

# Characterizing Color Properties of LED-Based Reading Lights

Although the lighting industry routinely uses color rendering index (CRI) to compare the color rendering properties of different light sources, CRI is not a good predictor of the color appearance of objects under a particular light source.

Recent work at the Lighting Research Center (LRC) indicates that by slightly shifting the spectrum of the red light emitting diode (LED) in a red, green, and blue (RGB-mix) LED system, we can significantly shift the CRI value from 23 to 63. We hypothesized that although the CRI value is dramatically different for the two RGB-mix LED light sources, human response to color appearance and preference for objects lighted by these sources would be almost the same. With funding from the Alliance for Solid-State Illumination Systems and Technologies (ASSIST), we conducted a human factors experiment to verify this hypothesis.

## Experiment

The project evaluated several types of white LED reading lights and compared them to conventional halogen and incandescent reading lights for color rendering and color appearance properties. Human subjects viewed two identical scenes placed side-by-side and lighted by different light sources. They rated their preference for a given scene compared to the reference scene.



Front view of experimental apparatus



Experimental apparatus

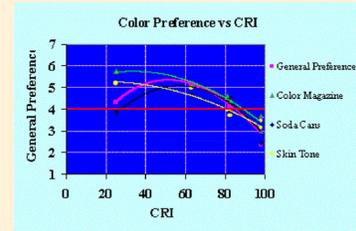
## Future Work

The LRC would like to determine the optimal spectral power distribution (SPD) for white LEDs.

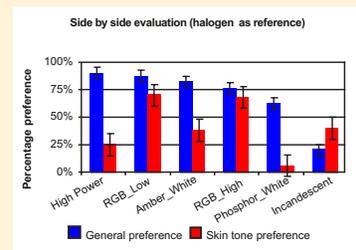


## Conclusions

- In general, people prefer LED-based reading lights over halogen and incandescent reading lights.
- Although two RGB-mix white LED reading lights had significantly different CRI values (23 and 63), subjects liked them about equally well.
- CRI is not a good predictor of object color appearance.
- Subjects rated phosphor-based white LED reading light poor for the appearance of human skin tones.



Mean preference rating versus CRI of the light sources. Preference rating of 1 represents least preference and 7 represents greatest preference.



Preferences for various types of LED and incandescent sources.

## ASSIST Sponsors

B/E Aerospace  
 GELcore  
 LumiLeds Lighting  
 New York State Energy Research and Development Authority  
 OSRAM SYLVANIA / OSRAM Opto Semiconductors

