SIMULATIONS OF THE PLANE WAVE SCATTERING BY MULTILAYER CYLINDRICAL STRUCTURE

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Problems associated with the scattering of electromagnetic radiation on cylindrical structures, for a long time attracted the attention of researchers. These objects have the basic nature for various branches of radioelectronics and optics. Diffraction of waves on cylinders of different configurations has been studied intensively in various branches of science and technology [1, 2].

In particular, multilayer cylinders are used for the simulation of optical fibers and various devices of gradient optics: the Luneburg lens, the Eaton-Lippmann lens and the "fish-eye" Maxwell lenses [3]. In addition, providing a periodic variation of the material parameters of the layers, it can be created effective microwave and optical waveguide system based on multilayer dielectric structures – Bragg waveguides [4].

In this paper the important problem of the electromagnetic field spatial distribution visualization for the wave scattered by a multilayer dielectric cylinder is considered. The solution of this problem allows investigating of the focusing properties of such structures and to optimize their parameters and dimensions.

The construction of the spatial distribution of the coordinate components of the field scattered by a multilayered cylinder was carried out using the graphics capabilities of computer algebra package MathCAD. Calculated project was developed on the basis of solving of the problem of diffraction of a plane monochromatic wave on an infinite multilayer cylinder. Matrix method of the linear algebraic equations set solving is used for acceleration of the calculations. The project allows to perform investigations for arbitrary number of structure layers, their geometric dimensions and material parameters.

Characteristics of the scattered fields for different values of the material parameters of the structure and normalized geometrical dimensions were considered using the developed calculation project. It should be noted that the refractive indices of the layers may be negative, i.e. this project can be suitable for the investigation of structures with metamaterials.

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