Abstracts

Variational Bound Principle for Scattering of Electromagnetic Waves by Obstacles in a Waveguide

I. Aronson, K. Kalikstein, C.J. Kleinman and L. Spruch. "Variational Bound Principle for Scattering of Electromagnetic Waves by Obstacles in a Waveguide." 1970 Transactions on Microwave Theory and Techniques 18.10 (Oct. 1970 [T-MTT]): 725-731.

A formulation is presented for the determination of variational bounds on the even and odd phase shifts that characterize the scattering of electromagnetic waves by symmetric dielectric obtacles in waveguides. The formulation is an extension of a technique recently developed in quantum mechanical scattering theory for the determination of variations bounds on partial-wave phase shifts for scattering by systems with internal degrees of freedom. As opposed to the usual variational principles which give values that may be below or above the true values, the formalism presented here gives results that are variational and represent rigorous bounds on the true values. The formulation is presented for a more general case, but for simplicity the method is applied to scattering from dielectric obstacles in a rectangular waveguide in which only the TE/sub 10/ mode is propagated. The method involves the use of a trial function orthogonal to the lowest mode with variational parameters and the introduction of a Green's function for a simplified problem in which the higher modes cannot be excited. Calculated values are presented for the phase shifts for the true problem and also for the series and shunt reactance of the equivalent network. The principle can be generalized to multimode waveguide problems.

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