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, Lighting Research Center, Rensselaer Polytechnic Institute, 21 Union St., Troy, NY 12180. Tel: 518-687-7100 Fax: 518-687-7120 e-mail: bulloj@rpi.edu.

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CORM ANNOUNCEMENTS

CORM 2014 Annual Conference and Business Meeting Held

On May 21-23, 2014, CORM held its annual conference and business meeting at the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland. The emphasis of the conference was on solid state lighting, spectrophotometry, uncertainty analysis for lighting measurements and a technical survey from the U.S. National Committee of the Commission Internationale de l'Éclairage (CIE). The Franc Grum Memorial Lecture was given by Scott Rosenfeld, Lighting Designer at the Smithsonian Institute, who presented "A Pleasure to See: The Art and Science of Lighting Art Museums."

Selected presentations from the 2014 CORM conference can be downloaded online at: http://www.cormusa.org/2014_Presentations.html.

CORM 2015 Annual Technical Conference

Preliminary Announcement and Call for Presentation Abstracts

May 12 - 15, 2015

The CORM 2015 Annual Technical Conference and Business Meeting will be held in Boulder, CO – in cooperation with the University of Colorado, Boulder. The tentative conference themes include **Solid State Lighting (SSL)**, **Uncertainty Analysis for Lighting Measurement**, **Advances in Radiometry**, **Optical Properties of Materials**, and a special **Student Session**.

The 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.

Preliminary Schedule

Tuesday, May 12	PM: Evening Reception
Wednesday, May 13	AM: CORM Technical Committee Meetings PM: Technical Sessions
Thursday, May 14	AM: Technical Sessions PM: Technical Sessions Franc Grum Memorial Lecture and Banquet
Friday, May 15	AM: Technical Sessions CORM Business Meeting PM: Facility Tour, UC Boulder

The conference fee of $495 include one banquet ticket for Thursday evening. Additional tickets will be available for $65. Online registration information will be available shortly through www.cormusa.org.

Deadline for abstracts is March 17, 2015. Please contact the conference coordinators for details.

Conference Coordinators

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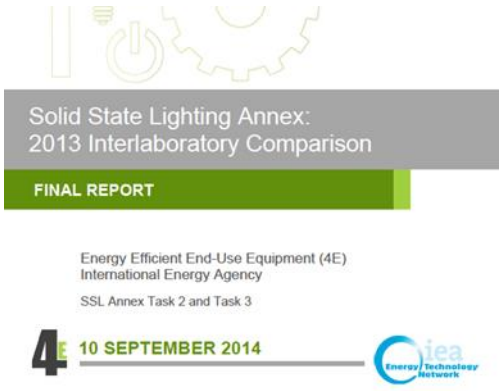
NEWS FROM THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Final Report on IEA 4E SSL Annex IC 2013 Interlaboratory Comparison Published

NIST led the Interlaboratory Comparison (IC 2013) for the measurement of solid state lighting (SSL) products as a project under International Energy Agency (IEA) 4E SSL Annex Task 2 (SSL Testing, Y. Ohno leader) and Task 3 (K. Nara, leader). 54 laboratories from 18 countries participated in this comparison for measurements of photometric, colorimetric, and electrical quantities of several different types of LED lamps and some luminaires. Measurements were conducted between October 2012 and August 2013, run by four nucleus laboratories covering different regions of the world – VSL, Netherlands (Europe), NLTC (National Lighting Test Center), China (Asia, Australia), NMIJ, Japan (Japan), and NIST (Americas and the organizer for IC 2013). In addition, measurement data of 35 laboratories from the SSL proficiency testing in the National Voluntary Laboratory Accreditation Program (NVLAP) and the NIST Measurement Assurance Program are linked to IC 2013. Further, data from 21 laboratories from the Asia Pacific Laboratory Accreditation Cooperation (APLAC) proficiency test T088, are also linked to IC 2013, making it a comparison of test results from 110 laboratories and 123 sets of data. Measurements of luminous flux, luminous efficacy, active power, RMS current, power factor, chromaticity *x*, *y*, correlated colour temperature, and colour rendering index were compared; thus a tremendous amount of data was analysed. IC 2013 was also designed so that the results can be recognised as proficiency testing for SSL testing laboratory accreditation programmes worldwide. The final report of the comparison, 77 pages with 91 figures, has been published at http://ssl.iea-4e.org. The report provides all the results of the differences of participants' results from the reference values as well as z' scores (defined in ISO 13528) and E_n numbers (defined in ISO 13528 and ISO/IEC 17043), and discussions on several findings observed from the results. (Contact: Yoshi Ohno)



