COMMISSION INTERNATIONALE DE L'ÉCLAIRAGE
INTERNATIONAL COMMISSION ON ILLUMINATION
INTERNATIONALE BELEUCHTUNGSKOMMISSION

DIVISION 2 : PHYSICAL MEASUREMENT OF LIGHT AND RADIATION

Home Page: http://www.cie.co.at/div2

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Minutes of 2008 CIE Division 2 Meeting

9:00 – 18:00, 11 July 2008
Turin

Abbreviations:

CIECB:	CIE Central Bureau	NC:	National Committee
CIEBA:	CIE Board of Administration	TC:	Technical Committee
D2:	Division 2 (D1, D4, D8, likewise)	TCC:	Technical Committee Chair
DD:	Division Director	TR:	Terms of Reference
AD:	Associate Director	ST:	Status
DS:	Division Secretary	WG:	Working Group
CM:	Country Member	ML:	Member List
VP:	Vice President	ILV:	International Lighting Vocabulary

Attendees:

Maria Luisa Rastello	INRIM, Itlay
Tongsheng Mou	SENSING, China
Janos Schanda	University of Pannonia, Hungary, (CIE VP-Technical)
Walter Steudtner	OSRAM GmbH, Germany
Peter Blattner	METAS, Switzerland
Udo Krüger	TechnoTeam, Germay
Ellen Carter	Konica Minolta, USA
Seongchong Park	Kriss, Korea

Seung-Nam Park	Kriss, Korea
Richard Austin	Gamma-Scientific, USA
Günther Heidel	OSRAM Optosemiconductors GmbH, Germany
Melvin Ho	OSRAM, Malaysia
Zsolt Kosztyán	University of Veszprém, Hungary
Yuqin Zong	NIST, USA
Meena Lysko	NMISA, South Africa
Yongick Cho	KOPTI, Korea
Yandong Lin	NIM, China
André Zschenker	PTB, Germany
Marek Smid	CMI, Czech Republic
Maria Nadal	NIST, USA
Cameron Miller	NIST, USA
Tony Bergen	PSI, Australia
Kosei Oshima	Otsuka Electronics Co. Ltd., Japan
Shu Takeshita	Tokai University, Japan
Stefan Forment	TU St. Lieven, Belgium
Nicolas Pousset	LNE-BNM/CNAM, France
Paul Miller*)	NPL, UK
Peter Sperfeld	PTB, Germany
Grega Bizjak	University of Ljubljana, Slovenia
Daniel Bos	NMi VSL, The Netherlands
Arnold Gaertner*)	NRC, Canada
George Eppeldauer	NIST, USA
Annick Razet	LNE-INM/CNAM, France
Gerhard Rösler	Gretag Macbeth XRITE, Germany
Predrag Vukadin	DMDM, Serbia
Richard Young	Optronics Labs, USA
Kathleen Muray	Inphora Inc., USA
Ichiro Saito	NMIJ, AIST Japan
Hiroshi Shitomi	NMIJ, AIST Japan
Jiangen Pan*)	Everfine, China
Richard Distl	Instrument Systems, Germany
Kohtaro Kohmoto	Teknologue Co. Ltd., Japan
Norbert Johnson	Retroreflection Museum, USA, (D2 AD)
Guy Vandermeersch*)	IBE-BIV, Belgium, (D2 AD)
Georg Sauter	PTB, Germany, (D2 AD)
Yoshi Ohno	NIST, USA, (D2 DD)
Armin Sperling	PTB, Germany (D2 DS)

Total **47** persons from **19** countries, including **15** country members. Underlines indicate country members. * proxy for country member.

1. Opening

Division Director, Yoshi Ohno, opened the meeting at 9:00 a.m. and welcomed everyone present. He appreciates the high quality of the contributions during the symposium and the meetings of the Technical Committees and the hospitality by INRIM during conference.

1. Attendance list, apologies

Secretary received regrets from the following persons:

Joanne Zwinkels (Canada, CM)
Carla Thereza Coelho (Brazil, CM)
Raisa Stolyarevskaya (Russia, CM)
Mihai Simionescu (Romania, CM)
John Clare (New Zeeland, CM)
Alan Robertson (USA, TC2-57chair)
Richard Harold (USA)
Larry Leetzow (USA)
Tom Larason (USA, TC2-29 chair)
Jens Shuette (Germany, TC2-50 chair)
Emma Woolliams (UK, TC2-60 chair)
Toni Gagg-Helminger (Germany)
Mike Pointer (UK, R2-32 reporter
Danny Rich (USA, R2-23 reporter)
Teresa Goodman (UK , CIE VP Publication, CM)
Gyula Dezsi (Hungary, CM)
Ken Vassie (UK, R2-39 reporter)
Kamuran Turkoglu (Turkey, CM)
Jim Gardner (Australia, D2 Editor)
Jean-Michel Deswert (Belgium, CM)
Dennis Cousin (USA)

2. Introductions

All the participants introduced themselves.

3. Approval of Agenda

The agenda of 2008 Division 2 meeting (Attachment 1), which was distributed via e-mail circular prior to the meeting and on the website in June 2008, was approved.

4. Approval of the 2007 Div.2 meeting minutes

The minutes of the 2007 D2 meeting in Beijing, China, which were distributed via e-mail circular and on the website in April 2008, were approved with no change.

5. Director's Report (Y. Ohno)

CIE CB: The website of the Central Bureau was renewed since last meeting in Beijing. The new URL is http://www.cie.co.at. The new CIE CB server now also hosts the websites of all Divisions. The Technical Manager Janos Makai retired and Peter Zwick will take office as Technical Manager of the CIE-Central Bureau as of Sep.1st, 2008.

Publications: The ILV:DS 17.1/E:2008 is under final preparation for BA ballot. The *Guidelines for Notation to be used in CIE Publications* are being developed, led by VP Publication T. Goodmann, to ensure the consistency in notations used in the new ILV. TC2-

25 was closed after publication of their TC report CIE 182:2007. DD thanked J. Zwinkels and the TC members for their efforts for many years.
The Japanese CM reported that they did not receive the ballot for CIE 182. DD will report this to CIE BA and request improvements to avoid such miscommunication.

New Liaisons: Three new liaison functions have been established through communication between CIE CB and ISO and IEC. J. Zwinkels was assigned as liaison officer for ISO/TC 145/SC 2 N519 and Y. Ohno (tentatively) for IEC/SC34A MT PRESCO with special attention to TS 62504 (Terms and definitions for LEDs in general lighting), and IEC/TC110 WG5 regarding OLED Displays, where Tongsheng Mou is an active member of WG5 and accepted to serve as the liaison person.

CIE 2009 Midterm Session: The Midterm meeting 2009 and the *Conference on Light and Lighting* with a focus on SSL will be held in Budapest, Hungary. Board meetings and the General assembly will be held May 24-26, followed by the conference (May 27-29) and Division and TC meetings, which are scheduled for June 1-3. Technical Committees may also meet after May 26 if more time is needed. The VP Technical J. Schanda, as the organizer of the conference, welcomes everybody to Budapest next year.

Other reports: The DD plans to develop a framework to improve and assist TC activities for faster progress and efficiency, following the general direction from CIE VP Technical. If Technical committees have no progress over some years, a remedy should be found. If a TC chair is not able to make progress, a new TC chair will be looked for or the TC should be closed. Proposals were made, including defined time scales for drafts or to establish a co-chair or a TC secretary.

6. Secretary's Report (A. Sperling)

The transfer of Secretary work from Ohno to Sperling took place after Beijing Session and was completed recently. Sperling now manages the D2 website and e-mail reflectors as well as various other work.

Membership: D2 now has 35 county members. Thailand was expelled from CIE membership
Dec. 2007. The representatives from France, Netherlands and China changed in 2008.

Report Issued: The summary of the 2007 D2 meeting in Beijing was produced and distributed in July 2007. The minutes of the 2007 D2 meeting in Beijing were distributed in April 2008. The Activity Report 2008, containing the actual list of country members, Technical Committees, Liaisons and Reporters as well as the minutes of the 2007 D2 meeting were also distributed in April 2008.

Division 2 Mailing List: 227 persons are on the D2 mailing list (reflector) and kept updated. The e-mail addresses are protected, and are available as the subscriber list of the D2 email reflector, which is password-protected (user id: cie2, password: vienna). The Secretary and the DD try to keep all the addresses updated as far as possible, but there are always a few addresses that do not work. The Secretary therefore requests everyone to inform him of any

changes of e-mail address, to ensure that D2 information can be distributed to everybody. The message archive is also available and accessible with the same password. The mailing list for ballots are handled separately by the CB. To avoid lack of information, remainder will be sent out in future.

