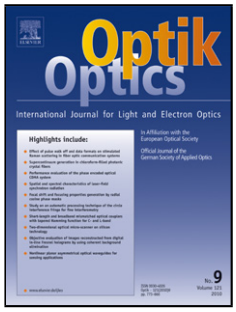

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Shack-Hartmann wavefront sensor with the precorrected holographic lenslet array

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Abstract

The method of the dynamic range expansion of the Shack-Hartmann wavefront sensor is discussed. It's based on the use of nonlinear dual focus holographic lenslet arrays with the aberration precompensation. The data concerning the optical setup and the technique of adaptive lenslet array producing based on nonlinear holographic recording phenomenon are represented. On the example of spherical wavefronts it is shown, that the use of three lenslet arrays with different amount of the aberration precompensation allows expanding approximately in five times the dynamic range of the sensor four times greater with preserving the specified sensitivity in comparison with the corresponding refractive lenslet array.

Keywords: Shack-Hartmann sensor, Adaptive optics, Holographic lenslet array, Aberration measurements

1. Introduction

Shack-Hartmann wavefront sensor is widely used in adaptive optics and metrology [1, 2, 3, 4]. The principle of the sensor work is based on measuring the local slopes of the tested wavefront with further reconstruction of its phase distribution [5]. The basic elements of the Shack-Hartmann wavefront sensor are the lenslet array and CCD-photodetector located in the focal plane of the lenslets. Lenslets of the array produce an array of diffraction-limited spots on the photodetector (hartmannogram). The shift of each image from

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