Abstracts

The Solution of Guided Waves in Inhomogeneous Anisotropic Media by Perturbation and Variational Methods

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The Schroedinger perturbation theory is extended to the boundary value problems of guided electromagnetic waves in cylindrical structures containing inhomogeneous, anisotropic, dissipative media. A general variational principle, which reduces to existing restricted forms valid for nondissipative media, is also formulated. These approximation methods evolve in a unified manner from the eigenvalue formulation of Maxwell's equations wherein the wave numbers are the eigenvalues of a linear operator. The properties of the media are restricted only by the requirement that they be independent of the axial coordinate. Perturbation of the backward wave is considered and the condition for nonreciprocal waveguides is stated. Modification of the perturbation method for application to gyrotropic media is outlined and it is indicated that convergence of the perturbation terms is improved in those media, such as the plasma and semiconductor, which permit a Taylor expansion of the susceptibility tensor in powers of the external field. Two specific examples, whose exact solutions are known, are included to illustrate the application.

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