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Creation and detection of vector Bessel beams using digital axicons

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Abstract content
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Bessel beams are optical fields that fall into the categories of non-diffracting beams. Vector Bessel beams have focal field distribution of cylindrical vector beams which has a high numerical aperture. These beams have found interesting applications in various facets of science ranging from biological optical trapping, optical communications and microscopy. In this work, Bessel beams are generated using digital axicons encoded into a spatial light modulator and converting the linearly polarized Bessel beams to circularly polarized vector Bessel beams. In addition, the orbital angular momentum modes in the beam were detected using modal decomposition. We further measured the degree of non-separability of the vector Bessel beams using state tomography quantum tool where we reconstructed the density matrix and calculated the concurrence and fidelity which explores the measure of vectorness of the beams. The results obtained are in agreement with literature.

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