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Spatial coherence measurement through Fourier transform of intensity of diffraction fringes of a 1D step in reflection

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Abstract

In this paper, we present a new method for measuring the spatial coherence of optical beams by utilizing the Fresnel diffraction patterns formed by a 1D phase step in reflection. The spatial coherence function is obtained from the ratio of the amplitude of the Fourier transform of the intensity distribution of the diffraction of the light beam of an arbitrary source from the step to the amplitude of Fourier transform of intensity distribution of the diffraction of a coherent light from the step. The advantages of this method are the possibility of the simultaneous study of the correlation between all pairs points along a line, simple and inexpensive setup, and recording no more than two diffraction patterns. By using the introduced method, the spatial coherence of a Schell-model beam is investigated theoretically and experimentally.

Keywords: spatial coherence, Fresnel diffraction, phase step, Fourier transforms

For full article, refer to the Persian section