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

CIE report to CCPR 2016

Dr Peter Blattner, METAS

Representative of CIE to CCU/CCPR

Director CIE Division 2

THE COMMISSION

- 1400 Experts (Scientists, Standardization Officers, Lighting Designers,…)
- NMIs, Measurement Labs, Universities, Companies,…
- 37 National Committees in all Continents
- 120 Scientific Project Groups (Technical Committees)
- More than 30 publications (technical reports/standards) during the last 4 years

CIE Overview

Board of Administration 2015 – 2019

Officers

President, Dr Yoshi Ohno (US)

Past-President, Dr Ann Webb (GB)

VP Technical, Dr Erkki Ikonnen (FI)

VP Publications, Professor Ronier Luo (GB)

VP Standards, Ad de Visser (NL)

VP, Dr Grega Bizjak (SI)

VP, Yiping Cui (CN)

VP, Yoshiki Nakamura (JP)

VP, Lorne Whitehead (CA)

Secretary, Teresa Goodman (GB)

Treasurer, Richard Distl (DE)

Division Directors

Div 1, Dr Youngshin Kwak (KR)

Div 2, Dr Peter Blattner (CH)

Div 3, Dr Jennifer Veitch (CA)

Div 4, Dr Ronald Gibbons (US)

Div 5, Dr Peter Schwarz (HU)

Div 6, Dr John O'Hagan (GB)

Div 8, Po-Chieh Hung (JP)

General Secretary : Kathryn Neild

CIE Overview

CIE Divisions

Division 1 Vision and Color

Division 2 Physical measurement of Light and Radiation

Division 3 Interior Environment and Lighting Design

Division 4 Lighting and Signaling for Transport

Division 5 Exterior Lighting and Other Applications

Division 6 Photobiology and Photochemistry

Division 8 Image Technology

CIE cross divisional activities-> JTCs

- JTC 1 (D1/D2/D4/D5): Implementation Mesopic Photometry in Outdoor Lighting
- JTC 2 (CIE-CCPR): Principles Governing Photometry
- JTC 4 (D3/D6): Visual, Health, and Environmental Benefits of Windows in Buildings during Daylight Hours
- JTC 5 (CIE-IEC): Review of Photobiological Safety Standard
- JTC 6 (CIE-ISO): Energy Performance of Lighting in Buildings
- JTC 7 (D3/D1): Discomfort caused by glare from luminaires with a non-uniform source luminance
- JTC 8 (D1/D2/D3/D4/D5/D6/D8): Terminology in light and lighting
- JTC 9 (D1/D2/D3/D6): Quantifying ocular radiation input for non-visual photoreceptor stimulation

CIE Research Fora

created to allow for discussions and exchanges on focussed topics that might not be mature enough for the creation of a TC. Each RF will have an initial time limit of four years and be able to:

- suggest symposia or workshops to facilitate their research focus.
- produce technical notes
- recommend new TCs

CIE Research strategy

International Commission on Illumination
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HOME
ABOUT US
PEOPLE IN CIE
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LINKS
CONTACT
CIE NEWSLETTER
BALLOTS

Events + | Divisions + | Technical Committees | Publications + | Research Strategy | eILV

CIE Tutorial and Practical Workshop on LED Lamp and Luminaire Testing to CIE S 025, Bern-Wabern, Switzerland

CIE Research Strategy

August 2016

Light and lighting technologies are essential to modern daily life, touching on its every aspect. These technologies require well-founded knowledge, both fundamental and applied, to ensure that they can be used with confidence in their safety and quality. CIE publications provide that confidence. They are

http://www.cie.co.at/index.php/Research+Strategy

CIE Research Strategy

- Recommendations for Healthful Lighting and Non-Visual Effects of Light
- Colour Quality of Light Sources Related to Perception and Preference
- Integrated Glare Metric for Various Lighting Applications
- New Calibration Sources and Illuminants for Photometry, Colorimetry and Radiometry
- Adaptive, Intelligent and Dynamic Lighting
- Application of New CIE 2006 Colorimetry
- Visual Appearance: Perception, Measurement and Metrics
- Support for Tailored Lighting Recommendations
- Metrology for Advanced Photometric and Radiometric Devices
- Reproduction and Measurement of 3D Objects

