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Characteristics of fork fringes formed by two obliquely-incident vortex beams with different topological charge numbers

Optical vortex is a mode of light whose phase distribution varies as exp(ilϕ), where m is called the topological charge of the vortex and ϕ is an azimuthal angle in the plane perpendicular to the propagating direction. The vortex beam of charge l carries an orbital angular momentum of l$\hbar$ and has its application in manipulating micrometer-sized particles. A common method to detect topological charges of optical vortices is interference with a tilted Gaussian beam. In this work, we study the interference pattern of two obliquely-incident vortex beams with different topological charges, created by spatial light modulators (SLMs). We find fork-like fringes similar to those observed from the interference between a vortex and a Gaussian beam. The fringe difference between the top and the bottom of the fork equals the difference between the topological charges of the two vortices, as predicted by the theory. When the topological charges are the same and the fork pattern disappears. The tilted angle between the vortex beams affects the fringe spacing: the larger the tilt angle the smaller the fringe spacing. When the tilt angle is zero, the fringes disappear and the interference patterns become radial from the defect center. We suggest the result can be used to detect a topological charge of a vortex beam.

Primary authors: SUVIPAK CHOMDAENG, SJ; Dr CHATTHAM, Nattaporn (Department of Physics, Faculty of Science, Kasetsart University); Dr PATTANAPORKRATANA, Apichart (Department of Physics, Faculty of Science, Kasetsart University)

Presenter: SUVIPAK CHOMDAENG, SJ

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