

## Abstract

In this thesis, we study electron-related nonlinear optical absorption and nonlinear optical rectification in  $\text{GaAsGa}_{1-x}\text{Al}_x\text{As}$  asymmetric double quantum wells under applied electric and magnetic field. The density matrix formalism and the effective mass and parabolic band approximations have been considered. The main findings show that in asymmetrical heterostructures under an appropriate strength of the electric field it is possible that the optical rectification is zero and in such circumstances the optical absorption has a relative maximum; similar behavior is observed in these optical properties as a function of the length of one of the two quantum wells and without applied electric field. Finally we found that the resonant peaks in the nonlinear optical rectification and nonlinear optical absorption can be controlled by changes in the external proofs such as applied electric and magnetic fields or by changes in the structural dimensions of the coupled quantum well system.