. The Technical Day by all accounts was highly successful with the conference having more than 65 participants and the public lecture more than 90 attendees. The Business Day on October 20th started with a joint morning session to share information about the seven CIE Divisions and Reports from the CIE quadrennial meetings in Manchester, UK in July 2015. This was followed by the separate CNC/CIE and CIE/USA business meetings.



The technical conference was held in the beautiful Faculty club of the University of Toronto. First paper of the morning session was given by Dr. Mark Fairchild (Munsell Color Science Laboratory, RIT).



Other meeting highlights included an evening public lecture by Professor Brainard, poster presentations and CNC/CIE IYL student paper award presented to Varun Venkataranum by the CNC/CIE Vice-President (Jennifer Veitch, NRC) and President (Venkat Venkataranum, University of Toronto).

10th Biennial Joint CNC/CIE and CIE/USA Technical Conference: Presentations Available

The complete program for the Technical Conference, with the abstracts of all the papers and posters are available at: http://en.cnc-cie.ca/images/Programme%20with%20abstracts_CNC-

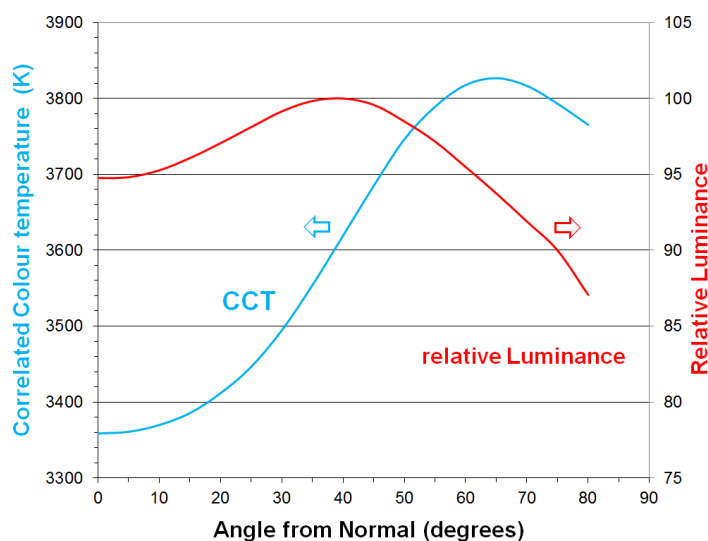
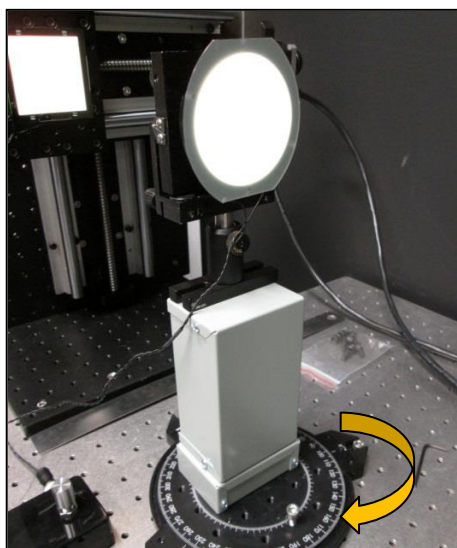
[USNC 2015.pdf](#). Many of the presentations (both papers and posters) that were given at the Technical Session, and additional reading material, are also available at the CNC/CIE web-site, or at the following link:

http://en.cnc-cie.ca/index.php?option=com_content&view=article&id=55&Itemid=9.

For further information, contact: Joanne Zwinkels (613) 993-9363 (joanne.zwinkels@nrc-cnrc.gc.ca)

NRC Solid-State-Lighting Measurement Lab

The NRC Measurement Science and Standards (MSS) portfolio has continued the development of measurement facilities to provide accurate, SI-traceable, photometric and radiometric measurements of solid state lighting (SSL) devices, in response to the increased scientific and commercial requirements for accurate SSL component measurement. This includes the measurement of both calibration standards and modules used in commercial lighting products. We have recently performed some goniometric and position dependent measurements of commercial OLED samples. As an example, we found that the correlated colour temperature (CCT) of one sample varied from approximately 3350 K on emission normal to the surface, to 3825 K for the emission at 60° from normal (see figure). The luminance of the same sample varied almost 15% in rotation from normal to 80°. The peak values in the CCT and the luminance are not at the same angular emission angles—65° for the CCT and 40° for the luminance.



