



Designation: E 925 – 83 (Reapproved 1994)<sup>ε1</sup>

## Standard Practice for the Periodic Calibration of Narrow Band-Pass Spectrophotometers<sup>1</sup>

This standard is issued under the fixed designation E 925; 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.

ε<sup>1</sup> NOTE—Section 11 was added editorially in June 1994.

### INTRODUCTION

In the application of spectrophotometric methods of analysis it is the responsibility of the analyst to verify and validate that the instrument is functioning properly and is capable of providing acceptable analytical results. It is preferable that the verification of instrument performance be accomplished through the use of readily available, stable reference materials whose properties have been accurately measured by a standardizing laboratory. Several such certified standards are currently available from the National Bureau of Standards and their use in the tests and measurements described in this practice is satisfactory for evaluating the performance of spectrophotometers.

This practice covers some of the essential instrumental parameters that should be evaluated to ensure the acceptability of the analytical data routinely obtained on the instrument. These parameters include the accuracy of the wavelength and absorbance scales and stray radiant power levels.

The accuracy of the wavelength scale in both the UV and VIS regions is determined using the sharp absorption bands of a holmium oxide glass filter.<sup>2</sup> The wavelength of maximum absorbance of these bands has been determined.<sup>3</sup> The accuracy of the absorbance scale is determined using certified standards available through the National Bureau of Standards. The absorbance scale accuracy in the UV region (235–350 nm) is determined using acidic solutions of potassium dichromate (solid potassium dichromate is available from the National Bureau of Standards as SRM 935) while in the visible region (440–635 nm) the absorbance accuracy is determined using three glass filters (National Bureau of Standards SRM 930 series).<sup>4</sup> The use of these reference materials provides a valid and relatively simple means to test the accuracy of the wavelength and absorbance scales of narrow band-pass spectrophotometers in the spectral ranges indicated.

### 1. Scope

1.1 This practice covers the parameters of spectrophotometric performance that are critical for testing the adequacy of instrumentation for most routine tests and methods.<sup>5</sup> The recommended tests provide a measurement of the important parameters controlling results in spectrophotometric methods, but it is specifically not to be inferred that all factors in instrument performance are measured.

1.2 This practice may be used as a significant test of the

performance of instrumentation. While this procedure is not designed to extensively evaluate the performance of an instrument, it may be used to verify quantitative performance on an ongoing basis and to compare one instrument's performance with that of other units.

1.3 This practice should be performed on a periodic basis, the frequency of which depends on the physical environment within which the instrumentation is used. Thus, units handled roughly or used under adverse conditions (exposed to dust, chemical vapors, vibrations, or combinations thereof) should be calibrated more frequently than those not exposed to such conditions. This practice should also be performed after any significant repairs are made on a unit, such as those involving the optics, detector or radiant energy source.

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.*

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E-13 on Molecular Spectroscopy and is the direct responsibility of Subcommittee E13.01 on Ultraviolet and Visible Spectroscopy.

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<sup>2</sup> Available from Beckman Instruments (Part No. 96157) and from distributors from Corning Glass Works (Catalogue No. 3131).

<sup>3</sup> McNeirney, J., and Slavin, W., *Applied Optics*, Vol 1, 1962, p. 365.

<sup>4</sup> SRM 935 and 930 may be purchased from the Office of Standard Reference Materials, National Bureau of Standards, Washington, D. C. 20234.

<sup>5</sup> Routine tests are defined as those in which absorbance data obtained on a sample are compared to those of a standard sample preparation.