Chirality in Nuclear Physics *

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In the work [1], it is pointed out that the rotation of triaxial odd-odd nuclei may attain to almost degenerate doublet bands with identical transition probabilities from the corresponding levels. The Interacting boson fermion-fermion model (IBFFM) [2] also reproduced well the level schemes of the chiral candidates, as for instance these in ^{134}Pr. In addition, crucial experimental observables for the understanding of nuclear structure and for checking the reliability of the theoretical models are the electromagnetic transition probabilities.

For the first time the lifetimes of the levels of the doublet bands in ^{134}Pr were measured by means of the recoil-distance Doppler-shift (RDDS) method and the Doppler-shift attenuation method (DSAM) using the Euroball spectrometer and the Cologne plunger device. The excited states of ^{134}Pr were populated via the reaction ^{119}Sn(^{19}F,4n)^{134}Pr at a beam energy of 87 MeV.

Nine lifetimes in the ground-state band and five in the second chiral candidate band were determined. Within the experimental uncertainties, the B(M1) values in both partner bands behave similarly, varying in an interval indicating relatively strong transition strengths. In contrast, the intraband B(E2) strengths within the two bands differ. This result is incompatible with the "static chiral picture" where the intraband B(E2) transition strengths must be equal. We have used particle-rotor + TAC and IBFF models to compare with the experimental data. In the first case, the calculation has been done using two quasi-particles plus a triaxial rotor with pairing. The moments of inertia have been calculated by means of the Cranking model. In the IBFFM case we have used a triaxial core. The calculations within the IBFFM are in a good agreement with the experimental data, while in the case of the particle-rotor + TAC model the calculations and the data differ. Such finding points to the fact that the limit of static chirality is not really reached in ^{134}Pr and the nuclear system stays in a very soft vibrational regime [3].

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