Gradient method for the generation of a multilayer circular dielectric cylinder

V.V. Kotlyar [1,2], M.A. Lichmanov [2]
[1] Image Processing Systems Institute of RAS
[2] Samara State Aerospace University

Abstract

The paper considers a gradient method for the design of a multilayer dielectric cylinder with a circular cross-section, focusing a plane TE-polarized electromagnetic wave into the points with a given intensity distribution at a certain distance from the cylinder.

The solution of the inverse problem of synthesis is based on the previously developed method for solving the direct problem of diffraction field calculation. In each homogeneous layer of the cylinder and outside it, the light field amplitude is expanded in rows by cylindrical functions. The unknown coefficients of these functions are calculated using recurrence relations from the equations obtained when the boundary conditions are satisfied at the boundaries of the homogeneous cylinder layers.

Keywords: dielectric cylinder, gradient method, TE-polarized electromagnetic wave, homogeneous cylinder.

Citation: Kotlyar VV, Lichmanov MA. Gradient method for the generation of a multilayer circular dielectric cylinder. Computer Optics 2003; 25: 16-20.

Access full text (in Russian)

References

[1] Kotlyar VV, Lichmanov MA. Diffraction of a plane electromagnetic wave on a gradient optical element with transverse cylindrical symmetry. Physics of wave processes and radio engineering systems 2002; 5(4): 37-43.
[2] Koltyar VV, Lichmanov MA. Diffraction of a plane electromagnetic wave by a gradient-index dielectric micro-cylinder. In Book: Singh K, Rastogi VK, eds. Perspectives in engineering optics. Delhi: Publ. Anita Publications; 2003: 38-46.
[3] Luneberg RK. Mathematical theory of optics. Providence, RI: Brown U Press; 1944.
[4] Nesterenko DV, Kotlyar VV. Design of subwavelength binary microoptics using a gradient optimization method. Proc. SPIE 2001; 4436: 171-178.
[5] Flores JR. Spherically symmetric GRIN amplitude formers. J Mod Opt 2001; 48(7): 1225-1238.
[6] Kotlyar VV, Melekhin AS. Abel transform in the problems of design of gradient optical elements. Computer Optics 2001; 22: 29-36.