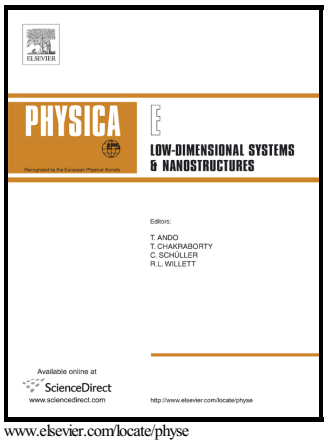
Energy levels of a particle confined in an ellipsoidal potential well

Tamaz Kereselidze, Tamar Tchelidze, Roman Ya. Kezerashvili



www.elsevier.com/locate/physe

PII: S1386-9477(14)00447-0
DOI: http://dx.doi.org/10.1016/j.physe.2014.12.019
Reference: PHYSE11810

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

Received date: 24 September 2014
Revised date: 14 November 2014
Accepted date: 10 December 2014

Cite this article as: Tamaz Kereselidze, Tamar Tchelidze and Roman Ya. Kezerashvili, Energy levels of a particle confined in an ellipsoidal potential well, *Physica E: Low-dimensional Systems and Nanostructures,* http://dx.doi.org/10.1016/j.physe.2014.12.019

Energy levels of a particle confined in an ellipsoidal potential well

Tamaz Kereselidze[1], Tamar Tchelidze[1], and Roman Ya. Kezerashvili[2,3*]

[1] *Faculty of Exact and Natural Sciences,*

Tbilisi State University, Tbilisi, 0179, Georgia

[2] *Physics Department, New York City College of Technology,*

The City University of New York, Brooklyn, NY 11201, USA and

[3] *Graduate School and University Center,*

The City University of New York, New York, NY 10016, USA

Abstract

The Schrödinger equation is solved for a particle confined within the ellipsoidal potential well using the perturbation theory and the Hamiltonian diagonalization method. The explicit expressions are obtained for the energy levels that are the size and shape dependent and appropriate wave functions. The calculated energy levels are in a good qualitative and quantitative agreement with the result obtained by numerical solution of the Schrödinger equation. It is revealed that for the lowest states of a given symmetry the region of validity of the perturbation approximation is much larger than it follows from the usual condition of applicability of the perturbation theory. The optical properties of nanoparticles of a prolate and oblate ellipsoidal shape are discussed.

Keywords: ellipsoidal potential, nanoparticles, energy levels, perturbation theory, diagonalization method

* Corresponding author. Tel.: 1 718 260 5276, Fax: 1 718 260 5542 *E-mail address:* RKezerashvili@citytech.cuny.edu (R.Ya. Kezerashvili).