CIE activities related to CCPR

CIE-CIPM Agreement point 6

"Recognizing that the CIPM's responsibility for the definition of the photometric units in the SI and the standardization of the action spectra of the human eye[2] by the CIE are interlinked cornerstones of practical physical photometry worldwide, the Parties undertake to inform each other whenever either Party is contemplating a change in any of these foundations of physical photometry…"

[2] The CIE action spectra for the human eye in various states of adaptations (photopic, mesopic and scotopic), for various field sizes (2°, 10°) and various other conditions (visual environment, age of observer, etc) as the CIE may decide to standarize)

SI (≥ 2019)

Constant based approach:

the luminous efficacy K_{cd} of monochromatic radiation of frequency 540 ×10^{12} hertz is 683 lm/W

$$1\,\mathrm{cd} = \left(\frac{K_{cd}}{683}\right)\mathrm{kg\ m^2\ s^{-3}\ sr^{-1}} \quad = \quad 2.614\,830...\times 10^{10}\ (\Delta\nu_{Cs})^2\ h\ K_{cd}.$$

Units based approach:

The effect of this definition is that one candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540 ×10^{12} Hz and has a radiant intensity in that direction of (1/683) W/sr.

BUREAU INTERNATIONAL DES POIDS ET MESURES

Monographie

PRINCIPES RÉGISSANT LA PHOTOMÉTRIE

PRINCIPLES GOVERNING PHOTOMETRY

Revision 2018

-Photopic 2° observer

-Scotopic observer

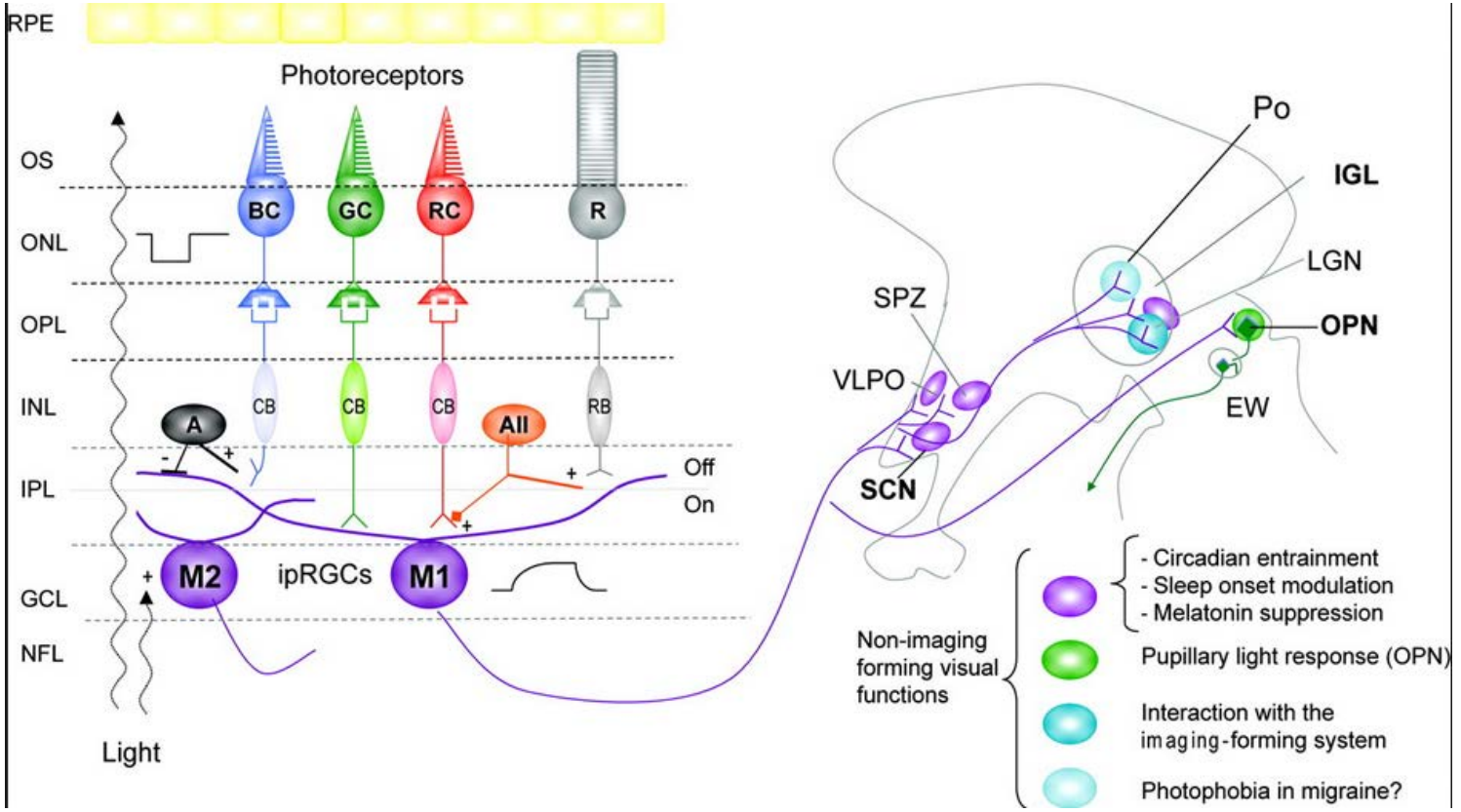
-Mesopic observer New

-10° observer New

Joint document BIPM – CIE (CIE 18.2-1983. The Basis of Physical Photometry)

Non-visual retinal effects of light

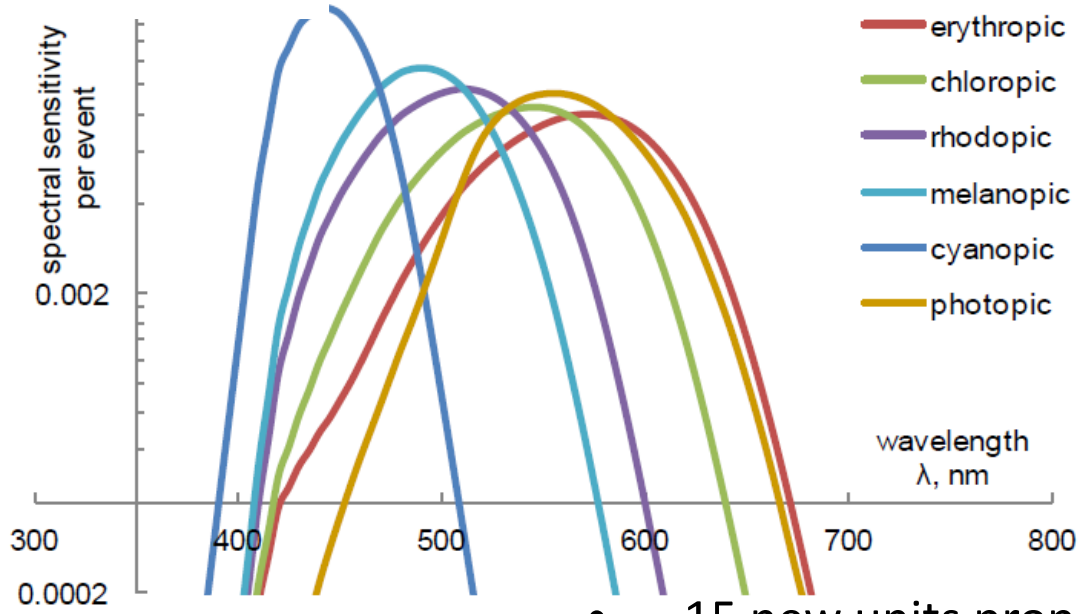
- Intrinsically photosensitive retinal ganglion cells (ipRGC)
- Discovered in 1990
- Influence on the circadian rhythm (body clock)



SCN suprachiasmatic nucleus

CIE TN 003:2015

Spectral sensitivity curves of the five human photopigments



- 15 new units proposed by some photobiological experts
  - sc-lx, mc-lx, lc-lx, z-lx, r-lx -> α–lx
  - sc-lm, mc-lm, lx-lm, z-lm, r-lm
  - sc-cd, mc-cd, lc-lx, z-cd, r-cd

-> standardization (prEN 16791 , NWI at ISO TC 274)

