

# Frontiers in Gamma Ray Spectroscopy

## FIG18

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## Exploring nature of collectivity in Lu nuclei with mass $A \sim 165$ via lifetime measurements

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### Content :

The Lu nuclei ( $A = 161 - 167$ ) present normal deformed prolate shape near ground state but assume strongly deformed triaxial shapes (TSD) [1] at  $I \geq 25 \hbar$ . The origin of large triaxiality ( $\gamma \sim 150^\circ$ ) giving TSD bands at high spins in Lu nuclei, though difficult to describe, is rather important in order to understand.

Interestingly, beyond  $^{167}\text{Lu}$  [2], no other higher mass Lu nuclei has shown any TSD band at high excitation. This further complicates the issue of the origin of triaxiality. Experimentally, information about triaxiality can be obtained either by observing decoupled bands and evaluating their signature splitting, as has been done for the yrast  $9/2^-$  band in  $^{163-165}\text{Lu}$  [3] or by measuring the quadrupole moment of the band as done in  $^{165}\text{Lu}$  [3]. However, the signature splitting as observed in  $^{163-165}\text{Lu}$  can also be due to K-mixing [3, 4] in axially deformed nuclei. The quadrupole moment on the other hand, depends upon deformation parameter ( $\beta^2$ ) and triaxiality parameter ( $\gamma$ ) and therefore provides a more reliable test of axial asymmetry of the nucleus. Due to this reason, the quadrupole moment of the yrast band in  $^{167}\text{Lu}$  was determined using RDM lifetime measurement technique.

The experiment was done at the Inter University Accelerator Center (IUAC), New Delhi, using  $^{159}\text{Tb}(^{12}\text{C}, 4n)^{167}\text{Lu}$  reaction at a beam energy of  $E_{\text{lab}} = 74 \text{ MeV}$ . The results of the measurement are very encouraging. Comparison of experimental  $Q_t$  values with the values of  $Q_t$  extracted using ( $\beta^2$ ,  $\gamma$ ) values obtained through total routhian surfaces (TRS) calculations, agree at low spins but tend to differ at higher spins suggesting a small involvement of triaxiality in  $^{167}\text{Lu}$ . The detailed analysis of the results and conclusions drawn will be discussed during the presentation.

### References

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3. K. Andgren, Z. Podolya\_k, A. Dewald, et al., Phys. Rev. C, 71 (2005) 014312.
4. H. Amro, G.B. Hagemann, W.C. Ma, et al., Phys. Rev. 325 C, 71 (2005) 011302(R).

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