VOLUME SINGULAR INTEGRAL EQUATIONS FOR ELECTROMAGNETIC SCATTERING ON DIELECTRIC STRUCTURES LYING OUTSIDE PERFECTLY CONDUCTING PLANE

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We will consider the following class of electromagnetic problems. The medium in a finite 3D domain Q is characterized dielectric permittivity tensor function and constant outside Q, the permeability is constant everywhere. Also the domain Q is situated over a perfectly conducting plane. The problem is to find the electromagnetic field excited in the medium by an external field. At first by using the method of mirror images we construct the Green tensor function. Then we derive volume singular integral equations that describe our scattering problems. We consider the equivalence of the boundary value problems for the Maxwell equations and the obtained integral equations. We formulate the existence and uniqueness theorem for a very wide family of scattering problems.

To solve the integral equations numerically, one reduces it to a system of linear algebraic equations (SLAE). The solution of that system must approximate the solution of the original problem with a prescribe accuracy. It is clear that we must apply an iteration method. Multiplication of matrix SLAE by vector is the most laborious operation of the iteration method. Taking into account the properties of the Green tensor function and using discrete fast Fourier transform techniques we construct fast algorithm for the multiplication of matrix by vector.