D2 website: D2 website has been moved early this year from the NIST server to the new webserver of CIE CB and is kept updated. There have been no major changes in structure. The TC status is updated every year on the TC page. TC drafts are posted with password protection on the website. Secretary requested all the TC chairpersons to send him a copy when they distribute a new TC draft so the website can be updated. There is a global password that can access all TC documents and there are TC passwords that can access only associated TC documents. The global password is distributed only to CMs, TC chairs and D2 management team. The passwords for each TC should be distributed to all members of the TC. The TC chair should distribute TC password to TC members periodically.

E-mail reflectors: 10 Email reflectors (for TC2-29, 40, 45, 46, 47, 48, 49, 50, 60, 62) are installed at the moment. The Email reflectors remains at the NIST server and are created upon request and maintained by the Division Secretary. A reply to CIE2-xx@nist.gov goes to the entire list of corresponding members. Use of email reflectors for TC discussions between physical meetings is strongly encouraged. Message archives are linked to the D2 webpage or the TC page (password required) respectively.

DD thanked Sperling for smooth start of the Secretary work and producing the detailed and accurate minutes of the Beijing meeting, which was a great deal of effort.

7. Editor's Report

DD, Y. Ohno, received a report from the Editor, Jim Gardner, who was not present.

Progress with TC drafts since the Beijing meeting is as follows:

TC2-32: MEASURING RETROREFLECTANCE OF WET ROAD MARKINGS
A preliminary edit has been sent to the TC chair.

TC2-37: PHOTOMETRY USING V( )-CORRECTED DETECTORS AS REFERENCE AND TRANSFER TANDARDS
Edit sent to TC chair. Document being re-balloted in the TC.

TC2-52: PHOTOMETRY AND GONIOPHOTOMETRY OF LUMINAIRES - EMERGENCY LUMINAIRES
Editing completed.

T2-17: STANDARD REFERENCE SOLAR SPECTRA
Formatting discussions being held with TC chair.

In addition, editorial comments were made on the revamped International Lighting Vocabulary.

DD thanked the Editor for his thorough and high quality work in editing many documents in a timely manner.

8. Progress reports from Technical Committees, Reporters, and Liaison persons

8.1 Associate Director Sauter and TC chairpersons

Reports on TCs: 2-29 ,37, 40, 43, 46, 47, 48, 58, 59, 60, 62,

8.2 Associate Director Vandermeersch and TC chairpersons

Reports on TCs: 2-23, 49, 50, 52

8.3 Associate Director Johnson and TC chairpersons

Reports on TCs: 2-17, 19, 25, 28, 32, 44, 51, 53, 56, 57

The reports given for 8.1, 8.2 and 8.3 are summarized below in the numerical order of all the TCs.

TC2-17 Recommendation for integrated irradiance and spectral distribution of simulated solar radiation

Chair: Gene Zerlaut (USA) **AD:** Johnson

ML: Chomiczewski (USA), Cordo (USA), DePietro (USA), Ellersick (USA), Christiaens (France), Grossman (USA), Gueymard (USA), Ketola (USA), Martin (USA), Myers (USA), Riedl (Germany), Robbins III (USA), Schoenlein (Germany), Scott (USA), Severon (Germany) – revised March 2006.

TR: Revise and update CIE Publication No.20 (1972)

ST: DD received a report on TC2-17 from the TCC. The committee activities have concentrated on the revision of Publication 85 with respect to its tables of reference solar spectral energy distributions. The tabulated data were difficult to manipulate with respect to the convolution of optical properties of materials and surfaces. These data consisted of various wavelength distributions and had insufficient data in the ultraviolet region, particularly the UV-B, with respect to a number of applications. These shortcomings have largely been overcome by use of the SMARTS2 atmospheric radiation transfer model (Version 2.9.5), developed by Dr. Christian Gueymard. After a number of iterations of the revised document, it is presently being converted into the CIE document format, a process that is expected to be completed shortly. Once completed, it will be submitted to CIE for editorial review after which it will undergo an official ballot as CIE Publication 85:2008.

TC2-19 Measurement of the Spectral Coefficient of Retroreflection

Chair: N. Johnson (USA) **AD:** Johnson

ML: Arens (USA), Brekke (Norway), Fisher (USA), Hsia (USA), Hubert (France), Kurioka (Japan), Price (Great Britain), Rendu (France), Rennilson (USA), Richey (Germany), Schreiber (Germany), Sugiyama (Japan), Terstiege (Germany), Vandermeersch (Belgium)

TR: Identify the critical measurement parameters, tolerances, and requirements for, and

conduct an international intercomparison of, the spectral coefficient of retroreflection.

ST: Report given by the TCC, Johnson. The TC 2-19 committee is still working. The interchange data had been collected some years ago. The data and analysis was previously circulated but still is not in final form. The chairman has been asked to use the repeatability data generated in ASTM Standard E811. A review meeting is planed for August in San Diego with a few members of the original Technical committee to get this job done. The report is in two parts. Hard copy of the complete original Data (to be deposited in Central Bureau) and a short Technical Report summarizing the results. It is expected that the final report will be send before next meeting in Budapest.

TC2-23 Photometry of Street-Lighting Luminairs

Chair: G. Vandermeersch (Belgium) **AD:** Vandermeersch

ML: Ian Lewin (USA), A. Blochouse (Belgium),A. Corrons (Spain), L. Bedocs(UK), A. Por (France), C. Stratford (UK), R. Rattunde (Germany), G. Rossi (Italy), D. Gibs (UK), A. Ottoson (Sweden) - rev. 2003

TR: Prepare a technical report on the photometry of street lighting luminaries

ST: Report given by the TCC. There was a meeting with manufacturers and it was discussed to modify the scope to include temperature sensitive questions. During the discussion it was pointed out that also LED luminaries for street lighting are entering the market. The TCC also likes to have input from Goniophotometric measurements. Some relevant input for this TC may also come from Div. 1 with respect to mesopic questions and from Div. 4 where the revision of Publ. 115 is ready for ballot. The TCC will contact the responsible person in Div.1 and Div.4 to get input for this TC.

TC2-25 Calibration Methods and Photoluminescent Standard for Total Radiance Factor Measurement

Chair: J. Zwinkels (Canada) **AD:** Johnson

ML: Bristow (Sweden), Erb (Germany), Leland (USA), McCamy (USA), Nayatani (Japan), Puebla (Germany), Racz (Hungary), Simon (USA), Witt (Germany), Peter Clarke (NPL)- revised Aug. 2002

TR: Prepare a CIE report on methods for measurement of total radiance factors of photoluminescent materials. Recommendations for realizing and calibrating photoluminescent standards by the one and two-monochromator methods will be included.

ST: This TC was closed after publication of the recommendation CIE 182:2007. DD thanked J. Zwinkels and the TC members for their efforts for many years.

TC2-28 Methods of characterizing spectrophotometers

Chair: T. Goodman (UK) **AD:** Johnson

ML: Andor (Hungary), Bastie (France), Berns (USA), Distl (Germany), Eckerle (USA), Konstantinova (Bulgaria), McCamy (USA), Robertson (Canada), Shinji Shimizu (Japan), Ulyanov (Russia), Zwinkels (Canada) -rev. 2008.

TR: Write a CIE report on the characterization of spectrophotometers by means of reference materials and other methods, with particular reference to linearity, wavelength error, stray light, and integrating sphere errors.

ST: The TCC sent her report to the DD. The TCC reviewed the most recent draft prepared by John Verrill and subsequently by Mike Pointer. Most of the document is still up to date, relevant and useful, but the section on colorimetric uncertainties has been superseded by work by Jim Gardner and by TC2-43. The TCC is considering how best to revise this section (one option is to delete it and simply make reference to other publications and documents) and will circulate a proposal to the TC members within the next few weeks. Once this issue has been resolved the remaining updates should be quickly completed. A new (hopefully final) draft will be ready for TC ballot in a few months. Sauter, TCC of TC2-43, remarked that it will be necessary to include models and associated uncertainty components consistent with TC2-43 within this document.

TC2-29 Measurement of Detector Linearity

Chair: Thomas Larason (USA) **AD:** Sauter

ML: J. Bastie (France), J. Clare (New Zealand), R. Distl (Germany), G. Eppeldauer (USA), T. Goodman (UK), P. Webb (USA), J. Palmer (US), G. Sauter (Germany), G. Andor (Hungary), A. Bittar (NewZealand), W. Budde (Canada), G. Dezsi (Hungary), Mihailov (Russia), K. Moestl (Germany) - July 2003 (being updated)

TR: Prepare a CIE guide on methods for the characterization of the linearity of detectors of optical radiation, including different principles by which the linearity of detectors can be determined and causes of non-linear behavior, to aid users of optical radiation detectors in the selection and use suitable devices for specific applications.

