ANSI/OEOSC OP1.007-2020

American National Standard

For Optics and Electro-Optical Instruments – Optical Elements and Assemblies – Infrared Spectral Bands

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Optical Elements and Assemblies – Infrared Spectral Bands

Secretariat
Optics and Electro-Optics Standards Council

Approved February 24, 2020
American National Standards Institute, Inc..

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Published by

Optics and Electro-Optics Standards Council
439 Monroe Avenue
ROCHESTER, NY 14607

Printed in the United States of America

Foreword

(This Foreword does not contain requirements necessary for conformance to this standard.)

ANSI/OEOSC OP1.007 defines standardized spectral bands and reference wavelengths for infrared materials, optical components, and electro-optical instruments.

Suggestions for improvement of this standard are welcome. They should be sent to the Optics and Electro-Optics Standards Council, 439 Monroe Avenue, Rochester, NY 14607.

This Standard was processed and approved for submittal to ANSI by the Accredited Standards Committee on Optics (ASC OP). ASC OP's Task Force 6, Infrared Materials, developed the manuscript.

Approval by the ASC OP Committee does not necessarily mean that all members voted for its approval. At the time of the approval of this Standard, the ASC OP Committee consisted of the following member organizations and representatives. Observer members are identified with the superscript º. Primary representatives are identified with the superscript ¹.

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1 Scope

This Standard divides the infrared region of the electromagnetic spectrum from 0.750 microns to 30.0 microns into named subregions, also known as bands, on the basis of the kinds of detectors or materials used to sense infrared radiation. It defines the generic form of the Abbe dispersion formula for materials that operate in the infrared spectrum and specifies reference wavelengths for standard Abbe numbers in each of the named bands. This Standard also defines standard reference wavelengths for the general metrology of infrared materials and components in each of the spectral bands.

2 Infrared Spectral Bands

The infrared spectrum encompasses a wide range of wavelengths from approximately 0.750 microns to approximately 30.0 microns. Various schemes have been used to designate functional subdivisions of this range, including those of the International Commission on Illumination (CIE), ISO 20473, and NASA's Infrared Processing and Analysis Center (IPAC). The scheme used in this standard is to divide the infrared spectrum according to the spectral response of detectors or materials used to detect infrared radiation within these bands.

To avoid unnamed gaps, one band begins where an adjacent band ends. To avoid the ambiguity of sharing boundary wavelengths, each band is defined to include its upper bound (also known as an inclusive upper bound) but not its lower bound (also known as an exclusive lower bound).

Spectral Band	Wavelength Range (μm)	Typical Sensors
Near Infrared (NIR)	(0.75 – 1.1]	Silicon, InGaAs
Short Wave Infrared (SWIR)	(1.1 – 3.0]	InGaAs, HgCdTe
Mid Wave Infrared (MWIR)	(3.0 – 5.0]	InSb, HgCdTe, PbSe
Long Wave Infrared (LWIR)	(5.0 – 14.0]	HgCdTe, Microbolometer
Very Long Wave Infrared (VLWIR)	(14.0 – 30.0]	Doped Si, Bolometer, Pyroelectric

Table 2-1: Standard bands in the infrared spectrum.

3 Infrared Abbe Number

3.1 Background on Abbe Wavelengths

The Abbe number of an optical material is a measure of its dispersion and facilitates the calculation of the chromatic aberration generated by a single lens element. It also facilitates the comparison of various materials relative to their suitability for use in the chromatic correction of a multi-element system.

Traditionally, the Abbe number for the visible spectrum is defined relative to the refractive indices at specific spectral emission wavelengths that can be generated conveniently in a testing laboratory with