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Nonlinear dynamics of q-Gaussian laser beams in narrow band gap semiconductors

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The theoretical investigation of self-focusing mechanism of q-Gaussian laser beam in narrow band gap semiconductor (e.g., n-type InSb) has been presented. On propagation of q-Gaussian beam, the conduction electrons of the semiconductor attain energy from laser field and their temperature get enhanced which is normally equal to lattice temperature in the absence of laser beam. Due to this additional temperature, the carriers start shifting towards low intensity regime from high intensity regime. Hence, the optical properties of semiconductor is modified and semiconductor start behaving like convex lens. The variational theory has been invoked in deriving the solution to nonlinear Schrodinger wave equation (NLSE). It is revealed that the off-axial intensity of the laser beam and semiconductor parameters enhances the self focusing of laser beam.

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