

1. Report No. UMTRI-2004-6		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Chromatic Aberrations Near the Cutoff of Low-Beam Headlamps			5. Report Date March 2004		
			6. Performing Organization Code 302753		
7. Author(s) Sivak, M., Flannagan, M.J., Schoettle, B, and Adachi, G.			8. Performing Organization Report No. UMTRI-2004-6		
9. Performing Organization Name and Address The University of Michigan Transportation Research Institute 2901 Baxter Road Ann Arbor, Michigan 48109-2150 U.S.A.			10. Work Unit no. (TRAIS)		
			11. Contract or Grant No.		
12. Sponsoring Agency Name and Address The University of Michigan Industry Affiliation Program for Human Factors in Transportation Safety			13. Type of Report and Period Covered		
			14. Sponsoring Agency Code		
15. Supplementary Notes The Affiliation Program currently includes AGC America, Autoliv, Automotive Lighting, Avery Dennison, BMW, DaimlerChrysler, DBM Reflex, Denso, Federal-Mogul, Ford, GE, General Motors, Gentex, Guide Corporation, Hella, Honda, Ichikoh Industries, Koito Manufacturing, Lang-Mekra North America, Magna International, Mitsubishi Motors, Muth, Nichia America, Nissan, North American Lighting, Olsa, OSRAM Sylvania, Philips Lighting, PPG Industries, Reflec USA, Reflexite, Renault, Samlip, Schefenacker International, Sisecam, Solutia Performance Films, Stanley Electric, TG North America, Toyota Technical Center USA, Valeo, Vidrio Plano, Visteon, 3M Personal Safety Products, and 3M Traffic Safety Systems. Information about the Affiliation Program is available at: http://www.umich.edu/~industry					
16. Abstract <p>Projector low beams are subject to color aberrations near the vertical cutoff caused by dispersion of light when passing through the lens. Color aberrations are especially of concern with high-intensity discharge (HID) lamps, because these color changes likely contribute to the discomfort-glare complaints for HIDs.</p> <p>The purpose of this study was to evaluate the extent and magnitude of color aberrations in HID and tungsten-halogen projector low beams. Specifically, we made colorimetric measurements near the cutoffs of 8 projector HIDs and 4 projector tungsten-halogen. For experimental control, we also evaluated 9 nonprojector HIDs and 5 nonprojector tungsten-halogen.</p> <p>Major color changes were present for 38% of the HID projector lamps, 50% of the tungsten-halogen projector lamps, and (as expected) for 0% of the HID or tungsten-halogen nonprojector lamps. Transformation of the chromaticity data into a perceptually uniform color space indicated that the color changes caused by aberrations near the cutoff were often considerably greater than the typical color differences between tungsten-halogen and HID sources. This suggests that some of the recent concern about headlamp color and glare on the part of the driving public may be caused by color aberrations—in either tungsten-halogen or HID lamps—rather than by HID lamps themselves. To minimize discomfort glare (especially for HIDs), it is important to avoid color aberrations in the regions of the beam pattern with substantial luminous intensity levels that may be directed toward oncoming drivers.</p>					
17. Key Words Color, aberrations, cutoff, low beams, HIDs, projector lamps, low beams				18. Distribution Statement Unlimited	
19. Security Classification (of this report) None		20. Security Classification (of this page) None		21. No. of Pages 19	
22. Price					