Abstracts

A Volume-Surface Integral Equation Method for Solving Maxwell's Equations in Electrically Inhomogeneous Media Using Tetrahedral Grids

J. Nadobny, P. Wust, M. Seebass, P. Deuflhard and R. Felix. "A Volume-Surface Integral Equation Method for Solving Maxwell's Equations in Electrically Inhomogeneous Media Using Tetrahedral Grids." 1996 Transactions on Microwave Theory and Techniques 44.4 (Apr. 1996 [T-MTT]): 543-554.

Starting with the solution of Maxwell's equations based on the volume integral equation (VIE) method, the transition to a volume-surface integral equation (VSIE) formulation is described. For the VSIE method, a generalized calculation method is developed to help us directly determine E fields at any interface combination in three-dimensional (3-D) electrically inhomogeneous media. The VSIE implementation described here is based on separating the domain of interest into discrete parts using nonuniform tetrahedral grids. Interfaces are described using curved or plane triangles. Applying linear nodal elements, a general 3-D formulation is developed for handling scatter field contributions in the immediate vicinity of grid nodes, and this formulation is applicable to all multiregion junctions. The special case of a smooth interface around a grid node is given naturally by this formulation. Grid nodes are split into pairs of points for E-field calculation, and node normals are assigned to these points. The pairs of points are assigned to the elements adjoining the grid node. For each pair of points, the correct field jumps on the interface are given by a surface integral over the polarization surface charge density.

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