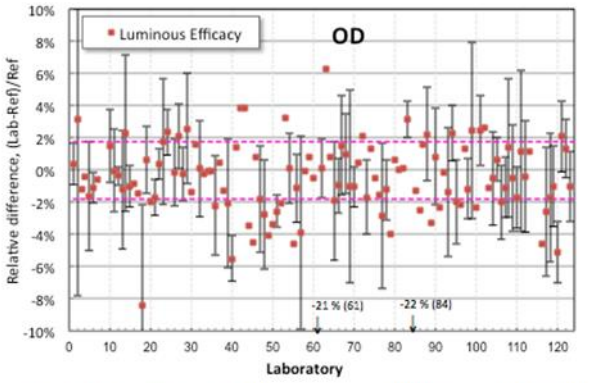
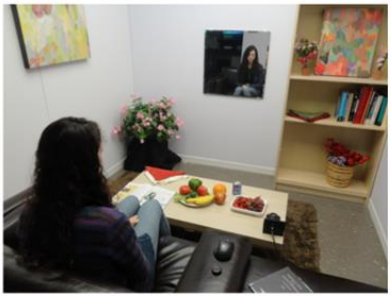


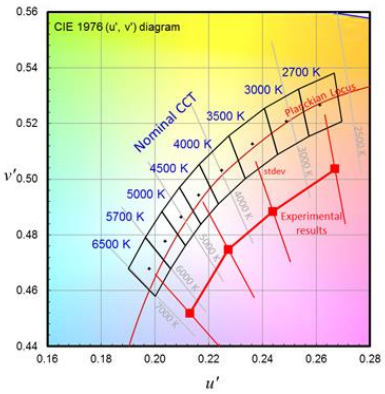
Figure 9-8. Relative differences of luminous efficacy for omnidirectional LED lamp (OD)

Vision Experiment on Acceptable and Preferred White Light Chromaticity for Lighting

Standards on white light chromaticity of fluorescent lamps (e.g., ANSI C78.376) have been used for more than three decades, and a standard for chromaticity specification for solid state lighting products (ANSI C78.377) is also available. In these standards, the center points of the

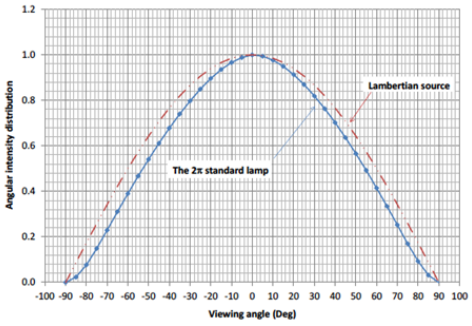
chromaticity ranges are around the Planckian locus. Thus, most of the light sources for general lighting have been designed to have such white points around the Planckian locus. These standards, however, have not been based on human vision perception data. Anecdotally, lights with chromaticities below the Planckian locus are expected to provide more preferred lighting for interiors. This question is often asked as various LED lighting products are designed and developed. To clarify this question, a series of vision experiments have been conducted at NIST using our Spectrally Tunable Lighting Facility. The experiments were conducted with 18 subjects on their response to various levels of Duv [distance from the Planckian locus in the CIE 1960 (u, v) diagram]. Experiments were made on 6 Duv points (-0.03, -0.02, -0.01, 0, 0.01, 0.02) at four correlated color temperatures (2700 K, 3500 K, 4500 K and 6500 K). There was a one-minute adaptation time at each point. The results show that a Duv of around -0.015 (below the Planckian locus) on average is perceived as the most natural. This Duv level is outside the ranges specified by existing standards. This indicates that new lighting products having more preferred chromaticity than current products may be possible. Details have been published: Y. Ohno, M. Fein, "Vision Experiment on Acceptable and Preferred White Light Chromaticity for Lighting," CIE x039:2014, pp. 192-199. (Contact: Yoshi Ohno)





