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**DIVISION 2 : PHYSICAL MEASUREMENT OF LIGHT AND RADIATION**

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Home Page: <http://cie2.nist.gov>

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# **DIVISION 2 ACTIVITY REPORT May 2003**

May 28, 2003

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## Division Officers

Director:	Miss Teresa Goodman
Associate directors:	Dr. Georg Sauter Mr. Nobert Johnson Mr. Guy Vandermeersch
Editor	Mr. John Moore
Secretary	Dr. Yoshi Ohno

## Country Members (36 countries: +2 from 2002)

ARGENTINA	Lic. Adrian J. Cogno	ITALY	Maria Luisa Rastello
AUSTRALIA	Jim Gardner	JAPAN	Ichiro Saito
AUSTRIA	Michael Matus	KOREA*	Jin Sang Kwon
BELGIUM	Guy Vandermeersch	NETHERLANDS	Paul Nederpel*
BRAZIL	Giorgio Moscati	NEW ZEALAND	John F. Clare
BULGARIA	Bojana Florian	NORWAY	Björn Brekke
CANADA	Joanne C. Zwinkels	POLAND	Jerzy Pietrzykowski
CHINA	Guan-Rong Ye	ROMANIA	Mihai Simionescu
CROATIA	Mrzljak Zeljko	RUSSIA	Raissa Stolyarevskaya
DENMARK	Poul Erik Pedersen*	SLOVENIA	Stanko Erste
FINLAND	Erkki Ikonen	SOUTH AFRICA	Franz Hengstberger
FRANCE	Jean Bastie	SPAIN	Antonio Corrons
GERMANY	Georg Sauter	SWEDEN	Allan Ottosson
GREAT BRITAIN	Teresa M. Goodman	SWITZERLAND	Peter Blattner
HONG KONG	T. M. Chung	THAILAND	Surapol Vatanawong
HUNGARY	Gyula Dézsi	TURKEY	Leyla D. Öztürk
INDIA	Anool J. Mahidharia	USA	Norbert Johnson
ISRAEL*	Dan Scheffer	YUGOSLAVIA	Predrag Vukadin

\* Israel and Korea are the two new D2 country members added in 2002.

\* Country representatives of Netherlands (Anton Bouman) and Denmark (Lars Larsen) changed in 2002.

## Current Technical Committees

May 2003

	Technical Committee	AD	Chair
	TC2-04 Secondary standard sources	S	John Moore
	TC2-16 Characterization of the performance of tristimulus colorimeters	S	M. Luisa Rastello
	TC2-17 Recommendation for integrated irradiance and spectral distribution of simulated solar radiation	J	Gene Zerlaut*
	TC2-19 Measurement of the Spectral Coefficient of Retroreflection	J	Norbert Johnson
	TC2-23 Photometry of Street-Lighting Luminaires	V	Guy Vandermeersch
	TC2-24 Users guide for the selection of illuminance and luminance meters	V	K. Ganesha
	TC2-25 Calibration Methods and Photoluminescent Standard for Total Radiance Factor Measurement	J	Joanne Zwinkels
	TC2-28 Methods of characterizing spectrophotometers	J	Peter Clarke
	TC2-29 Measurement of detector linearity	S	Tom Larason*
	TC2-32 Measuring Retroreflectance of Wet Horizontal Road Markings	J	Neil Hodson
Std	TC2-35 CIE Standard for $V(\lambda)$ and $V'(\lambda)$	J	Klaus Mielenz
	TC2-37 Photometry Using Detectors as Transfer Standards	S	Yoshi Ohno
	TC2-39 Geometric Tolerances for Colorimetry	J	Danny Rich
Std	TC2-40 Characterizing the Performance of Illuminance and Luminance Meters	S	Reiner Rattunde
	TC2-42 The Colorimetry of Visual Displays	J	Christine Wall
	TC2-43 Determination of measurement uncertainties in photometry	S	Georg Sauter
	TC2-44 Vocabulary Matters	J	John Moore
	TC2-45 Measurement of LEDs - Revision of CIE 127	S	Kathleen Muray
Std	TC2-46 CIE/ISO standards on LED intensity measurements	S	John Scarangelo
	TC2-47 Characterization and Calibration Methods of UV Radiometers	S	Gan Xu
	TC2-48 Spectral responsivity measurement of detectors, radiometers, and photometers	S	George Eppeldauer
	TC2-49 Photometry of Flashing Light	V	Yoshi Ohno
	TC2-50 Measurement of the optical properties of LED clusters and arrays	V	Georg Sauter
	TC2-51 Calibration of multi-channel spectrometers	J	Richard Austin
	TC2-52 Photometry of Emergency Lighting Luminaires	V	Guy Vandermeersch
	TC2-53 Multi-Geometry Color Measurements of Effect Materials	J	Gerhard Rösler
NEW	TC2-55 Round Robin Investigation of Implementation of CIE Photobiological Safety Standard	S	Kohtaro Kohmoto

Std: TCs producing ISO/CIE standards

AD: J- Johnson, S- Sauter, V- Vandermeersch

\* Chairperson changes: TC2-17 (from D. Kockot) and TC2-29 (from T. Goodman).

## Reporterships

	Reporter Title	AD	Reporter
	R2-05 Visual Gloss	J	Mike Pointer*
	R2-21 Use of Detectors as Absolute Transfer Standards for Spectroradiometry	S	Nigel Fox
	R2-23 ISO/CIE Standards for the measurement of reflectance and transmittance	J	Danny Rich
	R2-27 Field Measurement for Traffic Signals	V	Carl Andersen
	R2-28 Evaluation of Colorimeter Spectral Responsivity	S	Balazs Kránicz
NEW	R2-29 Characterization of imaging luminance measurement devices	S	Peter Blattner
NEW	R2-30 Problem linked to correct measurement of TL5 fluorescent lamps with existing electronic ballast	V	Guy Vandermeersch
NEW	R2-31 Problems with spectroradiometric measurement of light sources associated with bandpass and sampling intervals.	J	David Gibbs

\* Changed from J. Taylor.

## Liaisons

	Organization	Liaison Officer
	CCPR - Consultative Committee of Photometry and Radiometry	
	Division 8	Alan Kravetz
	ISO TC6 Paper, board & pulps	Joanne Zwinkels
	IEC TC 34: Lamps and related equipment	G. Vandermeersch
	ISO on reflectance and transmittance issues	Danny Rich
	IDA (International Dark Sky Association)	Justin Rennison
	OIML (Organization of International Legal Metrology)	Georg Sauter
NEW	IALA (International Association of Lighthouse Authorities)	Carl Andersen
NEW	IEC TC100/TA2 (Color Management and Measurement/Audio, Video and Multimedia Systems and Equipment)	Janos Schanda

## **Closed functions**

- TC2-30 Array radiometry (Palmer)
- TC2-54 Review of IEC documents for color measurement and management in multimedia systems (Schanda)
- R2-06 Standardization of Measuring Geometry for the Colorimetry of Metallic Coatings (McCamy)
- R2-24 Classification of color measuring instruments (Ohno)
- R2-25 Liaison with IALA (Tutt)
- R2-26 Eye Safety of Light Emitting Diodes
- Liaison ISOTC 180

## **New functions established**

- TC2-55 Round Robin Investigation of Implementation of CIE Photobiological Safety Standard (K Kohmoto)
- R2-29 Characterization of Imaging luminance measurement devices (Peter Blattner)
- R2-30 Problem linked to correct measurement of TL5 fluorescent lamps with existing electronic ballast (Guy Vandermeersch)
- R2-31 Problems with spectroradiometric measurement of light sources associated with bandpass and sampling intervals (David Gibbs)

Liaison: IALA (International Association of Lighthouse Authorities) (Carl Andersen)

Liaison: IEC TC100/TA2 (Janos Schanda)

## **Changes of functions**

- TC2-17: The chairperson has been changed from Dieter Kockott to Gene Zerlaut.
- TC2-29: The chairperson has been changed from Teresa Goodman to Tom Larason.
- R2-05: The reporter has been changed from Julie Taylor to Mike Pointer.

## **Progress on TC document publication (since Aug. 2002)**

- Divisional ballot for CIE draft standard DS 014-2.1/E:2002 "Colorimetry - Part 2: CIE Standard Illuminants, closed March 15, 2003.
- Division ballot for revision of International Lighting Vocabulary, closed June 11, 2002
- TC2-04 document "The use of Tungsten Filament Lamps as Secondary Standard Sources" has been published (CIE Publication 149:2002)
- TC2-22 document "Report on an intercomparison of measurements of the luminous flux of high-pressure sodium lamps" is being prepared for publication in the CIE Collection.

