



Standard Practice for Measuring Colorimetric Characteristics of Retroreflectors Under Nighttime Conditions¹

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1. Scope

1.1 This practice describes the instrumental determination of retroreflected chromaticity coordinates of retroreflectors. It includes the techniques used in a photometric range to measure retroreflected (nighttime) chromaticity with either a telecolorimeter or telespectroradiometer.

1.2 This practice covers the general measurement procedures. Additional requirements for specific tests and specifications are described in Section 7.

1.3 The description of the geometry used in the nighttime colorimetry of retroreflectors is described in Practice E808 and the methods for calculation of chromaticity are contained in Practice E308.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E284 Terminology of Appearance

E308 Practice for Computing the Colors of Objects by Using the CIE System

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E808 Practice for Describing Retroreflection

E809 Practice for Measuring Photometric Characteristics of Retroreflectors

2.2 CIE Documents:³

CIE Publication No. 15.2 Colorimetry, 2d ed.

CIE Standard S 001/ISO IS 10526, Colorimetric Illuminants

CIE Standard S 002/ISO IS 10527, Colorimetric Observers

CIE Technical Report 54.2 Retroreflection: Definition and Measurement

3. Terminology

3.1 The terms and definitions in Terminology E284 apply to this practice.

3.2 Definitions:

3.2.1 *chromaticity coordinates, n*—the ratios of each of the tristimulus values of a psychophysical color to the sum of the tristimulus values.

3.2.1.1 *Discussion*—Chromaticity coordinates in the CIE 1931 system of color specification are designated by x , y , z and in the CIE 1964 supplementary system by x_{10} , y_{10} , z_{10} .

3.2.2 *CIE 1931 (x , y)-chromaticity diagram*—the chromaticity diagram for the CIE 1931 standard observer, in which the CIE 1931 chromaticity coordinates are plotted with x as the abscissa and y as the ordinate.

3.2.3 *CIE 1931 standard observer, n*—ideal colorimetric observer with color matching functions $\bar{x}(\lambda)$, $\bar{y}(\lambda)$, $\bar{z}(\lambda)$ corresponding to a field of view subtending a 2° angle on the retina; commonly called the “ 2° standard observer.” [CIE]^{B4}

3.2.3.1 *Discussion*—The color matching functions of the CIE 1931 standard observer are tabulated in Practice E308, CIE Publication No. 15.2, and CIE Standard S 002.

3.2.4 *CIE standard illuminant A, n*—colorimetric illuminant, representing the full radiation at 2855.6 K, defined by the CIE in terms of a relative spectral power distribution. [CIE]^B

3.2.4.1 *Discussion*—The relative spectral power distribution of CIE standard illuminant A is tabulated in Practice E308, CIE Publication No. 15.2, and CIE Standard S 001.

¹ This practice is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.10 on Retroreflection.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from U.S. National Committee of the CIE (International Commission on Illumination), C/o Thomas M. Lemons, TLA-Lighting Consultants, Inc., 7 Pond St., Salem, MA 01970, <http://www.cie-usnc.org>.

⁴ Stephenson, H. F., “The Colorimetric Measurement of Retroreflective Materials. Progress Report on International Exchange Tests,” *Proceedings of the CIE*, 18th Session (London), pp. 595–609, 1975.