

On the light wavelength

Iain Carlile finds that SPD is a recurring theme in the latest issue of LR&T

In his opinion piece, Whitehead argues that the Planckian radiator is a suitable reference illuminant for evaluating the colour rendering of low-CCT lamps, noting that pleasant colour distortion due to non-smooth spectral power distributions (SPDs) is a different concept to colour rendering, and that a colour preference metric should be developed to complement the CRI.

Regarding optimal SPDs of LED light sources in offices, commerce and residential applications, as an introduction to a future series of papers, Schanda et al summarise the general questions relating to colour preference investigations.

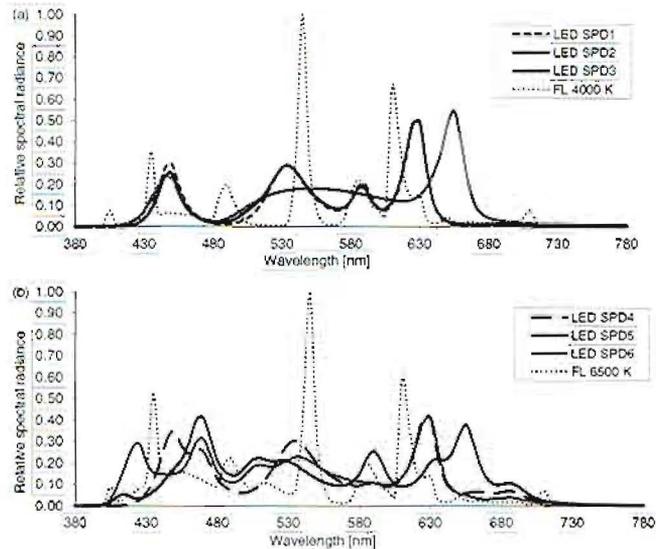
Using two mock-up office rooms, one with a spectrally tuneable white LED lighting system with a high value of reference-based colour metrics (CQS and gamut area index), and the other using fluorescent luminaires, Dangol, Islam et al investigated user acceptance studies for office lighting. Forty observers took part, performing office-related tasks totally immersed in the lighting condition. It was found that observers preferred the LED lighting at 4000K-6500K at an illuminance of 500 lux over 300 lux.

Another study by Islam, Dangol et al, using the same mock-up offices, examined observer preferences in terms of SPD, spatial brightness and illuminance. It was found that spatial brightness was affected by illuminance and SPD, with bias for lighting that had higher values of CQS colour preference scale and CQS gamut area scale metrics.

Regarding spatial brightness at the photopic level, Fotios et al consider how the SPD of a light source can be tuned to better match the sensitivity of visual perception, resulting in the same perceived spatial brightness but at lower illuminance levels, and the resultant energy savings. The authors conducted a review of 70 previous studies of spatial brightness in order to explore potential metrics for predicting the effects of SPD. While no suitable metric was found, a proposal for further work has been made in order to establish one.

Aries et al review the link between daylight and health in the built environment. The paper provides an overview of scientific literature on the proven effects of daylight exposure on health. It was found that the results from the different studies are diverse and either physiological or psychological. The authors note that more research is required to fully understand the link between daylight and health, and provide a number of first practical implementations for daylight and health building design.

Juntunen et al present the results from a study comparing a newly developed LED street light with commercially available lamp and LED-based street lighting luminaires. The new version incorporates sensors to dim the LEDs, allowing for changes in background ambient illuminance and also reducing light levels when no pedestrians were present. From their results they found an energy saving of 19-44 per cent based on improved technical characteristics. Once smart lighting control was taken into account, energy savings were between 40-60 per cent.



Spectral power distributions of FL and LED SPDs (a) at 4000K and (b) at 6500K (Dangol, Islam et al)

A pilot study also showed a user preference for the new model.

First developed in Brazil in 2002 by Alfred Moser, the solar bottle bulb (SBB) consists of a disused PET soft drinks bottle filled with water and fixed through a hole in the ceiling. Acting as a simple light pipe, the SBB increases the levels of daylight in a space in comparison to just opening a hole in the ceiling, without transmitting much heat into the interior. The SBB has found use in poor and developing countries across the world. Wang et al studied the performance of varying bottle sizes and interior bottle exposure levels, finding that a single 1.5 litre bottle performed better than three half-litre bottles together, and that an interior bottle exposure level of half performed the best.

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Editorial: Recognition and opportunity *Peter Boyce*

Opinion: In defence of the Planckian radiator

Lorne A Whitehead

Daylight and health: A review of the evidence and consequences for the built environment *MBC Aries,*

MPJ Aarts and J van Hoof

Introduction to a study of preferred colour rendering of light sources *J Schanda, P Csuti, F Szabó, P Bhushal*

and L Halonen

User acceptance studies for LED office lighting: preference, naturalness and colourfulness *R Dangol, MS Islam,*

M Hyvärinen, P Bhushal, M Puolakka and L Halonen

User acceptance studies for LED office lighting: lamp spectrum, spatial brightness and illuminance *MS Islam,*

R Dangol, M Hyvärinen, P Bhushal, M Puolakka and L Halonen

Lamp spectrum and spatial brightness at photopic levels: a basis for developing a metric *S Fotios, D Atli, C Cheal,*

K Houser and Á Logadóttir

A smart LED luminaire for energy savings in pedestrian road lighting *E Juntunen, E Tetri, O Tapaninen, S Yrjänä,*

V Kondratyev, A Sitomaniemi, H Siirtola, EM Sarjanoja,

J Aikio and V Heikkinen

The performance of solar bottle bulbs at different interior exposure levels *C Wang, VL How and H Abdul-Rahman*