CHIRALITY OF NUCLEAR ROTATION IN REAL NUCLEI

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Chirality in nuclear rotation is a novel collective feature predicted for odd-odd nuclei from angular momentum coupling considerations [1]. Many theoretical and experimental efforts have been dedicated to the study of that interesting phenomenon. In the work [1], it is pointed out that the rotation of triaxial nuclei may lead to the appearance of chiral doublet bands. Interacting boson fermion-fermion model calculations [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 and Doppler-shift attenuation methods using the multidetector array Euroball. The excited states of ^{134}Pr were populated via the reaction ^{119}Sn(^{19}F,4n)^{134}Pr at a beam energy of 88 MeV.

We have used advanced methods [3,4] for the analysis of the γ-ray line-shapes observed in RDDS and DSAM measurements of nuclear lifetimes. In the case of the RDDS measurement, the finite slowing-down time of the recoils in the stopper was taken into account in the lifetime determination. Ten lifetimes in the g.s.b. and five in the second chiral candidate band were determined. These are the first experimentally obtained absolute transition strengths which allow a check of the existence of chirality of nuclear rotation. For both B(M1) and B(E2) values, the obtained experimental absolute transition strengths are in qualitative agreement with the predictions of the theory of Döenau and Frauendorf. The behavior of these strengths with spin is also very similar in the two chiral bands. Thus, chirality in nuclear rotation is confirmed for the first time by the experimental electromagnetic transition strengths.

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