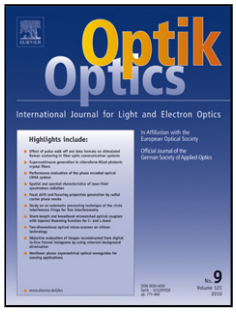


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**Title page**

# Radially polarized Lorentz-Gauss vortex beam with sine-azimuthal variation wavefront

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**Abstract**

Radially polarized Lorentz-Gauss vortex beam with sine-azimuthal variation wavefront was proposed and its focusing properties were investigated by vector diffraction theory. The effect of phase parameter on focal pattern is very considerable, and some novel intensity pattern comes into being under certain focusing condition, including multiple-peaks, crescent shape, multiple intensity lines, intensity cross. Especially, the symmetry characteristics are systematical on increasing phase parameter. For case of even number of phase parameter, there are two symmetric axes for whole focal pattern, while there is only one symmetric axis for odd number of phase parameter. When topological charge is small, the intensity maximum shifts within small distance range, while intensity maximum may switch for higher topological charge in focal pattern evolution process.

**Keywords:** Lorentz-Gaussian beam; Vector beam; Optical vortex; Wavefront modulation

**Text**

## 1 Introduction

Lorentz-Gaussian beams were introduced to describe the output beams from diode lasers in 1970s [1, 2], and since then many researches focused on properties of this kind of beams [3-5]. Nemoto showed experimentally that the field distribution of a diode laser in the directions normal and parallel to the junction plane agree well with Lorentzian and Gaussian functions, respectively [3]. Zhou studied the fractional Fourier transform of Lorentz-Gauss beams [6]. And the propagation of Lorentz-Gauss beams in crystal and fractional Fourier transform optical systems was also investigated [7]. Recently, optical vortex was also introduced in Lorentz-Gaussian beams to construct Lorentz-Gauss vortex beams and attracted many