ST: Report was given by the DD. There has been no progress since the last TC meeting in Braunschweig in 2006. TCC apologizes that his work activities has kept him from making progress with the next draft report. Some comments have been received after Braunschweig meeting. Before the end of the year TCC plans to revise the next draft to reference terms from the ILV and related work in other TCs, like TC 2-48. The eight people who requested to join the TC at the last meeting will be contacted by the TCC to see if they still have interest in joining (following the TC membership guidelines).

TC2-32 Measuring Retroreflectance of Wet Horizontal Road Markings

Chair: N. Hodson (USA) **AD:** Johnson

ML: Austin (USA), Davies (USA), Dibbern (Germany), Hubert (France), Johnson (USA), Lundkvistl (Sweden), Meydan (Australia), Meseberg (Germany), Rennilson (USA), Schmidt-Clausen (Germany), Schnell (USA), Schreuder (Netherlands), Soardo (Italy), Sorenson (Denmark) - revised August, 1999

TR: To prepare a guide for the methods of measuring coefficient of retroreflected luminance (specific luminance) of horizontal road markings under wet weather conditions.

ST: AD Johnson reported. The TCC Neil Hodson resigned because he is already retired for a couple of years and is not able to proceed. However, he reported that the current report is ready to send to the editor and that a new chairman should be selected to do

the final work. In the meantime, Jim Gardner went through the draft and reformated it into a CIE template. There is still work to be done on the pictures and diagrams. D2 voted with no objections that Norbert Johnson will take over the chairmanship of this TC for future work.

TC2-37 Photometry Using Detectors as Transfer Standards

Chair: Y. Ohno (USA) **AD:** Sauter

ML: Andor (Hungary), Austin (USA), Bastie (France), Bittar (New Zealand), Czibula (Germany), Corrons (Spain), Dézsi (Hungary), Eppeldauer(USA), Gardner (Australia), Goodman (U.K.), Kohler (BIPM), Moore (UK), Muray(USA), Pietrzykowski (Poland), Rattunde (Germany), Rastello(Italy), Sauter (Germany), Schanda (Hungary), Wychorski (USA)

TR: To prepare a report on the properties of $V(\lambda)$-corrected detectors that are suitable for disseminating and maintaining photometric units. This report will include methods for the use of these detectors.

ST: Report given by the TCC, Y. Ohno. TCC prepared draft 8 after Beijing, which was edited by G. Sauter and Division Editor. Draft was sent out for 2nd TC ballot in February 2008, and closed April 30, 2008. There were no negative votes, but many small comments received. TCC is consolidating comments to make a final draft for Division ballot.

TC2-40 Characterizing the Performance of Illuminance and Luminance Meters

Chair: P. Blattner (Switzerland) **AD:** Sauter

ML: Austin (USA), Bastie (France), Czibula (Germany), Dezsi (Hungary), Goodman (UK), Khandelwal (India), Khanh (Germany), Mahidharia† (India), Moore (UK), Ohno (USA), Pietrzykowski (Poland), Saito (Japan), Sauter (Germany), Stolyarevskaya (Russia), Xu (Singapore), Ye (China) – revised July 1999

TR: Convert the present CIE Technical Report No. 69 into an CIE/ISO standard. Prepare a combined CIE/ISO standard describing the definitions of quantities influencing the performance of illuminance and luminance meters, as well as defining measurement procedures for the individual error quantities.

ST: Report given by the TCC, P. Blattner. Prior to the meeting in Turin, the 8th Draft was distributed together with the agenda and open issues to be discussed in Turin. The TC met in Turin on July 9 and 10, with 8 members and 39 observers. The symposium in Turin provided good inputs to the TC on the issues of measurement of f_1' and its uncertainty. Further inputs from members and observers are expected within this year on several issues including measurements of f_2. The TCC will try to arrange a next meeting already this year. There is some pressure of time, as the European Standard CEN EN 13032 is to be revised next year and this document should be harmonised with the CIE Standard being developed in TC2-40.

TC2-43 Determination of measurement uncertainties in photometry.

Chair: G. Sauter (Germany) **AD:** Sauter

ML: Bastie (France), Corrons (Spain), Daubach (USA), Ellis (USA), A.Gaertner (Canada), Goodman (Great Britain), Moore (Great Britain), Ohno (USA). Aug. 2002

TR: To prepare a CIE recommendation as the basis for the determination of measurement

uncertainties valid for selected quantities used in photometry.

ST: Report was given by G. Sauter. It is expected that the meeting in Turin was the last meeting of the TC because the draft has reached is final state. It will be published as a fundamental document with examples given in annexes. The draft will be sent for ballot before the end of the year. Additional examples are expected to be included in the Appendix, depending on the input and requests of other TC's. A new way of publishing CIE documents is necessary to deal with such a growing document. DD will bring this up to CIE BA. Also, perhaps a new TC will be necessary to implement new examples into the publication.

TC2-44 Vocabulary Matters

Chair: J. Gardner (Australia) **AD:** N. Johnson

ML: Billmeyer (USA), Burghout (Netherlands), Ionescu (Romania), Johnson (USA), Kohler (BIPM), Morren (Bergium), Nishi (Japan), Ohno (USA), Poppe (Hungary), Sauter (Germany), Schanda (Hungary), Woo (Canada)-this list is outdated and to be revised.

TR: To provide liaison between Div.2 and TC 7-06 "Lighting Terminology" and support the preparation of the new edition of the Lighting Vocabulary in the field of light and colour measurements.

ST: The TCC, Gardner, sent his report to the DD. The TCC reported that editorial comments have been made on the draft of the revamped Lighting Vocabulary. The format of this document is significantly different from previous editions and it represents an enormous amount of work, particularly for John Bastie and his immediate working group.

Once the ILV is published, D2 members should review it against the older version for any inconsistencies or items which might have been overlooked. New items related to the physical measurement of light and radiation (i.e. within the purview of D2) require a full discussion and consensus within D2. No new terms requiring consideration for inclusion in the next version of the ILV have been brought to TTCs attention, either directly or in terminology in completed TC drafts. See also 5. Director's report about the activity in CIE BA.

TC2-46 CIE/ISO standards on LED intensity measurements

Chair: John Scarangello (USA) **AD:** Sauter

ML: Angerstein (Germany), Bando (Japan), Bouman (Netherlands), Bym (USA), Carr (USA), Distl (Germany), Ellis (USA), Goodman (UK), Heidel (Germany), Hwang (Taiwan), Jones (USA), Lester (USA), Moore (UK), Ohno (USA), Rastello (Italy), Sauter (Germany), Scarangello (USA), Schanda (Hungary), Schumacher (Germany)

TR: To prepare a CIE/ISO standard on the measurement of LED intensity measurements based on the CIE Pub. 127.

ST: The TCC sent his report to the DS: The TC has been inactive since Braunschweig meeting, but TCC is willing to continue his work. The TCC needs some assistance of a few serious and knowledgeable volunteers who can give him advice on revising and completing the draft. J. Schanda, G. Sauter, and Y. Ohno accepted to provide assistance to the TCC.

TC2-47 Characterization and Calibration Methods of UV Radiometers

Chair: Armin Sperling (Germany) **AD:** Sauter

ML: L.P.Boivin (Canada), Hengstberger (South Africa), Wilkinson (Australia), Lambe (UK), Rattunde (Germany), Saunders (USA), Pietrzykowski (Poland), Corrons (Spain), Larason (USA), Thompson (USA), Kohmoto (Japan), McArthur (Canada), Kravetz (USA)- Aug. 2002

TR: Prepare a CIE recommendation on methods of characterization and calibration of broad-band UV radiometers in the spectral ranges of UVA and UVB for industrial applications.

ST: The report was given by the TCC. The TC2-47 meeting was held on July 10, 2008 in Turin. There were 34 participants. Prior to the meeting in Turin a new pre-draft 3.0 was distributed to all members. Based on this pre-draft, S. Takeshita, representing Japanese national committee of TC2-47, presented their proposals during the meeting. There was a consensus that the quality indices for broadband UV detectors defined in this pre-draft are chosen to be consistent with the quality indices of photometers. Because of the variety of action spectra, it was also decided, not to define quality classes in the document. Some examples for specific action spectra may be given within an annex. The TCC asked for assistance and contribution regarding measurements results for the outer band response (f_u and f_r) using the formulas given in the new pre-draft. The next pre-draft 3.1, including the contributions made during the meeting in Turin will be distributed and posted on the website short after the meeting of Turin.

