THE MECHANISMS OF FORMATION OF VORTICES IN OPTICS AND HYDRODYNAMICS

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S u m m a r y

A theory of the nucleation of optical vortices after the asymmetric excitation in a beam with initially smooth wave fronts is built. The theory is based on the developed two-dimensional mathematical model of diffraction, as a diffusion of transverse perturbation waves. Two possible mechanisms of the nucleation of optical vortices in combined Gaussian beams and the diffraction of a plane wave by the arc are represented. The nucleation of vortices is considered as an analog of the well-known birth of vortices due to "the magnetohydrodynamic instability of neutral current layer" and "the hydrodynamic instability of tangential disruption of the current velocity". The conditions for their realization and evolution in space are analyzed. All the known cases of the linear and nonlinear nucleations of optical vortices can be described in the frame of the developed mechanisms.