Abstracts

An Accurate Measurement Technique for Line Properties, Junction Effects, and Dielectric and Magnetic Material Parameters

A. Enders. "An Accurate Measurement Technique for Line Properties, Junction Effects, and Dielectric and Magnetic Material Parameters." 1989 Transactions on Microwave Theory and Techniques 37.3 (Mar. 1989 [T-MTT]): 598-605.

Transmission/reflection coefficients of unknown transmission lines are analyzed. The characteristic impedance, the propagation constant, and the parameters of the junctions at the connections with the measurement setup can be calculated if the coefficients of three different lengths of the line being investigated are measured. Therefore it is called the L^3 method (line/line/line). Transmission data suffice for the determination of only the propagation constant. They are used in the case of material parameter measurements with loaded lines. Dielectric and magnetic properties of the filling material are calculated via the set of transverse resonance equations. Even nonreciprocal lines and off-diagonal tensor elements are amenable as are the properties of fluids or powders. Due to the availability of an analytically exact formulation, the overall accuracy achievable can be precisely specified, e.g. 0.1 percent in the X-band for the absolute values of material parameters. The accuracy is dependent mainly on geometrical tolerances if precise vector network analyzers are used.

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