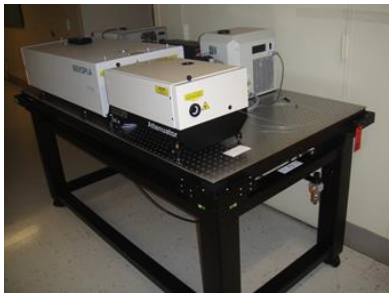
2π Total Spectral Radiant Flux (TSRF) Standard Lamp from 360 nm to 1100 nm

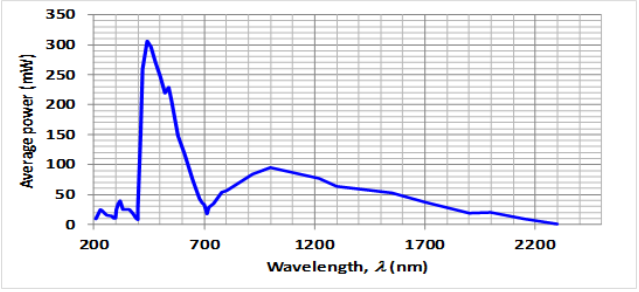
NIST has developed a 2π total spectral radiant flux (TSRF) standard lamp, based on a reflector-type tungsten halogen lamp (photo below), in the spectral range from 360 nm to 1100 nm. The 2π standard lamp has a near Lambertian beam pattern and is used to calibrate sphere-spectroradiometer systems in 2π geometry as described in IES LM-79 and LM-85. Relative expanded uncertainties (k=2) of the 2π standard lamp are between 1.3% (in the visible region) and 2.9 % (in the ultraviolet region), which are similar to those of the 4π TSRF transfer standard developed in 2006. The details have been published: Y. Zong and H. Shen, "Development of Total Spectral Radiant Flux Standards at NIST," CIE x039:2014, pp. 421-426. Calibrated 2π standard lamps will be available in the NIST calibration service from early 2015. (Contact: Yuqin Zong)



Applications of Pulsed OPO Tuneable Laser Systems for Optical Radiometry

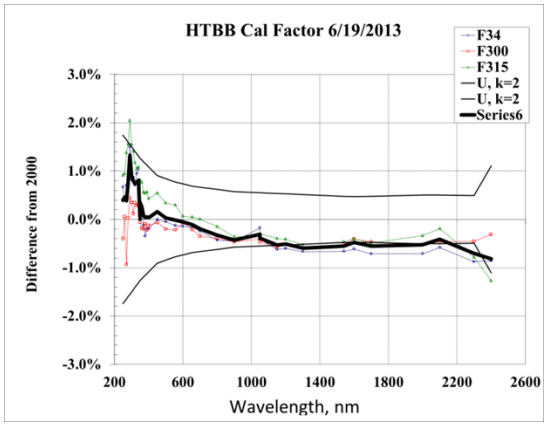
Newly developed kHz tuneable optical parametric oscillator (OPO) laser systems are new and valuable tools for optical radiometry. Such OPO laser systems are typically automated with wide tuneable spectral ranges (210 nm to 2200 nm) and are relatively low-cost compared to continuous wave (CW) tuneable lasers. Different from CW tuneable lasers, output power of a kHz OPO laser system fluctuates on the order of 10%, and it is difficult to stabilize an OPO laser system using a laser power controller commonly used in CW laser systems. Furthermore, the duty-cycle of a kHz OPO is very low ($\approx 10^{-5}$) which makes measurement of the laser power difficult using conventional trans-impedance amplifiers. However, these difficulties associated with the application of kHz OPO lasers in optical radiometry have been overcome by changing the measurement mode from the conventional optical power mode to an optical energy mode. We developed a method in 2011 for calibration of spectral responsivity of broadband detectors with an expanded uncertainty of 0.05% (k = 2) using a kHz OPO laser system. Recently we have extended this method for calibration of spectroradiometers in order to achieve smaller calibration uncertainties than with source-based methods. OPO laser systems have also been used in other optical radiometry fields at NIST such as correction of stray light of spectroradiometers, characterization and calibration of imaging instruments, measurement of optical properties of materials, etc. The details were presented at the NEWRAD 2014 conference in June in Helsinki and the extended abstract is available for further details. (Contact: Yuqin Zong)





