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Review of Dielectric Permittivity Measurement Techniques

Authors : Ahmad H. Abdelgwad, Galal E. Nadim, Tarek M. Said, Amr M. Gody

Abstract : The prime objective of this manuscript is to provide intensive review of the techniques used for permittivity measurements. The measurement techniques, relevant for any desired application, rely on the nature of the measured dielectric material, both electrically and physically, the degree of accuracy required, and the frequency of interest. Regardless of the way that distinctive sorts of instruments can be utilized, measuring devices that provide reliable determinations of the required electrical properties including the obscure material in the frequency range of interest can be considered. The challenge in making precise dielectric property or permittivity measurements is in designing of the material specimen holder for those measurements (RF and MW frequency ranges) and adequately modeling the circuit for reliable computation of the permittivity from the electrical measurements. If the RF circuit parameters such as the impedance or admittance are estimated appropriately at a certain frequency, the material's permittivity at this frequency can be estimated by the equations which relate the way in which the dielectric properties of the material affect on the parameters of the circuit.

Keywords : dielectric permittivity, free space measurement, waveguide techniques, coaxial probe, cavity resonator
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