

In this paper, the Newmark-Beta algorithm is introduced into the finite-difference time-domain (FDTD) method to eliminate the Courant-Friedrich-Levy constraint. A time-marching FDTD formulation involving the calculation of a banded-sparse matrix equation is derived while the spatial and temporal derivatives are discretized by the central difference technique and Newmark-Beta algorithm, respectively. Since the coefficient matrix keeps unchanged during the time-marching process, the lower-upper decomposition needs to be performed only once at the beginning of the calculation. Moreover, the reverse Cuthill-McKee technique, an effective preconditional processing technique in bandwidth compression of sparse matrices, is used to improve computational efficiency. The 3-D stability proof and numerical dispersion analysis of the proposed method are given. Two 3-D numerical examples are presented to validate the accuracy and efficiency of the proposed method.