Lifetime measurements in ^{167}Lu

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The nuclei in the mass region A ~165 are known to be strongly deformed in their ground state but found to observe strongly deformed triaxial character at high spins. In the experimental investigation so far a number of triaxial strongly deformed (TSD) bands have been observed in Lu, Hf, Ta and Tm nuclei at high spins [1-4]. In most of these nuclei, the TSD bands are found to be based on the strongly deformation driving proton $i_{13/2}$ orbital. So, the presence of a high j, strongly deformation driving orbital seems to be necessary condition to observe such high spin phenomena. However, the observation of TSD bands based on different configurations in ^{160,161}Tm [5] tends to negate this condition and therefore complicates the theoretical interpretation of such important high spin phenomena. To have a better understanding of the observed low spins and high spin properties in these nuclei the deformation measurements as a function of spins are needed. In Lu nuclei, (the best known cases of TSD and wobbling excitations), the non-observation of TSD bands for A > 169, indicate the changing structural properties in this nuclei with neutron number. So to find the answer to many such important structural issues and also to track the changes in shape from strongly prolate to strongly triaxially deformed shape, the B(E2) measurements are needed in the Lu nuclei. In case of ^{169}Lu nucleus, the analysis of signature splitting [6] suggests the existence of stable triaxial shapes at normal deformation. To test this with conformity, transitional quadrupole moment needs to be measured in ^{167}Lu nucleus. So, with this motivation, a recoil distance Doppler shift lifetime measurement (RDM) [7] has been performed in ^{167}Lu nucleus using the plunger setup present at IUAC.

In the experiment the high spin states of the ^{167}Lu isotope was populated using the heavy ion fusion reaction ^{159}Tb (^{12}C,4n) at beam energy of 74 MeV. The target of thickness ~1mg/cm^2 was and the stopper of thickness ~8mg/cm^2 was used in the experiment. To detect gamma rays the GDA setup consisting of 12 HPGe detectors were used. The data in singles mode was taken at 16 target-stopper distances ranging from 10 - 2000 μm.The data analysis have been done using LIFETIME code.

The preliminary results obtained from the data analysis do indicate a very promising picture for this nucleus. A plot of the experimentally obtained quadrupole deformation parameter (β_2) as a function of rotational frequency ($\hbar\omega$) is shown in Figure 1.

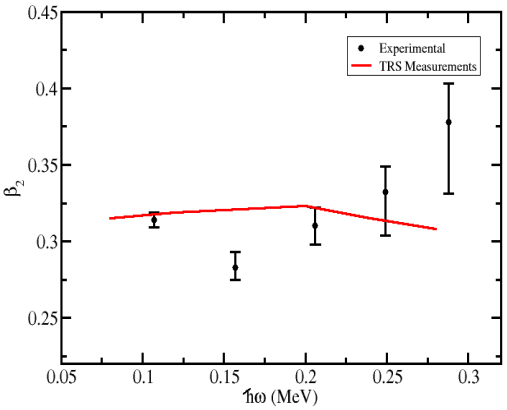

Fig.1. Variation of experimental and TRS calculated β_2 with $\hbar\omega$.

The detailed discussion of the data analysis and the results obtained will be done at the time of presentation during the conference.

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