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A new approach to one-dimensional oscillators in relativistic quantum mechanics. (English)

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Summary: A new approach to the one-dimensional oscillatory motion of a relativistic quantum particle with the spin 1/2 is presented. It is based on a modified form of the Hamilton operator of the particle. As particular cases, the one-dimensional Dirac oscillator and the one-dimensional oscillator with equidistant energy levels are discussed. In this context, the first oscillator appears as an ancient representative, while the second oscillator is a new representative of an entire class of relativistic quantum one-dimensional oscillators.

MSC:

81Q05 Closed and approximate solutions to the Schrödinger, Dirac, Klein-Gordon and other equations of quantum mechanics
81Q80 Special quantum systems, such as solvable systems
81Q10 Selfadjoint operator theory in quantum theory, including spectral analysis
70H40 Relativistic dynamics for problems in Hamiltonian and Lagrangian mechanics

Keywords:

one-dimensional Dirac oscillator; one-dimensional oscillator with equidistant energy levels