TC2-48 Spectral responsivity measurement of detectors, radiometers, and photometers

Chair: G. Eppeldauer (USA) **AD:** Sauter

ML: Austin (USA), Boivin (Canada), Bouman (USA), Corrons (Spain), Coutin (France), Dezsi (Hungary), Gardner (Australia), Goodman (UK), Köhler (BIPM), Larason (USA), Larsen (Denmark), McArthur (Canada), Ohkubo (Japan), Palmer (USA), Pietrzykowski (Poland), Rattunde (Germany), Sauter (Germany), Webb (USA), Xu (Singapore), Schanda (Hungary) – June 2001.

TR: To rewrite the technical report CIE 64 (1984) "Determination of the spectral responsivity of optical radiation detectors" to update device and measurement technology, and include the spectral irradiance and radiance responsivity measurement for radiometers and photometers from UV to near IR.

ST: Report given by the TCC, G. Eppeldauer. The TC2-48 meeting was held on July 10, 2008 at Atahotel Concord in Turin, Italy. There were 43 participants in the meeting. The 11th draft of the Technical Report was distributed to the members and participants of the meeting. The document is close to its final shape having 8 chapters and 72 pages. The changes in the new draft were discussed. The German title and summary have been done. In addition to many minor changes throughout the document, a few sections, prepared by four contributors have been added to the 11th draft. Chapter 3.2, The measurement setup was divided into two subchapters: 3.2.1 Monochromator based setup and 3.2.2 Fourier-transform spectrometer based setup. The latter was written by Simon Kaplan of NIST. In 3.4.1, linearity measurements were added to the detector characteristics. The 3.6 Uncertainty chapter was modified by Georg Sauter.

The titles of 3.7.1, 3.7.2, and 3.7.3 were changed and more references were added to this chapter. The TC2-43 Uncertainty document that includes the mathematical methods based on the GUM standard will also include this chapter and references will be made in both documents. George Sauter will make the necessary changes in this document. The Differential Spectral Responsivity (DSR) method in 4.5.4 has been extended by Armin Sperling and Georg Sauter of PTB. The DSR uncertainty is discussed in 4.5.4.1. Chapter 5.4 on Electronic imaging devices was deleted. Chapter 6.5 on Spectral stray light and fluorescence issues has been added to the document. This chapter has two sub-chapters, 6.5.1 Spectral stray light in monochromators and 6.5.2 Fluorescence of optical components. Yuqin Zong of NIST agreed to extend this chapter to 3-4 pages by giving more data and examples for stray light and fluorescence. The Table of content, the References, the page numbers and the figure numbers are to be fixed because of the many additions. As the CIE Document #63 on Spectroradiometric Measurement of Light Sources discusses some monochromator details, this document will be referenced and the Appendix will be modified. A general finalization and then editing is needed to finish the document by the next meeting. The document will be ready for TC ballot in one year

TC2-49 Photometry of flashing light

Chair: Y. Ohno (USA) **AD:** Vandermeersch

ML: Carl Andersen (USA), John Arens (USA), Richard Austin (USA), Jan Berkhout (USA), Dennis Couzin (USA), Dave Ellis (USA), George Eppeldauer (USA), Ahmad Fedai (USA), Irena Fryc (Hungary), David Gibbs (UK), Teresa Goodman (UK), Franz Hengstberger (South Africa), David King (USA), Rainer Kohler (BIPM), Hideki Kondo (Japan), Reiner Rattunde (Germany), Justin Rennilson (USA), Ken Sagawa (Japan), H. -J. Schmidt-Clausen (Germany), Georg Sauter (Germany), Ian Tutt (UK), Francoise Vienot (France), Pierce Webb (USA). – April 2003.

TR: Produce a technical report on CIE recommendation for measurement of effective intensity of flashing lights. (modified, July 2008)

ST: The report was given by the TCC, Y. Ohno. The TC2-49 met in Turin on July 9 with 45 participants including six TC members. The results of the Beijing meeting were first summarized. The new draft 4.0, distributed to the members prior to the meeting, was presented and discussed. The new draft proposed the new title of the document and the new TR, which were agreed as below.

Title: Measurement of Effective Intensity of Flashing Lights

TR: Produce a technical report on CIE recommendation for measurement of effective intensity of flashing lights.

Contents of the main part are now limited to definition and measurement of effective intensity. General physical measurements parts have been removed, except those parts specific to effective intensity. A section on limitation of Modified Allard method has been added. Several minor comments on the draft were received during the meeting. TCC also received many editorial comments from I. Tutt after the meeting. No major changes to the draft were requested or suggested. It was also suggested that the TC membership list should be updated.

D. Couzin presented his analyses on Schmidt-Clausen's original thesis data applied to Modified Allard method and other convolutional methods. The results of his analyses

showed that all the four methods (Form Factor, Allard, Modified Allard, and a further modified Allard with sheared q(t) function) have a similar degree of agreement with Schmidt-Clausen's visual experimental results for the seven forms of pulse. This serves as an experimental verification for the Modified Allard method for non-rectangular single pulses. A written report "Confirming other methods with the Form Factor Method data," 21 November 2007 on the details of his analyses was distributed to all TC members in November 2007 and is also available on the website. The TCC thanked Couzin for his great deal of efforts in conducting this analysis and the presentation.

The TCC asked the members present for any further comments on Draft 4.0 for the next one month before he creates next draft version. He will ask the same to other TC members who were not present. The TCC hopes to make a draft for TC ballot before next meeting in Budapest.

TC2-50 Measurement of the optical properties of LED clusters and arrays

Chair: J. Schuette (Germany) **AD:** Vandermeersch

ML: C. Jones (USA), J. Scarangello (USA), Xu Gan (Singapore), J. Arens (USA), T. Goodman (UK), D. Halkin (Belgium)

TR: To produce a technical report for the measurement of optical properties of visible LED arrays and clusters, to derive optical quantities for large LED arrays and recommendations for measurement methods and conditions.

ST: There was no report available at the meeting of Turin. From his recent communication, TCC plans to hold the TC meeting in Budapest in 2009.

TC2-51 Calibration of multi-channel spectrometers

Chair: Richard Austin (USA) **AD:** Johnson

ML: T. Goodman (UK), G. Hopkinson (UK), S. Prince (UK), Pietrzykowski (Poland), R. Smith (USA), R. Bergman (USA)

TR: Produce a technical report for the calibration of detector array spectroradiometers primarily for the determination of colorimetric and photometric quantities, including performance characteristics , evaluation of these characteristics, calibration methods and guidance in the application of methods for the determination of uncertainty.

ST: Report given by the TCC, R. Austin. The TCC gave a report on the Beijing meeting where a new TR was agreed. Since Beijing there was only little progress. There is still help necessary to include the work of Jim Palmer. The TCC will send a new member list to the DS and an email reflector will be installed in near future. The following task list was given by the TCC for the future work of the TC:

- Create a specific task list with members assigned
- Conduct a Webinar based meeting in September
- Schedule others based on the results of the items above
- Find a replacement TCC and schedule a transition time for a new TCC

TC2-52 Addendum to CIE 121 for the Photometry of Emergency Lighting Luminaires

Chair: G. Vandermeersch (Belgium) **AD:** Vandermeersch

ML: Antonio Corrons (Spain), Allan Ottosson (Sweden), Reiner Rattunde (Germany), Christine Stratford (UK), Bruno Weiss (Germany), Lou Bedocs (UK), Giuseppe Rossi (Italy), - updated July 2003.
David Price (UK, until 1/3/2003), John Arens (USA, until 1/1/2002).

TR: To produce an addendum to CIE publication 121 containing specific requirements for the photometry of emergency lighting luminaires, in particular to provide additional correction factors on the relative output of the luminaires at specified times of operation.

ST: Report given by the TCC, G. Vandermeersch. The TCC reported that the draft V5 is in a final state and was sent for division ballot in March. Japanese C/M reported that they did not receive this ballot also. DD will report this to CIE CB for improvements in communication.

TC2-53 Multi-Geometry Color Measurements of Gonio-apparent Materials and Metrics for Evaluation (modified)

Chair: Roesler (Germany) **AD:** Johnson

ML: Mike Pointer (UK), Maria Naddal (USA), Jerzy Pietrzykowski (Poland), George Andor (HU), Luise Rastello (Italy), Marta Klanjsek Gunde (SI), Irena Fryc (Poland), Allan Rodrigues (USA), Mike Nofi (USA), Danny Rich (SUSA), Thomas Dauser (Germany), Peter Gabel (Germany), Werner Cramer (Germany), Gorow Baba (Japan), Ellen Carter (USA), Harold VanAken (USA) - April 2003

TR: To write a technical report giving recommendations for the colour measurement and evaluation of colorimetric properties of gonioapparent materials. (modified)

ST: Report given by the TCC, G. Roesler. The TC met in Turin with 14 participants and 5 members. It was reported that new instruments are available on the marked with new a evaluation method xDNA. During the meeting there was a discussion on a new terminology needed for out of plane viewing directions. Also the new content for the draft was defined. The decision is, to finish a part one without metric for evaluation. Part two for metrics will take some more time. Promising new method called xDNA released which will allow the separation of application variations from recipe variations

It needs to be discussed whether the metric should be removed from the title to create a new TC or is it expedient to divide in part 1 and part 2. The TC plans to finish part 1 first and have a final draft for discussion in Budapest.