For further information contact: Arnold Gaertner (613) 993-9344 (arnold.gaertner@nrc-cnrc.gc.ca)



UPCOMING IES MEETINGS CALENDAR

The IES is sponsoring the following meetings and conferences in 2016:



Hotel: Gaithersburg (MD) Hilton
Program Venues: Hilton Hotel and NIST

The IES Research Symposium, LIGHT + COLOR, is a must-attend event. This symposium (April 3-5, 2016 in the Washington, DC area) will feature outstanding speakers from research and application perspectives, visits to the NIST color tuning laboratory, demonstrations, poster papers, and plenty of time for networking. Program information is posted to www.ies.org/symposium. Registration for this event is currently open.

Additional Events:

2016 IES Street and Area Lighting Conference
September 18-21, 2016
Loews Hollywood Hotel
Hollywood, CA

2016 IES Annual Conference
October 23-25, 2016
Hyatt Regency Grand Cypress Hotel
Orlando, FL

Visit http://www.ies.org/programs/meetings_calendar.cfm for more detail about these and other upcoming events.

NEWS FROM THE CIE



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

Upcoming Events

CIE Lighting Quality & Energy Efficiency Conference

March 3 to 5, 2016

Melbourne, Australia

Followed by Divisions 2, 4 & 5 Annual Meetings, March 7 to 9, 2016.

CIE Tutorial and CIE 4th Symposium on Colour and Visual Appearance

September 5 to 7, 2016

Prague, Czech Republic

Followed by the Division 1 Technical Committee Meetings on September 8, 2016 and annual meeting on September 9, 2016.

Visit <http://www.cie.co.at/index.php/Events/Future+CIE+Events> for more information.

New Publications

Fundamental Chromaticity Diagram with Physiological Axes – Part 2: Spectral Luminous Efficiency Functions and Chromaticity Diagrams

The CIE has published report 170-2:2015, authored by Technical Committee TC 1-36 with the following Terms of Reference: "Establish a fundamental chromaticity diagram of which the coordinates correspond to physiologically significant axes".

This report aims at providing the user with practical colorimetric tools, in the form of chromaticity diagrams. The publication is written in English, with a short summary in French and German. It consists of 72 pages with 11 figures and 8 tables and is readily available at the National Committees of the CIE or via the CIE Webshop (<http://www.techstreet.com/cgi-bin/joint.cgi/cie>).

Report on the First International Workshop on Circadian and Neurophysiological Photometry, 2013

This Technical Note (CIE TN 003:2015) deals with the role of the eye in processing light information and the measurement of the eye's light exposure, with particular emphasis on the physiological or photobiological effects whose distinction from visual perception has become widely recognized since the discovery of melanopsin in human retinal ganglion cells. The Technical Note summarizes the proceedings and consensus of The 1st International Workshop on Circadian and Neurophysiological Photometry ("IWCNP 2013", the "Workshop") and aims to provide an interpretation for governments, the lighting community and professionals working in public health, and to highlight the importance of scientific advances and the growing evidence base in this area.

The Proceedings of the 28th Session of the CIE (CIE 216:2015) comprise two volumes. Volume 1, subdivided into two parts, contains on 2124 pages the texts of the invited papers, contributed papers and posters presented at the Session as well as the introductions to the workshops and seminars. Volume is available at the National Committees of the CIE or via the CIE Webshop (<http://www.techstreet.com/cgi-bin/joint.cgi/cie>). Volume 2 contains official reports of the administrative and technical meetings of the Session, thus presenting an overview on the technical work in CIE achieved during the Quadrennium.

LRC Study on Emergency Visual Alarms Published

Flashing visual alarms are a critical element of emergency notification systems in buildings. They help ensure that individuals with hearing loss or in otherwise noisy environments are aware of emergencies and other situations requiring their attention. Based on experimental results, LRC researchers devised a new metric from their experimental results, which they named the indirect effectiveness quantity (IEQ). The IEQ is a modification of effective intensity based on indirect viewing conditions in lighted building spaces. Importantly, two lights with the same IEQ value produced equal detectability, regardless of their flash durations. The study, "Indirect Detection of Visual Signals for Emergency Notification," has been published in the journal *Fire Technology*, and is available online (<http://dx.doi.org/10.1007/s10694-015-0488-8>).

