PI-05

ELECTRICALLY CONTROLLED LIQUID CRYSTALIC FRENEL LENS AND DETERMINATION OF TOPOLOGICAL CHARGE OF OPTICAL VORTICES

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Abstract. The unique physical properties and the possibility of effective electrical control of anisotropy have become the determining factors for the use of nematic liquid crystals (NLCs) in the development of new optical devices of flat optics, which are characterized by simplicity, compactness, reliability and affordable price [1-3]. Currently, the key areas of research of many scientific groups are the development of liquid crystal lenses with improved characteristics [4] and the development of simple and inexpensive methods for determining the phase topology of optical vortices [5].
In the work, an anisotropic diffraction structure with a spatial frequency gradient, representing an electrically switchable Fresnel lens, was formed in the NLC layer based on the photoorientation method of the AtA-2 azo dye [6-9]. Effective focusing of radiation in the visible and near-infrared ranges has been experimentally demonstrated. It has been experimentally demonstrated that the application of an external control voltage to a Fresnel lens makes it possible to adjust the focusing efficiency of laser radiation and turn off the lens when the voltage reaches a value of about 20 V. The liquid crystal element has a maximum focusing ability at a voltage of about 3 V. A new simple method for determining the phase topology of optical vortex beams is proposed, based on the coherent addition of beams scattered in the direction of the zero and first orders of diffraction, while information about the topology of the optical vortex is encoded in the resulting interference pattern. The effectiveness of the developed method has been confirmed both experimentally and theoretically.

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