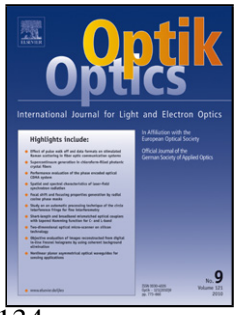

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Polarization in Maxwell Optics

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Abstract

A unified formalism of light beam optics and light polarization is presented. The starting point of our formalism is an exact eight-dimensional matrix-representation of Maxwells equations in an inhomogeneous medium, which is presented in detail. The beam-optical Hamiltonians are derived without any specifications on the varying refractive index. The new formalism generalizes the traditional and non-traditional treatments of Helmholtz optics. As for the light polarization, the elegant Mukunda-Simon-Sudarshan rule for transition from scalar optics to vector wave optics is obtained as the paraxial limit of the general formalism presented here. The new formalism is a suitable candidate to extend the traditional theory of polarization beyond the paraxial approximation. The unified formalism light beam-optics and light polarization advances the Hamilton's optical-mechanical analogy into the wavelength-dependent regime.

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