

Frontiers in Gamma Ray Spectroscopy

FIG18

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Test of Chirality in ^{130}La using lifetime measurement

Content :

Many nuclei near mass 130- with two nearly degenerate bands- were earlier established to have Chiral symmetry. But the electromagnetic selection rules for the inter-band and intra-band transitions provide the stringent criteria for the bands to be qualified as Chiral [1, 2]. The reduced transition probabilities, the $B(E2)$ values follow the identical pattern for the two Chiral bands, whereas the $B(M1)$ values alternate between the low and high values for intra-band as well as inter-band transitions. While ^{128}Cs showed the expected behavior, ^{132}La deviated from the selection rules [3]. To ensure Chirality for the existing two nearly degenerate bands in ^{130}La [4, 5] on the basis of the suggested selection rule, we performed an experiment at the Inter University Accelerator Center (IUAC), New Delhi. The Indian National Gamma Array (INGA) (with 18 Compton suppressed clover HPGe detectors) was utilized. A self-supporting ^{116}Cd target (thickness $\sim 4.6 \text{ mg/cm}^2$) was bombarded with the ^{19}F beam at energy 94 MeV. The nucleus ^{130}La was formed via reaction $^{116}\text{Cd}(^{19}\text{F}, 5n)^{130}\text{La}$ with the maximum cross-section. Three asymmetric matrices corresponding to detectors in the forward, backward and 90° angles were constructed. The gamma transitions belonging to the proposed Chiral bands [4] were clearly identified in the projected spectrum with gates on two low lying 137 keV and 279 keV transitions. The initial lineshape fitting has been done for many states and tentative values of the lifetimes were found in the picosecond range using Doppler shift attenuation method (DSAM). A rigorous data analysis is in progress and the results will be presented.

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