## **Meetings**

### **1. CIE Symposium on Temporal and Spatial Aspects of Light and Color Perception (22-23 August 2002)**

This symposium was jointly organized by Division 1 and Division 2 in Veszprem, Hungary, hosted by Janos Schanda (organizing committee: Janos Schanda, Yoshi Ohno, Ken Sagawa, Francois Vienot, Teresa Goodman and Peter Bodrogi). The symposium was attended by about 50 participants. There were five sessions: 1) Perception and flashing lights, 2) Physical photometry and colorimetry, 3) Mesopic photometry, 4) Contrast sensitivity, and 5) Spatio-colour perception and measurements. The main focus was on recent developments in the photometry of flashing lights and in contrast sensitivity functions. 15 papers plus several posters were presented. The proceedings have been published as CIE x025: 2003.

### **2. Division 1 and Division 2 Joint meetings (24-28 August 2002)**

Division 1 and Division 2 met jointly in Veszprem, Hungary, August 2002, in conjunction with the Symposium. There were several TC meetings and General meeting of each Division from Aug. 24 through 28. A D1/D2 joint session was held on the morning of Aug. 26. The following four topics were presented and discussed.

- 1) Discussion of D1 and D2 priorities for mesopic photometry (Yasuhisa Nakano introduced the topic, Ken Sagawa acted as moderator for the discussion)
- 2) Discussion of D1 and D2 priorities for LEDs (Peter Bodrogi introduced the topic, Teresa Goodman acted as moderator for the discussion)
- 3) Discussion of issues relating to colorimetry of interest to D1 and D2 (Yoshi Ohno introduced the topic, Alan Robertson acted as moderator for the discussion)
- 4) Discussion of D1 and D2 priorities for the evaluation of pulsed sources (Dennis Couzin introduced the topic, Yoshi Ohno acted as moderator for the discussion)

### **2002 Division 2 Meeting (27-28 August 2002)**

The 2002 Division 2 Meeting was held on 27-28 August, 2002, at Veszprem, Hungary, with 32 attendees from 15 countries, including 13 country members. The minutes of the meeting were compiled by the Secretary and distributed in May 2003, and are attached to this Activity Report.

### **2002 Technical Committee Meetings (24-27 August 2002)**

The following meetings were held in conjunction with the 2002 Division 2 Meeting. Reports on these TC meetings are included in the 2002 Division 2 Meeting minutes.

TC2-23 Photometry of Street-Lighting Luminaires (G. Vandermeersch)

TC2-48 Spectral responsivity measurement of detectors, radiometers, and photometers (G. Eppeldauer)

TC2-49 Photometry of Flashing Light (Y. Ohno)

TC2-52 Addendum to CIE 121-1996 for the Photometry of Emergency Lighting Luminaires  
(G. Vandermeersch)

TC2-53 Multi-Geometry Color Measurements of Effect Materials (Gerhard Rösler)

Ad-hoc meeting on Risk Evaluation of Lamps and LEDs with CIE Safety Standard (K.  
Kohmoto)

### **Other Division 2 Activities**

1. An email ballot was held for the Division 2 Director, Associate Directors and Secretary for the 2003-2007 quadrennium. All votes were in favour of the existing Officers continuing in these roles for a further 4 years, and the Officers have all agreed to continue.
2. A lively email discussion on the topic of the definition of ‘radiance’ (and related terms) took place during November – December 2002. No clear concensus was reached. The summary of the points raised will be passed to the vocabularly committee (TC2-44) for consideration during the revision of the ILV. Until a new definition has been incorporated into the ILV, all Division 2 publications will continue to use the existing ILV definition.



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

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May 6, 2003

### Minutes of 2002 CIE Division 2 Meeting

8:30 – 12:00 Aug. 27 and 09:00 – 12:00 Aug. 28, 2002

Veszprém, Hungary

#### Abbreviations:

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

#### Attendees:

George Andor*	OMH, <u>Hungary</u>
<u>Jean Bastie</u>	BNM-INM/CNM, <u>France</u>
Peter Bodrogi	Univ. Veszprém, Hungary
<u>Peter Blattner</u>	METAS, <u>Switzerland</u>
Dennis Couzin	Avery Dennison, USA
Ellen Carter	Color Res. & Appl., USA
<u>Antonio Corrons</u>	IFA, <u>Spain</u>
George Eppeldauer	NIST, USA
Irena Fryc	Bialostocka University of Technology, Poland
David Gibbs	NPL, UK
<u>Teresa Goodman</u>	NPL, <u>UK</u> (D2 Director)
<u>Norbert Johnson</u>	3M, <u>USA</u> (D2 AD)

Hoon Kim	KNU, Korea
Kohtaro Kohmoto	JELMA, Japan
Gabor Kutas	Univ. Veszpém, Hungary
Balázs Kránicz	Univ. Veszprém, Hungary
<u>Jin Sang Kwon</u>	KATS, <u>Korea</u>
Hans Allan Löfberg	Univ. Gävle, Sweden (CIE President)
Janos Makai	CIE CB
Rita Mátrai	Univ. Veszprém, Hungary
John Moore	UK (D2 Editor)
Cameron Miller	NIST, USA
Yoshi Ohno	NIST, USA (D2 Secretary)
<u>Allan Ottosson</u>	Univ. Gävle, <u>Sweden</u>
Tom Ondró	Univ. Veszprém, Hungary
<u>Jerzy Pietrzykowski</u>	Central Office of Measures, <u>Poland</u>
Etienne Pierson	Laborelec, Belgium
Alan Robertson*	NRC, <u>Canada</u>
<u>Maria Luisa Rastello</u>	IEN, <u>Italy</u>
Gerhard Roesler	GretagMacbeth, Germany
H. J. Schmidt-Clausen	Tech. Univ. Darmstadt, Germany
Farhad Samadov	UME, Turkey
<u>Ichiro Saito</u>	NMIJ/AIST, <u>Japan</u>
<u>Guy Vandermeersch</u>	Laborelec, <u>Belgium</u> (D2 AD)
Pierce Webb	Eastman Kodak-retired, USA

Total 35 persons from 15 countries, including 13 country members. Underlines indicate country members. \* indicates substitutes for country member.

### **Handouts**

Agenda of 2002 Division 2 meeting (**Attachment 1**)  
List of the country members, list of TCs and Reporterships  
July 2002 Division 2 Activity Report

### **Opening**

Division Director, Teresa Goodman, opened the meeting at 8:30 a.m., and welcomed everyone present. All the participants introduced themselves.

### **1. Attendance list, apologies**

Secretary received regrets from the following persons:

- Carl Andersen (USA)
- Anton Bouman (Netherlands C/M)
- John Clare (New Zealand C/M)
- Peter Clarke (UK)
- Jeanne-Marie Coutin (France)
- Gyula Dezsi (Hungary C/M)
- Jim Gardner (Australia C/M)

K. Ganesha (India)  
Alan Kravetz (USA)  
Hideki Kondo (Japan)  
Larry Leetzow (USA)  
Ian Lewin (USA)  
Michael Matus (Austria C/M)  
Giorgio Moscati (Brazil C/M)  
Cal McCamy (USA)  
Kathleen Muray (USA)  
J Rennilson (USA)  
Danny Rich (USA)  
Georg Sauter (Germany C/M)  
J Scarangelo (USA)  
Dave Sliney (USA)  
Klaus Witt (Germany)  
Gan Xe (Singapore)  
Gan Rong Ye (China)  
Joanne Zwinkels (Canada C/M)

## **2. Approval of Agenda**

The agenda of 2002 Division 2 meeting, which was distributed to attendees and also via e-mail circular prior to the meeting, was approved with no changes.

## **3. Approval of the 2001 Div.2 meeting minutes**

The minutes of the 2001 D2 meeting at NIST, Gaithersburg, USA, which were distributed via e-mail circular and on the website, were approved with no changes.

