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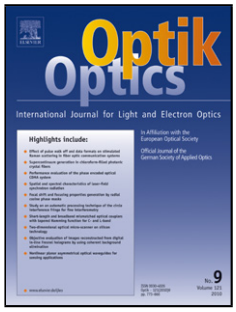

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Optical Transfer Function Without Using Fourier Transformation

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Abstract

The optical transfer function (OTF) can be used to evaluate the performance of optical imaging systems comprehensively and objectively. However, current method of determining an OTF is based on analyzing the imaging process in the spatial domain and combining the Fourier transform. For this issue, replacing optical rays by waves, we studied the lens imaging process of a cosine-fringe pattern and obtained the OTF of the lens without using the Fourier transform. First of all, we analyzed the properties of the light waves emitted from the cosine-fringe pattern. Then according to the lens' parameters and the use conditions, the quantity and quality of the coherent waves collected and utilized by the lens were analyzed, and the parameters of the cosine-fringe pattern on the image plane were obtained. Finally, the method of investigation of OTFs for ideal lens and aberrant lens without using Fourier transform was obtained.

Keywords: Optical Transfer Function; Modulation Transfer Function; Evaluation of Imaging Quality; Optical Imaging; Lens Image Formation

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