Abstracts

Influence of Higher Order Modes on the Measurements of Complex Permittivity and Permeability of Materials Using a Microstrip Discontinuity

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The accurate electromagnetic analysis of discontinuities in a microstrip device, used for the broad band measurement of complex permittivity and permeability of materials, is presented. This analysis is based on the spectral domain approach together with the mode matching method which consists in the electromagnetic field matching at the discontinuities for each mode of the microstrip line. The study of the influence of higher order modes on the S-parameter measurements enabled us to determine the domain of validity of the transmission-line theory that has been used until now in the processing of the data. The use of the transmission-line theory for the description of the electromagnetic behavior of the cell discontinuities permits in the 45 MHz-14 GHz frequency band the achievement of a good precision (better than 5%) for the results on materials with low electromagnetic characteristics (epsilon' <10 and μ' < 10). The improvement in high frequencies of the results on materials with greater permittivity and permeability is provided by the calculation of higher order modes (about 10) in the analysis of the microstrip discontinuity.

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