Abstracts

Rapid Measurement of Dielectric Constant and Loss Tangent

D.M. Bowie and K.S. Kelleher. "Rapid Measurement of Dielectric Constant and Loss Tangent." 1956 Transactions on Microwave Theory and Techniques 4.3 (Jul. 1956 [T-MTT]): 137-140.

The problem of evaluating dielectric constant and loss tangent by the short-circuited-waveguide technique has been encountered continually in recent years in the study of artificial dielectric media and radome materials. In general, practical measurements have involved materials with low loss and dielectric constants less than 10. The analytical method normally applied to data on such materials requires laborious computation. The available graphical methods have not completely eliminated computation and have provided answers of unsatisfactory accuracy. The present paper describes rapid graphical techniques for evaluating dielectric constant and loss tangent from the quantities normally measured with the slotted line, using samples of arbitrarily chosen length. It begins with equations previously derived for the case of low-loss media. By use of a new parameter, the relationship between dielectric constant and the measured shift in standing-wave minimum is plotted in such a way that all possible values of dielectric constant within any predetermined range are read directly from the graph with no computation whatsoever. A graph can be readily prepared to apply over a full range of frequency to all sizes of rectangular waveguide.

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