Abstracts

Efficient time-domain and frequency-domain finite-element solution of Maxwell's equations using spectral Lanczos decomposition method

An efficient three-dimensional solver for the solution of the electromagnetic fields in both time and frequency domains is described. The proposed method employs the edge-based finite-element method (FEM) to discretize Maxwell's equations. The resultant matrix equation after applying the mass-lumping procedure is solved by the spectral Lanczos decomposition method (SLDM), which is based on the Krylov subspace (Lanczos) approximation of the solution. This technique is, therefore, an implicit unconditionally stable finite-element time and frequency-domain scheme, which requires the implementation of the Lanczos process only at the largest time or frequency of interest. Consequently, a multiple time- and frequency-domain analysis of the electromagnetic fields is achieved in a negligible amount of extra computing time. The efficiency and effectiveness of this new technique are illustrated by using numerical examples of three-dimensional cavity resonators.

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