

Benchmarking Electric Light versus Sunshine

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Abstract : Considering that sunshine is the ultimate reference in lighting, we have examined the spectral correlation between a series of electric light sources and sunlight. As the latter is marked by fluctuations, we have taken two spectra of reference: on the one hand, the CIE daylight standard illuminant, and on the other hand, the global illumination by the clear sky with the sun at 30° above the horizon. We determined the coefficients of correlation between the spectra filtered by the sensitivity of the CIE standard observer for photopic vision. We also calculated the luminous efficiency of the radiation in order to compare the ideal energy performances as well as the CIE color indexes Ra, Ra14, and Rf, since the choice of a light source requires a trade-off between color rendering and luminous efficiency. The benchmarking includes the most commonly used bulbs, various white LED (Lighting Emitting Diode) of warm white or cold white types, incandescent halogen as well as two HID lamps (High-Intensity Discharge) and two plasma lamps of different types, a solar simulator and a new version of the sulfur lamp. The latter obtains the best correlation, whether in comparison with the solar spectrum or that of the standard illuminant.

Keywords : electric light sources, plasma lamp, daylighting, sunlight, spectral correlation

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