Dirac Equation with a New Tensor Interaction under Spin and Pseudospin Symmetries

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Abstract

The approximate analytical solutions of the Dirac equation under spin and pseudospin symmetries are examined using a suitable approximation scheme in the framework of parametric Nikiforov-Uvarov method. Because a tensor interaction in the Dirac equation removes the energy degeneracy in the spin and pseudospin doublets that leads to atomic stability, we study the Dirac equation with a Hellmann-like tensor potential newly proposed in this study. The newly proposed tensor potential removes the degeneracy from both the spin symmetry and pseudospin symmetry completely. The proposed tensor potential seems better than the Coulomb and Yukawa-like tensor potentials.

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