Investigation of characteristics of a multichannel phase DOE matched with Gauss-Laguerre modes and evaluation of the experimental data

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Abstract

In this work, a multichannel phase filter is generated for the expansion of light fields using the basis of generalized Gauss-Laguerre modes, $\Psi nm(r,\phi)$, $0 \le n,|m| \le N$.

The filter enables the selection of any of the 9 preset modes. The contribution of a particular mode to the analyzed image can be determined on the basis of the value of the correlation peak in the focal plane in the corresponding diffraction order. A study has been performed to select the optimal radius of the flat and Gaussian illuminating beams. The paper provides the results of the numerical simulation of the experiment on the selection of preset modes in a laser beam being a linear combination of Gauss-Laguerre modes. The work proposes an algorithm for assessing the deviations of the images generated experimentally from the theoretical ones; it presents the results of software implementation of this algorithm in a semi-automatic mode. The geometrical error of the experimental images is estimated.

Keywords: multichannel phase DOE, Gauss-Laguerre mode, experimental data, light field, filter, image, diffraction order, Gaussian illuminating beam, laser beam, semi-automatic mode, geometrical error.

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Access full text (in Russian)

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