Abstracts

An efficient eigen-based spatial-MRTD method for computing resonant structures

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In this letter, we present a new procedure, called the spatial-MRTD, for analyzing the resonant structures. It is based on the multiresolution time-domain (MRTD) and spatial finite-difference temporal-differential (SFDTD) formulations. In it, wavelets are used to expand the electromagnetic fields in spatial domain while the time differentials are kept with the Maxwell's equations, resulting in a sparse eigenvalue problem. By applying the sparse matrix techniques, resonant frequencies and modes of a structure are solved directly. Like MRTD, the required number of spatial grid points is low (as low as two grid points per wavelength). However, unlike MRTD, recursive time-stepping computations are not required and the method is numerical-instability free. In addition, no postdata-processing, such as discrete Fourier transform, is needed. Numerical examples are given to demonstrate the accuracy and efficiency of the proposed approach.

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