

[Home](#) > [Optical and Quantum Electronics](#) > [Article](#)

Periodic characteristics of a finite Airy–Hermite–Hollow Gaussian beam propagating in a gradient–index medium

Published: 05 September 2024

Volume 56, article number 1475, (2024) [Cite this article](#)

[Optical and Quantum Electronics](#)
[Aims and scope](#) →

[Submit manuscript](#) →

A. A. A. Ebrahim, F. Saad & A. Belafhal [✉](#)

50 Accesses [Explore all metrics](#) →

[Access this article](#)

Abstract

Based on the extended Huygens–Fresnel diffraction integral, the analytical expressions for a finite Airy–Hermite–Hollow Gaussian Beam (FAHHGB) propagating through a gradient-index medium (GRINM) are developed. The characteristics of the normalized intensity for the FAHHGB through the GRINM are theoretically and numerically investigated. The effects of gradient-index parameter β , the mode-orders (beam order m and hollow term order n), and the Gaussian waist ω_0 on the propagation process of the studied beam are numerically discussed in detail. It is found that the normalized intensity distribution of FAHHGB undergo periodic changes during its propagation process in the GRINM. The periodical traits of the normalized intensity distribution of the FAHHGB in a GRINM are strongly affected by the gradient-index parameter. However, the changing of the beam parameters (m and n) play a clear role in geometrical form of the beam profile in the medium. Finally, the current study included three types of finite Airy Gaussian modes as special cases.