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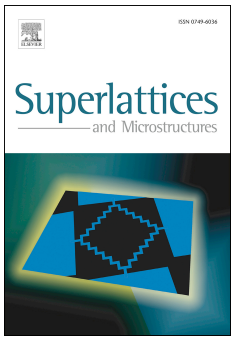

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Nonlinear optical response in intersubband transitions of a symmetric quantum well: role of electron-electron interactions

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Abstract

We investigate theoretically the saturation problem of the nonlinear intersubband response in a symmetric quantum well. We first obtain the analytical expressions for the absorption/dispersion spectra from the steady-state solutions of the nonlinear density matrix equations. This expressions include the depolarization effect that results from the electron-electron interactions and also depends on the population difference between the first two subbands. We calculate the line shape of the dispersion spectrum and show that the dispersion spectrum becomes non-antisymetric as the intensity of the radiation increases. For larger values of the electron sheet density, this distortion becomes more apparent. We also find that the optical bistability can be obtained for appropriate values of the electron sheet density and the intensity of the optical radiation. Our results also show that the electron redistribution among the subbands by additional external factor has a dramatic effect on the nonlinear intersubband response.

Keywords: Nonlinear optical properties, Symmetric quantum wells, Density matrix equations,

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