

Are high dynamic range displays bad for the eyes?

James A. Ferwerda¹, and Aries Arditi²

1) Munsell Color Science Laboratory, Rochester Institute of Technology; 2)
Arlene R. Gordon Research Institute, Lighthouse International

Abstract: Recent advances in electronic display technologies have led to the development of high dynamic range (HDR) displays that can produce a much wider luminance range than conventional devices [Seetzen04]. Peak luminances on the order of 8500 cd/m² and luminance ratios of 40,000:1 are possible. HDR displays have great potential for both basic and clinical vision research because they allow controlled presentation of images that accurately reproduce the wide variations in luminance we experience in the real world. However one concern about vision testing with HDR displays, is recent evidence that exposure to short-wavelength light, even at moderate levels, can cause irreversible damage to the eyes of people with retinal disease (the "blue light hazard") [Glickman02, Cideciyan05]. To assess the potential phototoxicity of HDR displays we have conducted a radiometric analysis of the first commercially available HDR display (made by Brightside Technologies) which consists of an LCD panel transilluminated by an array of high intensity LEDs. We have determined the spectral radiance and retinal irradiance produced by the display, and evaluated this radiation with respect to international phototoxicity guidelines [Sliney05]. While our analysis indicates that the display poses no known hazards, for additional safety we have developed an approach for reducing to short wavelength radiation to negligible levels, while only moderately reducing display luminance. The results of this project have important implications for the use of existing HDR displays in vision research and for the design of future HDR displays.

Contact:

James A. Ferwerda, Ph.D.
Associate Professor
Center for Imaging Science
Munsell Color Science Laboratory
18/1069 Lomb Memorial Drive
Rochester Institute of Technology
Rochester, NY 14623
585-475-4923
585-475-4444 (fax)
jaf@cis.rit.edu
<http://www.cis.rit.edu/jaf>