ALGEBRAIC COLLECTIVE MODEL AND ITS APPLICATION TO CORE QUASIPARTICLE COUPLING

Abstract

by

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The triaxiality of even-even nuclei has been well studied, but the triaxiality of odd-mass nuclei is less well understood. The triaxiality of odd-mass nuclei is addressed in this thesis, by coupling a quasiparticle to an even-even core through core quasiparticle coupling model. We consider both triaxial “soft core” and “rigid core”. The “soft core” is described by the collective model with rotation-vibrational motion, while the “rigid core” is described by the triaxial rotor model, which is a limiting case of the collective model with only rotational motion.

To investigate the triaxiality of odd-mass nuclei through the two different approaches, experimental information is needed on high spin states. The present work involves comparisons of two theoretical calculations to experiment in the Pd, Ru, and Rh isotopic chains, with mass numbers around 100. Also, in collaboration with experimental groups at Notre Dame, the two other exploration has been carried out, of triaxiality and transverse wobbling in $^{135}$Pr, and of triaxiality at low spin in $^{109}$Pd.

These comparisons with available experimental data demonstrate that, the odd-mass nuclei are better described by coupling to rigid triaxial rotor than by coupling to the soft collective core.