Abstracts

Modeling Three-Dimensional Discontinuities in Waveguides Using Nonorthogonal FDTD Algorithm

J.-F. Lee, R. Palandech and R. Mittra. "Modeling Three-Dimensional Discontinuities in Waveguides Using Nonorthogonal FDTD Algorithm." 1992 Transactions on Microwave Theory and Techniques 40.2 (Feb. 1992 [T-MTT]): 346-352.

In this paper, we present a generalization of the finite difference time domain (FDTD) algorithm adapted to nonorthogonal computational grids and apply it to the investigation of three dimensional discontinuity problems. The non-orthogonal FDTD uses a body-fitted grid for meshing up the computation domain and, consequently, is able to model the problem geometry with better accuracy than is possible with the staircasing approach conventionally employed in the FDTD algorithm. In addition to extending the FDTD algorithm to nonorthogonal grids, we also derive the stability conditions for the nonorthogonal FDTD algorithm in two and three dimensions. Numerical results including an H-plane waveguide junction, a circular waveguide with a circular iris, a circular wave-guide with a rectangular iris, and a microstrip bend discontinuity, are presented to validate the current nonorthogonal FDTD approach.

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