TC 2-56 (S) CIE/ISO standard on retroreflection measurements

Chair: C. Miller (USA) AD Johnson

ML: Johnson (USA), Stratford (UK), Jenkins (Australia), Sorenson (Denmark), Rastello (Italy), Ledoux (France), Frank (Germany)

TR: To prepare a CIE/ISO standard on the measurement of retroreflective materials based on CIE Publication 54.2

ST: Report given by TCC, C. Miller. The TC met in Turin with 4 members and 8 guests. It took a lot of time to set up the requirement section, but the existing document is very close to the CIE/ISO standard.

TC2-57 (S) Revision of CIE S014-2

Chair: A. Robertson (Canada) **AD** Johnson

ML: Bristow (Sweden), Hirschler (Hungary), McGinley (Austria), Pointer (UK), Ohno (USA), Rich (USA), Schanda (Hungary), Zwinkels (Canada) – confirmed June 2007

TR: To revise CIE Standard S014-2 (Colorimetry Part 2: CIE Standard Illuminants) to include Illuminant D50.

ST: A report from TCC, A. Robertson, was sent to DD before the meeting in Turin. The TC was established at the 2003 D2 meeting in San Diego on the understanding that it would not start work until the current revision of S014-2 was completed. With the publication of CIE S 014-2/E:2006 *Colorimetry – Part 2: CIE Standard Illuminants* in December 2006, this barrier was removed. The Chair has obtained an editable copy and will use this as the basis of the first draft of the revision. He has been informed of a change that occurred in 1997 in the last digit of the values of D65. This appears to have resulted from a change in the rounding procedure. He plans to use the post-1997 procedure for the 1-nm values of D50.

In addition to this formal report, the TCC raised an issue that the 1-nm values of D65 were linearly interpolated from the 10-nm values, which has been causing minor anomalies in colorimetric calculations. It was already addressed in CIE 15:2004 Appendix C with a suggested new interpolation method. While TC 2-57 has no mandate to change D65 or to use a different interpolation procedure for D50, the TC discussed this issue through email communication, and agreed that this issue should be revisited before the TC2-57 start its work. Thus, the TC proposes to create a new TC in D1 to investigate the issue of smoothing the values of the D Illuminants and to propose a calculation method for new definitions of D Illuminants. During the D2 meeting, it was agreed that D2 supports this proposal, and will send a formal request to D1 to establish such a new TC. TC2-57 will be on hold until we have a conclusion on this interpolation issue.

TC2-58 Measurement of LED radiance and luminance

Chair: K. Kohmoto (Japan) **AD** Sauter

ML: Horak (Germany), Sliney (USA), Muray (USA), Goodman (UK), Ohno (US) + others to be agreed

TR: To prepare a CIE Technical Report recommending measurement methods for the luminance and radiance of LEDs, taking particular account of the specific requirements of relevant photobiological safety standards. (changed)

ST: Report given by TCC K. Kohmoto. The TC met in Turin with 35 participants. It was the 6th meeting of the TC. The TCC explained the importance of LED luminance measurements and presented examples for these measurements. After some discussions, it was decided to modify the TR to focus more on the urgent photobiological safety issues. This change of the TR was approved by D2 with no objection. Moreover, it was also pointed out that the main focus of this TC should be effective luminance and how to make photobiological measurements for safety aspects. W. Horak already prepared some sections on this topic which should be included in the next draft. The TCC announced that the next meeting will be in Budapest. The TCC remarked that there is also a need for an additional CIE report on luminance measurement in general, if this issue is no longer covered by the TC2-58. The TCC plans to make a proposal for such a new TC at the next meeting.

TC2-59 Characterisation of Imaging Luminance Measurement Devices

Chair: U. Krüger (Germany) **AD:** Sauter

ML: To be finalised

TR: To prepare a Technical Report on methods for the characterization of imaging luminance measurement devices.

ST: Report given by TCC, U. Krüger. The TC met in Turin with 49 participants. One important issue during the meeting was the naming of quality indices. After some discussions there was an agreement to hold the *f* notation in all cases. (The new *k* notation proposal did not obtain support during the discussion.) If the current definitions (in CIE 69 or draft TC2-40) can be applied, the current numbering can be used. If a new index is necessary or a change in the definition is necessary new numbering shall be used, where we might use the range starting from number 20 for ILMDs. Values with no other remarks are stated to be average values (including the expanded uncertainty). There was also some discussion on the quality index for linearity and its measurement. A specific definition of f_{11} (range change) for ILMDs is necessary, because of the continuously adjustable integration time, and then a statement for a linearity evaluation while changing the luminance of the source is necessary. Regarding uniformity equations, there was an agreement on the basic kind of uniformity measurement proposed in WD08. The next meeting will be in Budapest 2009

TC2-60 Effect of Instrumental Bandpass Function and Measurement Interval on Spectral Quantities

Chair: Emma Woolliams (UK) **AD**: Sauter

ML: Heidel (Germany), Ohno (USA), Robertson (Canada), Saito (Japan), Sauter (Germany), Schanda (Hungary), Sperling (Germany), Steudtner (Germany), Kohmoto (Japan), Lau (Malaysia), Zwinkels (Canada), Bastie (France), Scarangello (USA), Young (USA), Woolliams (UK), Goodman (UK) – Feb. 2006

TR: To prepare a technical report that describes the effect of instrumental bandpass functions and measurement wavelength interval on spectrally resolved quantities and provide recommendations on suitable methods to minimize the error introduced by instrumental bandpass functions on spectrally integrated or weighted quantities.

ST: There was no meeting of this TC in Turin. DS received a report from the TCC. A third draft has been circulated to committee members. The main point of discussion is about how many different but similar bandwidth correction techniques should be included within the report itself. It is anticipated that a fourth draft will be prepared in time for the NEWRAD conference so that committee members attending that can discuss it in person. The next draft should be complete by the end of 2008. The committee has suggested that additional work is needed to discuss stray-light correction for array spectrometers, perhaps as a follow-on activity of this TC or as a new committee.

TC2-62 Imaging-photometer-based Near-Field Goniophotometrie

Chair: W. Steudtner (Germany) **AD:** Sauter

ML: To be finalised

TR: To prepare a CIE recommendation on the methods for characterization and calibration of imaging-photometer-based near-field goniophotometers and for determination and conversion of photometric data of lamps and luminaries for both near-field and far-field applications.

ST: Report given by the TCC, W. Steudtner. The TC had its first meeting in Turin. After his welcome and introduction, W. Steudtner explained that an e-mail inquiry among TC members resulted in two main manufacturers of such systems using different technical approaches: Radiant Imaging Inc. USA and TechnoTeam Bildverarbeitung GmbH Germany. To study the differences in these approaches, presentations were given by Ron Rykowski from Radiant Imaging and Udo Krüger from TechnoTeam Bildverarbeitung. Radiant Imaging operates the goniophotometer in a non continuous start/stop mode whereas TechnoTeam operates it in a continuous mode during data acquisition. Radiant Imaging uses a luminance camera only whereas TechnoTeam uses a luminance camera and a photometer head mounted close to the camera. Radiant Imaging saves the original data of the camera whereas TechnoTeam saves in some kind evaluated (compressed) data to the file system. Then TCC showed and distributed a list of literature provided by TechnoTeam regarding near-field goniophotometers and asked for further references. Then Draft 0 of the table of contents for the technical report was presented and discussed. TCC then presented the future work plans: the literature list and draft 0 of the table of contents will be posted on the TC website; any comments, additions should be sent to the TCC until mid of September 2008 to be integrated in these documents. Until end of September 2008 the work will be distributed to the TC members. Proposals for parts of the first draft of the Technical Report are due to end of January 2009 at latest and should be sent to the TCC. The first draft will then be put together and should be available to the next TC meeting. The next TC meeting will be held after the CIE Midterm Meeting in Budapest on June 1st or 2nd, 2009. W. Steudtner thanked Ron Rykowski and Udo Krüger for their presentations and the attendees for attending this meeting and their comments.