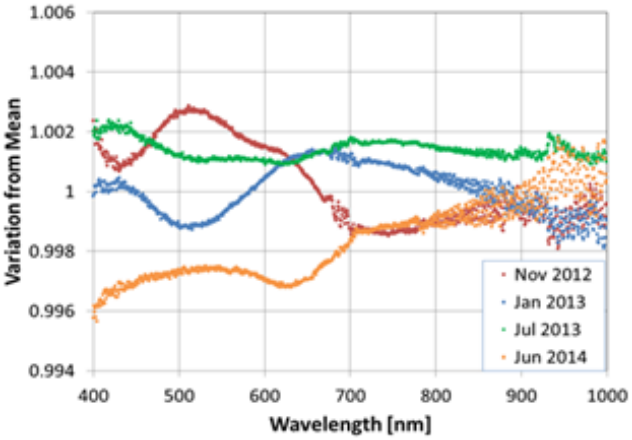
Decade-long Stability of the NIST Detector-based Spectral Irradiance Scale

The long-term stability of the NIST spectral irradiance scale as maintained on FEL lamps was validated in 2013 using the spectral irradiances from a high-temperature blackbody. The process of the 2013 scale realization will be described. The new 2013 scale is compared to the previous scale of 2000 that was utilized by NIST to issue customer lamps from 2000 to 2013. The comparison is performed with a set of check-standard lamps. The measurements show that a set of FEL lamps can be stable to better than ±0.5% (k=2) over a decade time period. (Contact: Howard Yoon, hyoon@nist.gov)



Establishing a Detector-Based Transfer Standard Spectrograph for the Measurement of Broadband Sources

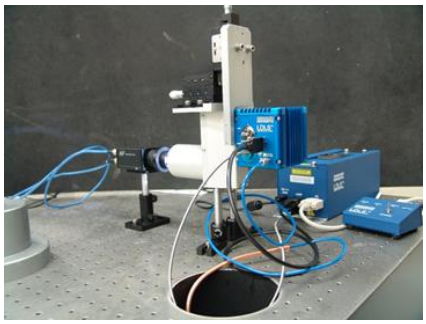
Spectrographs have been shown to be radiometrically stable at the 0.2% level over 3 years by trending using FEL-type irradiance standards. Much of the uncertainty comes from the uncertainty in the reproducibility of the measurements. We have calibrated two spectrograph-based radiometers using tunable lasers (SIRCUS) and have begun the uncertainty analysis. (Contact : S. Brown)



Right: Spectrograph Stability in Response to an FEL-type Standard Irradiance Lamp

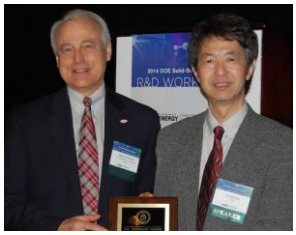
Use of a laser-driven plasma source in ultraviolet detector calibrations between 200 nm and 400 nm

Recently, the illumination source used in the Ultraviolet Spectral Comparator Facility (UV SCF) has been changed from an argon mini-arc source to a laser-driven plasma light source. This new source has higher brightness, a smaller source size, better temporal stability, and much lower heat load. The laser-driven light source is now used in detector calibrations between 200 nm and 400 nm. (Contact : Uwe Arp and Rob Vest)



Researchers of Sensor Science Division Honored

Dr. Yoshi Ohno, NIST Fellow in Sensor Science Division, was honored by the Department of Energy as the first recipient of the SSL Visionary Award. The award was presented at DOE's annual SSL R&D Workshop in January 2014, with citation "for contributions to the field of color science as it applied to SSL measurement, color perception, and the development of industry consensus standards."



