# Spin-orbit Laguerre-Gauss modal beam shaping from silica optics

Vagharshak Hakobyan[1], Keshaan Singh[2], Yuhao Lei[3], Peter Kazansky[3],

Delphine Coursault[1], Andrew Forbes[2], and Etienne Brasselet[1]

[1]Université de Bordeaux, CNRS, LOMA, UMR 5798, Talence, France
[2]School of Physics, University of the Witwatersrand, Johannesburg, South Africa
[3]Optoelectronics Research Centre, University of Southampton, Southampton, SO17 1BJ, UK

We report on the development of a novel generation of flat-optics spin-orbit Laguerre-Gauss beam shapers made from silica glass using femtosecond laser nanostructuring technology. The basic design principle consists to endow a transparent dielectric material, initially isotropic and homogeneous, with doubly inhomogeneous anisotropic characteristics (optical axis orientation and birefringence). The quantitative structural characterization of the fabricated devices is achieved by Stokes polarimetric analysis and the modal beam shaping performances are assessed via modal decomposition owing to a binary amplitude spatial light modulator. The obtained modal beam shaping capabilities outperform that of previously produced spin-orbit beam shapers based on the same fabrication technology. Also, current challenges and perspectives associated with high-order and spectrally broadband modal beam shaping are discussed. More generally, the proposed approach extends the scope of spin-orbit optical elements to any situation where complex field amplitude shaping is required. As such, this invites for considering other optical materials and micro/nanofabrication technologies to contribute to the growth of this theme and encourage the emergence of novel applications. In Fig.1 it is shown how a polychromatic incident Gaussian beam from a supercontinuum laser is transformed into a polychromatic LG mode of a given order, which highlights the broadband character of our approach.

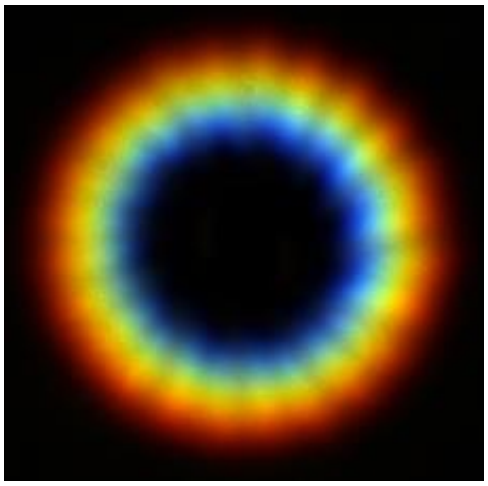

Fig.1 Polychromatic LG beam generated by modal plate