# Abstracts

## Numerical Analysis of a TM/sub 010/ Cavity for Dielectric Measurement

*X. Zhao, C. Liu and L.C. Shen. "Numerical Analysis of a TM/sub 010/ Cavity for Dielectric Measurement." 1992 Transactions on Microwave Theory and Techniques 40.10 (Oct. 1992 [T-MTT]): 1951-1959.*

The property of a TM/sub 010/ cavity containing a lossy dielectric material is obtained by using the transmission-line-matrix (TLM) technique with serial nodes in cylindrical coordinates. The TM/sub 010/ cavity operating at 1.1 GHz has three concentric layers and an air gap between the sample and cavity cover. The influence of this air gap in terms of the Q-factor and the resonant frequency is studied by the numerical method. Employing the serial graded TLM technique, the resonant curve of the cavity is computed. From this, the Q factor and the center frequency can be evaluated. In the TLM method, the entire cavity space is discretized into small cells, Maxwell's equations in each cell are transformed into a matrix of transmission line equations. The voltage and the current in the inter-connected transmission line network are proportional to the electric and the magnetic field. The formulation of the method is in cylindrical coordinates and each cell may have different physical dimensions. Compared with the TLM method in rectangular coordinates and uniform grids, the present method is more efficient and easier to program for the analysis of the cavity with cylindrical symmetry. Computed results show that the air gap between the sample and cavity cover is very critical to the accuracy of the measurement of the dielectric property of the sample when the sample diameter is small, but negligible when the diameter of the sample is large.

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