

Abel transform to calculate the gradient of optical elements with spherically symmetric distribution of the refractive index

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Abstract

The Abel integral transform in the framework of ray optics was used to derive and solve the integral equations for the well-known lenses with a spherically symmetric distribution of the refractive index: the Maxwell's fisheye lens and the Eaton-Lipman lens. In addition, this work presents a solution to the problem of generating a gradient optical element with a spherically symmetric distribution of the refractive index, which focuses a plane light beam into a radially symmetric region with a given intensity distribution, located at a certain distance from the element in a plane perpendicular to the optical axis of the incident beam.

Keywords: Abel transform, refractive index, integral equation, Maxwell's fisheye lens, Eaton-Lipman lens, gradient optical element.

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