



Standard Guide for Establishing Spectrophotometer Performance Tests¹

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1. Scope

1.1 This guide covers basic procedures that can be used to develop spectrophotometer performance tests. The guide is intended to be applicable to spectrophotometers operating in the ultraviolet, visible, near-infrared and mid-infrared regions.

1.2 This guide is not intended as a replacement for specific practices such as Practices [E275](#), [E925](#), [E932](#), [E958](#), [E1421](#), or [E1683](#) that exist for measuring performance of specific types of spectrophotometers. Instead, this guide is intended to provide guidelines in how similar practices should be developed when specific practices do not exist for a particular spectrophotometer type, or when specific practices are not applicable due to sampling or safety concerns. This guide can be used to develop performance tests for on-line process spectrophotometers.

1.3 This guide describes univariate level zero and level one tests, and multivariate level A and level B tests which can be implemented to measure spectrophotometer performance. These tests are designed to be used as rapid, routine checks of spectrophotometer performance. They are designed to uncover malfunctions or other changes in instrument operation, but do not specifically diagnose or quantitatively assess the malfunction or change. The tests are not intended for the comparison of spectrophotometers of different manufacture.

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

[E131 Terminology Relating to Molecular Spectroscopy](#)

[E275 Practice for Describing and Measuring Performance of](#)

[Ultraviolet and Visible Spectrophotometers](#)

[E925 Practice for Monitoring the Calibration of Ultraviolet-Visible Spectrophotometers whose Spectral Bandwidth does not Exceed 2 nm](#)

[E932 Practice for Describing and Measuring Performance of Dispersive Infrared Spectrometers](#)

[E958 Practice for Measuring Practical Spectral Bandwidth of Ultraviolet-Visible Spectrophotometers](#)

[E1421 Practice for Describing and Measuring Performance of Fourier Transform Mid-Infrared \(FT-MIR\) Spectrometers: Level Zero and Level One Tests](#)

[E1655 Practices for Infrared Multivariate Quantitative Analysis](#)

[E1683 Practice for Testing the Performance of Scanning Raman Spectrometers](#)

3. Terminology

3.1 *Definitions*—For terminology relating to molecular spectroscopic methods, refer to Terminology [E131](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *action limit, n*—the limiting value from an instrument performance test, beyond which the spectrophotometer is expected to produce potentially invalid results.

3.2.2 *check sample, n*—a single pure compound, or a known, reproducible mixture of compounds whose spectrum is constant over time such that it can be used in a performance test.

3.2.3 *level A test, n*—a pass/fail spectrophotometer performance test in which the spectrum of a check or test sample is compared against historical spectra of the same sample via a multivariate analysis.

3.2.4 *level B test, n*—a pass/fail spectrophotometer performance test in which the spectrum of a check or test sample is analyzed using a multivariate model, and the results of the analysis are compared to historical results for prior analyses of the same sample.

3.2.5 *level one (1) test, n*—a simple series of measurements designed to provide quantitative data on various aspects of spectrophotometer performance and information on which to base the diagnosis of problems.

3.2.6 *level zero (0) test, n*—a routine check of spectrophotometer performance, which can be done in a few minutes, designed to visually detect significant changes in instrument

¹ This guide is under the jurisdiction of ASTM Committee E13 on Molecular Spectroscopy and Separation Science and is the direct responsibility of Subcommittee E13.03 on Infrared and Near Infrared Spectroscopy.

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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.