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Editorial

The Potential Model in High Energy Physics

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Although the quantum mechanics and its mathematical aspects are quite old, there are still so many unsolved problems in this field. In addition, the rather recent generalizations of quantum mechanics to other space-time, noncommutative phase-space, minimal length formulation, and fractional formalism have renewed the studies.

Within the present special issue, we proposed a variety of such related topics which are all related to the interaction among constituent particles.

As one of the main aims of the present issue, F. M. Andrade et al. considered the relativistic Dirac equation in cosmic-string space-time with Dirac Delta function and studied a variety of concepts including phase shift, phase-matrix, and the scattering amplitude. Such studies might provide us with interesting clues on our way to unification of quantum mechanics with gravitational effects.

H. Hassanabadi et al., in two contributions to the present special issue, considered the q-deformed formulations of quantum mechanics that is an appealing generalization of ordinary quantum mechanics arising from noncommutative formulation. The approach has found wide applications in solid, nuclear, and particle physics. They considered harmonic, Morse, Dirac Delta, and double Dirac Delta potentials and, working on analytical approaches, reported the solutions and investigated the effect of q-parameter on the spectra.

W. Li et al., bearing in mind the necessity of generalization of central interactions to model the physical phenomena including deformation effects, considered a ringed-shaped interaction and reported the solutions of the arising polar angular equation in terms of universal associated Legendre polynomials. Their approach can be applied to other classes of problems involving such polynomials.

M. Baradaran and H. Panahi considered a kind of double-well potential. To obtain the wave functions and the spectra, they used the powerful quasi-exact Lie algebra and Bethe-Ansatz approaches. These techniques are of great importance as only a few problems of quantum mechanics can be exactly solved.

I. B. Okon et al. considered the analytical Nikiforov-Uvarov technique, which is based on transforming the equations into hypergeometric type, to solve the Schrödinger equation with the so-called Yukawa inverse square term, and thereby reported the approximate solutions by considering an approximation to the centrifugal term.

N. Roshanbakht and M. R. Shojaei, by working with the cylindrical Schrödinger equation and a two-center Gaussian potential well, investigated the structure of light nuclei within the cluster approach using a combination of numerical and analytical approach.

We hope the special issue provided the readers with some useful ideas on the current related researches in the field.

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