



Standard Test Method for Colorimetry of Teeth Using Digital Still Camera Technology¹

This standard is issued under the fixed designation E2466; 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

Tooth color is an important parameter used to ascertain certain medical and esthetic information. CIE colorimetric values for the teeth are derived from the native RGB signals generated by a digital still camera, DSC, by broadband measurement of the reflectance of teeth. The illumination angle is 45 degrees and CIELAB colorimetric coordinates are computed using equations contained in Practice E308. This test method, E2466, specifies the procedure used for the measurement of tooth color *in-vivo* and *in-vitro* with illumination at 45 degrees relative to the sample plane which is also the normal of the mouth, under an approximate equal energy spectrum. This test method is appropriate for anterior and posterior teeth.

1. Scope

1.1 This test method covers the procedure, instrumental requirements, standardization procedures, material standards, measurement procedures, and parameters necessary to make precise measurements of *in-vivo* tooth color and tooth whiteness. In particular it is meant to measure the color of teeth in selected human subjects.

1.2 Digital images are used to evaluate tooth color of both posterior and anterior dentition (teeth). All other non-relevant parts, such as gums, spaces, etc., must be separated from the measurement and the analysis. All localized discoloration; such as stains, inclusions, etc., may be separated from the measurement and the analysis.

1.3 The broadband reflectance factors of teeth are measured. The colorimetric measurement is performed with a digital still camera while using an illuminator(s) that provides controlled illumination on the teeth. The measured data from a digital image are captured using a DSC. This test method is particularly useful for the gamut of tooth color which is:

1.3.1 CIE L^* from 55 to 95,

1.3.2 CIE a^* from 3 to 12,

1.3.3 CIE b^* from 8 to 25 units.

1.4 The wavelengths for this test method include that portion of the visible spectrum from 400 to 700 nm.

1.5 Data acquired using this test method is for comparative purposes used during clinical trials or other types of research.

1.6 This test method is designed to encompass natural teeth, artificial teeth, restorations, and shade guides.

NOTE 1—This procedure may not be applicable for all types of dental work.

1.7 The apparatus, measurement procedure, data analysis technique are generic, so that a specific apparatus, measurement procedure, or data analysis technique may not be excluded.

1.8 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.9 *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 to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards*:²

D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

E179 Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials

¹ This test method is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.06 on Image Based Color Measurement.

Current edition approved Jan. 1, 2013. Published January 2013. Originally approved in 2006. Last previous edition approved in 2011 as E2466 – 06 (2011). DOI: 10.1520/E2466-13.

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.