Dr. Cameron Miller, Group Leader of Optical Radiation Group, Sensor Science Division, received 2014 ISCC Nickerson Service Award Citation at the ISCC 2014 Annual Business Meeting and Awards Luncheon in June 2014. The award was given "for his outstanding, long-term contributions towards the advancement of the Council and its aims and purposes."

NATIONAL RESEARCH COUNCIL OF CANADA

NRC · CNRC National Research Council Canada Conseil national de recherches Canada

NRC LIAISON REPORT

New LED Measurement Facilities

NRC has recently established a new measurement facility for solid state lighting (SSL). We have obtained a 1.6-m diameter integrating sphere for total luminous flux measurements and constructed a linear bench to enable goniometric and surface-scanned measurements to be performed on LED arrays. A commercial temperature-controlled photometer has been purchased for the luminous flux measurements. A rapid-scanning double-grating commercial spectroradiometer system (ISS320D) has been purchased to carry out spectral measurements. The spectroradiometer includes three sets of detectors and gratings that will enable spectral measurements from approximately 200 nm to 1700 nm. The input to the spectroradiometer is fibre-optic coupled to the integrating sphere to allow total spectral flux measurements. An AC power supply and AC power meter have been purchased to enable the required AC electrical measurements.

For further information contact: Arnold Gaertner, 613-993-9344

Participation in IEA 4E SSL Annex 2013 Interlaboratory Comparison

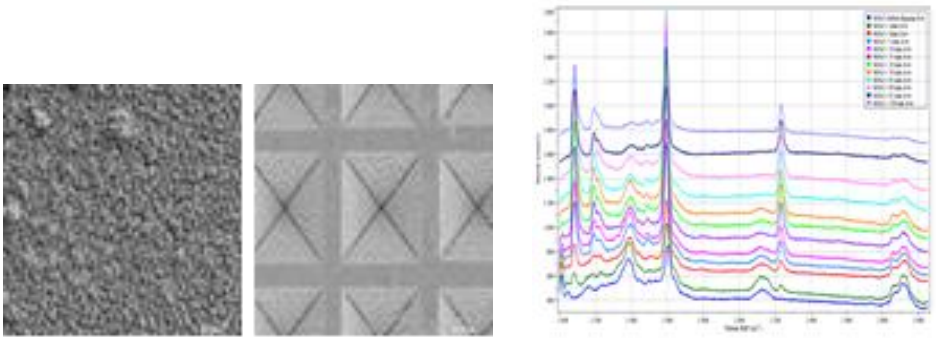
NRC has participated in an International Energy Agency (IEA) international comparison of photometric, colorimetric, and electrical quantities of several different types of SSL products. Measurements of luminous flux, luminous efficacy, active power, RMS current, power factor, chromaticity x, y, and correlated colour temperature were compared. The NRC measurements were performed with our 3-m diameter integrating sphere, equipped with an NRC-custom-built temperature controlled photometer. The results have recently been published (http://ssl.iea-4e.org/task-2-ssl-testing/2013-ic-final-report) and indicate satisfactory agreement of the NRC reported values with those of the reference laboratory (NIST), in most cases within the combined uncertainties.

For further information contact: Arnold Gaertner, 613-993-9344

New Capabilities in Portable Raman Spectrometer for Sensor Applications

NRC's photometry, radiometry and thermometry discipline (PRT) has expanded its Raman spectroscopy measurement capability to cover in-field measurements and study materials that cannot be brought into a typical laboratory. This is achieved with a light weight (~0.4 kg), free-space handheld Raman spectrometer operating with an excitation wavelength of 785 nm and a two-stage thermoelectric cooled array CCD detector. The handheld spectrometer unit is also equipped with a spectral library to facilitate the identification of unknown materials in the field. Different Raman spectral libraries (commercially available or user generated) can be loaded onto the portable spectrometer and used in the field. The miniaturization of all optical components in the handheld spectrometer unit will inevitably impact its performance degrading for example spectral resolution, sensitivity and spectral range. NRC's PRT team is working to quantify some of these performance parameters. Recently, the team has used the handheld spectrometer unit

coupled with plasmonic nanostructure enabled surface enhanced Raman scattering sensors for the detection and identification of aerosol particulates. An example of this type of metrological security application is shown in the figure below. This technology will have applications in law re-enforcement, security sensors, environmental hazard and food safety monitoring.

