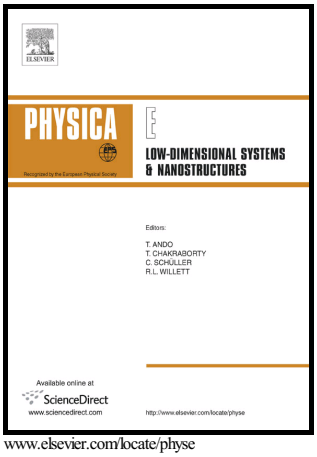
Optical "Visualization" of Pythagorean Triples and Electrostatic Multipoles in Quantum Dash

D.A. Baghdasaryan, E.M. Kazaryan, H.A. Sarkisyan, K.D. Moiseev



www.elsevier.com/locate/physe

PII: S1386-9477(17)30206-0
DOI: http://dx.doi.org/10.1016/j.physe.2017.03.026
Reference: PHYSE12768

To appear in: *Physica E: Low-dimensional Systems and Nanostructures*

Received date: 9 February 2017
Revised date: 24 March 2017
Accepted date: 27 March 2017

Cite this article as: D.A. Baghdasaryan, E.M. Kazaryan, H.A. Sarkisyan and K.D. Moiseev, Optical "Visualization" of Pythagorean Triples and Electrostatic Multipoles in Quantum Dash, *Physica E: Low-dimensional Systems and Nanostructures,* http://dx.doi.org/10.1016/j.physe.2017.03.026

Optical "Visualization" of Pythagorean Triples and Electrostatic Multipoles in Quantum Dash

D A Baghdasaryan[1], E M Kazaryan[1], H A Sarkisyan[1,2,3*], K D Moiseev[4]

[1]Russian-Armenian University, 0051 Yerevan, Armenia.

[2]Yerevan State University, 0025 Yerevan, Armenia,

[3]Peter the Great Saint-Petersburg Polytechnic University, St. Petersburg, 195251 Russia

[4]Ioffe Institute, St Petersburg, 194021, Russia

[*]shayk@ysu.am (H.A. Sarkisyan)

Abstract

The problem of the features of the electron energy spectrum in a quantum parallelepiped has been considered. The family of triply degenerate energy levels has been found for the chosen model of the quantum parallelepiped. The optical transitions in this system has been investigated. It has been established that primitive Pythagorean triples are in the basis of every family of triply degenerate levels and this fact is directly reflected on the optical properties of the quantum dashes. In particular, due to the selection rules for the electronic transitions, it is possible to "visualize" Pythagorean triples theoretically. The dependence of absorption coefficient on the incident photon energy of quantum dash ensemble has been studied. The dipole, quadrupole moments and the electrostatic field created by the electron localized in a quantum dash have been investigated.

Keywords: Quantum Dash, Pythagorean triples, Optical "visualization", Electrostatic multipoles.

I. Introduction.

Quantum dot (QD) is the most convenient system in terms of controlling the energy spectrum [1]. Therefore, the QD structures are considered as a promising active medium for the semiconductor optoelectronics devices of the new generation. Manipulation of energy levels of the charge carriers in QDs can be made both by changing the geometric dimensions of a QD and by successful selection of the geometry of the nanostructure. On the one hand, we usually have to find