8.4 Reporters

During the status reports on the following reporterships were given:

R2-23 ISO/CIE Standards for the measurement of reflectance and transmittance

Reporter: Danny Rich **AD:** N. Johnson

ST: The reporter sent the report prior to the D2 meeting. The DD presented the report at the meeting..

CIE Recommendations in Publication 130 cover a broad range of measurements and instruments. It quantified explicitly the spectral requirements for calibration and the methods for standardization of the photometric scale. However, it is too broad and too complex to serve as a single standard. Publication 176 reviewed the influence of instrumental geometry on the reproducibility of spectral diffuse reflectance and reflectance factor and on regular transmittance. The recommendations reported there are not currently included in any documentary standard, including Publication 15.

Division 1 is in the process of converting Publication 15, the recommendations on colorimetry, into a standard on colorimetry, section by section. So far, the illuminants, the observers and the colour space have been standardized. TC 2-25 has recently completed its work on the measurement of luminescence, including requirements for instrumental assessment of luminescent materials. Their report was issued as CIE Publication 182. I therefore believe that we have enough information to begin the process of issuing standards on the measurement of the following properties:

1. Spectral Diffuse Reflectance and Spectral Diffuse Reflectance Factor (Recommended geometries of hemispherical diffuse: near normal and directional 45/0 directional).
2. Spectral Regular Transmittance (Recommended geometry of 5°/0°)
3. Spectral Regular Reflectance (Recommended geometries 6°/6° 45°/45° 60°/60°)

Therefore a new TC should be organized that would create these 3 standards.

R2-32 Visual Appearance Measurement

Reporter: Mike Pointer **AD:** N. Johnson

ST: The reporter sent the report prior to the D2 meeting. The DS presented the report. This reportership provides a liaison between Division 1 TC1-72 and Division 2. The TC1-72 "Measurement of Appearance Network: MApNet" was formed in Beijing, 2007. The Reporter is also the chair of this TC.

Terms of Reference:

1. To establish a network of those interested in the measurement of visual appearance.
2. The network shall be under the direction and guidance of a group of at least four Technical Leaders each responsible for a particular aspect of the subject.
3. Each Technical Leader shall provide substantial periodic reports in a form that might be published.
4. A second Expert Symposium on Appearance shall be organised at an appropriate time within the next 4 years.
5. A database of relevant published work shall be maintained.
6. Consideration shall be given to the establishment of separate Technical Committees when appropriate.

Report:

MApNet is now active, currently with 68 members. There are 8 Subject Groups:

1.	Physical aspects of appearance	To understand what happens to light incident on a surface, and to include interference, diffraction, absorption and scattering at surfaces and in the bulk, leading to effects that are responsible for colour, gloss, translucency and texture.
2.	Non-imaging appearance metrology	To measure light, including BSDF (including BRDF and BTDF), gloss, geometry, reflection, translucency, physical texture, distinctness-of-image, etc.

3.	Imaging appearance metrology	To measure spatial information, including images, focussing on the object, the illuminant, visual rendering, the reproduction of appearance, etc.
4.	Gloss	To investigate visual correlates that interpret the physical stimulus in terms of gloss.
5.	Colour	To investigate visual correlates that interpret the physical stimulus in terms of colour.
6.	Translucency	To define the relevant measurements and the contextual conditions which determine specific impressions of transparent/translucent objects.
7.	Texture	To investigate visual correlates that interpret the physical stimulus in terms of texture.
8.	Total appearance	To consider the interpretation of visual aspects of objects and scenes.

The Technical Leaders are:

1.	Joanne Zwinkels	National Research Council Canada, Ottawa, Canada
2.	Frédéric Leloup	KaHo Sint-Lieven University College, Gent, Belgium
3.	Marina Bloj	Division of Optometry, Bradford Optometry, Colour and Lighting Laboratory, University of Bradford, UK
4.	Gaël Obein	LNE-INM/Cnam - Institut National de Métrologie
5.	Changjun Li*	Dept of Colour Science, University of Leeds, UK
	Anya Hurlbert	University of Newcastle, UK
6.	Osvaldo da Pos	Dipartimento di Psicologia Generale, University of Padua
7.	Mike Chantler	Texture Laboratory, School of Mathematical and Computer Sciences, Heriot Watt University, UK
8.	No yet appointed	

*Changjun Li is only contributing to Group 5 within the remit that he has as Reporter R1-42 on extensions of the CIECAM02 colour appearance model.

Achievements

- Network established
- Subject areas decided
- Technical Leaders appointed
- Details of appropriate meetings have been circulated
- A database of relevant published work (>1300 references) has been donated by one network member
- Offers have been received to host the next CIE Expert Symposium on Appearance

- Consideration is being given to establish at least two new Technical Committees.

Next activities – by year end

- Major reports from Technical Leaders
- Set location of next Expert Symposium and appoint organising committee

R2-33 Measurement of laser-based projection displays

Reporter: Keith Niall **AD:** G. Sauter

ST: There was no report available this time.

R2-34 Methods for characterising and calibration detectors in photon counting regime

Reporter: Maria Rastello **AD:** G. Sauter

ST: The reporter gave a report. During the last years, new equipment is available on the market and the methods of photon counting are needed more and more in many fields off radiometry. However, there are no experts in CIE and probably no need to establish a TC in CIE, though this reportership should maintained to give input on this subject to the community. There was a desire to have a talk of an invited speaker during one of the next meetings to get a better overview. The reportership will be kept another year.

R2-36 Measurement requirements for solid state light sources

Reporter: Günther Heidel **AD:** G. Sauter

ST: The reporter gave a report during the D2 meeting in Turin
The main focus of this reportership is, to investigate the needs for the measurement requirements for the 100% testing during the manufacturing process. First of all, the measurements have to be carried out in a high speed in pulsed mode, as this is the only way carry out these measurements in production lines. Second, the results are used for binning purpose and as catalogue data. Therefore, these measurements have to be traceable to laboratory DC measurements. There are efforts to investigate pulsed mode measurement procedures for measuring high power LEDs. However, these investigations do not include high speed measurements during production. They only cover the link between the pulsed mode and DC measurements, which is necessary but not sufficient. Therefore, the reporter requested the establishment of a new technical committee to deal with the special measurement requirements for the 100% testing in production lines. (See 10.1 for establishment of the new TC.)

R2-38 Measurement of spectral properties of photometers and colorimeters

Reporter: Jiangen Pan **AD:** G. Sauter

ST: The reporter gave a report. This reportership is to investigate the issues on measurement of f_1' which were not addressed in TC2-16 (colorimeter report already published) and being discussed in TC2-40. The reporter, in cooperation with NIST, measured spectral responsivity of several commercial photometers with three different instruments, some with different conditions, and compared. The results were presented at the Symposium in Turin. There were also several other contributions regarding f_1' at the Symposium. They show that in principle f_1' values can be determined with low uncertainties. However, the calculated value of f_1' strongly depends on its measurement uncertainty itself and on the selected

wavelength range. Therefore, it is very important to account for all available uncertainty contributions with their respective amounts. This outcome is very important for the technical committees TC2-40 and also TC2-59, which can use these results for further discussion. The reporter plans to provide information and results of f_1'measurements of luminance meters at the next meeting. The reportership will be kept for another year.

R2-39 Display measurement standard – liaison with ICDM

Reporter: Ken Vassie **AD:** N. Johnson

ST: The reporter sent a report prior to the D2 meeting, which was presented by DD.

"The needs of those involved in display metrology appear to be well met through the ICDM (International Committee on Display Measurement - http://www.icdm-sid.org/ http://www.icdm-sid.org/). The ICDM seems to be attracting support by all those organisations involved in display metrology world wide with the commitment already demonstrated by NIST and Sun Microsystems (and NPL), to name a few. Meetings have been held in the USA, Europe and the Far East. Subcommittees have recently been set up on Gamma & Gray-scale, Viewing Angle, 3D-Stereo, Low Luminance, Reflection, Uniformity, Motion Artefacts and Touch Screens.

The major benefits of the ICDM are that

a) it covers the full range of displays measurements to a depth that ensures the level of accuracy, robustness and repeatable required by the industry; it is very much 'applied' rather than 'research'
b) it is fully inclusive of all those bodies, organisations and individuals throughout the world involved in display metrology,
c) it provides a single 'expert' focus for display metrology - with the level of accessibility that the industry needs

These achievements are, as I understand it, outside the role of the CIE.

If the ICDM were to be dependent on the CIE for publication of its standard then this would greatly restrict the objectives of the ICDM - with no benefit to the CIE. The intention of the ICDM appears to be to implement the definitions and conventions created by the CIE - so there is no conflict between the two organisations.