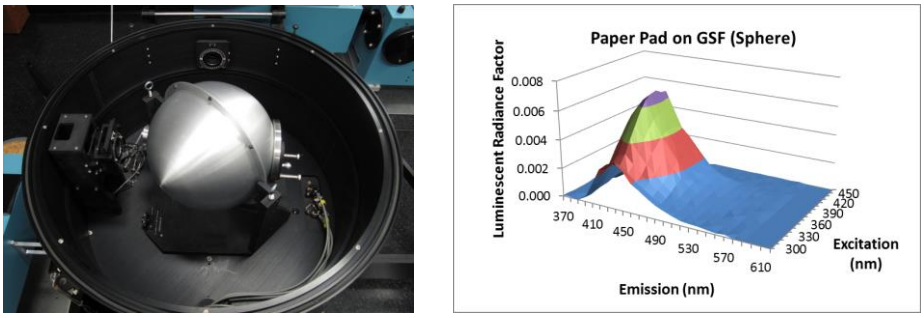


Surface enhanced Raman spectroscopy (SERS) detection of volatile chemicals for security applications.

For further information contact: Li-Lin Tay, 613-993-3919

Extension of NRC Fluorescence Measurements to Other Geometries for Practical Applications in Colorimetry

The traceability of absolute fluorescence calibrations for colorimetric applications has been a concern for several years because this traceability is to a fluorescence scale realized using the CIE two-monochromator reference method with a bidirectional geometry (45°:0 or 0:45°) whereas for many important applications of fluorescence colorimetry, e.g. for paper and textiles, the measurement geometry is hemispherical using an integrating sphere. To address this need for more direct traceability, NRC is developing a new versatile fluorescence instrument that can be configured for measurements under different geometries, including bidirectional and hemispherical. This instrument is referred to as reference goniospectrofluorimeter (GSF) and features a large sample compartment that can accommodate a variety of sampling accessories.



The basic design of the GSF is similar to the NRC Reference Spectrofluorimeter which is based on the two-monochromator method and has been used for traceable surface fluorescence calibrations in a bidirectional geometry (45a:0) for more than 15 years. The characterization of this new instrument and its performance validation by measurement comparisons with the NRC well-established reference facilities for diffuse hemispherical reflectance and bidirectional fluorescence was reported at the Newrad2014 conference (Espoo, Finland, June 24-27, 2014, pp. 314-315). The sphere accessory is 300 mm in diameter and the samples are mounted at a port

on the sphere wall; it was originally designed for single-beam substitution mode and has been recently modified to allow for comparison-type measurements referenced to a fixed comparison standard. This modification has significantly reduced the impact of changes in sphere efficiency when the sample or standard are at the measurement port. A figure of the sphere accessory mounted in the sample compartment and representative bispectral fluorescence data of a fluorescent paper pad measured using this sphere geometry are shown below.

For further information contact: Joanne Zwinkels, 613-993-9363

UPCOMING IES MEETINGS CALENDAR

The IES is sponsoring the following meetings and conferences in 2015:

Roadway Lighting Committee Meeting
March 26-27, 2015
Houston Marriott South Hobby Airport
Houston, TX

LIGHTFAIR International 2015
May 5-7, 2015
Javits Center
New York, NY

2015 Street and Area Lighting Conference
October 4-7, 2015
Westin Savannah Harbor Hotel
Savannah, GA

For more information, please visit http://www.ies.org/programs/meetings_calendar.cfm.

NEWS FROM THE CIE

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

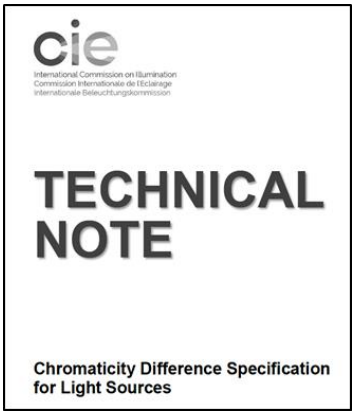
New CIE Logo

This new logo is now used in all new CIE publications and CIE website. This logo was chosen from among many proposals in a competition, and was chosen by vote by the CIE Board members. Also, the office of CIE Central Bureau moved to a new location (smaller and less cost), still in Vienna, Austria.

