Abstracts

An Improved Formulation of an Optimizing Rayleigh--Ritz Technique for Closed Dielectric Waveguide Analysis

B. Young. "An Improved Formulation of an Optimizing Rayleigh--Ritz Technique for Closed Dielectric Waveguide Analysis." 1991 Transactions on Microwave Theory and Techniques 39.11 (Nov. 1991 [T-MTT]): 1836-1846.

Previous work in the application of the Rayleigh-Ritz method to the analysis of closed dielectric waveguides has shown that if the modes of the homogeneous rectangular waveguide are used to model the modes of an inhomogeneous rectangular waveguide, then it is numerically advantageous to use an optimized value for the permittivity of the homogeneous waveguide's dielectric filling. The paper reformulates this work to use a complete set of basis functions. It is shown that use of the E/sub z/H/sub z/ formulation to describe the modes of the homogeneous rectangular waveguide leads to a relative convergence phenomena as well as to incorrect loss calculations. The paper reformulates the method using an E/sub x/E/sub y/H/sub x/H/sub y/ description of the homogeneous modes. The new formulation is validated for step-index waveguides through non-perturbational calculations of the propagation and attenuation constants of the round step-index dielectric waveguide. Comparison with the direct eigenvalue solution shows excellent agreement for the dominant and three higher-order modes. The new formulation is validated for graded-index waveguides through calculation of the dispersion curves for three modes of a Gaussian-Gaussian graded-index channel waveguide. Comparison of the results with two other methods shows excellent agreement.

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