



Standard Practice for Specifying the Geometries of Observation and Measurement to Characterize the Appearance of Materials¹

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INTRODUCTION

The appearance of objects depends on how they are illuminated and viewed. When measurements are made to characterize appearance attributes such as color or gloss, the measured values depend on the geometry of the illumination and the instrumentation receiving light from the specimen. This practice for specifying the geometry in such applications is largely based on an international standard ISO 5/1, dealing with the precise measurement of optical density in photographic science, based on an earlier American National Standard.^{2,3}

1. Scope

1.1 This practice describes the geometry of illuminating and viewing specimens and the corresponding geometry of optical measurements to characterize the appearance of materials. It establishes terms, symbols, a coordinate system, and functional notation to describe the geometric orientation of a specimen, the geometry of the illumination (or optical irradiation) of a specimen, and the geometry of collection of flux reflected or transmitted by the specimen, by a measurement standard, or by the open sampling aperture.

1.2 Optical measurements to characterize the appearance of retroreflective materials are of such a special nature that they are treated in other ASTM standards and are excluded from the scope of this practice.

1.3 The measurement of transmitted or reflected light from areas less than 0.5 mm in diameter may be affected by optical coherence, so measurements on such small areas are excluded from consideration in this practice, although the basic concepts described in this practice have been adopted in that field of measurement.

1.4 The specification of a method of measuring the reflecting or transmitting properties of specimens, for the purpose of characterizing appearance, is incomplete without a full description of the spectral nature of the system, but spectral conditions

are not within the scope of this practice. The use of functional notation to specify spectral conditions is described in ISO 5/1.

2. Referenced Documents

2.1 *ASTM Standards*:⁴

E284 Terminology of Appearance

2.2 *Other Standard*:

ISO 5/1 Photography—Density Measurements—Part 1: Terms, Symbols and Notations⁵

3. Terminology

3.1 *Definitions*:

3.1.1 The terminology used in this practice is in accordance with Terminology **E284**.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *anormal angle, n* —an angle measured from the normal, toward the reference plane, to the central axis of a distribution, which may be an angular distribution of flux in an incident beam or distribution of sensitivity of a receiver.

3.2.2 *aspecular angle, n* —the angle subtended at the origin by the specular axis and the axis of the receiver, the positive direction being away from the specular axis.

3.2.3 *aspecular azimuthal angle, n* —the angle subtended, at the specular axis in a plane normal to the specular axis, by the projection of the axis of the receiver and the projection of the x -axis on that plane, measured from the projection of the x -axis in a right-handed sense with respect to the specular axis.

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.

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² ISO1/5 Photography — Density Measurements — Part 1: Terms, symbols, and notations.

³ ANSI PH2.36–1974 American National Standards terms, symbols, and notation for optical transmission and reflection measurements.

⁴ 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.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.