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Theoretical studies of chiral systems described within particle-rotor model

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Chirality in nuclear systems requires an aplanar orientation of the total angular momentum and stable triaxial nuclear shape is needed [1-2]. It is expected that the angular momenta of an odd particle and an odd hole (both occupying high-j orbitals) are aligned predominantly along the short and the long axes of the nucleus respectively, whereas the collective rotation occurs predominantly around the intermediate axis of a triaxially deformed nucleus to minimize the total energy of the system. Experimentally one observes $\Delta I = 1$ rotational partner bands built on two- or multi-quasiparticle configuration. Multiple chiral bands (M χ D) with different or same nucleon configuration can indeed form in a single nucleus, as theoretical calculations show (e.g., 3-5]), and experimental data suggest (e.g., [6-8]).

Investigations using the particle-rotor model have shown that the fingerprints of chirality in the two-quasiparticle system can occur in an idealised model description, where an odd proton and an odd neutron are restricted to one orbital each located at the lowest- and highest-energy orbitals or vice versa of a high-j shells [9-10]. For systems with many-quasiparticles, the calculations showed that nuclear chirality can also persist [11-13]. The present work reports on the review of theoretical studies of chiral systems performed using two-quasiparticle-rotor [14] and many-particle-rotor [15] models in different mass regions.

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