Abstracts

An unconditionally stable extended (USE) finite-element time-domain solution of active nonlinear microwave circuits using perfectly matched layers

Hsiao-Ping Tsai, Yuanxun Wang and T. Itoh. "An unconditionally stable extended (USE) finite-element time-domain solution of active nonlinear microwave circuits using perfectly matched layers." 2002 Transactions on Microwave Theory and Techniques 50.10 (Oct. 2002 [T-MTT]): 2226-2232.

This paper proposes an extension of the unconditionally stable finite-element time-domain (FETD) method for the global electromagnetic analysis of active microwave circuits. This formulation has two advantages. First, the time-step size is no longer governed by the spatial discretization of the mesh, but rather by the Nyquist sampling criterion. Second, the implementation of the truncation by the perfectly matched layers (PML) is straightforward. An anisotropic PML absorbing material is presented for the truncation of FETD lattices. Reflection less than -50 dB is obtained numerically over the entire propagation bandwidth in waveguide and microstrip line. A benchmark test on a microwave amplifier indicates that this extended FETD algorithm is not only superior to finite-difference time-domain-based algorithm in mesh flexibility and simulation accuracy, but also reduces computation time dramatically.

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