Shapes and symmetries in $A \sim 130$ nuclei: A perspective through measured transition probabilities

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Abstract

The triaxial nuclear shapes often give rise to signature splitting, and inversion can occur due to shape change. We investigated the triaxial nuclei $^{126}$I [1], $^{129}$Cs [2] and $^{127}$I from the B(E2) values, by measuring the lifetimes (in ps) using Doppler Shift Attenuation Method (DSAM). The stable beams of $^7$Li and $^{11}$B, delivered by the Pelletron accelerators at TIFR (Mumbai, India) and IUAC (New Delhi, India), were bombarded on enriched targets of $^{124}$Sn. The experimental set-up consisted of 15-18 Compton suppressed HPGe clover detectors.

The figure (left) presents an example of DSAM lineshapes for $^{127}$I in the forward ($32^\circ$), backward ($148^\circ$), and $90^\circ$ detectors. The right figure shows the signature splittings and inversion for $\pi g_{7/2}$ bands; however, no inversion occurs for $^{129}$Cs. Our measured B(E2) values were within the range 0.1-0.6 e$^2$b$^2$. We compared the signature splittings, inversion and B(E2) values with the theoretical particle rotor model (PRM) estimates, and extracted the nuclear deformation ($\beta$, $\gamma$ in Lund convention). There was a larger shape asymmetry found for $^{127}$I ($\beta=0.23$, $\bar{\gamma}=33^\circ$) than for $^{129}$Cs ($\beta=0.15$, $\gamma=18^\circ$) [2].

References