Abstracts

Some aspects of stability and numerical dissipation of the finite-difference time-domain (FDTD) technique including passive and active lumped elements

W. Thiel and L.P.B. Katehi. "Some aspects of stability and numerical dissipation of the finite-difference time-domain (FDTD) technique including passive and active lumped elements." 2002 Transactions on Microwave Theory and Techniques 50.9 (Sep. 2002 [T-MTT]): 2159-2165.

This paper presents a stability analysis of the extended finite-difference time-domain method including passive and active devices. An explicit, implicit, and semi-implicit incorporation of lumped elements is investigated and the eigenvalues of the resulting discrete system are discussed. With the underlying assumption that the domain is homogeneously loaded with lumped elements, stability criteria are derived on the basis of a resistance, a conductance, and an inductance. Applying a fully implicit method, a parasitic resistance can be observed when reactive devices are included. For an inductance, this numerical dissipation is characterized in detail and an equivalent circuit is given. As an example, the impact on the quality (Q) factor of a cavity loaded with an inductance is shown and compared to the theoretical derivation.

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