Editorial for special issue on complex optical fields

Recently there is an increasing interest in tailored optical fields with complex amplitude, phase and polarization spatial distributions, as well as specifically designed temporal waveforms. Scalar optical vortices carrying orbital angular momentum and vectorial vortices such as radially and azimuthally polarized beams are among the most intensively studied examples. Comprehensive summaries of earlier developments can be found in several recent articles and edited books, e.g., by Zhan (Adv. Opt. Photon. **1**, 1, 2009), Padgett (Adv. Opt. Photon. **3**, 161, 2011), Forbes (Adv. Opt. Photon. **8**, 200, 2016), Zhan (*Vectorial Optical Fields*, World Scientific Publishing, 2013), and Forbes (*Laser Beam Propagation*, CRC Press, 2014), while applications of these complex optical fields in promising areas continue to emerge. To capture the latest developments in this important emerging field of optics, it is our pleasure to introduce the *Chinese Optics Letters* Special Issue on the Complex Optical Fields with contributions from scientists around the world who are active in this field.

Researchers continue to invent new types of complex optical fields along with the tools to generate and characterize them. A highly adjustable helical beam is introduced in a paper by Wen *et al.* The design and propagation properties of this type of beam are investigated. Using a mode selective coupler, Zhang *et al.* propose and demonstrate an efficient method to generate optical vortices in an optical fiber. A paper by Zhang *et al.* reports a flexible method for generating femtosecond cylindrical vector beams with an arbitrary polarization order. Through combining the spatial and temporal modulations, Li *et al.* generate and measure versatile vortex linear light bullets, which incorporate a high-order Bessel beam and an Airy pulse. Such novel and versatile complex optical fields may be useful in various applications, including micromachining. An experimental characterization method for partially coherent Laguerre–Gaussian (LG) modes is presented by Liu *et al.*

Interest in the focusing properties of complex optical fields remains strong. The linear momentum density of light in the complex three-dimensional field distributions of tightly focused vortex segmented beams is studied in detail by Neugebauer *et al.* Wackenhut *et al.* report interesting findings in the spirally polarized doughnut beams as a tool for tuning the field distribution in the focus of a high numerical aperture objective lens. The findings from these studies may provide essential tools for nanotechnology investigations and biomedical experiments.

The added degrees of freedom arising from the amplitude, phase, and polarization diversity within the cross-section and tailored waveforms of a complex optical field enable many novel optical and photonic applications. A nice review on data information transfer using complex optical fields is presented by Wang. Challenges and perspectives are also discussed. Chen *et al.* investigate the stimulated Brillouin scattering of light beams carrying orbital angular momentum. The findings may find potential applications in photon-phonon conversion-based signal-processing scheme using orbital angular momentum multiplexing. Milione reports remote sensing of an object's rotational orientation using light's orbital angular momentum. Lopez-Morales *et al.* demonstrate the refractive index measurement of a dielectric sample using highly focused radial polarized light. Lamstein *et al.* design and demonstrate new types of optical tweezers with lateral pulling forces, which allow for the full control of biological samples with complex geometric shapes by appropriately shaping the optical fields.

There has indeed been extraordinary growth in the research on *Complex Optical Fields* with the collection of papers in this special issue providing a useful snapshot of the field that is representative of the international and interdisciplinary scope of interest. With exciting new developments ever on the horizon, we strongly encourage our colleagues who have an ongoing interest in this subject to submit their future work in this very promising area of optics to *Chinese Optics Letters*.

Sincerely,

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