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Tilted Precession Bands in 133Ce and 131Ba

Most nuclei that exist in nature have deformed nuclear shapes. In the A = 130 mass region, nuclei are predicted to show triaxial nuclear shapes at low spins and therefore provide a rich testing ground for nuclear structure theories. Triaxial nuclei have unequal nuclear matter distribution along the three principle nuclear axes. Unlike axially symmetric nuclei, triaxial nuclei can rotate around all three nuclear axes simultaneously which gives rise to 3D Tilted Precession (TiP) bands [1, 2].

Here results from two experiments are presented. The first experiment was carried out in 2019 using the AFRODITE array at iThemba LABS. A new excited rotational band based on the neutron orbital in 133Ce was discovered. Quasiparticle-plus-Triaxial Rot (QTR)or model calculations suggest that the new band has the same intrinsic configuration as the yrast band, but different rotational angular momentum. In general, the bands correspond to a gradual re-alignment of the angular momentum of the valence neutron towards the intermediate axis as the spin increases. Experimental observables including the signature splitting, the excitation energies, the mixing ratios, and the transitional probability ratios of the new band in 133Ce are compared the QTR model and an interpretation of the band as a TiP band is proposed.

The data set from the iThemba LABS experiment also revealed a new positive-parity rotational band based on the neutron orbital in 133Ce. The second experiment, aiming at study of 131Ba , was carried out at the XTU Tandem accelerator of Laborotori Nazionali di Legnaro, Italy. This experiment revealed a new positive-parity rotational band based on the neutron orbital. The Nilsson configuration was assigned to both bands in 133Ce and 131Ba. A comparison of the experimentally observed signature splitting and excitation energies with theoretical calculations using the QTR model revealed that an interplay between the effects of triaxiality and the Coriolis associated with single particle s1/2 contributions. This interplay determines the features of the observed bands in 133Ce and 131Ba [3, 4].

1. E. A. Lawrie, O. Shirinda, and C. M. Petrache, Tilted Precession and Wobbling in Triaxial Nuclei," Phys. Rev. C, vol. 101, p. 034306, Mar 2020. [Online]. Available: https://link.aps.org/doi/10.1103/PhysRevC.101.034306
2. B. F. Lv, C. M. Petrache, E. A. Lawrie, et al. , "Tilted Precession Bands in 135Nd," Phys. Rev. C, vol. 103, p. 044308, Apr 2021. [Online]. Available: https://link.aps.org/doi/10.1103/PhysRevC.103.044308
3. B. Ding, C. M. Petrache, S. Guo, E. A. Lawrie, I. Wakudyanaye, et al., Phys. Rev. C, vol. 104, p. 064304, Dec 2021. https://link.aps.org/doi/10.1103/PhysRevC.104.064304
4. I. Wakudyanaye, "Triaxiality and Rotational Bands in 133Ce", MSc. Thesis, University of the Western Cape, 2021. https://etd.uwc.ac.za/handle/11394/8922

Apply to be considered for a student ; award (Yes / No)?

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