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Gone with the Wind...or Not? Tracking Light's Twists

Optical vortices—phase and polarization singularities—are central to structured light applications, yet their comparative resilience to atmospheric turbulence remains underexplored. This study investigates the robustness of phase versus polarization vortices under Kolmogorov-model turbulence using Laguerre-Gaussian and vector beam superpositions. Vortex dynamics are tracked via phase unwrapping and Stokes parameter analysis to quantify spatial drift and topological stability. Understanding the resilience of phase and polarization vortices to atmospheric turbulence can enhance the reliability of structured light in applications such as free-space optical communication, remote sensing, and optical trapping.

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