

# Elliptic Laguerre-Gaussian beam

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## Abstract:

An analytical expression describing the diffraction of a paraxial elliptical Gaussian-Laguerre beam is developed and analyzed. It is shown that for any degree of ellipticity and at any finite distance  $z$  from the reference plane, the intensity on the optical axis of the beam with an even order of singularity is nonzero, although the intensity on the optical axis of the beam is zero when  $z=0$  and  $z=\infty$ . For a beam with a small degree of ellipticity and with an even order of singularity, it is shown that in the beam cross section in the Fresnel zone, two isolated intensity zeros arise on a straight line lying at an angle of  $45^\circ$  or  $-45^\circ$  depending on the right or left “helicity” of the beam. Numerical and natural experiments confirm the theoretical conclusions.

**Keywords:** Laguerre-Gaussian beam, ellipticity, Fresnel zone

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