The CIE should not try to re-create the type of all-encompassing standard that the ICDM appears to be aimed towards. Rather, the CIE could provide much greater benefit to the community through concentrating on specific technical and scientific issues.

Standardisation of BRDF measurement for displays may be one such topic.

The CIE may also be ideally placed to create solid structure for applying perception to display measurement. There are several strands of work in this area and perhaps a CIE technical committee, with CIE's long involvement in this area, could bring them together in a more cohesive manner to a level that could be directly applied to visual displays (a key reference in this is work would be the document <ftp://ftp.fpdl.nist.gov/pub/reflection/Daylight_ Readability_JSID.pdf>ftp://ftp.fpdl.nist.gov/pub/reflection/Daylight_Readability_JSID.pdf which points the way as to how the CIE 145 Visual Performance Model could be applied in practice to visual displays).

The proposal would be that the CIE would work towards this in conjunction with the ICDM rather than independently of it.
In conclusion, internationally the SID and ICDM provide the leadership in display metrology needed by the display community. CIE can and should provide leadership in narrowly defined and specific technical issues that require specific technical expertise (BRDF and image perception). However this should be very much in conjunction with the ICDM and not independently of it.
Perhaps it would be worth continuing the reportership to monitor the situation, and to identify areas where it would be valuable for the CIE to form a technical committee to support the display community worldwide."

8.5 Liaisons with other organizations

During the status reports on the following reporterships were given

CCPR - Consultative Committee of Photometry and Radiometry

Lisison Officer: Y. Ohno

CCPR is a committee under CIPM, which is under CGPM and Meter Convention. The current president of CCPR is F. Hengstberger (also CIE President). The BIPM-CIE agreement was signed in April 2007.

Last Working Group meetings: June 2007at BIPM, Paris

- J. Bastie as official liaison person from CIE to CCPR.
- CIE has an official observer status in CCPR.
- Ohno is the liaison person from CCPR to CIE
- There are three Working Groups which meet every year;
  - WG Key Comparisons (chair, Ohno)
  - WG Calibration and Measurement Capabilities (chairman rotates among RMOs)
  - WG Strategic Planning (chair, Zwinkels).

Status of Key Comparisons

CCPR K1.a	Spectral irradiance (250-2500 nm)	Complete
CCPR K1.b	Spectral irradiance (200-400 nm)	Draft B in CCPR
CCPR K2.a	Spectral responsivity (900-1600 nm)	Draft A2
CCPR K2.b	Spectral responsivity (300-1000 nm)	Complete
CCPR K2.c	Spectral responsivity (200-400 nm)	Measurement in progess
CCPR K3.a	Luminous intensity (cd)	Complete
CCPR K3.b	Luminous responsivity (A/lx)	Complete
CCPR K4	Luminous flux (lm)	Complete
CCPR K5	Diffuse spectral reflectance	Pre-Draft A
CCPR K6	Regular spectral transmittance	Draft B in WG-KC

<Supplementary Comparisons>

CCPR S1	Spectral radiance	Draft B in CCPR
CCPR S2	Aperture area	Complete
CCPR S3	Cryogenic radiometer	Complete

(additional bilateral comparisons in progress)
* No further supplementary comparisons will be conducted under CCPR.

For further information, visit CCPR website:
http://www.bipm.fr/en/committees/cc/ccpr/

Division 8

Liaison Officer: A Kravetz

No report available during the meeting in Turin.
The next meeting of Div 8 will be in November 2008.

ISO TC6 Paper, board & pulps

Liaison Officer: J. Zwinkels

The most recent meeting of TC6/WG3 was June 9, 2008 in conjunction with the ISO TC6 meetings in Seoul, Korea, June 6-13, 2008.

There has been a change in the convenorship of WG3 due to the recent resignation of Robert Wood, CAN. Dr. Byron Jordan, CAN has been nominated to assume the Chairmanship of ISO TC6 and Dr. Joanne Zwinkels, CAN has been nominated to replace Dr. Jordan as the convenor of WG3. Both of these nominations were supported by the delegations at the ISO TC6 meeting.

One standard is being balloted as a CD: CD 11476: *Determination of whiteness, C/2° Indoor illumination conditions).* It is proposed by one of the members to continue to carry out the UV adjustment corresponding to the CIE illuminant C condition but to change from C/2° to D65/10° colorimetric evaluation. This will cause a significant change in the indoor whiteness scale but this change is argued on the following points: the 10° observer is more relevant; CIE whiteness was originally developed only for D65; and there should be consistency in the whiteness measurements with the related ISO 11475: *Determination of CIE whiteness, D65/10°(outdoor daylight conditions).* At the WG3 meeting, the majority of the members present did not support this proposal and felt that the proposed revision was too substantive and would make colorimeters that currently conform with this Standard no longer compliant.

There is one standard being balloted as an FDIS: FDIS 9416: *Determination of light scattering and absorption coefficients using Kubelka-Munk theory).* At the DIS ballot stage there were questions about the validity of the precision statement data that are presented in the method. At the WG3 meeting, it was decided to proceed to the FDIS level and initiate a round robin comparison immediately. Upon publication of the standard, a new work item will be proposed to revise the standard to incorporate an updated precision statement based upon these round robin comparison results.

There is one new work item that is being balloted: a revision of ISO 2469:2007: *Measurement of diffuse radiance factor* to include the following statement: " A filter or other means shall be provided to ensure that the ultraviolet intensity is negligible for wavelengths shorter than 300 nm". This revision is proposed to improve inter-instrument agreement due to the fact that the instruments used to measure the fluorescent radiance of fluorescent papers have different relative amounts of UVA and UVB and it has been shown that the fluorescence excited in these papers is due to a combination of UVA and UVB. Thus, for a one-point UV-A adjustment procedure, as in ISO 2469:2007, to be valid, the instrument source should produce negligible UVB intensity. This revised procedure will also give closer agreement with CIE standard illumination conditions which specify a zero value below 300 nm.

There is considerable interest in WG3 on the recommendations of CIE TC 1-66 (Indoor Daylight) and two WG3 members are also members of this TC (Zwinkels and Jordan). The draft recommendations of this TC for spectral distributions for indoor D65 (ID65) and indoor D50 (ID50) are being analyzed by WG3 to determine if one of these indoor illuminants can be adopted as a replacement for Illuminant C which is presently used in several WG3 standards..

IEC TC 34: Lamps and related equipment

Liaison Officer: G. Vandermeersch

The Liasison officer gave a report on ISO TC34 activities.

There are 4 SCs within TC34.

IEC/TC 34/SC 34A: Lamps
IEC/TC 34/SC 34B: Lamp caps and holders
IED/TC 34/SC 34C: Auxillaries for lamps
IEC/TC 34/SC 34D: Luminaires

There are at the moment 3 to 4 documents in preparation including LED Modules. At the Milano meeting in June, the document for retrofit LED lamps was discussed in SC 34A. In SC 34C two new standards were published.

ISO on reflectance and transmittance issues

Liaison Officer: D. Rich

ST: The Report on this liaison was sent to DD and DS prior to the meeting. It was communicated to the participants during the D2 meeting.
ISO TC 42 in cooperation with ISO TC 130 (JWG21) is in the process of updating and revising the ISO 5 series on densitometry. All 4 parts will be edited and released at the same time. This will be the first time this has ever occurred. One of the issues addressed in this includes better definitions of the geometry of reflection densitometry and transmission densitometry to reflect actual practice. In addition, the pervasiveness of substrates and inks containing luminescent chemicals has been acknowledged and the instrument light source has been expanded to include the following specimen illumination conditions: M0 which recommends an incandescent lamp operated so as to approximate CIE standard illuminant A; M1

which recommends a source that is an EXACT simulation of CIE illuminant D50; M2 which recommends any source which can be filtered to eliminate all radiance below 400nm (UV-cut source); M3 which recommends the M2 source with the addition of a linear polarization filter in the influx beam and a similar filter, positioned with the polarization axis at 90 in the efflux beam. This is the first time that the ISO has recognized a polarized measurement method for reflection density.
These same four source conditions are being implemented in the revision of ISO 13655, the standard on the measurement of diffuse reflectance factor for colour measurements in the graphic arts. ISO 13655 continues to have no references to documents, other than CIE Publication 15, on the design, calibration and standardization of bidirectional spectrophotometers and spectrocolorimeters. This lack of specification on how to configure and calibrate reflectometers affects other ISO standards as well, except for ISO 2469 which has taken upon itself to create the specifications itself. That standard is being recommended for revision so that a new requirement will be added to the instruments used for the measurement of the optical properties of pulps and papers. It has been reported and confirmed that sources with a rich supply of ultraviolet radiations below 300nm will affect the reproducibility of the measurement of the total radiance factor of papers, even if the UVA and UVB spectral contents have been matched. Therefore, the standard is to be revised to include a requirement to have a filter that blocks all radiance below 300nm.

