Electromagnetic Wave Diffraction on the Conducting Thin Screen Placed on the Isotropic and Anisotropic Media Interface

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Abstract— Let the conducting thin screen be placed on the media interface. The upper medium is isotropic and the lower medium is anisotropic. The two-dimensional diffraction problems of the electromagnetic wave on the screen are reduced to integral equation.

First of all, the waves reflected into the upper semi-space and transmitted into the lower semi-space are found by the over-determined boundary value problem method. The main idea of the over-determined problem method is the following: the auxiliary boundary value problems are considered in the partial domains of the structure being under consideration. These problems contain more conditions on the boundary than it is necessary to select the unique solution. The connections between boundary functions (necessary and sufficient conditions for solvability of the over-determined problems) are to be considered together with the conjugation fields conditions in the auxiliary problem.

The different cases are presented when the conditions for solvability of the over-determined problems can be found in the analytical form. It is essentially that in these cases the equation for the Fourier transform of the potential functions of the electromagnetic field has the solution of the simple form.

The field perturbation by the screen is determined by the same over-determined boundary value problem method. The diffraction problem in the case of TE-polarization is equivalent to the integral equation with logarithmic singularity in the kernel, and in the case of TM-polarization it can be reduced to hyper singular integral equation. The Galerkin method with set of basic functions being the Chebyshev polynomials of the first or second kind is usually used for approximate solving integral equations in both cases.