## **4. Director's Report (T. Goodman)**

The last CIE Board meeting was held in June 2002 in Vienna. A large part of the meeting was devoted to discussions relating to preparations for the quadrennial meeting in San Diego. There are several changes planned:

- a) There will be no presented poster sessions; instead, there will be more presented papers, each slightly shorter in length than at the last session (10 min presentation + 5 min discussion).
- b) During the poster sessions, there will be designated times when authors must be present at the poster to answer questions. (If the author is not present, the paper will not be published in proceedings).
- c) Authors of presented papers will also be offered the opportunity to display a poster (to allow those who missed the presentation due to parallel sessions).
- d) Any papers not actually presented will not be published in the proceedings.
- e) All the abstracts received have been reviewed and allocated as either presented papers or posters. About 40 % are presented papers (much higher than before).

f) Format of proceedings: All delegates will get books of extended abstracts (page limit 4 pages for both presented papers and poster papers). Papers that exceed 4 pages will be cut off to 4 page limits. After the meeting, official proceedings in CD ROM format only, will be produced. These will include full papers (with no page limits and the ability to include color figures if required), together with workshop reports and Divisional reports. Final full version papers should be submitted at the Conference. If no full paper is submitted, the extended abstract will be included in the CD ROM. Refereeing of papers was discussed, but was not done this time (will occur for future Sessions).

Other issues raised during the Board meeting:

- (i) The benefits of the new classes of supportive membership have been improved significantly. New publicity material will be published later in the year.
- (ii) A trial of selling publications on the web has started in South Africa (Franz Hengstberger).
- (iii) The Board are still keen that Divisions should consider publication of CIE handbooks on particular topics; this was on the Agenda for discussion later in the D2 meeting.
- (iv) Education: there are 42 active members in Dr. Janos Schanda's email group, and this initiative appears to be working well. Div. 7 will not be reactivated.
- (v) CIE CB is working with CEN to smooth the relationship with CEN.
- (vi) The establishment of an introductory course on optical radiation is being considered. This would be a joint initiative between D2 and D6 and would be held at the Central Bureau.
- (vii) CIE is reducing the prices of publications. Prices (publication handed from CIE CB to national committees) are reduced by 50 % (as a trial, to see whether the number of publications sold is directly influenced by their cost). The prices at which national committees sell publications are up to national committees.

## **5. Secretary's Report (Y. Ohno)**

Div. 2 now has 35 country members, the same number as last year. We have a new member from Korea. Slovak Republic was removed from membership (a notice from CIE CB received in March 2002). The country representatives of Bulgaria, Denmark, and Finland have changed.

The Secretary produced and circulated the minutes of the 2001 D2 meeting (NIST, Gaithersburg, USA) by email and on the website in June 2001. The last Activity Report was produced and circulated on the website in July 2002. It was also mailed to a few people who have no email access.

The D2 mailing list now has 152 persons (last year – 144). Almost all communications in Division 2 are done by email and through the website. We have now five persons who do not have email accounts, or with whom email communication has been lost, and these are contacted by fax or mail for important communications only.

Div.2 Website: The server for the D2 website has been changed within NIST, and the URL

is changed to <cie2.nist.gov>. Several items have been added following the decisions at the last D2 meeting and other improvements:

- Template of TC draft document (prepared by CIE CB) - posted on the TC list page
- TC drafts posted: TC2-24, TC2-25, TC2-37, TC2-40, TC2-42, TC2-46, TC2-47, TC2-48, TC2-49. Password protection installed – one global password for all TC documents (distributed to D2 officers and all TC chairs), and individual password for each TC (to be distributed to each TC members). Passwords are assigned only to the TCs posting documents. Not all TC drafts have been posted; TCCs who haven't placed drafts on the website are recommended to do so. .
- What's NEW area (listing new items recently added) has been added.

<Discussion>

The Editor raised a concern that, when downloading TC drafts from the website, some fonts often appear differently. The Secretary answered that we try to avoid such font problems by using PDF format, but doc files are also used to allow comments to be entered, despite the fact that this may cause problems when using special characters and equations. The Secretary requests those who encounter such problems with electronic documents to contact him.

Email Reflectors:

- We now have four reflectors being used: CIE-D2@nist.gov, CIE2-45@nist.gov, CIE2-46@nist.gov, and CIE2-48@nist.gov. More email reflectors can be created on a by request basis.
- A non-subscriber block has been set for all the reflectors, to avoid junk mails being circulated. If a subscriber's email address changes, he/she cannot post messages. The Secretary must be contacted in order to register new email addresses of subscribers.

## 6. Editor's report (J. Moore)

The report from TC2-36 was published in July 2001 as CIE 54.2. The document has many color figures, which is a first for a CIE publication.

TC2-04 Use of tungsten filament lamps as secondary standard sources

The ballot process has been finished, and the document is ready for publication. Only one minor point on quality of photographic reproduction needs to be fixed.

TC2-22 Intercomparison of Measurements on HPS lamps

The document went through Division ballot, and there was one rejection due to the fact that the results had not been subjected to an uncertainty evaluation carried out in accordance with GUM (1993) recommendations and also because the laboratories are identified. The comparison was carried out in 1991-1992. Following some discussion, it was suggested that the results should be presented in an anonymous format, and this suggestion was endorsed by those present. The Editor will make this change, and it is hoped this will resolve the negative vote.

TC2-35 CIE Standard for  $V(\lambda)$  and  $V'(\lambda)$

See TC report.

No new reports have been received since the last D2 Meeting in Gaithersburg. The Editor indicated that he plans to resign from the responsibility of Editor at the San Diego meeting.

## **7. Progress reports from Technical Committees, Reporters, and Liaison persons**

### **7.1 Technical Committees**

Progress reports on the TCs were given by ADs and TCCs who were present at the meeting.

TCs under AD Sauter: TCs 2-04, 16, 29, 37, 40, 43, 45, 46, 47, 48 (As AD Sauter was not present, reports were given by DD and TCCs.)

TCs under AD Vandermeersch: TCs 2-23, 24, 49, 50, 52.

TCs under AD Johnson: TCs 2- 17, 19, 25, 28, 30, 32, 35, 39, 42, 44, 51, 53, 54.

#### **TC2-04** Secondary standard sources

**Chair:** J. Moore (UK)                      **AD:** Sauter

**ML:** Bandyopadhyay (India), Corrons (Spain), Gaertner (Canada), Jiang (China), Low (USA), Metzdorf (Germany), Nishi (Japan), Schanda (Hungary)

**TR:** Produce a technical report on the selection and operation of stable secondary standard sources.

**ST:** Covered in the Editor's report. Ballot process has been finished, and the document is ready for publication. Only one minor point on quality of photographic reproduction needs to be fixed.

#### **TC2-16** Characterization of the performance of tristimulus colorimeters

**Chair:** M. L. Rastello (Italy)                      **AD:** Sauter

**ML:** Denner (South Africa), Goodman (UK), Hengstberger (South Africa), Moore (UK), Muray (USA), Ohno (USA), Rattunde (Germany), Robertson (Canada), Sauter (Germany), Schanda (Hungary), Steindl (Austria), Terstiege (Germany)

**TR:** To produce a report recommending methods for assessing the performance of tristimulus colorimeter heads for measuring chromaticity coordinates.

**ST:** Document is near completion. At the last meeting in 2001, comments on the 6<sup>th</sup> draft were received and an editorial board was formed within the TC to prepare the final version for TC ballot. The TCC hopes to finish the document at San Diego meeting.

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

**Chair:** D. Kockott (Germany)                      **AD:** Johnson

**ML:** Aydinli (Germany), Goodman (UK), Ignatiev (Russia), Justus (USA), Kaase (Germany), Kasten (Germany), Kok (South Africa), Wilkinson (Australia), Zerlaut (USA)

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

**ST:** The TC has not been active for several years. DD Goodman reported that she was able to contact the TCC recently and heard that Kockott is retired and is not continuing this TC. He is contacting an expert in the field who is expected to take over the chairmanship. DD suggested that we allow a little more time and contact him again to obtain the new chairman's name.

(Later on, the TCC informed the DD that Gene Zerlaut (USA) has agreed to take over the chairmanship. A proposal for the change of the TCC was made to the CIE Board and was approved, following email ballot.)

**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 (UK), Rendu (France), Rennilson (USA), Richey (Germany), Schreiber (Germany), Sugiyama (Japan), Terstiege (Germany – now deceased), 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 AD Johnson. The intercomparison is complete and the report now needs only final editing. The report will be sent to Editor Moore and is expected to be sent for TC ballot shortly.

