



Standard Practice for Testing Variable-Wavelength Photometric Detectors Used in Liquid Chromatography¹

This standard is issued under the fixed designation E1657; 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 practice covers the testing of the performance of a variable-wavelength photometric detector (VWPD) used as the detection component of a liquid-chromatographic (LC) system operating at one or more wavelengths in the range 190 to 800 nm. Many of the measurements are made at 254 nm for consistency with Practice E685. Measurements at other wavelengths are optional.

1.2 This practice is intended to describe the performance of the detector both independently of the chromatographic system (static conditions) and with flowing solvent (dynamic conditions).

1.3 For general liquid chromatographic procedures, consult Refs (1-9).²

1.4 For general information concerning the principles, construction, operation, and evaluation of liquid-chromatography detectors, see Refs (10, 11) in addition to the sections devoted to detectors in Refs (1-7).

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

1.6 *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:³

¹ This practice is under the jurisdiction of ASTM Committee E13 on Molecular Spectroscopy and Separation Science and is the direct responsibility of Subcommittee E13.19 on Separation Science.

Current edition approved Nov. 1, 2011. Published December 2011. Originally approved in 1994. Last previous edition approved in 2006 as E1657 – 98 (2006). DOI: 10.1520/E1657-98R11.

² The boldface numbers in parentheses refer to the list of references at the end of this practice.

³ 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.

E685 Practice for Testing Fixed-Wavelength Photometric Detectors Used in Liquid Chromatography

3. Terminology

3.1 Definitions:

3.1.1 *absorbance calibration*—the procedure that verifies that the absorbance scale is correct within $\pm 5\%$.

3.1.2 *drift*—the average slope of the noise envelope expressed in absorbance units per hour (AU/h) as measured over a period of 1 h.

3.1.3 *dynamic*—under conditions of a flow rate of 1.0 mL/min.

3.1.4 *linear range*—of a VWPD, the range of concentrations of a test substance in a test solvent over which the ratio of response of the detector versus concentration of test substance is constant to within 5 % as determined from the linearity plot specified in 7.1.2 and illustrated in Fig. 1. The *linear range* should be expressed as the ratio of the upper limit of linearity obtained from the plot to either (a) the lower linear concentration, or (b) the *minimum detectable* concentration, if the *minimum detectable* concentration is greater than the lower linear concentration.

3.1.5 *long-term noise*—the maximum amplitude in AU for all random variations of the detector signal of frequencies between 6 and 60 cycles per hour (0.1 and 1.0 cycles per min).

3.1.5.1 *Discussion*—It represents noise that can be mistaken for a late-eluting peak. This noise corresponds to the observed noise only and may not always be present.

3.1.6 *minimum detectability*—of a VWPD, that concentration of a specific solute in a specific solvent that results in a detector response corresponding to twice the static short-term noise.

3.1.6.1 *Discussion*—The static short-term noise is a measurement of peak-to-peak noise. A statistical approach to noise suggests that a value of three times the rms (root-mean-square) noise would insure that any value outside this range would not be noise with a confidence level of greater than 99 %. Since peak-to-peak noise is approximately five times the rms noise (12), the minimum detectability defined in this practice is a more conservative estimate.