Measurement Procedure for Quantifying Perceptible Flicker Proposed in LRC's ASSIST Recommends Publication

The Alliance for Solid-State Illumination Systems and Technologies (ASSIST), a program of the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute, has released a publication that proposes a new method of evaluating human perception of directly observed light source flicker. The publication, ASSIST recommends...Recommended Metric for Assessing the Direct Perception of Light Source Flicker, provides specific measurement procedures and calculations to objectively determine whether the amount of flicker from a light source is above or below the threshold of human perception. The metric is applicable to any waveform shape and frequency and is based on peer-reviewed laboratory and human factors experiments. The ASSIST recommends publication is available for free from the ASSIST website at <http://www.lrc.rpi.edu/programs/solidstate/assist/recommends/flicker.asp>. To further show the metric calculation procedure, also included for download are several waveform examples that can be used with the sample Matlab code included in the publication's appendices. Also available online are two previous flicker publications from ASSIST dealing with the perception of indirect flicker, also known as stroboscopic effects.

LRC Study Shows Uniform Lighting in Parking Lots Provides Better Sense of Security, 75% Energy Savings

A newly published study from the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute shows that improving the uniformity of lighting in parking lots can increase the sense of safety and security, as well as provide up to an additional 75% energy savings by lowering total light levels. The study, "Energy and user acceptability benefits from improved illuminance uniformity of parking lot illumination," now in press with *Lighting Research and Technology* journal, describes a field demonstration, human factors study, and systems analysis that tested the relationship between illuminance, uniformity, and user acceptance in parking lots, and calculated the advantage that LED luminaires offer at producing more uniform beam patterns compared with high-intensity discharge (HID) luminaires. For more details about the parking lot lighting study, visit <http://www.lrc.rpi.edu/programs/solidstate/parkingLotUniformity.asp>.

LRC Launches Interactive Lighting Design Website to Support Health and Wellbeing of Older Adults

A team of researchers at the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute have created a portfolio of lighting patterns, available via interactive website, to help lighting and healthcare professionals to select and place luminaires to support circadian health and wellbeing, while supporting the vision and orientation needs of older adults. The patterns are based upon the 24-hour lighting scheme for older adults proposed by LRC Professor Mariana Figueiro in 2008, which recommends cycled electric lighting with cool, high light levels for high circadian stimulation during the daytime, and warm, low light levels for reduced circadian stimulation in the evening, along with good lighting for visibility, and nightlights to provide horizontal/vertical cues to improve postural control and stability. The new website—Lighting Patterns for Healthy Buildings—is designed in the spirit of traditional architectural pattern books, presenting model designs for typical rooms that can be adapted to specific buildings and styles. It can be found online at: <http://lightingpatternsforhealthybuildings.org>.

Summer Interns Investigate Solid-State Lighting Issues

This summer, five undergraduate students spent eight weeks at the Lighting Research Center learning about solid-state lighting technologies and investigating technology and application issues in LED and OLED lighting. The LRC's summer undergraduate research internship, sponsored by the Alliance for Solid-State Illumination Systems and Technologies (ASSIST), provides an opportunity for engineering, architecture, and science students from universities around the country to learn from the LRC's lighting experts about a career path that most might never have thought of: solid-state lighting research. For more information about the research internship, visit: <http://www.lrc.rpi.edu/education/SSLInternship>.

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.

Optical Radiation News Editorial Policy

Optical Radiation News (ORN) is published semi-annually in the April and October of 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 Eclairage* (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.

Instructions for Contributing Authors

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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The Council for Optical Radiation Measurements (CORM) does not permit commercial activities in conjunction with technical sessions of CORM conferences and CORM workshops. Commercial activities include, but are not limited to, product exhibition and dissemination or display of advertising in any format. Speakers at CORM conferences and workshops may not use talks for overt commercialization of products. Commercial activities as defined above are permitted for a fee for defined periods prior to social activities associated with the conference or workshop at the discretion of the CORM Board of Directors. Registration requirements, details of the structure of the allowed activities and fees are (event and site) specific.



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