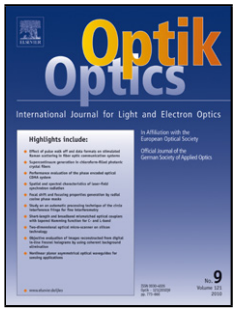

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Self-focusing of Hermite–cosh–Gaussian laser beam in semiconductor quantum plasma

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Abstract

Self-focusing of Hermite-cosh-Gaussian (HchG) laser beam in semiconductor quantum plasma (ScQP) has been presented by considering the decentred parameter and quantum effect. We drive the equation of beam width parameter by using parabolic wave equation and solved it numerically by using WKB approximation. Our simulation results show that HchG beam gives freedom to source parameters that influence the self-focusing significantly. Additional self-focusing has been observed in ScQP than that of classical case of reference. The quantum plasma also adds pinching effect to laser propagation in semiconductor like germanium which further enhances the self-focusing more and more in ScQP.

Keywords: Hermite-cosh-Gaussian (HchG) laser beam; Semiconductor; Self-focusing; Quantum Plasma.

1. Introduction

High power lasers interactions with plasmas and semiconductors have been a fascinating area of research during last few decades [1-4] due to its potential applications such as particle accelerations, laser-driven fusion, radiation generations, generation of magnetic fields etc. [5-7]. The effectiveness of laser beam in such applications is determined by the extended propagation without loss of energy. The penetration of laser beams in plasma generates various nonlinear phenomena's (self-focusing, harmonic generation, electron acceleration etc.). Among these phenomena self-focusing is an important nonlinear phenomenon. In semiconductors the nonlinearities that are important in self-focusing appear through the redistribution of carriers and energy dependence mass of carriers. However, at low lattice