**TC2-23** Photometry of Street-Lighting Luminaires.

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

**AD:** Vandermeersch

**ML:** Arens (US), Blaser (Switzerland), Blochouse (Belgium), Claassens (NL), Corrons (Spain), Price (UK), Rattunde (Germany), Rossi (Italy), Simons (UK), Sorensen (Denmark) - to be updated

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

**ST:** Report given by the TCC. The scheduled TC meeting in Veszprem was cancelled due to lack of members, but instead an ad-hoc meeting has been arranged for the afternoon of Aug. 27, in conjunction with the meeting of 2-52. The document is to provide industrial laboratories with the information they need in order to carry out the photometric measurements of street-lighting luminaires required in documents published by D4. CIE 140 already addresses many issues related to measurement. TCC needs an exchange of ideas with TC members about what to add on street-lighting luminaires.

**TC2-24** Users guide for the selection of illuminance and luminance meters

**Chair:** K. Ganesha (India)

**AD:** Vandermeersch

**ML:** Andor (Hungary), Arens (USA), Austin (USA), Bastie (France), Chang (Taiwan), Dibbern (Germany), Eppeldauer (USA), Gardner (Australia), Goodman (UK), Hengstberger (S. Africa), Moore (UK), Muray (USA), Ohno (USA), Rennilson (USA), Ritzol (USA), Sauter (Germany), Sojourner (USA)

**TR:** Prepare a user's guide for the selection and use of illuminance and luminance meters.

**ST:** AD Vandermeersch reported. The TCC sent apologies for not being present, saying that the draft is now completed but there are some cosine response problems to discuss. The TCC planned to have a virtual meeting to distribute the draft, but this has not yet taken place.

**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), Verrill (UK)
- 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:** A written report was received from the TCC: The TC last met in May 2001 in Gaithersburg, MD in conjunction with the CORM annual meeting. The meeting was attended by seven TC members and ten observers. A new member from the UK (P. Clarke of NPL) has replaced John Verrill (deceased). The ninth draft of the TC report was discussed. Input was received on: properties and availability of additional fluorescent material standards, additional details of NPL spectrofluorimeter, and editorial changes to list of references. There was considerable discussion regarding terminology and notation; in particular, the need to consistently distinguish between fixed and variable measurement parameters. It was proposed to include an Appendix in this TC report, containing a cross-reference of notation in current use for quantities relevant to fluorescence measurements (ASTM, F. Clarke and K. Mielenz). This proposal was circulated to TC members for comment and approved. This stimulated the TCC to carefully review the document to ensure that notation was clearly defined and consistently implemented. These revisions have been made by the TCC and the document (tenth draft) is currently undergoing final review before being circulated for TC ballot. This work should be completed before the next quadrennial meeting in San Diego.

#### **TC2-28** Methods of characterizing spectrophotometers

- Chair:** Peter Clarke (UK)      **AD:** Johnson
- ML:** Andor (Hungary), Bastie (France), Berns (USA), Distl (Germany), Eckerle (USA), Konstantinova (Bulgaria), McCamy (USA), Robertson (Canada), Sugiyama (Japan), Ulyanov (Russia), Zwinkels (Canada)
- 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:** Report given by DD Goodman. The work has not progressed as quickly as planned. The draft is close to completion (thanks to the former chairman J Verrill), and it is mainly editorial issues that now need to be sorted out. The DD will encourage the TCC to circulate a final draft by the end of the year.

#### **TC2-29** Measurement of Detector Linearity

- Chair:** T. Goodman (UK)      **AD:** Sauter
- ML:** Andor (Hungary), Bastie (France), Bittar (New Zealand), Budde (Canada), Distl (Germany), Dezsi (Hungary), Mihailov (Russia), Mostl (Germany), Ohno, Parr (USA)
- 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 given by the TCC. The draft is at a fairly advanced stage but needs some more work to complete. Last year the TCC called for a volunteer for a new chairperson. Several people were interested. Based on their experiences and knowledge of the subject of the TC, the TCC recommends Tom Larason of NIST to take over the chairmanship. This proposal was voted and agreed with no objections. The other people who volunteered are asked to help the TC activity as TC members.

#### **TC2-30** Array Radiometry

**Chair:** Jim Palmer (USA)

**AD:** Johnson

**ML:** Abasari (Hungary), Andoh (Japan), Goodman (UK), Jones (USA), Mihailov (Russia), Pflieger (Austria), Sauter (Germany), Wychorski (USA)

**TR:** Prepare an annotated bibliography for the CIE journal on diode array radiometry. Make appropriate recommendations for future work in diode array radiometry.

**ST:** AD Johnson reported. The Chairmanship changed to Palmer in 1998 but no progress has been reported since then. Quite a few abstracts were collected by the former chairman, but there was an issue of copyright for abstracts collected in the former chairman's company and a concern that the information might already be outdated. There was a suggestion at the last D2 meeting in 2001 to move this work to TC2-51 (R. Austin). AD Johnson spoke with J. Palmer and R. Austin, and both of them agreed on this action. R. Austin is to look at the material collected and consider integrating them as a part of his TC document if appropriate. TC2-30 is to be closed.

#### **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 TC met last September in Istanbul, and subsequently prepared the third draft document. The TC document is closely related to D4. TCC plans to have another TC meeting in conjunction with the next D4 meeting in Torino, Italy.

#### **TC2-35** CIE Standard for $V(\lambda)$ and $V'(\lambda)$

**Chair:** K. Mielenz (USA)

**AD:** Johnson

**ML:** Bastie (France), Gardner (Australia), Hengstberger (South Africa), Moore (UK), Ohno (USA), Parr (USA), Robertson (Canada), Sauter (Germany), Schanda (Hungary)

**TR:** To prepare a new CIE Standard on the present  $V(\lambda)$  and  $V'(\lambda)$  functions.

**ST:** Editor Moore reported. The document has gone through NC ballot for comments. It will go to yes/no vote. There were many comments, mostly editorial, which need to be sorted out.

#### **<Discussion>**

The Editor raised a question who (among the TCC, CIECB and Editor) should be

responsible for final judgments on the comments from national committees, and said that the TCC had handed over to the Editor judgment on the many editorial comments. J. Makai pointed out that there was one technical comment regarding the definition of radiance and luminance (i.e. whether to use  $d\lambda / \dots$ ,  $d\lambda^2 / \dots$ , or some other formalism), which needs to be agreed by the Division, since the change of the equation will necessitate revision of the ILV. There was some discussion amongst the participants, but no consensus was reached. This question is to be discussed again at a later date. The Editor added that the TCC had responded directly to some national committee comments, without reference to the Editor (with previous standards, the Editor talked to national committees to resolve some objections, with some success, but this procedure has not been followed for this document). The Editor highlighted one particular technical comment (to add a paragraph to allow use of integral calculation intervals larger than 1 nm, to be consistent with the draft colorimetry standard), which the TCC has rejected but the Editor supports. After considerable discussions on these points, the DD suggested that the Editor contact the TCC directly to discuss such technical issues, but that all members of D2 should be involved in any decision on changing the definition of radiance and luminance in the ILV. All present agreed.

#### **TC2-37** Photometry Using Detectors as Transfer Standards

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

**ML:** G. Andor (Hungary), R. Austin (USA), J. Bastie (France), A. Bittar (New Zealand), G. Czibula (Germany), A. Corrons (Spain), G. Dezsi (Hungary), G. Eppeldauer (USA), J. Gardner (Australia), T. Goodman (U.K.), R. Köhler (BIPM), J. Moore (UK), K. Muray (USA), J. Pietrzykowski (Poland), R. Rattunde (Germany), M. L. Rastello (Italy), G. Sauter (Germany), J. Schanda (Hungary), P. 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. The work is nearly complete. The sixth draft was distributed in April 2002 by email, and only a few minor comments were received. The next draft is for TC ballot, and needs only minor changes and updates to some figures and the format of document. The TC ballot is to be distributed by the San Diego meeting.

#### **TC2-39** Geometric Tolerances for Colorimetry

**Chair:** D. Rich (USA)                      **AD:** Johnson

**ML:** Baba (Japan), Bittar (New Zealand), Decarreau (France), Erb (Germany), Fisch (USA), Early (USA), Hanssen (USA), Johnson (USA), Kravetz (USA), Ladson (USA), Jordon (Canada), Witt (Germany), Pietrzykowski (Poland), Taylor (UK), Zwinkels (Canada)

**TR:** Compile a technical report and recommendations specifying the geometric tolerances for the various geometries in colorimetry, including 0/45, 0/d and others. Parts of this technical report may be suitable for inclusion in a CIE standard specifying several geometric tolerance levels.

