Abstracts

New method for determining the permeability tensor of magnetized ferrites in a wide frequency range

P. Queffelec, M. Le Floc'h and P. Gelin. "New method for determining the permeability tensor of magnetized ferrites in a wide frequency range." 2000 Transactions on Microwave Theory and Techniques 48.8 (Aug. 2000 [T-MTT]): 1344-1351.

To provide a broadband method for measuring the complex permeability tensor components of magnetized ferrites we have realized a nonreciprocal rectangular waveguide cell. A network analyzer setup is used to measure the scattering parameters of the cell over a wide range of frequencies. The nonreciprocity of the cell permits the determination of the permeability tensor components in a single experimental phase. Complex permittivity and complex components of the permeability tensor are computed from a data-processing program, taking into account higher order modes excited at the cell discontinuities and using a numerical optimization procedure to match calculated and measured values of the S-parameters. We have studied the convergence of the calculated S-parameters as the number of modes taken into account in the calculations. Sensitivity to the input parameters for the optimization algorithm is discussed. A thru-reflect-line calibration in conjunction with a specific sample holder is used to eliminate systematic errors inherent in the S-parameter measurements. Measured complex permeability tensor components data for microwave ferrites are presented at X-band frequencies (8-12 GHz). Experimental results are in good agreement with theoretical results given by the ferromagnetic material theory.

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