

Shape invariant higher-order Bessel-like beams carrying orbital angular momentum

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Abstract

We present a method for generating higher-order Bessel beams with z-dependent cone angles. Such fields, if engineered correctly, are shape invariant during propagation and thus do not suffer from a transition from a Bessel-shaped intensity profile in the near field to an annular ring in the far field. We demonstrate the production of such fields in the laboratory with an optical system comprising a combination of two axicons and a lens, allowing for control of the cone angle of the resulting field. While the resulting shape invariant fields are not perfectly non-diffracting, they do maintain many of the same properties as Bessel beams, including self-reconstruction.