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Polarization Mapping of Elements with Spatially-Varying Birefringence

Polarization mapping refers to the process of measuring and visualizing the spatial distribution of the polarization state across a light beam. It reveals how the polarization varies from point to point in space showing, e.g., regions with radial, azimuthal, or elliptical polarization [1-3]. Polarization mapping is essential in analyzing vector beams, structured light, and beams with spatially varying polarization such as those produced by q-plates or metasurfaces. It typically involves elements like rotating polarizers, wave plates, and imaging detectors to reconstruct the Stokes parameters or polarization ellipses across the beam profile.

In this work, however, we report a method for parallel determination (mapping) of the polarization change introduced by an unknown optical element using arrays of linearly polarized Gaussian beams. More precisely, we present an experimental technique for polarization mapping of birefringent elements generating polarization vortices, such as vortex retarders. The approach is applicable also for clear determination of the polarization response of spatial light modulators. Experimental data will be presented and discussed, focusing on benefits and the limitations of the demonstrated approach.

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