**ST:** Report given by AD Johnson. After the last meeting in Gaithersburg, a fourth draft was prepared and circulated by the TCC around June 2002. The DD added that NPL has been doing some work on geometric tolerances and had fed some data to the TCC.

**TC2-40** Characterizing the Performance of Illuminance and Luminance Meters

**Chair:** R. Rattunde (Germany)                      **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 ISO/IEC 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:** No report received. The DD pointed out that this is an important TC producing a standard. The DD is to contact the TCC to request an updated work plan, in order to move things forward.

**TC2-42** Colorimetric Measurements for Visual Displays

**Chair:** C. Wall (UK)                      **AD:** Johnson

**ML:** G Andor (Hungary), S Ansell (USA), R Baribeau (Canada), R Berns (USA), P Boyton (USA), CDalton (UK), A Hanson (UK), J Hardis (USA), H Ikeda (Japan), H Lara (USA), J Laur (Germany), C Leone (USA), M Lindfors (Finland), R Luo (UK), L MacDonald (UK), J Maelfeyt (Belgium), S McFadden (Canada), Y Ohno (USA), ML Rastello (Italy), M Reid (UK), T Sakai (Japan), J Schanda (Hungary), A Stienstra (Netherlands), M Stokes (USA), F Vienot (France) – revised June 2001

**TR:** To produce a Technical Report summarizing recommended practice for the measurement of the colorimetric and spectroradiometric properties of visual displays.

**ST:** No report received.

**TC2-43** Determination of measurement uncertainties in photometry.

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

**ML:** Bastie (France), Corrons (Spain), Goodman (UK), Köhler (BIPM), Moore (UK), Ohno (USA)

**TR:** To prepare a CIE recommendation as the basis for the determination of measurement uncertainties valid for selected quantities used in photometry.

**ST:** No report received.

**TC2-44** Vocabulary Matters

**Chair:** J. Moore (UK)                      **AD:** N. Johnson

**ML:** Billmeyer (USA), Burghout (Netherlands), Ionescu (Romania), Johnson (USA), Köhler (BIPM), Morren (Belgium), Nishi (Japan), Ohno (USA), Poppe (Hungary), Sauter (Germany), Schanda (Hungary), Woo (Canada)

**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:** Editor Moore reported. The Division 2 part of the Vocabulary (proposed changes) went through Division ballot in June 2002. One objection, which was also raised with the TC2-35 document (DS10.2e), was that the ILV definition of radiance and

luminance may be incorrect. . Another request was to define the CIE standard spectral luminous efficiency function in the ILV.

**<Discussion>**

The definition of radiance was discussed in the TC2-35 report (see above). Regarding the CIE standard spectral luminous efficiency function, Moore did not think it necessary. Ohno commented that there are many spectral luminous efficiency functions –  $V(\lambda)$ ,  $V_M(\lambda)$ ,  $V_B(\lambda)$ , etc. If  $V(\lambda)$  is referred to, it should be called “CIE standard ...”. K. Kohmoto commented that the revision cycle of the ILV is unclear: a definite schedule should be made. The availability of an electronic version of the ILV was also discussed: where or how will it be made available? There were no clear answers.

**TC2-45 Measurement of LEDs - Revision of CIE 127**

**Chair:** Kathleen Muray (USA)                      **AD:** Sauter

**ML:** Austin (USA), Bando (Japan), Balta (USA), Berkhout (USA), Bouman (Netherlands), Budzinski (South Africa), Bym (USA), Carr (USA), Distl (Germany), Ellis (USA), Fleischer (USA), Gan (Singapore), Halkin (Belgium), Heidel (Germany), Jones (USA), Kohmoto (Japan), Larsen (Denmark), Marchl (Germany), Moore (UK), Myers (USA), Ohno (USA), Rastello (Italy), Sauter (Germany), Scarangelo (USA), Schanda (Hungary), Solomon (Taiwan), Stolyarevskaya (Russia), Webb (USA), Young (USA) – revised Jul.00.

**TR:** Revise CIE Pub. 127 to include improved definitions of quantities and methods of measurement for total flux and partial flux of LEDs and to re-evaluate other parts including spectral and color measurements of LEDs.

**ST:** No report was received from the TCC. DD reported that there was a request from D6 for guidance on the measurement of the radiance of LEDs. There is a new CIE publication from D6 on photobiological safety of light sources, and radiance is one of the critical quantities for the safety limits specified in the document. It is therefore important that measurement procedures are unambiguous and clearly defined. The agreement with D6 was that TC2-45 will cover radiance as well as other quantities that the TC has already planned to include. Kohmoto added that bare chips, in addition to encapsulated LEDs, should be covered for radiance. Ohno added that e-mail discussions had taken place on the use of  $f_{1-LED}$  to evaluate the  $V(\lambda)$  match of photometer heads, proposed by R. Young, but no conclusion had yet been reached. DD added that the TC also plans an intercomparison of spectral measurements of LEDs, and there were some discussions regarding this by email reflector.

**TC2-46 CIE/ISO standards on LED intensity measurements**

**Chair:** John Scarangelo (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), Scarangelo (USA), Schanda (Austria), Schumacher (Germany), Sojourner (USA).

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

**ST:** No report received. The Secretary received apologies from the TCC, saying that he plans to have on-line discussion on the next draft and to have a meeting in San Diego.

#### **TC2-47** Characterization and Calibration Methods of UV Radiometers

**Chair:** Gan Xu (Singapore)      **AD:** Sauter

**ML:** 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)

**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:** No report was received from the TCC. Kohmoto reported that the first draft was distributed by email, and the TCC received comments. The second draft is being prepared. Bastie mentioned that there was an unscheduled TC meeting during NEWRAD 2002 at NIST, Gaithersburg, with many attendees with a high level of interest in this topic.

An email from TCC in May 2002 said: At the UV workshop held after the NEWRAD conference, again people showed strong interest in the work of TC2-47 and the need for a new international standard for UV meters was evident. At the meeting, three labs (CSIRO, CSIR and HUT) promised to send their calibration procedures to the TCC and these will be put on the CIE website for member's reference and discussion. TCC would encourage other labs to send their procedures or other materials for discussion. Any suggestions or comments related to the new document or TC work are welcome. TCC is preparing the 2<sup>nd</sup> draft of the TC document and will circulate it for comments shortly.

DD Goodman added that this TC has taken advantage of the UV Network within EC looking at various issues related to measurements of UV radiation. One of their WG is looking at the same issue of characterization and calibration methods for UV radiometers. They prepared a document based on CIE 69. This document did not address all of the issues that TC2-47 is working on, but the current TC2-47 draft is based on this document and will need to cover more issues. The documents of UV network are available on UV Network website.

#### **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)– revised June 01.

**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. The TC met on Aug. 24, 2002 in Veszprem with 17 participants. The scope of the report is to cover spectral responsivity in radiant power,

irradiance, and radiance mode, in the 200 nm to 2.5  $\mu\text{m}$  spectral region. The Fourth Draft was distributed and discussed in detail. Four chapters including chapter 3 on radiant power responsivity and chapter 4 on irradiance responsivity have been written. Work on Chapter 5 (radiance responsivity) is to start shortly. Several suggestions were made at the meeting, and the next version of the draft document is to be prepared before the San Diego meeting.

**<Discussion>**

Kohmoto requested that the wavelength range should be extended to 3  $\mu\text{m}$ , to cover the range required in the photobiological safety standards. DD Goodman mentioned that national scales for sources do not cover the 2.5 to 3.0  $\mu\text{m}$  region and that for this reason it was advisable to restrict the range to 2.5  $\mu\text{m}$ . Ohno mentioned that the photobiological safety requirements concern measurement of sources and not detectors, so this TC document is not directly relevant. The participants agreed not to change the wavelength range.

**TC2-49** Photometry of Flashing Light

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

**AD:** Vandermeersch

**ML:** Andersen (USA), Arens (USA), Austin (USA), Berkhout (USA), Couzin (USA), Ellis (USA), Eppeldauer (USA), Goodman (UK), Hengstberger (South Africa), King (USA), Köhler (BIPM), Kondo (Japan), Rattunde (Germany), Rennilson (USA), Sagawa (Japan), Schmidt-Clausen (Germany), Sauter (Germany), Tutt (UK), Webb (USA)

**TR:** Produce a technical report for photometric measurements of flashing light, including derivation of the photometric quantities applied to flashing light, measurement of light sources, and calibration of photometers for flashing light.

