



PROJECT TITLE: LEVERAGING BRIGHTNESS FROM TRANSPORTATION LIGHTING SYSTEMS THROUGH LIGHT SOURCE COLOR

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Conventional photometric quantities such as illuminance and luminance make the specification and calculation of lighting possible, but are based on human visual responses under a limited range of conditions. Visual perception at nighttime, such as under roadway and vehicle lighting, often occurs under lower light levels and larger visual fields than the conditions used to develop the conventional photometric system.

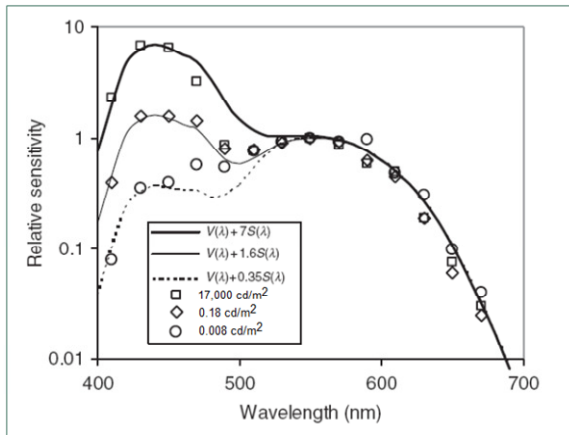


Figure 1: Spectral sensitivity functions illustrating increased short-wavelength ("blue") sensitivity as a function of increasing adaptation light levels.

One response, which is strongly related to pedestrians' judgments of personal security under roadway lighting, is brightness perception. Previous studies suggest that sensitivity to light for scene brightness perception at light levels typical for roadway lighting exhibits higher sensitivity to short-wavelength ("blue") light than predicted by conventional photometric quantities and further, that this short-wavelength sensitivity increases as the overall light level increases.

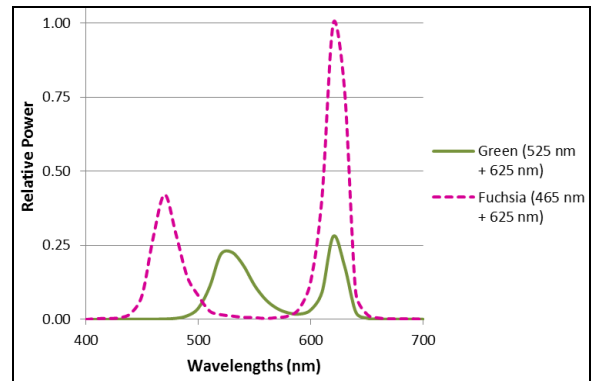


Figure 2: Spectral power distributions used in the laboratory studies.

Through a series of laboratory studies of scene brightness perception these mechanisms have been validated and a potential role of recently discovered visual mechanisms has been provisionally described. The results can have significant implications for the specification of roadway lighting when personal security and safety of pedestrians and other road users are important criteria.

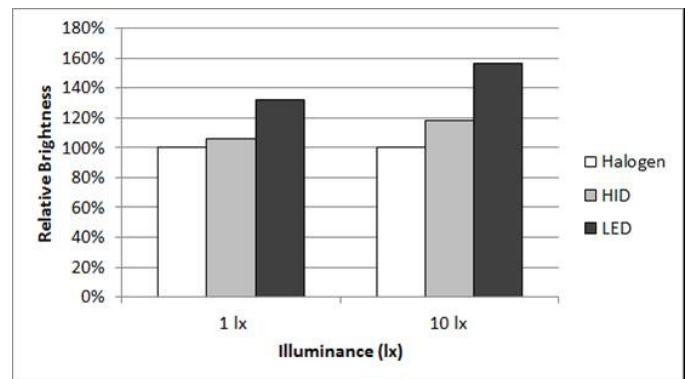


Figure 3: Relative predicted roadway scene brightness under halogen, high-intensity discharge (HID) and light-emitting diode (LED) sources.