



Designation: D 5568 – 9501

An American National Standard

Standard Test Method for Measuring Relative Complex Permittivity and Relative Magnetic Permeability of Solid Materials at Microwave Frequencies¹

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1. Scope

1.1 This test method covers a procedure for determining relative complex permittivity (relative dielectric constant and loss index) and relative magnetic permeability of isotropic, reciprocal (nongyromagnetic) solid materials. If the material is nonmagnetic, this procedure may be used to measure permittivity only.

1.2 This measurement method is valid over a frequency range of approximately 1 MHz to 50 GHz. These limits are not exact and depend on the size of the specimen, the size and type of transmission line used as a specimen holder, and on the applicable frequency range of the network analyzer used to make measurements. The lower frequency is limited by the smallest measurable phase shift through a specimen, and the upper frequency limit is determined by the excitation of higher-order modes that invalidates the dominant-mode transmission line model. Any number of discrete measurement frequencies may be selected in this frequency range. To achieve maximum measurement accuracy, use of different transmission line sizes and types may be required. For example, use of a 7-mm diameter coaxial geometry can provide for measurements from 1 MHz to 18 GHz. However, air gaps

¹ This test method is under the jurisdiction of ASTM Committee D-9 D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.12 on Electrical Tests.

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