Designation: E2729 – 09(Reapproved 2015)

Standard Practice for Rectification of Spectrophotometric Bandpass Differences[1]

This standard is issued under the fixed designation E2729; 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.

1. Scope

1.1 This standard outlines the methods that can be used to deconvolve, at least partially, the spectral bandpass differences of raw spectral data acquired by abridged spectrophotometry. Such differences are introduced because the spectral passband must be of significant bandwidth to allow sufficient energy to reach the detector. On the other hand, the spectral data that should be being reported is that of a virtual 1-nm bandwidth spectrum in order to be useful in the CIE method of tristimulus integration which involves 1-nm summation.

1.2 The standard establishes practices for whether, when, and how a bandpass rectification should be made to any reflectance or transmittance spectrum acquired by abridged spectrophotometry.

1.3 It is applicable where the shape of the passband is triangular and the bandwidth is equal to the measurement interval between passbands. Information is provided in Section 7 for users when that condition is not satisfactorily met.

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

3. Terminology

3.1 *Definitions*—For definition of terms used in this practice, refer to Terminology E284.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *virtual 1-nm bandwidth spectrum, n*—spectral data that have been corrected by numerical methods so as to match as closely as possible a spectrum from the same source but with a putative bandwidth of 1 nm.

4. Summary of Practice

4.1 The practice assumes that the shape of the passband is triangular and that the bandwidth is equal to the measurement interval between passbands. This condition is thought to be met by a majority of commercial instruments in use in spectrophotometry and spectrocolorimetry. Under those conditions, the methods of Section 6 are to be utilized to rectify the raw reflectance or transmittance data for its bandpass differences immediately upon the return of the data to the host computer program from the acquiring instrument, or before presentation of the data to the user.

5. Significance and Use

5.1 Failure to make such a rectification introduces differences from the true value of the spectrum of about 0.02 to 0.4 ΔE^*_{ab} units. All users are required to make a rectification of such bandpass differences. It is especially incumbent upon writers of computer programs whose function it is to acquire such spectra from instruments to see that a competent rectification is implemented in the program before any additional processing of the spectrum, or calculations involving the spectrum are accomplished, or before the spectrum is made available to a user.

5.2 Legacy measuring systems are explicitly exempted from any requirements for retrofitting of hardware or software and may continue to utilize previously accepted methods of making the bandwidth rectification.

6. Methodology

6.1 *The First and Last Passbands*—In the first and last passband being rectified, no correction is called for. The corrected spectral value $R_{s,\lambda}$ should be set equal to the measured spectral value $R_{m,\lambda}$.

$$R_{s,1} = R_{m,1} \qquad (1)$$

$$R_{s,n} = R_{m,n}$$

[1] This practice is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.04 on Color and Appearance Analysis.

Current edition approved April 1, 2015. Published April 2015. Originally approved in 2009. Last previous edition approved in 2009 as E2729 – 09. DOI: 10.1520/E2729-09R15.

[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.