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DIFFRACTION OF A PLANE *H*-POLARIZED ELECTROMAGNETIC WAVE ON A DIHEDRAL CYLINDER-TIPPED WEDGE

A. Ye. Shepilko and Ye. V. Shepilko

Kharkov State Academy of Municipal Economy, Ukraine

Based on the method suggested, the strict solution in closed form is obtained for the problem of diffraction of a plane electromagnetic wave on an infinitely long two-sided round-ended wedge. The numerical realization of the solution is used for analysis of the field in the remote zone. The results of exact calculations are presented in a wide domain of the structure parameters' variation.

Real electrodynamic structures have finite dimensions, a certain place for their installation, mounting hardware, and wiring. The direct investigation of diffraction properties of these structures in strict mathematical formulation is a difficult problem. It is more practical to obtain first the strict solution of the problem of electromagnetic wave diffraction on various idealized obstacles, at arbitrary parameters characterizing these obstacles. Then we could use the obtained results as basic ones when studying the scattering properties of actual, more intricate objects [1].

The investigation concerning the impact of the round edge on the scattering of the electromagnetic wave field [3], was revised in [2] using the methods of mathematical diffraction theory. However, these results can be extended to the long-wave domain only qualitatively. In [4], based on the strict solution for an arbitrary opening angle of the longitudinal slot on a circular cylinder, we investigated the impact of width and curvature of a cylindrical screen on the field of a magnetic dipole.

The purpose of this paper is to obtain the strict and complete solution of the problem of diffraction of the field of a plane electromagnetic wave on an ideally conducting and infinitely long dihedral round-ended wedge. Thus we can analyze the diffraction properties of the structure in a wide domain of typical parameters. In the case of arbitrary angles of opening, the wedge can be transformed into a half-plane, complemented up to a single cylinder, i.e., into a half-space with a half-cylinder placed inside, or into a sectorial horn with a chamfered vertex.

A plane electromagnetic wave falls at an arbitrary angle β between the vector $\vec{k}$ ($k = 2\pi/\lambda$) of the incident wave and the line of reference of angle φ in the cylindrical coordinate system ρ, φ, z, and normally to the generatrix of the circular cylinder representing the edge of an ideally conducting wedge with its external angle of semi-opening $\pi\delta$ ($0 < \delta \le 1$), which is counted from the line $\varphi = 0$. The z-axis coincides with the axis of the cylinder having the radius a. In what follows the time dependence of the $\exp(-i\omega t)$ type will be omitted. The field in the space will be represented as superposition of the incident and diffraction fields, which are marked by superscripts "0" or "1", respectively.

Consider the case of H-polarization (the field vector H^0 is parallel to the z-axis). The magnetic field component of the falling plane wave of unit amplitude $H_z^0 = e^{-ik\rho\cdot\cos\beta}$ will be represented as decomposition in cylindrical Bessel functions [5]

$$H_z^0 = \sum_{n=-\infty}^{\infty} (-i)^n J_n(k\rho) e^{in(\varphi-\beta)}.$$

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