CIE Statement on Non Visual Effects

- Non visual effects are recognized (ipRGC)
- Still many open questions
- CIE TC 3-46 WD “Research Roadmap for Healthful Interior Lighting Applications”
- CIE TN 003 Report of Workshop -> proposes a metric ~~and new units (α-lm)~~
- Announcement of creation of new JTC dealing with “QUANTIFYING RADIATION IN NON-VISUAL PHOTOMETRY” (JTC9)

JTC9 QUANTIFYING RADIATION IN NON-VISUAL PHOTOMETRY

- Definition of SI compatible quantities
- Review of the published 8th SI-Brochure, in particular Appendix 3
- Proposal for updating the wording in the SI-Brochure related to photo-biological and photo-chemical effects
- However in the latest draft of the 9th edition Appendix 3 is missing!!
- -> action from CIE to CCU, support from CCPR

Division 2 TC activities (extract)

Instruments

TC2-69 (Classification Photometers)

TC2-59 (done) (imaging luminance measurement devices)

TC2-51 (done) (array spectrometers)

TC2-62 (nearfield goniophotometer)

TC2-74 (Goniospectro-radiometer)

TC2-79 (Integrating Sphere)

TC2-47 (UV-Radiometer)

TC2-78 (Goniophotometer)

TC2-80 (spectroradiometer)

Applications

TC2-67 (Automotive Lighting)

DR2-70 (Guide for Field Photometric Measurements)

Products

TC 2-84 new LED package test data

TC2-75 (curved OLEDs)

TC2-63 done (high power LEDs)

TC2-76 (AC LEDs)

TC2-68 (OLEDs)

TC 2-83: CIE Standard on test methods for OLED new

TC2-64 done (LED highspeed testing)

Fundamentals

TC2-77 (Fundamental Concepts)

TC 2-85: Recommendation on the geometrical parameters for the measurement of BRDF new

TC2-72 (measurement uncertainties)

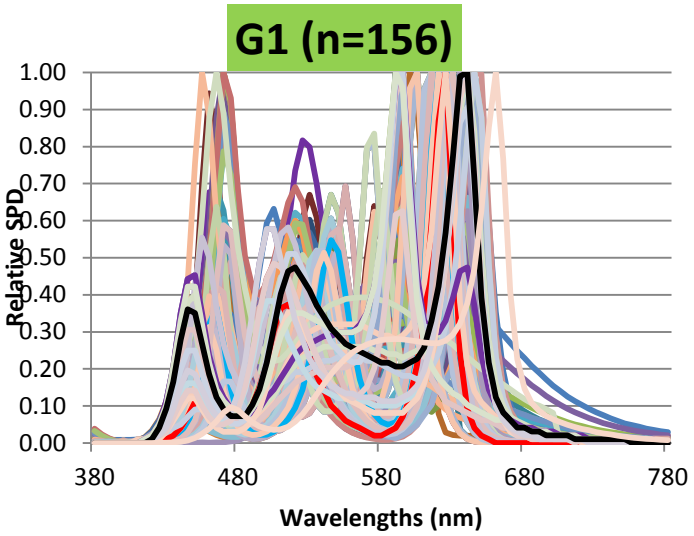
JTC2 (Principle Governing Photometry)

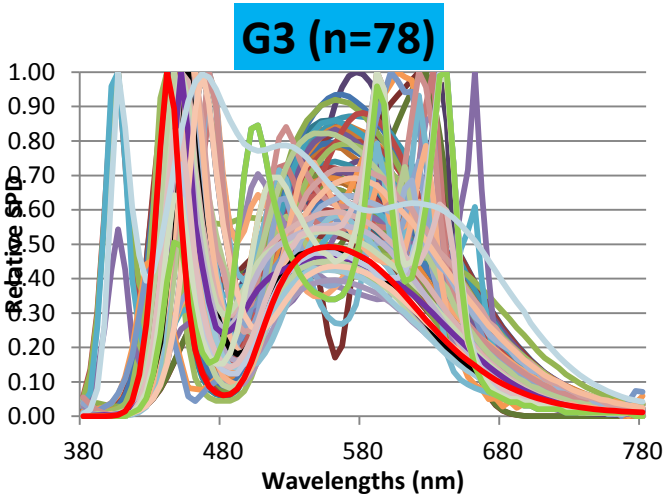
DR2-71 new (Towards LED based standard calibration sources for photometry

