

Quantum Physics

An improved approximation scheme for the centrifugal term and the Hulthen potential

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We present a new approximation scheme for the centrifugal term to solve the Schrodinger equation with the Hulthen potential for any arbitrary l state by means of a mathematical Nikiforov-Uvarov (NU) method. We obtain the bound state energy eigenvalues and the normalized corresponding eigenfunctions expressed in terms of the Jacobi polynomials or hypergeometric functions for a particle exposed to this potential field. Our numerical results of the energy eigenvalues are found to be in high agreement with those results obtained by using the program based on a numerical integration procedure. The s-wave ($l=0$) analytic solution for the binding energies and eigenfunctions of a particle are also calculated. The physical meaning of the approximate analytical solution is discussed. The present approximation scheme is systematic and accurate.

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