



Contribution ID: 299

Type: Oral Presentation

Is classical entanglement of a vector beam fragile or robust?

Tuesday, 4 July 2023 15:00 (20 minutes)

Vector beams are characterized by their non-separable (entangled) polarisation and spatial degrees of freedom. However, different views persist on the entanglement's robustness against phase-perturbing turbulent media: on one hand the entanglement should be robust, on the other it decays. This work is aimed at reconciling the two contradictions, by experimentally and theoretically studying vector beams, entangled via their orbital angular momentum modes and polarisation degrees of freedom through a turbulent media. Using a quantum mechanical framework, we show that turbulence results in the broadening of the OAM spectra, and by performing the measurement in the original basis we lose information. However, by performing basis-independent measurements, we show that entanglement is invariant against phase perturbations and the state remains non-separable. Thus, showing how you measure determines what you see.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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Session Classification: Photonics

Track Classification: Track C - Photonics