Abstracts

A simple method to correct the reflection error of absorbing boundary condition in the FDTD analysis of waveguides

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The recent progress in absorbing boundary conditions (ABCs), especially Berenger's perfectly matched layer (PML), promises to be very attractive for microwave circuit and packaging full-wave analysis using the FDTD method. However, in waveguides, multimodal and dispersive waves exist, which makes it difficult to minimize the error from absorbing boundary reflection. Several studies have shown that no single ABC, including the PML, is effective in absorbing energy having widely varying transverse distributions and group velocities. The possibility of excitation of evanescent modes by input spectral content below the cutoff frequency complicates the design of the ABC. In this paper, an efficient and simple method, the geometry rearrangement technique (GRT), is implemented to minimize the boundary truncation error in a waveguide. Numerical illustration of the propagation constant in a rectangular waveguide, terminated with Mur's first-order ABC, demonstrates the effectiveness of GRT in correcting the ABC-induced reflection error for waveguide problems.

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