Abstracts

Note on Perturbation Analysis of Guided Waves in Inhomogeneous Media (Correspondence)

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Perturbation methods have been widely used in the past for solving electromagnetic problems, particularly on resonant cavities. Recently it has been extended to the solution of guided waves in anisotropic and inhomogeneous media. The standard perturbation procedure usually starts with an expansion in powers of a small "perturbation parameter" tau and arrives at a set of recursive differential equations in "various order of perturbation." In doing so, one implicitly assumes that the perturbed solution so obtained will converge uniformly to the unperturbed solution as the perturbation parameter tau tends to zero. This, however, is not the case for waveguides filled with inhomogeneous media. Near the perturbing media the difference between the perturbated and the unperturbed fields remains finite as the perturbing volume becomes smaller and smaller. As a result the standard perturbation procedure yields rather poor approximations as the permittivity epsilon and permeability μ increase. This singular character of perturbation has been observed before, for instance, in the well-known Bethe-Sehwinger perturbation formula. It is the purpose of this correspondence to develop a modified perturbation method for guided structures containing anisotropic and inhomogeneous media.

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