



# Standard Practice for Describing and Measuring Performance of Fourier Transform Mid-Infrared (FT-MIR) Spectrometers: Level Zero and Level One Tests<sup>1</sup>

This standard is issued under the fixed designation E 1421; 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 describes two levels of tests to measure the performance of laboratory Fourier transform mid-infrared (FT-MIR) spectrometers equipped with a standard sample holder used for transmission measurements.

1.2 This practice is not directly applicable to FT-IR spectrometers equipped with various specialized sampling accessories such as flow cells or reflectance optics, nor to Fourier Transform Near-Infrared (FT-NIR) spectrometers, nor to FT-IR spectrometers run in step scan mode.

1.2.1 If the specialized sampling accessory can be removed and replaced with a standard transmission sample holder, then this practice can be used. However, the user should recognize that the performance measured may not reflect that which is achieved when the specialized accessory is in use.

1.2.2 If the specialized sampling accessory cannot be removed, then it may be possible to employ a modified version of this practice to measure spectrometer performance. The user is referred to Guide E 1866 for a discussion of how these tests may be modified.

1.2.3 Spectrometer performance tests for FT-NIR spectrometers are described in Practice E 1944.

1.2.4 Performance tests for dispersive MIR instruments are described in Practice E 932.

1.2.5 For FT-IR spectrometers run in a step scan mode, variations on this practice and information provided by the instrument vendor should be used.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

E 131 Terminology Relating to Molecular Spectroscopy

E 932 Practice for Describing and Measuring Performance

of Dispersive Infrared Spectrophotometers

E 1866 Guide for Establishing Spectrophotometer Performance Tests

E 1944 Practice for Describing and Measuring Performance of Fourier Transform Near-Infrared (FT-NIR) Spectrometers: Level Zero and Level One Tests

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, refer to Terminology E 131. All identifications of spectral regions and absorption band positions are given in wavenumbers ( $\text{cm}^{-1}$ ), and spectral energy, transmittance, and absorbance are signified in equations by the letters *E*, *T* and *A* respectively. The ratio of two transmittance or absorbance values, and the ratio of energy levels at two different wavenumbers are signified by the letter *R*. A subscripted number signifies a spectral position in wavenumbers (for example,  $A_{3082}$ , the absorbance at  $3082 \text{ cm}^{-1}$ ).

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

3.1.2 *level zero (0) test, n*—a routine check of instrument performance, that can be done in a few minutes, designed to visually detect significant changes in instrument performance and provide a database to determine instrument function over time.

## 4. Significance and Use

4.1 This practice permits an analyst to compare the general performance of an instrument on any given day with the prior performance of an instrument. This practice is not necessarily meant for comparison of different instruments with each other even if the instruments are of the same type and model. This practice is not meant for comparison of the performance of one instrument operated under differing conditions.

## 5. Test Conditions

5.1 *Operating Conditions*—A record should be kept to document the operating conditions selected so that they can be duplicated. In obtaining spectrophotometric data, the analyst must select proper instrumental operating conditions such as

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E13 on Molecular Spectroscopy and is the direct responsibility of Subcommittee E13.03 on Infrared Spectroscopy.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.