Abstracts

Efficient Finite Element Analysis of Waveguides with Lossy Inhomogeneous Anisotropic Materials Characterized by Arbitrary Permittivity and Permeability Tensors

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This paper presents a new finite element formulation for solving arbitrarily shaped waveguides including lossy inhomogeneous anisotropic media. The materials are characterized by simultaneous [epsilon] and [μ] full tensors. Complex-mode computation, spurious-mode suppression and the possibility of specifying the frequency as an input parameter are also achieved. The formulation leads to a quadratic eigenvalue problem of dimension N which is transformed into an efficient 2N-dimensional generalized eigensystem with sparse complex matrices. This eigensystem is solved by the subspace method, taking full advantage of the sparsity of the matrices. Permittivity and permeability tensors with some null terms allow an additional reduction from the N-dimensional quadratic eigenvalue problem to a N-dimensional sparse complex generalized eigensystem. The proposed method has been validated by analyzing different lossy, inhomogeneous and anisotropic waveguides. Results show good agreement with previously published data.

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