RESEARCH AND STANDARDISATION

RESPONSE FORM for Standardisation groups

Opportunity for standardisation to contribute to the *European Partnership on Metrology EPM* under Horizon Europe

Objective: to collect standardization needs and suggestions to develop research projects in testing and measurements for the upcoming European Partnership on Metrology (EPM) calls in 2021

In the frame of the cooperation agreement between CEN-CENELEC and EURAMET, CEN and CENELEC have been invited by the EURAMET Management to put forward their **testing and measurement needs in research** for consideration by metrology institutes for future calls under EPM.

Relevant technical groups (sector fora, advisory boards, coordination groups, TCs, WGs...) **are invited to contribute with**

- a short introduction or an overview paper of their unaddressed standardization needs for testing and measurement, and
- a contact person (secretary, chair, convenor, liaison officer, etc.) whom proposers for the Potential Research Topics can contact,

by using this Response Form and send it at STAIR EMPIR, Mr Ortwin Costenoble: empir@nen.nl

Deadline for the consultation: **11 December 2020**.

Source of the identified need (identification of TC, WG, etc, incl. title)	☐ CEN/TC 0/WG 0 / ☐ CLC/TC 0/WG 0 ☐ ISO/TC 0/SC 0 / WG 0 / ☐ IEC/TC 0/SC 0 / WG 0 ☒ Other, namely *CIE, International Commission on Illumination, Division 6 Photobiology and Photochemistry*
European entity responsible for submission of the need	*International Commission on Illumination (CIE)*
Person that can be contacted for more detail	*Kathryn Nield* *General Secretary* *CIE Central Bureau* *Babenbergerstrasse 9/9A* *Vienna 1010* *Austria* *ciecb@cie.co.at*
Title:	*Performance of "light dosimeters" that measure light for non-visual and visual effects*
Unaddressed need	*So far no international standard exists for the calibration or performance characterizations of light dosimeters used in the field for monitoring non-visual effects.*
Further explanation of need (TC business plan, road map, formal decision, work item, etc.)	*Although light is defined as electromagnetic radiation that provides the stimulus for vision, there is abundant scientific evidence that light received by the eye also has important biological effects relevant for human health, performance and wellbeing that are not dependent on visual images.*

	Pioneering work over the past 25 years revealed another kind of retinal photoreceptor, in addition to rods and cones. This new photoreceptor plays an important role in non-visual effects of light and has an intrinsic light sensitivity that peaks in the shorter wavelength part of the visible spectrum. These new photoreceptors are known as intrinsically-photosensitive retinal ganglion cells (ipRGCs), and their intrinsic photosensitivity is based on the photopigment melanopsin that is contained within them. *These findings have opened up a new research field, investigating how light as detected by any of the five photoreceptor types (three cones, rods and ipRGCs) drives biological, non-visual responses. Although this research programme is far from complete, there is significant interest within the lighting community to develop and define lighting innovations and applications that are based on non-visual responses to light. Such applications can also now take advantage of the high flexibility in the design of new types of light sources, like solid-state lighting (SSL), which also includes light-emitting diodes (LEDs). In view of their potential benefits for human health and wellbeing, such applications are sometimes marketed under the term "Human Centric Lighting". Moreover, many other applications that are not (exclusively) related to human vision, can be envisioned, in particular in horticulture lighting.* *In general, standardization work has significantly increased over the last few years:* *– CIE has published a new international standard (CIE S 026:2018 "CIE System for Metrology of Optical Radiation for ipRGC-Influenced Responses to Light") defining quantities and action spectra for the measurement of light with respect to its non-visual effects.* *– In Europe a technical report CEN/TR 16791:2017 "Quantifying irradiance for eye-mediated non-image-forming effects of light in humans" was published, drafted within CEN TC 169 on "Light and Lighting".* *– ISO/TC 274/JWG 4 "Integrative lighting (joint working group with CIE JTC 14)" is presently undertaking an analysis of published scientific studies and reviewing experiences from published application studies on non-visual effects of light on humans, aiming to provide guidance for safe and beneficial use in lighting applications beyond illumination for vision.* *Measurement of spectral distributions of light sources in testing laboratories and the field are usually well understood, and the measurement uncertainties are at acceptable level. For the assessment of (spectrally weighted) non-visual irradiances, radiances, doses and temporal variations in the field, the situation is more difficult. Guidance and standards are now needed regarding the optical performance of small mobile digital sensors and*

	wearable devices ("light dosimeters") used to monitor temporal patterns in environmental irradiance / light exposure in terms of the newly defined five retinal photoreceptor inputs (ipRGCs, rods, and the three cone types) that can contribute to both non-visual and related visual responses to light in humans. *Such light dosimeters are used in research and also in clinical practice (e.g. sleep and exercise-related applications), and in the near future may be expected to be produced for the general retail sector. They are based on compact filter radiometers having intrinsically limitations on the accuracy due to different sources of errors (i.e. spectral match, linearity, directional response, temperature effects, out-of-band sensitivity, …). Researchers spend large amounts of their funding resources on purchasing these devices, which, through better optical design, could relatively easily provide data to their studies that much more closely relate to the effects they are studying.* *So far no international standard exists for the calibration or performance characterizations of this class of field measurement device. The design and quality of exposure measurements varies greatly between models and is unsuitable in the vast majority of cases (if not all cases), and as a result the market does not adequately meet users' needs. To draft such a standard, additional research is needed, in particular to define calibration conditions and quality indices, and to analyse the measurement uncertainty.*
Proof of need by the TC/SC	*CIE has identified the need for research in the research strategy (http://www.cie.co.at/research-strategy, research topic no 1 and no 9).*
Enclosures	☐ Yes ☒ No

*See **more information or a link to the webinar at** **EMPIR website**
CEN/CENELEC website "Standards and metrology"