IDA (International Dark Sky Association)

Liaison Officer: J. Rennison

No report was available at the meeting. In during the next meeting in Budapest 2009 it has to be discussed whether this liaison may be possibly closed.

OIML (Organization of International Legal Metrology)

Liaison Officer: G. Sauter

The report was given by the liaison officer. There is nothing of immediate interest to report. Due to the political discussion on incandescent lamps, this liaison should be kept open. However, a new liaison officer is needed as Sauter is not able to continue this work. It was remarked that the Journal of OIML is available at CIE CB.

IALA (International Association of Lighthouse Authorities)

Liaison Officer: Carl Andersen/ Ian Tutt

A PowerPoint presentation was sent to the DD, who gave the report.

IALA Events

- IALA Specialist Working Group Meeting, Koblenz Feb 2008
- IALA Engineering, Environment and Preservation (EEP) Committee Meeting, Paris April 2008
- IALABATT/IALALITES Workshop, Copenhagen 29th Sept 2008 (inc EEP meeting)
- IALA Engineering, Environment and Preservation (EEP) Committee Meeting, Santander April 2009

- Japan Coast Guard Expert Meeting, Tokyo November 2008 (Visual Conspicuity – flash and flicker).

IALA Specialist WG

IALA E-200 "Recommendation on Aid-to-Navigation Signal Lights"

E-200-0 Overview

E-200-1 Colour

Including the optimum colour gamuts of red, yellow, green, blue and white light

- Discussions with EN14744 & IMO

E-200-2 Notation of Range and Luminous Intensity

- Discussions with TC2-49
- IALA: the internationally accepted value of the threshold of illuminance for observation of a light at night under typical maritime conditions is 2 $x10^{-7}$ lux. This figure was agreed at the International Technical Conference of Lighthouse Authorities, Paris 1933.
- **Hecht (1942) – Achromatic Threshold:** 7×10-8 lux photopic, 1.5×10-9 lux scotopic – by experiment with around 60% probability.

E-200-3 Measurement

- Goniophotometry
- Gonio-spectroradiometry
- Colorimetry
- Flash Photometry
- LED Arrays
- Lamp/Lens Arrangements
- Fixed/Rotating/Floating.

E-200-4 Effective Intensity

- Discussions with TC2-49
- 1977 Recommendation gave Blondel-Rey, Allard and Schmidt-Clausen
- 1980 Recommendation gave Schmidt-Clausen Form Factor but not for rapid pulses (Talbot–Plateau)
- E-122 Recommendation gave Schmidt-Clausen Form Factor with Talbot-Plateau
- E-200 will probably recommend Modified Allard for discrete measurement data if proved compatible with S-C for existing published figures and dependent on CIE!!

E-200-5 Calculation

- Revamp of 1977 Recommendation
- Will probably recommend Blondel-Rey I*t/a+t for calculated figures of Io and t for rotating lens systems and flashed lamp/LED

- Will probably recommend Schmidt-Clausen Form Factor for graphs of flash profiles (historic).

IEC TC100/TA2 Multimedia Systems and Equipment

Liaison Officer: D. Rich

ST: The Report on this liaison was sent to DD and DS prior to the meeting. It was communicated to the participants during the D2 meeting.
The last new standard issued by this committee was dated 2003. The committee is currently in a review phase of the existing standards. The only standards of interest to CIE Div2 would be 61966-9 on characterization of digital cameras. The current move is to review and update the standard to reflect changes to devices used to derive the spectral response of a digital camera. The original standard recommended the use of a scanning monochromator to irradiate the camera, with one band of wavelengths at a time. Recent reports have shown that an array of back lighted interference filters using fibre optics or diffuse illuminations or coloured LED sources may provide a faster and more reliable characterization. No other changes to existing standards have been recommended and the standards have been re-approved for a 5yr review period.

10. Proposals for dissolutions of TCs and reporterships

- TC2-25 Calibration methods and photo-luminescent standards for total radiance factor measurements (J. Zwinkels) is closed, as CIE 182:2007 was published.
- R2-36 Measurement requirements for solid state light sources (G. Heidel) is closed, as a new TC is established.

10. Proposals for new TCs and reporterships

10.1 New Technical Committees

Ad hoc meeting LED, Turin 2008-07-10

There was an ad hoc meeting on LEDs held in Turin. This meeting with 54 participants was chaired by Yoshi Ohno who gave an overview on the needs of industry. Main issue regarding measurements of high power LEDs is the knowledge of junction temperature which is not easy to measure. However, versatile programmable heat sinks (developed for laser diodes) are now available and can be used for temperature setting of high-power LEDs.
A very useful measurement procedure was presented at the symposium in Turin and discussed in the meeting. It also shows that pulsed and DC methods seemed to be equivalent if the junction temperature is kept equal. On this background, it was agreed without dissenting votes that a new TC will be established:

TC2-63: **Optical measurements of High-Power LEDs**.
Chair: Yuqin Zong (USA) **AD:** Sauter

TR: Develop a CIE recommendation on methods for the operation of high-power LEDs in DC and in pulsed mode, at specified junction temperature, for optical measurements.

High-power LEDs: LEDs that require a heat sink to operate at the rated current. The document covers single package LEDs with single or multiple chips.

It was also agreed without dissenting votes that a second TC on LED will be established as an outcome of the reportership R2-36. The main emphasis within this new TC is on measurement and testing procedures during the manufacturing process of LED products. The work of this TC will be linked with the other TC on high power LEDs

TC2-64: High speed testing methods for LEDs
Chair: Günther Heidel (Germany) **AD:** Sauter

TR: To prepare a technical report on high-speed testing methods for electrical, thermal and optical quantities during the production of LEDs and conversion of the values to DC operational conditions including the related time-dependent functions.

10.2 New Reporterships

R2-40: **Spectral and Colorimetric Electronic Data Exchange**
Reporter: Mike Pointer
TR: To monitor progress in ISO TC 38 Textiles who are working on a standard to specify the form of electronic data interchange between spectral and colorimetric measuring instruments.

This new reportership was first discussed in 2006 (see the TC2-61 report in 2006) but its establishment has not been formalized. As the need still exists, D2 agreed to establish this reportership as detailed above at the meeting in Turin.

R2-41: **Retroreflection Intercomparison**
Reporter: Cameron Miller (USA)
TR: To investigate the interest in the international retroreflection community to participate in an inter-comparison according to the requirements of the new CIE ISO standard. The goal would be to develop a list of participants.

R2-42: **Photometry of curved surface sources**
Reporter: Hsueh-Ling Yu (Taiwan)
TR: To report on the measurement requirements for the photometric characterisation of extended sources having curved surfaces.

All new reporterships were agreed without dissenting votes.

11. General issues

There were no contributions to this topic during the meeting.

12. Future D2 meetings

2009: D2 will meet in Budapest, Hungary on June 1 – 3 as a part of the CIE Midterm session May 24 – June 3. The conference on Light and Lighting (May 27 – 29) will include sessions on measurement of LEDs and SSL.

2010: Bern, Switzerland, was proposed by Peter Blattner (METAS). Other proposals are welcome by 2009 D2 meeting. Suggestions for a symposium are also welcome.

2011: Sun City, South Africa (27^{th} Quadrennial Session)

12. Any other business

It was remarked that the handling of the electronic versions of CIE recommendations could be improved, as it is only printable once. It should be more customer-friendly.

Adjournment

DD Ohno expressed his great thanks to Maria Luisa Rastello and her staff members of INRIM for hosting the CIE Expert Symposium and Division 2 meetings in Turin, with excellent facilities, arrangements, and gracious hospitality. The meeting adjourned at 6 PM.

Attachment 1

2008 Division 2 Meeting

Turin, Italy

09:00-17:00, 11 July 2008

Agenda

1. Opening, attendance list, apologies
2. Introductions
3. Approval of agenda
4. Approval of the minutes of 2007 Division meeting
5. Director's report
6. Secretary's report
7. Editor's report
8. Progress reports from Technical Committees, Reporters and Liaison Persons
    - 8.1. Associate Director Sauter and TC chairpersons
    - 8.2. Associate Director Vandermeersch and TC chairpersons
    - 8.3. Associate Director Johnson and TC chairpersons
    - 8.4. Reporters
    - 8.5. Liaisons with other Organisations
9. Proposals for dissolution of TCs and reporterships
10. Proposals for new TCs and reporterships
11. General issues
    - 11.1 Future D2 Symposia
    - 11.2 Future directions for measurement R&D
12. Future D2 meetings
13. Any other business

Adjournment