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Abstract for Paper

Title: **Mesopic Vision and Photometry**

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In the current photometric practice, the response of the visual system is approximated by the CIE (Commission Internationale de l'Eclairage) photopic spectral luminous efficiency function V(λ) established in 1924. The V(λ) function characterises the spectral sensitivity of foveal cones in photopic lighting conditions. In the mesopic luminance region, between the photopic and scotopic, both the rods and cones on the retina may be active. This results in changes of spectral sensitivity in the mesopic luminance region (between about 0.001 and 10 cd/m^2). Mesopic lighting applications include those where our eye gets into a state of mesopic vision, i.e where both rods and cones contribute to visual functions. The visual environment in night-time driving conditions falls largely in the mesopic luminance region. Road, street and other outdoor lighting conditions are claimed to be relevant applications where mesopic vision plays an important role and where mesopic optimization of the lit environment is of relevance.

The CIE is the head organisation in the lighting field. The technical activities of CIE are carried out in Technical Committees (TC's). Through the establishment of the technical committee TC1-58 'Visual Performance in the Mesopic Range' the CIE has recognised the merit of the visual performance based approach for developing mesopic photometry. The objective of the TC1-58 is to propose a model for the basis of performance based mesopic photometry to be adopted worldwide. The work of TC1-58 started in 2004 and it is foreseen to be accomplished during 2008. It is found encouraging within the CIE that, after more than 70 years of research, the time is now close to establishing a practical system of mesopic photometry, as this will be a major breakthrough for the CIE also.

Instead of trying to describe the detailed performance of the eye under a given set of conditions, the emphasis within TC1-58 has been on developing a system which can be readily implemented in practice, but which may not provide a precise description of visual performance. This places two important constraints on the model; it must be additive and it must tend to $V(\lambda)$ at the upper end of the mesopic region and to $V'(\lambda)$ a the lower end. Thus the practical model of mesopic photometry takes the form $V_{mes}(\lambda) = x\ V(\lambda) + (1 - x)\ V'(\lambda)$, with x being a function of the level of illumination.

Mesopic lighting applications are of substantial practical interest as they include road lighting, outdoor lighting and other night-time traffic environments. It is especially the higher part of the mesopic luminance region that is of importance for practical applications (e.g. traffic lighting) and for which a practical system of mesopic photometry is very much needed. An internationally accepted basis for assessing and dimensioning lighting in the mesopic region will promote the development of mesopically optimised lighting products. It will give the lamp manufacturers foundations on which to develop light sources that are optimised for low light level applications. Industry and users should be strongly motivated to use a photometric method that is valid and functionally relevant.