Analysis of multimode optical fibers with an arbitrary axisymmetric refractive index profile based on a modified Gaussian approximation method

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Abstract

The paper proposes a method for calculating the transmission parameters of arbitrary-order guided modes propagating in the core of a multimode optical fiber with an arbitrary axisymmetric refractive index profile. The proposed method is a generalization of the modified Gaussian approximation method for the above case. In contrast to the existing solutions based on the Gaussian approximation, a multimode optical fiber with an arbitrary axisymmetric refractive index profile is considered as an optical fiber with a multilayer refractive index profile. The authors obtain a variational expression for the core mode parameter and a characteristic equation, the solution of which is the normalized equivalent radius of the mode spot. The authors present the results of comparing the values of the transmission parameters of the guided modes obtained on the basis of exact solutions and using the proposed method.

Keywords: multimode optical fiber, modified method, Gaussian approximation, axisymmetric refractive index, index profile, variational expression, equivalent radius.

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