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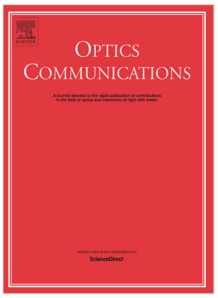

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The performances of different OAM encoding systems

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Abstract

Recently, the vortex beam carrying orbital angular momentum (OAM) has attracted lots of attentions in the optical communication system, which can extend the channel capacity effectively due to the orthogonality among different vortex beams. In addition, the different vortex beams can also be used to encode the information with different topological charges. In this paper, we discuss the performances of different multiplexing methods (coherent superposition or incoherent superposition) and de-multiplexing methods (2-D Dammann fork grating (DFG) or multiplexing phase hologram (MPH)) of vortex beams, from which we can select the better one for encoding/decoding system. On this basis, we establish a free-space optical (FSO) communication system for image transmission by simulation, in which the gray-scale values of each pixel are transformed to eight-bit digital information and then mapped to the multiplexing vortex beam with the corresponding topological charges. After propagation in the ideal environment, the multiplexing vortex beam is separated and detected by the de-multiplexing device at the receiver. According to the intensity profile of each special location, the eight-bit digital information of the gray-scale value can be recovered efficiently.

Keywords: `Optical vortices`, Optical communication, Multiplexing

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