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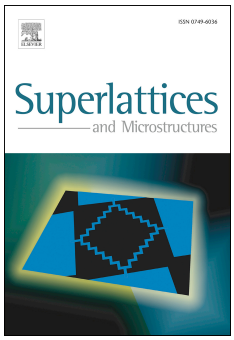

Temperature effects on bound polaron in triangular quantum dot qubit subjected to an electromagnetic field

Yingjie Chen, Haitao Song, Jinglin Xiao

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Temperature effects on bound polaron in triangular quantum dot qubit subjected to an electromagnetic field

Yingjie Chen[a*], Haitao Song[b], Jinglin Xiao[c]

[a] Shandong Provincial Key Laboratory of Laser Polarization and Information Technology, College of Physics and Engineering, Qufu Normal University, Qufu 273165, China
[b] Qufu Library, Qufu 273100, China
[c] College of Physics and Electronic Information, Inner Mongolia University for Nationalities, Tongliao 028043, China

Abstract: In this work, the variational method of the Pekar type is used to theoretically study the temperature effects on the bound polaron in the triangular quantum dot (QD) qubit subjected to an electromagnetic field. We analyze and discuss in detail the numerical results and show that the relationships of the ground and first excited state energies, the electron probability density and the electron oscillation period in the superposition state of the ground state and the first-excited state with the temperature, the cyclotron frequency, the electron-phonon coupling constant, the electric field strength, the confinement strength and the Coulomb impurity potential, respectively.

Keywords: Triangular QD qubit, Hydrogen-like impurity, Temperature effects

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1. Introduction

In recent years, with development of the nanotechnology field, there has been increasing interests in quantum information process and quantum computation. Due to the manipulability, scalability and tenability in the electronic and optical properties [1-5], semiconductor QD has become an excellent candidate for designing qubits of quantum information processing. Quantum computer with a great quantity of qubits would be inevitably realized in solid, particularly by utilizing semiconductor QD system [6, 7]. However, non-ideal quantum system is popularly impressible to its environment, and its quantum behaviors are very substantially influenced by unwanted couplings to its surroundings. Quantum systems of qubits are so delicate that many factors, such as temperature, would influence quantum coherence of stored information. Therefore, it is meaningful to be capable of accurately describing the

*Corresponding author, E-mail: sdchenyingjie@126.com (Y.J. Chen)