Electromagnetic wave diffraction on infinite circular cylinder with homogeneous layers

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Abstract

The article considers a method for calculating the intensity distribution for the diffraction of a TE and TM polarized plane wave by a dielectric homogeneous cylinder with an arbitrary sectional shape. The method is based on expanding the field inside and outside the cylinder into the series of cylindrical functions being the specific solutions of the Helmholtz equation. The coefficients of the series are calculated based on the coupling conditions of the external and internal fields at the boundary of the cylindrical object. The work also proposes a field calculation method for the case of a plane wave diffraction by a multilayer dielectric cylinder with a circular cross section. When the cylinder has more than two homogeneous layers, the problem is reduced to solving a linear system of algebraic equations; when the cylinder has only two layers, analytical relations are obtained for the field. A numerical example of calculating the intensity distribution for the diffraction of a plane TE wave by a two-layer dielectric cylinder is given: the calculation was performed by two methods: by the finite element method and by the analytical formulas derived.

Keywords: wave diffraction, circular cylinder, homogeneous layer, Helmholtz equation, TE wave, polarized plane.

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Access full text (in Russian)

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