

Structured light and its applications

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Abstract:The light possessing helical wavefront and orbital angular momentum is called an optical vortex beam or twisted beam. The most common form of the helically phased beam is the so-called Laguerre–Gaussian (LG) mode. The LG mode can be easily produced by conversion of Hermite-Gaussian (HG) mode directly from laser cavities. However, there are various techniques for generating the structural or twisted light by the Gaussian beam, such as (1) Liquid crystal spatial light modulator, (2) cylindrical lens, (3) Q-plates, etc. The twisted light has unique optical properties due to the existence of an extra degree of freedom as compared to that of the polarized beam. Hence, it is used to perform a wide variety of applications like; trapping and rotating of microscopic particles in hydrodynamics and biology, controlling the chirality of twisted metal nanostructures, quantum communications and cryptography, and spiral interferometry. Furthermore, it opens a new window of physics while structured light interacts with 2D semiconductor materials for fabricating the valleytronic devices. Currently, our group mainly focuses on studying the structural light-matter interaction of transition metal dichalcogenide (TMD) materials including photoluminescence and Raman spectroscopy.