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The over-determined boundary value problems for the maxwell equations set in the orthogonal coordinates and some applications for the electromagnetic wave diffraction problems

Pleshchinskii N.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The necessary and sufficient conditions of solvability of the over-determined problems for the Maxwell equations set are obtained in the cases of Cartesian, cylindrical and spherical coordinates. These conditions are used by reduction of the electromagnetic wave diffraction problems on the thin conducting screen placed on the coordinate surfaces to integral or summatorial equations. Moreover, these conditions can be used for regularization of the integral equations of the first kind obtained by solving the diffraction problems. In the case on three-dimensional problems of electrodynamics the over-determined problems appear when both the tangential components of the electric vector and of the magnetic vector are given on the boundary of the partial domains. It is shown that the conditions of solvability of the over-determined problems can be obtained in the different form. The common form is the dependence of the Fourier transforms or Fourier coefficients of the boundary functions. But the mixed form is possible when both expressions participate. The set of the three-dimensional diffraction problems on the thin conducting screens in the wave-guided structures is considered as examples.