**ST:** The report was given by the TCC. The TC met in Veszprem on Aug. 26, 2003. 7 members and 15 guests attended. Draft 2 (Aug. 2002) was distributed and discussed. Previous Sections 3 and 4 have been merged into one section. Minor changes on the definition of terms were discussed and agreed. Section 4 (Effective Intensity), which described only the Form Factor method in the previous draft, has now been rewritten to include the three methods currently used, as a temporary treatment until a consensus can be reached for one best (recommended) method. The TCC reported that Couzin & Ohno had carried out some calculations to compare the three methods and had developed the Modified Allard method, which was presented at the Symposium. There were considerable discussions on the new method and the validity of the conventional methods. A consensus was that visual experiments are needed to evaluate the Modified Allard method, as well as the conventional methods, for trains of pulses and other specific pulses. The TCC agreed to form a Working Group comprising experts from D1 and D2 (Schmidt-Clausen, Couzin, Vienot, Sagawa, Goodman, and Ohno) to formulate the experimental conditions of the required visual experiments and publicize a call for research. Related documents will be posted on the website.

**<Discussion>**

DD Goodman asked whether a TC should be established in D1 to define the experimental conditions and review data. She suggested that this part of the planned activity (choice of formula) is a D1 issue and such recommendations should come from D1. The TCC answered that the WG includes the best experts in the subject

from D1 (Schmidt-Clausen, Sagawa, and Vienot) and that any recommendations from the WG should therefore be acceptable to D1. DD suggested that DD and TCC talk to D1D to see if D1 has any advice or suggestions. The TCC and participants agreed. (After the D2 meeting, such discussions with D1 officers took place but D1 could not find anybody to volunteer to lead such an effort as a new TC or a reportership.)

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

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

**AD:** Vandermeersch

**ML:** C. Jones (USA), J. Scarangelo (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:** No report received from TCC since the last meeting in Gaithersburg.

**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:** To produce a technical report which sets out guidelines for the recommended procedures, methods and transfer standards for the calibration of multi-channel spectrometers.

**ST:** No progress reported since the last meeting in Gaithersburg. The TC is to take over the materials from TC2-30 to consider use of these for the TC report. (See report for TC2-30)

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

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

**AD:** Vandermeersch

**ML:** L. Bedocs (UK), TA. Boeman (Netherlands), A. Ottoson (Sweden) – more members are searched.

**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. The TC met on Aug. 26 in Veszprem. The first draft was presented and discussed. The TC work relates to work in D5, IEC and CEN. There has been good progress in IEC. There were three international meetings and one workshop for the past year. There has been a good solution for evaluation of lighting performance of centrally supplied luminaires, a concept of emergency mode ballast lumen factor. This has been approved by IEC, but the document is still before voting stage. Regarding self-contained emergency luminaires, work is being carried out in IEC 592-2-22. The TCC intends to have another meeting in October in Brussels.

**TC2-53 Multi-Geometry Color Measurements of Effect Materials**

**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:** Write recommendations for the color measurement of effect materials.

Workplan:

Comparison of the DIN and ASTM standards on Multigeometry color measurement.

Preparation of an educational section to combine most interests.

Recommendations from the educational section for the next meeting.

Meetings are planned for the CIE Session in San Diego and for DIN and ASTM meetings.

**ST:** Report given by the TCC. The TC met first time on Aug. 24 in Veszprem with many participants. It was a brainstorming session on what should be done by the TC, and what specific inputs are needed for the report. There was an agreement to start with a review of existing standards and protocols for measurements on metallic paints and pigments and effect materials, possibly including a measurement comparison. The report will begin with educational part and then measurement recommendations, including measurement geometry. The recommendations from TC2-39 will be used as the basis for any recommendations on measurement geometry. The TC will look at DIN and ASTM standards to find the classical description of geometric tolerances.

**TC2-54** Review of IEC documents for color measurement and management in multimedia systems

**Chair:** Janos Schanda (HU)                      **AD:** Johnson

**ML:** Y. Ohno (USA), D. Rich (USA)

**ST:** DD Goodman reported. Due to decreased interest, the TCC proposes to close this TC and maintain the activity as a reportership. A suggestion was made to move it to a liaison function rather than reportership. The participants agreed.

## 7.2 Reporterships

Progress reports on the reporterships were given by the ADs and the reporters who were present.

**R2-05** Visual Gloss (J. Taylor, UK)                      **AD:** Johnson

**ST:** DD Goodman reported that Mike Pointer had agreed to take over the reportership. Pointer is preparing a report for the project on measurement of appearance at NPL. This will form the basis for the report for this reportership. The change of the reporter was approved with no objections.

**R2-06** Standardization of Measuring Geometry for the Colorimetry of Metallic Coatings (C. McCamy, USA)                      **AD:** Johnson

**ST:** AD Johnson reported. The new TC (2-53) was formed last year as a result of this reportership. He had contacted C. McCamy, who confirmed that the reportership should now be closed. D2 agreed to close this reportership with no objections.

**R2-21** Use of detectors as absolute transfer standards for spectroradiometry (N. Fox, UK)

**AD:** Sauter

**ST:** DD Goodman reported. This reportership is to investigate the potential for taking the next step, which is to use detectors as absolute standards for spectroradiometry, e.g., to use diode-array instruments or tunable-filter systems. There are a lot of developments, but nothing is yet reliable enough to be generally recommended. This reportership is to be kept open and will continue to monitor the situation. Moore commented that this reportership is important in the respect that source standards are becoming more and more difficult to obtain.

**R2-23 ISO/CIE Standards for the measurement of reflectance and Transmittance (D. Rich)** **AD:** Johnson

**ST:** No report has been received. This reportership is to decide whether we should convert CIE 130 into standards. Johnson will try to update the status with TCC.

**R2-24 Classification of Color Measurement Instruments (Reporter: Ohno)**

**AD:** Johnson

**ST:** Ohno reported. This reportership was established in 1999 following a request from D8 for methods for classification of color measuring instruments in terms of accuracy. The reporter investigated methods including those using  $f_1'$  (CIE 69), average  $\Delta E$  (CIE 13.3), and metamerism index, but is not convinced that any of these have yet been shown to be suitable for recommendation for classification purposes. As it will take a lot more research and the reporter cannot find time to do this, and because there no longer seems to be a strong demand from D8 for a classification system for colorimeters, it was proposed that the reportership should be closed. The DD suggested that this matter be carried on to the D8 liaison function and continue to be monitored. Closure of this reportership was approved with no objections.

**R2-25 Liaison with IALA (Reporter: Ian Tutt)** **AD: Vandermeersch**

**ST:** Goodman reported. According to Tutt, IALA discussed joint standards with CIE on marine navigation signal lights but they did not confirm a real need for a joint standard with CIE. DD Goodman suggests that this reportership be closed and further needs be monitored under a liaison function. Carl Andersen is recommended to serve as the liaison person. D2 agreed to close this reportership and to move it to a liaison function.

**R2-26 Eye safety of Light Emitting Diodes**

**ST:** Goodman reported. This reportership was set up last year following on from the LED Symposium in Gaithersburg. Following a discussion between D2D and D6D, a new TC (6-55) on Photobiological Safety of LEDs (Werner Horak) was established in D6 during their meeting in Istanbul. In addition, it was agreed that TC2-45 should be asked to include a section on measurement of the radiance of LEDs, and this has now been added to the planned work for this TC. Therefore, the work of the reportership is done. Closure of this reportership was approved with no objections..

## **R2-27 Field Measurement for Traffic Signals (Reporter: Carl Andersen)**

**AD:** Vandermeersch

**TR:** To assess the need for a TC to produce recommendations on field measurements for traffic signals, in particular those using LED arrays.

**ST:** Vandermeersch reported. Andersen started to investigate existing equipment used for field measurement of traffic signals, as used in the U.S. The US FHWA has an instrument that is made by Lighting Sciences. The instrument measures luminous intensity of traffic signals in two directions, normal to the fixture and left or right directions. Andersen intends to verify the performance of this device for LED traffic signals. Vandermeersch is not aware of such field measurement instrument used in Europe. A suggestion was made to request Andersen to extend his study outside the U.S.

## **R2-28 Evaluation of Colorimeter Spectral Responsivity Balazs Kranicz**

**TR:** To review new methods for assessing the 'quality-of-fit' of the spectral responsivity of colorimeters, particularly for use with new sources such as LEDs.

