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Title:Magneto-photon-phonon interaction in a parabolically confined quantum dot in the presence of high magnetic fields and intense terahertz radiation fields

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Abstract:We present a theoretical study on magneto-photon-phonon interaction in a parabolically confined quantum dot subjected simultaneously to static magnetic field and radiation field. A nonperturbative treatment for electron-photon interaction is proposed by solving analytically the time-dependent Schrodinger equation in which the magnetic field and the radiation field are included exactly. We employ the energy-balance equation approach on the basis of the Boltzmann equation to evaluate the energy transfer rate induced by optical transition events. It is found that for relatively low radiation levels, two peaks of the cyclotron resonance (CR) appear at two Kohn's frequencies omega(+/-), and the strength and the width of the CR increase with radiation intensity. The CR omega(+) is more prominent than that at omega(-). When the radiation become intense, the splitting of the CR peaks can be observed and the splitting increases with radiation intensity. The physics reasons behind these interesting findings are discussed. This study is pertinent to the application of intense terahertz radiation sources such as free-electron lasers in the investigation into low-dimensional semiconductor systems.

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