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A high-order accurate multidomain Legendre-Chebyshev spectral method for 2D Maxwell’s equations in inhomogeneous media with discontinuous waves. (English) Zbl 07479023

Summary: A multidomain Legendre-Chebyshev spectral method is developed for solving two dimensional Maxwell’s equations in inhomogeneous media with discontinuous electromagnetic waves. The method keeps spectral accuracy being not affected by the discontinuity of solutions. We construct a reasonable weak form which deals with the interface conditions similar to the natural boundary condition. Polynomial spaces of different degrees are used to approximate the electric and magnetic fields so that they can be decoupled in computation, and the optimal error estimate is obtained which improves the previous results. Numerical examples confirm the higher accuracy compared with other related method.

MSC:

78M22 Spectral, collocation and related methods applied to problems in optics and electromagnetic theory
78A25 Electromagnetic theory (general)
78A40 Waves and radiation in optics and electromagnetic theory
65N35 Spectral, collocation and related methods for boundary value problems involving PDEs
65L06 Multistep, Runge-Kutta and extrapolation methods for ordinary differential equations
44A15 Special integral transforms (Legendre, Hilbert, etc.)
42C10 Fourier series in special orthogonal functions (Legendre polynomials, Walsh functions, etc.)
35Q60 PDEs in connection with optics and electromagnetic theory

Keywords:
two dimensional Maxwell’s equations; inhomogeneous media; discontinuous electromagnetic waves; multidomain Legendre-Chebyshev spectral method; optimal error estimate

Full Text: DOI

References:


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