CIE DIS 025 Test Method for LED Lamps, LED Luminaires, and LED Modules Published

TC2-71, chaired by Yoshi Ohno, finally finished their work and the TC document was published as Draft International Standard, DIS 025, on September 16th, 2014, after nearly four years of hard work by the TC. The TC collaborated with CEN (European Committee for Standardization) and the same technical contents will also be published as an European standard, EN 13032-4. This EN standard will be used by European regulations for solid state lighting (SSL). CIE DIS 025 is expected to be used as a test method for SSL regulations in many other countries, and also in IEC performance standards. DIS 025 will go through further approval process by CIE national committees to become an International standard (S 025), then through further approval processes by IEC (and ISO), it is expected to become an IEC/CIE (or IEC/ISO/CIE) joint standard. This standard is the first CIE standard related to products. CIE plans to produce more of such standards urgently needed by the industry and be more relevant to the industry. DIS 025 has similar structure as IES LM-79, with several tolerance intervals for operating conditions of DUT and also a number of requirements for the instruments characteristics. There are many common requirements, but DIS 025 is slightly more stringent than LM-79. For example, uncertainty statement is required in test reports, but not for individual test items, rather for a typical product of the similar type, making it a little easier for the situation of testing large numbers of similar products.

CIE TN 001:2014 Chromaticity Difference Specification for Light Sources published



CIE TN (Technical Note) is a new type of CIE publication, to meet the urgent needs in the industry, published in much shorter approval processes than technical reports and standards, and to be published on-line with free of charge. This TN 001 is the very first one of this type published (in July 2014), which took about one year to finish. This TN came out from R2-66, and drafted by Yoshi Ohno, to meet the urgent needs to standardize and simplify the method for specification of chromaticity tolerances for SSL products. MacAdam ellipses (developed in 1942) have been commonly used in specification of chromaticity ranges for fluorescent and other traditional light sources. However, the shape and size of the ellipses are different at different chromaticity points, and three parameters need to be interpolated. Such interpolation procedures have never been standardized and it was often questioned. Also, units such as SDCM and JND are often used with different meanings and

cause confusion. This TN defines *u'v' circle* (and *n-step u'v' circle*), a much simpler way to specify chromaticity tolerances without ambiguity, and with no need for interpolation, and this can replace the complicated MacAdam ellipses. The TN also defines color difference $\Delta u'v'$, which should be used for specifications of color uniformity and color shifts. TN 001 is freely available at http://files.cie.co.at/738_CIE_TN_001-2014.pdf.

CIE 210:2014 Photometry Using V(λ)-Corrected Detectors as Reference and Transfer Standards Published

This technical report was published in June 2014, from TC2-37 chaired also by Y. Ohno. It provides guidance on using photometers (photometer heads) as standards for luminous intensity or illuminance, instead of using traditional incandescent standard lamps. This practice will be useful for the industry as well as NMIs, especially with the increasing difficulty in obtaining high quality incandescent standard lamps these days.

CIE Tutorial and Expert Symposium on Measurement Uncertainties in Photometry and Radiometry for Industry

This symposium was organized by CIE Division 2 (Director, Peter Blattner) and was held in Vienna on September 11 and 12. A similar symposium on measurement uncertainty was held in October 2013 in Bled, Slovenia, and many participants expressed it was "too difficult" after the meeting, thus a symposium "for industry" was organized this time. The first day was a tutorial and the 2nd day was a contributed paper session. The symposium was registered by about 60 participants, more than expected. The tutorial was given by several Division 2 experts, started with basics, covered fundamentals of GUM to applied methods using Monte Carlo simulation (GUM Supplement 1). In spite of the title of the symposium, it seemed the level of participants was pretty high. One of the discussion points was "Monte Carlo or non-Monte Carlo". Some lecturers strongly recommended the Monte Carlo method, while some others expressed concerns that it is difficult for average engineers in the industry. Ohno's lecture was on "Practical Measurement Uncertainty Guide from TC2-71". There was a major concern among the industry members that uncertainty evaluation for SSL (from spectral data) is too difficult and there are no good practical guidance documents (not covered in GUM and CIE 198). TC2-71 created a Task Group in 2013 to develop a "Guide for Practical Uncertainty Evaluation for Testing LED Lamps and LED Luminaires", chaired by Ohno and a draft is being developed. This guide uses a step-by-step approach (non-Monte Carlo). Some materials on this symposium are still available at http://div2.cie.co.at/?i_ca_id=939.

