Xiaozhe Hu

Efficient Solvers for Asymptotically Disappearing Solutions of Maxwells Equations

Department of Mathematics
Tufts University
503 Boston Avenue
Bromfield-Pearson
Room 212
Medford
MA 02155
Xiaozhe.Hu@tufts.edu
J. H. Adler
V. Petkov
L. T. Zikatanov

This work is on the numerical approximation of incoming solutions to Maxwell's equations, whose energy decays exponentially with time (asymptotically disappearing), meaning that the leading term of the back-scattering matrix becomes negligible. We consider a structure-preserving finite-element approximation and a Crank-Nicolson scheme to approximate the electric and magnetic fields. In order to solve the linear system of equations at each time step efficiently, we design iterative solvers based on exact block factorization. We emphasize the importance of structure-preserving discretization, which makes the exact Schur complement sparse and computable. Numerically, we show that the proposed solver significantly reduces the computational time and the finite-element solution approximates well the asymptotically disappearing solutions constructed analytically when the mesh size becomes small.