

COLLECTIVE EXCITATIONS IN ATOMIC NUCLEI WITH ENERGY-DEPENDENT POTENTIALS

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Abstract

The analytical solutions for various realizations of the Bohr model Hamiltonian with energy-dependent Kratzer and Davidson potentials are presented. The domain of applicability for the associated solutions are determined from the analysis of the parameter dependence of selected spectral characteristics. Special cases of hyperbolic and harmonic oscillator potentials are considered to ascertain the isolated effect of the energy dependence on the energy spectrum. The theoretical formalism is validated by offering suitable experimental realizations. A systemized model description of nuclear collective spectra revealed a correlation between energy dependence of the potential and critical phenomena associated with shape phase transitions.

keywords: Geometric models, energy-dependent potentials, Collective energy levels

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