**ST:** Kranicz reported. He will study the evaluation method for tristimulus colorimeter spectral responsivity for LEDs.  $f_1$  is not sufficient for LEDs. An accurate fitting is needed especially for blue LEDs. CIELAB cannot be used because there is no white light reference. He will also look at TC2-16's draft by Rastello, and is studying a new method which he has developed himself. A report is to be prepared for the next meeting in San Diego. Vandermeersch commented that Stevenson's paper (in CR&A) on an intercomparison of spectroradiometric measurements of retroreflective materials might be useful. AD Johnson to send a copy to Kranicz.

## **7.3 Liaisons with other organizations**

### **CCPR (Rainer Köhler)**

DD reported that Köhler moved to a different position and Michael Stock has taken over. Ohno attended the Key Comparison Working Group meeting in May 2001. The meeting reviewed the status of several comparisons in progress – spectral irradiance (UV, UV-NIR), spectral responsivity (UV, visible, NIR), diffuse spectral reflectance, spectral radiance, and aperture area. DD suggested that those who are not familiar with CCPR activities should visit the BIPM website (<http://www.bipm.fr>), which lists all the key comparisons and results.

### **Division 8 (Alan Kravetz)**

Kravetz sent a regret for not being present, and sent a PowerPoint file for his report, which was shown to the participants. D8 currently has six TCs. A new TC Multispectral Imaging (Patrick Herzog) has been proposed. There are four reporterships, three of which are to be closed. Several TC meetings are being planned for Scottsdale with the next formal meeting of the Division planned for San Diego during the CIE Quadrennial Meeting. Updates on D8 activities are available at the website (<http://www.colour.org>). The PowerPoint file is to be posted at D2 website.

### **ISO TC6/WG3 Paper, board & pulps – optical properties (J. Zwinkels)**

The written report was submitted from Zwinkels. DD Goodman read the report. The most recent meeting of TC6/WG3 was on June 6, 2002 in Paris. Several ISO draft standards are being balloted. Two new ISO standards, “The determination of D65 brightness”, and “The determination of colour (D65/10°)” have been proposed. Several general issues were also discussed at this meeting. See **Attachment 2** for the details.

### **ISO TC 180/SC 1: Solar energy/Climate - Measurement and data (Dieter Kockott)**

There have been no reports for several years. DD Goodman recently contacted D. Kockott and confirmed he is retired and no longer active. DD proposed to close this liaison unless someone takes over. There was no objection to closing it.

### **IEC TC34 Lamps and related equipment (Vandermeersch)**

Vandermeersch reported. TC34 met four times during the past year. TC34A is responsible for lamps. There are still some controversial issues related to the measurement of 16 mm tubular fluorescent lamps (TL5 lamps) working only with an electronic ballast. At present, the recommendation is to measure these lamps at 25°C and to deliver service conversion factor for 35°C. There is a new study showing that, before each measurement, the lamp should be burned-in in a vertical position with the cold spot down, while it is measured horizontally. TC34 has agreed on this new procedure but has not voted yet. TC34E is responsible for safety aspects of lamps, which includes LEDs.

### **ISO on reflectance and transmittance issues (D. Rich)**

AD Johnson reported. No report received.

### **IDA (J. Rennilson)**

No report received. AD Johnson commented that IDA is a fast growing organization with 6000- 10000 members, many professional or amateur astronomers. The key person at IDA is already active in CIE-USA. She has also been elected chairman for a new TC in skylight in D4. Probably more a D4 matter than D2.

### **OIML (G. Sauter)**

No report received.

## **8. Summary of dissolution of TCs and other functions**

TC2-30 Array radiometry (Palmer): The materials are to be forwarded to TC2-51 (Richard Austin) and to be considered for inclusion in this TC document if applicable.

TC2-54 Review of IEC documents for color measurement and management in multimedia systems (Schanda): closed as an activity of TC due to lack of active interest and volunteers, and moved to a liaison function.

R2-06 Standardization of Measuring Geometry for the Colorimetry of Metallic Coatings (McCamy): A new TC (TC 2-53) has been established to cover this subject.

R2-24 Classification of color measuring instruments (Ohno): closed due to no prospect of agreed-upon methods yet.

R2-25 Liaison with IALA (Tutt): moved to a liaison function (possibly Carl Anderson)

R2-26 Eye Safety of Light Emitting Diodes: A new TC (6-55) on Photobiological Safety of LEDs (Werner Horak) has been established in D6 to cover this subject.

Liaison ISOTC 180: Not active for a long time. The reporter has retired, and no one to take over.

## **9. Proposals for new TCs and other functions**

### **9.1 New Technical Committees**

#### **1) Round Robin Investigation of Implementation of CIE Photobiological Safety Standard.**

Proposed by K Kohmoto as a result of the Ad-hoc meeting on Risk Evaluation of Lamps and LEDs with CIE Safety Standard held on Aug. 24, 2002. The original proposal is attached (**Attachment 3**). Agreed by D2. Kohmoto to chair. AD: Sauter

**TR:** To conduct a measurement intercomparison in order to investigate potential systematic errors in the interpretation of the measurement procedures laid down in the CIE photobiological safety of lamp standard (CIE S009), and determine whether improvements are required to the specified procedures. The output will be a technical report describing the intercomparison, the results, and recommendations for improvements to the measurement procedures in CIE S009.

#### **<Discussion>**

A discussion was held on the original proposal made by Dr Kohmoto. Goodman commented that measurement up to 3000 nm is probably not possible, and classification is not D2 work. Section 3.2 (risk evaluation and lamp classification) should be removed and the scope modified (as in the TR written above). This was agreed by the participants. Moore commented that an intercomparison involves a lot of work. He questioned the need for the intercomparison, and suggested that effort should be spent solely on a review of the standard to determine whether improvements are required. Goodman answered that this could be done in parallel, but suggested an intercomparison is a good test for how well recommendations are implemented in practice. It was also suggested at the ad-hoc meeting to limit the comparison to two types of lamps. The TC will discuss how many types of lamps should be included in the intercomparison.

#### **2) CIE/ISO standards on retroreflection measurements (from CIE54.2)**

AD Johnson proposed. D2 agreed on the need for such new TC. Goodman has already approached Christine Stratford as a possible chairperson, and she is now seeking approval from her employers. DD to contact her to confirm whether this has been approved. Rennilson may have another suggestion if C. Stratford cannot accept. DD to prepare TR and official proposal for vote.

### **9.2 New Reporterships**

D2 agreed to establish the following reporterships.

#### **1) Characterization of imaging luminance measurement devices**

Proposed by Peter Blattner.

**TR:** To prepare a proposal for a new TC to prepare recommendations on the characterization and calibration of CCD-based imaging photometers, having input from

D4 and D8 on the needs from the application side.  
Vandermeersch commented that there is a need for this work also in D4 for road lighting. The proposal was supported by Etienne Pierson. Endorsed by D2. Blattner to be the reporter. AD: Sauter

## **2) Problems linked to correct measurement of TL5 fluorescent lamps with existing electronic ballasts.**

Proposed by Guy Vandermeersch. As discussed earlier, there are several problems in measurement of TL5 lamps, which have different thermal behavior that depends on characteristics of ballasts. There is a need to study such measurement problems. Endorsed by D2. Vandermeersch to be the reporter and to prepare TR. AD: Vandermeersch

## **3) Problems with the spectroradiometric measurement of light sources, particularly those associated with bandpass and sampling intervals.**

Proposed by Moore. AD: Johnson

**TR:** To consider the need for a revision of CIE 63 (1984) and make a recommendation regarding whether a separate document is necessary to deal specifically with issues relating to band pass and sampling intervals, including the effects on color calculations. There are issues relating to the spectroradiometric measurement of light sources for colorimetry, as discussed in the D1/D2 session on Aug. 26, e.g., bandwidth and sampling. It seems there is a need for a guidance, probably to revise CIE publication 63 to bring it up to date and re-iterate various principles such as bandwidth and sampling. Ohno agreed that CIE 63 does not address colorimetry aspects. Stearns and Stears' bandpass correction should be recommended more widely. DD suggested to set up a reportership to decide exactly how we should take this forward, e.g. whether we need two documents or just a revision and extension of CIE 63. It was agreed with no objection to establish a reportership. David Gibbs volunteered to be the reporter and this was accepted by the Division.

## **9.3 New Liaisons**

Div.2 agreed to establish the following liaison functions.

- **IALA (International Association of Lighthouse Authorities)** (Carl Andersen) ... moved from R2-25.
- **IEC TC100/TA2** (Janos Schanda) ... moved from TC2-54.