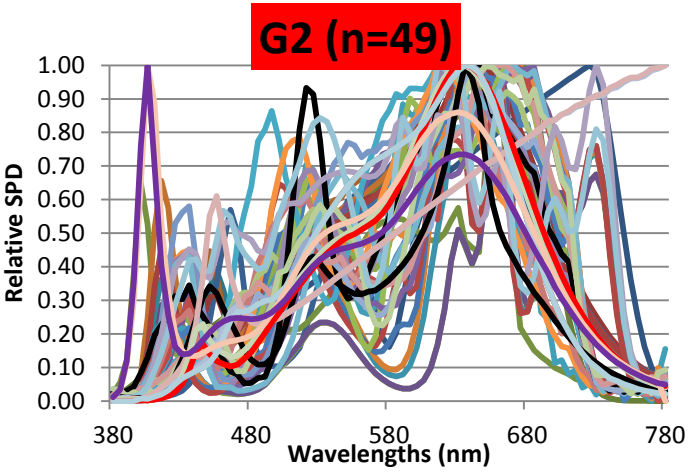
TC2-65 done (Mesopic Photometry)

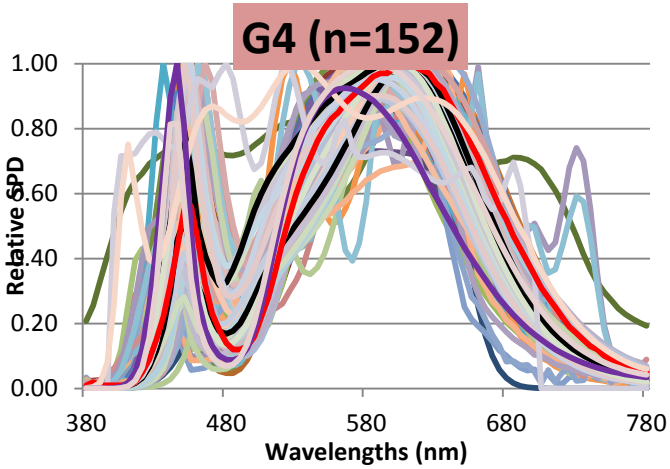
TC2-81 new Absolute Radiometers

DR1-62 Typical LED spectra
DR2-71 Towards LED based standard calibration sources for photometry









Supported by EMPIR project «photoLED»

Towards LED based standard calibration sources for photometry

- Selection of 5 to 10 typical LED spectra that will be include in the next revision of CIE 15 (octobre 2016)
- DR2-71 -> creation of new TC in Division 2
- Selection of 1 to 2 reference spectra
- Prototype realisation (supported by EMPIR project «photoLED»)
- Publication ready in 2018

CIE Publications

Others

219:2016: Maintaining Summer Levels of 25(OH)D during Winter by Minimal Exposure to Sunbeds: Requirements and Weighing the Advantages and Disadvantages

218:2016: Research Roadmap for Healthful Interior Lighting Applications

217:2016: Recommended Method for Evaluating the Performance of Colour-Difference Formulae

170-2:2015: Fundamental Chromaticity Diagram with Physiological Axes – Part 2: Spectral Luminous Efficiency Functions and Chromaticity Diagrams

TN 006:2016 Visual Aspects of Time-Modulated Lighting Systems – Definitions and Measurement Models

Events (1)

- 28th CIE Session 2015 took place in Manchester, Great Britain, from June 28 to July 4, 2015
- CIE 2017 Midterm Meeting, Jeju Island, Republic of Korea
- 29th CIE Session 2019 will take place in Washington DC, US in spring 2019

Events (2)

- Conferences
  - Lighting Quality & Energy Efficiency, Melbourne, March 2016
- Symposia, Workshops & Tutorials
  - CIE Tutorial and Expert Symposium on the CIE S025 LED Lamps, LED Luminaires and LED Modules Test Standard, PTB Braunschweig, November 23, 2015 Germany.
  - 4th CIE Tutorial and Expert Symposium on Appearance, Prague, Czech Republic September 2016.
  - CIE Tutorial and Practical Workshop on LED Lamp and Luminaire Testing to CIE S 025 , May 2017

CIE Tutorial and Practical Workshop on LED Lamp and Luminaire Testing to CIE S 025

May 08 - 11, 2017, METAS Bern-Wabern, Switzerland