Other Recent CIE Publications Related to Photometry and Radiometry

- ISO/CIE 19476:2014: Characterization of the Performance of Illuminance Meters and Luminance Meters
- ISO/CIE 11664-6:2014: Colorimetry – Part 6: CIEDE2000 Colour-Difference Formula
- TN 002:2014: Relating Photochemical and Photobiological Quantities to Photometric Quantities

(Contributed by Yoshi Ohno)

Lighting Research Center

NEWS FROM RENSSELAER'S LIGHTING RESEARCH CENTER (LRC)

Lighting Value Metrics Video

Since the advent of the electric lamp, the lighting industry has focused on reducing costs so that everyone can enjoy the benefits of lighting. However, there's a problem with only focusing on costs because it assumes that light is light, so the cheaper the light, the better the lighting, which is simply not true. The light needed in an office is different than the light needed to drive, which is different than the light needed to highlight a product, which is different than the light needed to regulate the sleep-wake cycle. Traditionally, we have measured light for all of these situations in terms of lumens. But the lumen is not always the best way to measure the benefits of light. The Lighting Research Center has developed new metrics, based upon research in neuroscience, which can be used to quantify the various and multifaceted benefits of light. Advances in lighting technologies like SSL and controls enable us to increase the value of lighting. Not only can we continue to decrease the cost of lighting, but we can increase the benefits of lighting because now we can measure light in terms of those benefits. A video summarizing these issues can be found online at: http://www.lrc.rpi.edu/value.

Lighting Research Center Launches Lighting Energy Alliance

The Lighting Research Center (LRC) at Rensselaer Polytechnic Institute has launched a new collaborative initiative, the Lighting Energy Alliance, to increase the benefits of lighting while reducing its environmental and monetary costs. Member utilities and efficiency agencies will direct the work of the Alliance in order to produce the information needed to effectively reduce lighting energy use. The charter members are Efficiency Vermont, National Grid and Energize Connecticut.

Lighting Research Center Authors National Academies Report on New Roadway Lighting Technologies

The rapid development of lighting technologies, particularly solid-state systems using light emitting diodes (LEDs), has opened a universe of new possibilities as well as new questions about roadway lighting in the U.S., which for decades has been dominated by the use of high pressure sodium (HPS) lamps. Other light source technologies have also been angling for roadway market share. There is a critical need for objective technical information about new types of roadway lighting among transportation agencies. In response, the Transportation Research Board (TRB), part of the National Academies, initiated a project to evaluate new lighting technologies and identify new metrics for comparison. The Lighting Research Center authored the report, entitled "Analysis of New Highway Lighting Technologies," which can be found online at: http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-07(305)_FR.pdf.

LRC Issues New DELTA Report: LED Lighting in a Campus Building

The Lighting Research Center at Rensselaer Polytechnic Institute recently evaluated a newly constructed building at Siena College—Rosetti Hall, a 25,000 square foot, 3-story, contemporary brick building that includes classrooms, meeting rooms, and offices. The New York State Energy

Research and Development Authority (NYSERDA) awarded funding to change the lighting specification from the originally specified conventional fluorescent lighting to all light-emitting diodes (LEDs), designed by Engineered Solutions of Clifton Park, NY, and to have the project evaluated as a DELTA demonstration project by LRC. The 20-page full color, illustrated report, "LED Lighting in a Campus Building," detailing the evaluation and findings, is available at: http://www.lrc.rpi.edu/programs/delta/publications/publicationsDetails.asp?id=943&cat=17.

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 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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