## **9.4 Changes in TCs and reporterships**

- The chairperson of TC2-17 has been changed from D. Kockott to Gene Zerlaut.
- The chairperson of TC2-29 has been changed from T. Goodman to Tom Larason
- The reporter for R2-05 has been changed from Julie Taylor to Mike Pointer.

## **10. General issues (DD Goodman)**

### **10.1. Division Director for 2003-2007**

DD Goodman and the other members of the management team are willing to serve another term but any other nominations were welcome and requested. There were no nominations,

and the consensus was that D2 is not requesting any changes to the current management team. There will be a formal vote for the DD for next term.

## **10.2. Discussion on future activities within D2**

### **1) Future Symposia**

D2 has organized a number of symposia: two on LED measurements (1997, 2001); one on uncertainty (2001); and one on flashing lights (2002). Following each symposium there has been a wish expressed for a follow-on symposium on the same topic. What is the highest priority? The vote for the next symposium to be held was: LED (8), uncertainty (5), flashing light (0). Vote for flashing light some time in future (8). No suggestions were made for other symposia. Agreed to have LED Symposium in 2004.

### **2) Potential CIE D2 'Handbook'**

CIE BA has an idea to publish new forms of publication (like a handbook) on various themes (like color, spectroradiometry, etc.), as new way to sell publications. We discussed compiling CIE publications on related subjects within D2 as one book, with some introductory pages at the beginning - a similar form as the Color and Appearance book from ASTM (that includes a CD in the back of the book). N. Johnson suggested that such a publication would be of interest, but only if produced in high quality book-bound form. It can be done for a small number of copies with reasonable cost these days. The participants agreed on such a direction. The costs for this, and the possibility to print on demand, need to be investigated by CIE CB. More ideas are solicited, including thoughts on which publications would be suitable for grouping together in this form. DD to ask everyone later on how the compilation should be done (which documents should be bound, etc.) for what handbook.

### **3) Other initiatives**

The categories for supportive membership have been revised. Cost for the membership is will be much lower than previously required. It is important to stimulate the supportive membership because this is one of the ways that CIE is going to develop in the future i.e. to hopefully move toward free publications rather than relying on publication income. There will be new information available on new supportive membership categories in CIE NEWS. Try to encourage your company to become supportive members.

## **10.3. Liaison with other Divisions**

During the Symposium, people were addressing questions of the level of input that there needs to be from other Divisions into the work of D2. In D2, we already have liaisons with D6 and D8. To take a step further, DD suggests that we send a questionnaire to other Divisions, listing things we do in D2 and asking them to provide information on priorities or level of interest to them, and also giving them an opportunity to raise issues on measurement that we are not addressing now. There was no objection to this proposal. DD will prepare a draft of such a questionnaire and send out to D2 mailing list for comments, then will send it to other Divisions for their input.

## **11. Future D2 meetings:**

2003 San Diego (Quadrennial meeting)

2004 It was agreed that the 2004 D2 meeting should be held in conjunction with the LED Symposium. Two proposals: 1) Japan (D1 might also be interested); 2) Italy. Either venue could also host the 3rd CIE Expert Symposium on LED Measurements. Vote (preliminary): Japan (8), Italy (8). Explore further possibilities to have it either in Japan or Italy, or elsewhere.

2005 open

## **12. Adjournment**

The Division 2 meeting adjourned at 12 noon, August 28.

**Attachment 1** Agenda of 2001 Div.2 Meeting

**Attachment 2** TC2-39 Committee Activity Report May 2001

**Attachment 3** Proposal - Round Robin Investigation of Implementation of CIE  
Photobiological Safety Standard

**2002 Division 2 Meeting**  
**Veszprém University, Veszprém, Hungary**  
**8:30 – 12:30 Aug 27, 2002 and 09:00 – 12:00 Aug 28, 2002**

**Agenda**

1. Attendance list, apologies
2. Approval of agenda
3. Approval of the minutes of 2001 Division meeting
4. Director's report
5. Secretary's report
6. Editor's report
7. Progress reports from Technical Committees, reporters and liaison persons
  - 7.1. Associate Director Sauter and TC chairpersons
  - 7.2. Associate Director Vandermeersch and TC chairpersons
  - 7.3. Associate Director Johnson and TC chairpersons
  - 7.4. Reporters
  - 7.5. Liaisons with other organisations
8. Proposals for dissolution of TCs and reporterships
9. Proposals for new TCs and reporterships
10. General issues
  - 10.1. DD for 2003 - 2007
  - 10.2. Discussion on future activities within D2 (symposia, potential CIE D2 'handbook', other initiatives)
  - 10.3. Liaison with other Divisions
11. Future meetings
  - 11.1. 2003 (Quadrennial meeting)
  - 11.2. 2004
  - 11.3. 2005
12. Any other business
13. Adjournment

## Attachment 2

### Liaison Report (J. Zwinkels)

#### ISO TC6/WG3 Paper, board & pulps – optical properties

The written report submitted from Zwinkels. DD Goodman read the report. The most recent meeting of TC6/WG3 was on June 6, 2002 in Paris.

The following ISO draft standard is being balloted (parallel CEN and ISO voting):  
ISO 8254-2 (prEN ISO 82545-2) “Gloss at 75° according to DIN”.

The following ISO draft standards are currently being prepared/reviewed:  
ISO/DIS 8254-3.2 “Determination of Gloss at 20°” ( will soon be circulated for ballot)  
ISO/CD 22891 “Determination of Transmittance” (for translucent paper)  
ISO/CD 22754 “Determination of Residual Ink Concentration”  
Revision of ISO 2469 “Measurement of diffuse reflectance factor”

Of possible interest to CIE are the following proposed changes in this standard:

- Introduction – change “CIE tristimulus values” to “luminous reflectance factor”
- The concept of a new “ISO/TC6 consensus reflectance scale” to be introduced as an “accepted reference scale” in order to provide a basis for a meaningful expression of measurement uncertainty associated with the values assigned by the authorized laboratories to their IR3s.

The following new ISO standards have been proposed:

- “The determination of D65 brightness”
- “The determination of colour (D65/10°)”

The following general issues were also discussed at this meeting: (1) method to correct standardizing laboratory data for geometric and possible photometric differences with authorized laboratory instruments; (2) proposal to improve inter-instrument agreement on fluorescent materials by using an interior D65 source, ID65, based on the use of a Xe lamp system with a 330 nm cut-off filter, (3) liaison with ISO TC38 (textiles) and ISO TC130 (graphic arts); (4) approval of resolutions to: contact International Color Consortium, ICC, to establish liaison concerning colour management on paper substrates; and to contact the Standardizing Laboratories (NRC, PTB, and NIST) to request a new intercomparison be carried out, that includes a Spectralon LS99, and (5) limitations in measuring the fluorescent component of brightness or whiteness.

## Attachment 3

[Proposal for a new Technical Committee]

### Round Robin Investigation of Implementation of CIE Photobiological Safety Standard

#### 1. Scope

To investigate photobiological safety risks of actual lamps for general lighting services, with the CIE Standard: CIE S 009/E: 2002 -- Photobiological Safety Standard for Lamps and Lamp Systems. International round robin measurements of several light sources will be processed under an agreement of CIE Division 2 and CIE Division 6, as one of their TC works (a joint TC of Division 2 and Division 6).

#### 2. Applicable Lamps (Prepared by Japan)

Next 4 kinds of lamps will be prepared by Japanese Member.

No	Lamp Types	Type Designation	Base	Qty.	Operating con.
1	Tungsten Halogen	JD110V90W N/E-W	E11	2 pcs for each	at rated voltage (designated)
2	Fluorescent Lamp	FPL36EX-N	GY10q-6		according to IEC
3	HID Lamp	H400	E39		with reference ballast
4		NH360 L			

#### 3. Testing Items

##### 3.1 Measuring Items

- (relative) spectral power distribution (200 nm – 3000 nm)
- total luminous flux
- radiance (with measuring procedure and method)
- irradiance (at a designated distance)
- luminance (with measuring procedure and method)
- illuminance (at a designated distance)

##### 3.2 Evaluating Item

- photobiological risk evaluation
- lamp classification according to the CIE Standard

#### 4. Others

##### (1) Expected Participants

NIST, NPL, PTB, ETL,  
GE, US Army, OSRAM Sylvania, Philips, OSRAM,  
UK, Austria, Hungary, France, Australia, Russia, and others

##### (2) Rough Schedule

Round Robin Test will be started at October, 2002 from Japan.