



Standard Practice for Estimation of the Spectral Bandwidth of Ultraviolet-Visible Spectrophotometers¹

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1. Scope

1.1 This practice describes procedures for estimating the spectral bandwidth of a spectrophotometer in the wavelength region of 185 to 820 nm.

1.2 These practices are applicable to all modern spectrophotometer designs utilizing computer control and data handling. This includes conventional optical designs, where the sample is irradiated by monochromatic light, and ‘reverse’ optic designs coupled to photodiode arrays, where the light is separated by a polychromator after passing through the sample. For spectrophotometers that utilize servo-operated slits and maintain a constant period and a constant signal-to-noise ratio as the wavelength is automatically scanned, and/or utilize fixed slits and maintain a constant servo loop gain by automatically varying gain or dynode voltage, refer to the procedure described in **Annex A1**. This procedure is identical to that described in earlier versions of this practice.

1.3 This practice does not cover the measurement of limiting spectral bandwidth, defined as the minimum spectral bandwidth achievable under optimum experimental conditions.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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. Terminology

2.1 Definitions:

2.1.1 *spectral bandwidth, n* —the wavelength interval of radiation leaving the exit slit of a monochromator measured at half the peak detected radiant power.

¹ This practice is under the jurisdiction of ASTM Committee E13 on Molecular Spectroscopy and Separation Science and is the direct responsibility of Subcommittee E13.01 on Ultra-Violet, Visible, and Luminescence Spectroscopy.

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3. Summary of Practice

3.1 The following test procedures are written for all spectrophotometer designs that have provision for recording (that is, collecting and storing) spectral data digitally. Processing may be by built-in programs or in a separate computer. Data may be collected in either the transmittance or the absorbance mode, although for the Liquid Ratio procedure, the peak and trough values must be measured in absorbance.

3.2 *Line Emission Source Procedure*—The continuum source is replaced with a line emission source, such as a mercury lamp, and the apparent half-intensity bandwidth of an emission line occurring in the wavelength region of interest is measured using the slit width, or indicated spectral bandwidth required to be estimated. This procedure can be used for instrumentation having spectral bandwidths in the range 0.1 to 10 nm.

NOTE 1—In photodiode array instrumentation, the array spacing between the diode elements may invalidate this procedure.

3.3 *Liquid Ratio Procedure*—The calculated spectral peak to trough ratio of a defined small percentage of toluene in hexane will vary with the spectral bandwidth of the spectrophotometer when scanned in the UV region. This procedure can be used for all instrumentation having spectral bandwidths in the range 0.5 to 3.0 nm.

3.4 *Benzene Vapor Procedure*—The characteristics of a spectrum of benzene vapor in the UV region will vary significantly with the spectral bandwidth of the spectrophotometer. This procedure can be used for instrumentation having spectral bandwidths in the range 0.1 to 0.5 nm.

4. Significance and Use

4.1 These practices should be used by a person who develops an analytical method to ensure that the spectral bandwidths cited in the practice are actually the ones used.

NOTE 2—The method developer should establish the spectral bandwidths that can be used to obtain satisfactory results.

4.2 These practices should be used to determine whether a spectral bandwidth specified in a method can be realized with a given spectrophotometer and thus whether the instrument is suitable for use in this application. If accurate absorbance