Abstracts

Numerical validations of a nonlinear PML scheme for absorption of nonlinear electromagnetic waves

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There have been several algorithms which extend the finite-difference time-domain (FDTD) solution of Maxwell's equations to nonlinear electromagnetic problems. Relative to other methods, FDTD achieves robustness by directly solving for the fundamental quantities, electric field E, and magnetic field A in space and time, rather than performing asymptotic analyses or assuming paraxial propagation and nonphysical envelope functions. As a result, the FDTD method is almost completely general and can account for any type of electromagnetic problems. As in linear cases, for a practical simulation, nonlinear FDTD modeling also requires the development of absorbing boundary conditions (ABCs) to effectively absorb the nonlinear electromagnetic waves for open nonlinear structures. In this paper, based on the Berenger's perfectly matched layer (PML), a nonlinear PML (nPML) absorbing scheme is presented and then implemented in the transmission-line matrix (TLM)-based FDTD method. Numerical results are given to demonstrate the effectiveness of the nPML proposed.

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