



Standard Practice for Specifying the Geometry of Multiangle Spectrophotometers¹

This standard is issued under the fixed designation E2175; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

The appearance of metallic coatings and plastics usually depends on the directions of illumination and viewing, a phenomenon called “gonioappearance.” This phenomenon is also observed with other materials, such as lustrous textiles and materials containing pearlescent or interference pigments. The characteristic appearance of most such materials is accentuated by directional illumination, such as that provided by the sun on a clear day or a small lamp at night. The variation in color, as a function of geometry, is usually measured by spectrophotometry with several specified sets of geometric conditions. Measurement of this kind, at a few selected angles, is called “multiangle spectrophotometry,” as distinguished from measurement over a broad range of angles, which is called “goniospectrophotometry.” Spectrophotometric aspects of these measurements, including spectral resolution and linearity of photometric scales, are treated in other standards, including Practice E308 and Practice E1164. Practice E1767 provides practice for specifying the geometry of measurements. Retroreflectors exhibit a special kind of gonioappearance, which is treated in other ASTM documents. The present document provides standard practice for specifying influx and efflux angles, angular selectivity, spatial distributions of illuminators and receivers, and angular aspects of standardizing the photometric scale, that are peculiar to multiangle spectrophotometry. Directional illumination emphasizes the gonioappearance of most materials, but when interference pigments are used, such as those used in ink to mark paper currency, the effect is observed with diffuse illumination and varying angles of viewing, so these materials are also measured with diffuse illumination.

1. Scope

1.1 This practice provides a way of specifying the angular and spatial conditions of measurement and angular selectivity of a method of measuring the spectral reflectance factors of opaque gonioapparent materials, for a small number of sets of geometric conditions.

1.2 Measurements to characterize the appearance of retroreflective materials are of such a special nature that they are treated in other ASTM documents and are not included in the scope of this standard.

1.3 *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

E1164 Practice for Obtaining Spectrometric Data for Object-Color Evaluation

E1767 Practice for Specifying the Geometries of Observation and Measurement to Characterize the Appearance of Materials

3. Terminology

3.1 For definitions of appearance terms used in this practice, refer to Terminology E284.

4. Significance and Use

4.1 This practice is for the use of manufacturers and users of instruments to measure the appearance of gonioapparent

¹ This practice is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.03 on Geometry.

Current edition approved Oct. 1, 2013. Published October 2013. Originally approved in 2001. Last previous edition approved in 2008 as E2175 – 01 (2008). DOI: 10.1520/E2175-01R13.

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.