Abstracts

A revised formulation of modal absorbing and matched modal source boundary conditions for the efficient FDTD analysis of waveguide structures

F. Alimenti, P. Mezzanotte, L. Roselli and R. Sorrentino. "A revised formulation of modal absorbing and matched modal source boundary conditions for the efficient FDTD analysis of waveguide structures." 2000 Transactions on Microwave Theory and Techniques 48.1 (Jan. 2000 [T-MTT]): 50-59.

A revised formulation of modal absorbing and matched modal source boundary condition is proposed for the efficient analysis of a waveguide circuit with the finite-difference time-domain (FDTD) method. The formulation is based on a suitable translation operator modeling, in time domain, the propagation in a uniform hollow waveguide. By applying this operator, a multimodal absorbing boundary condition is obtained. Moreover, a source algorithm is developed that generates a given incident wave, while absorbing each modal component reflected from a discontinuity. The source is capable of separating incident and reflected waves without requiring any presimulation of long uniform waveguides. The validity and effectiveness of the formulation is verified by means of three numerical experiments. The first two refer to waveguide discontinuities. In these cases, the FDTD results are compared to mode-matching results. The third example is a transition from waveguide to printed circuit transmission line. The numerical simulation is compared with published experimental results. The presented examples show that the generalized scattering matrix of a waveguide circuit can be evaluated accurately in the smallest computational space allowed by the structure.

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