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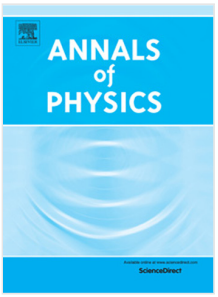

Analytical solutions of the Dirac equation under Hellmann–Frost–Musulin potential

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ANALYTICAL SOLUTIONS OF THE DIRAC EQUATION UNDER HELLMANN-FROST-MUSULIN POTENTIAL.

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Abstract

The approximate analytical solutions of the Dirac equation with Hellmann-Frost-Musulin potential have been studied by using the generalized parametric Nikiforov-Uvarov (NU) method for arbitrary spin-orbit quantum number k under the spin and pseudospin symmetries. The Hellmann-Frost-Musulin potential is a superposition potential that consists of Yukawa potential, Coulomb potential, and Frost-Musulin potential. As a particular case, we found the energy levels of the non-relativistic limit of the spin symmetry. The energy equation of Yukawa potential, Coulomb potential, Hellmann potential and Frost-Musulin potential are obtained. Energy values are generated for some diatomic molecules.

Keywords: Dirac equation, Hellmann potential; Frost-Muslin potential; Wave equation; Eigensolution; Nikiforov-Uvarov method.
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