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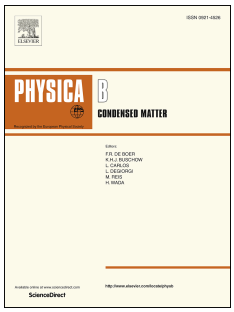

Electron-related optical responses in Gaussian potential quantum wells: Role of intense laser field

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Electron-related optical responses in Gaussian potential quantum wells: Role of intense laser field

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Abstract

A theoretical study of the effects of non-resonant intense laser field on the optical response in a Gaussian potential quantum well is performed in the framework of the effective mass approximation. The obtained results indicate that, the depth and range of the considered confinement potential and intense laser field intensity has a significant effect on the optical properties in Gaussian potential quantum wells. Also it was found that the laser field is more effective on the optical response in Gaussian potential quantum wells with smaller range.

Keywords: Gaussian quantum well, Optical response, Intense laser field

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1. Introduction

As we all know the low-dimensional semiconductor systems have a great importance in the development of opto-electronic devices, for example, semiconductor lasers, electro-optical modulators, optical switches, photo-detectors, semiconductor optical amplifiers, and tera-hertz devices [1–5]. Hence, the nonlinear optical properties of these structures have gained special interest. It has been reported that, due to the motion of the electron is restricted in all three directions, the nonlinear effects in quantum wells (QWs) can be improved more dramatically over those in bulk structures. In this context, recently many theoretical studies have been carried out on the nonlinear optical response of semiconductor QWs [6–15]. It should be noted that, the geometry of the confinement potential in QW structures has a significant role in fundamental physical properties of the semiconductor quantum nano-structures [12, 14].

There is no direct experimental method for defining the confinement potential. The confinement potentials are frequently modeled by rectangular potential well or the parabolic potential [16]. It was noted that, the conventional rectangular QW has basic, but unrealistic form owing to the non-parabolic shape at the center of the QW. On the other hand, the parabolic potential is inappropriate to describe the experimental results due to its infinite depth and

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