Evaluation of the Wobbling Motion in Even-Even Nuclei Within a Simple Rotor Model

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ORAL PRESENTATION

Abstract:

A unique fingerprint of triaxiality in nuclei, i.e., wobbling motion, is studied for several even-even isotopes within the $A\approx 130$ mass region. The used formalism is based on a simple rigid rotator, which achieves triaxiality due to the asymmetry of the three moments of inertia corresponding to the rotational ellipsoid. From the initial rotor Hamiltonian, a set of equations for each wobbling band will emerge. The equations describe a rotational (collective) motion of the nucleus around the axis with the largest moment of inertia, combined with an oscillatory-like perturbation of phonon character around the other two axes. With the obtained analytical results, the wobbling spectrum for ^{130}Ba, ^{134}Ce, and ^{136}Nd isotopes is studied, performing calculations of quantities such as excitation energies, quadrupole moments, deformation parameters, transition probabilities and so on. This straightforward approach provides a good quantitative analysis of the wobbling motion in even-even nuclides.

Keywords: wobbling motion, particle rotor model, rotation, collective motion, triaxiality, signature, parity.

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