

# Optical vortices and vector beams

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Amplitude, phase and polarization are essential parameters of an optical field. In the past decade, with the enhancement of techniques in manipulating phase and polarization states in complex optical fields, optical vortices and vector beams are investigated in a closely coupled fashion in terms of efficient beam generation and manipulation, stable transmission and novel detection aimed at various applications. In this special issue 6 invited papers demonstrate a number of typical topics in the field, with emphasis on the vectorial beam generation and optical communication systems utilising orbital angular momentum (OAM). © 2016 Chinese Laser Press

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With the ever-increasing demands for capacity in the digital super highways of the Internet, massive data transmission and efficient data routing have become hot topics in data centres and super-computers. In recent years, orbital angular momentum (OAM) enabled multiplexing, switching and routing schemes have been proposed and demonstrated. In this special issue, Willner *et al.* review reconfigurable OAM-based switching and routing, including optical add/drop multiplexing, space and polarization switching, channel hopping and multicasting; Wang reviews the advances in optical communication with optical vortices and vector beams in both free space and fiber; Zheng *et al.* present an OAM-based antenna for efficient multiplexing/demultiplexing in radio frequency.

From the point of view of fundamental optics, there are a few important topics associated with optical vortices and vector beams. For example, the creation of arbitrarily high order vectorial beams with high power efficiency in a reconfigurable

and dynamic manner is always desirable in the field. Further extending beam studies to pulsed lasers is an important move towards finding new nonlinear properties and phenomena. Evaluation of the transmission stability of vortex beams in either free space or waveguides is essential and critical in almost all practical scenarios. In this special issue, Zhan *et al.* report on the creation of radially polarized optical field with multiple controllable parameters using a vectorial optical field generator; Wang *et al.* study the stability of multiple femtosecond laser filamentation caused by axial-symmetry breaking polarization; Fu and Gao investigate influences of atmosphere turbulence effects on the OAM spectra of vortex beams.

We hope that the articles in this special issue provide the readers with a useful update in the fundamental studies and technical advances in the field of optical vortices and vector beams.