Abstracts

Numerical Solution of Steady-State Electromagnetic Scattering Problems Using the Time-Dependent Maxwell's Equations

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A numerical method is described for the solution of the electromagnetic fields within an arbitrary dielectric scatterer of the order of one wavelength in diameter. The method treats the irradiation of the scatterer as an initial value problem. At t = 0, a plane-wave source of frequency f is assumed to be turned on. The diffraction of waves from this source is modeled by repeatedly solving a finite-difference analog of the time-dependent Maxwell's equations. Time stepping is continued until sinusoidal steady-state field values are observed at all points within the scatterer. The envelope of the standing wave is taken as the steady-state scattered field. As an example of this method, the computed results for a dielectric cylinder scatterer are presented. An error of less than ±10 percent in locating and evaluating the standing-wave peaks within the cylinder is achieved for a program execution time of 1 min. The extension of this method to the solution of the fields within three-dimensional dielectric scatterers is outlined.

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