



Designation: E 387 – 84 (Reapproved 1995)^{ε1}

Standard Test Method for Estimating Stray Radiant Power Ratio of Spectrophotometers by the Opaque Filter Method¹

This standard is issued under the fixed designation E 387; 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.

^{ε1} NOTE—Section 9 was added editorially in November 1995.

1. Scope

1.1 This test method affords an estimate of the relative radiant power (that is, the Stray Radiant Power Ratio (SRPR) at wavelengths remote from those of the nominal pass band transmitted through the monochromator of an absorption spectrophotometer. Test-filter materials are described that discriminate between the desired wavelengths and those which contribute most to SRP for conventional commercial spectrophotometers used in the ultraviolet, the visible, the near infrared, and the alkali halide infrared ranges. These procedures apply to instruments of conventional design, with usual sources, detectors, and optical designs. The vacuum ultraviolet and the far infrared present special problems that are not discussed herein.

NOTE 1—An equivalent test method (1,2)² for use in the ultraviolet that is easier and faster to perform might be preferred, especially when frequent testing is indicated.

NOTE 2—Recent research (3) has shown that particular care must be exercised in testing grating spectrophotometers that use moderately narrow bandpass blocking filters. See 4.2.

1.2 These procedures are neither all-inclusive nor infallible.³ Because of the nature of readily available filter materials, with a few exceptions the procedures are insensitive to SRP of shorter wavelengths in the ultraviolet or visible, or of lower frequencies in the infrared, and they are not necessarily valid for “spike” SRP nor for “nearby SRP.” (See Annexes for general discussion and definitions of these terms.) However, they are adequate in most cases and for typical applications. They do cover instruments using prisms or gratings, in either single or double monochromators.

1.3 The proportion of SRP (that is, SRPR) encountered with a well-designed monochromator, used in a favorable spectral region, is a small fraction of 1 %. With a double monochromator it may easily be less than 1 ppm even with a broad-band continuum source. Under these conditions, it may be difficult to do more than determine that it falls below a certain level. Actual measurement often requires special techniques and instrument operating conditions that are not typical of those occurring during use. When absorption measurements with continuum sources are being made, it is frequently true that, owing to the effect of slit width on SRP in a double monochromator, these test procedures tend to give “conservative” results; that is, because larger slit widths than normal must be used to admit enough energy to the monochromator to permit evaluation of the SRP, the stray proportion indicated is greater than would normally be encountered in use.

1.4 The principal reason for a test procedure that is not exactly representative of normal operation is that the effects of SRP are “magnified” in sample measurements at high absorbance. It is usually necessary to increase sensitivity in some way during the test in order to evaluate the SRP adequately. This is usually accomplished by increasing slit width and so obtaining sufficient energy to allow meaningful measurement of the SRP after the monochromatic energy has been removed by the SRP (test) filter. A further reason for increasing energy or sensitivity can be that many instruments have only absorbance scales, which obviously do not extend to zero transmittance. Even a SRP proportion as large as 1 % may fall outside the measurement range.

1.5 Many instruments that use optical attenuators to balance sample absorption make relatively inaccurate measurements below 10 % transmittance, because of poor attenuator linearity. All instruments should be carefully and frequently checked if used below about 1 % transmittance because of the possibility of zero shift due to electrical pickup or other causes. For these reasons, the test procedure specifies that the measurements be made within 100 % and 10 % on the scale. Obviously this is not required if reliable photometric linearity and zero checks are made under the conditions prevailing during the test, and use of the 10 and 1 % range may give lower and more

¹ This method 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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² The boldface numbers in parentheses refer to the list of references at the end of this method.

³ Currently in preparation by E13.01 are test methods that reduce the potential for error that occurs when the test-filter absorbs an appreciable portion of the SRP.