Abstracts

Investigation of numerical errors of the two-dimensional ADI-FDTD method [for Maxwell's equations solution]

T. Namiki and K. Ito. "Investigation of numerical errors of the two-dimensional ADI-FDTD method [for Maxwell's equations solution]." 2000 Transactions on Microwave Theory and Techniques 48.11 (Nov. 2000, Part I [T-MTT] (Mini-Special Issue on RF/Microwave Applications in Medicine)): 1950-1956.

We previously proposed the ADI-FDTD method as a means of solving two-dimensional Maxwell's equations. The algorithm used in this method is unconditionally stable, which means the time-step size ran be set arbitrarily when this method is used. The limitation of the time-step size is not dependent on the Courant-Friedrich-Levy (CFL) condition, but on numerical errors such as numerical dispersion. In this paper, we investigate the numerical errors of the method quantitatively and discuss the calculation accuracy and efficiency of the method. We found that a large time-step size results in high numerical dispersion. However, the limit of the time-step size due to numerical dispersion is greater than the CPL limit if the size of the local minimum cell in the computational domain is much smaller than the other cells and the wavelength. In that case, because the large time-step size reduces the number of time-loop iterations, the ADI-FDTD method is more efficient than the conventional FDTD method in terms of computer resources such as central processing unit time.

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