Gamma spectroscopy of ^{155}Ho

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Introduction

The generation of angular momentum in the atomic nucleus has been a topical question in nuclear spectroscopy, especially at the extreme values, now routinely accessible with large highly efficient multi-detector γ -ray spectrometers. Heavy rare-earth nuclei with neutron number $N \sim 90$ are amongst the best candidates for the study of normally deformed ($\beta 2 \leq 0.2$) level-structure to high spin. At very high spins ($\leq 50\hbar$) super deformations are predicted in nuclei whereas at spin below 40 ħ there is known to be a competition among several shapes, approximately spherical, weakly deformed oblate and moderately deformed prolate. As the angular momentum increases in this mass region, the prolate nuclei exhibit dramatic Coriolis-induced alignments of both neutron and proton pairs along yrast lines. As more and more valence nucleons align with the axis of rotation, a larger fraction of the nuclear spin is generated by single-particle *noncollective* contributions. Eventually, the angular momentum is wholly generated by the single-particle contributions of a finite number of valence nucleons outside a closed spherical (doubly magic) core.

Several odd- A nuclei were studied in this region. ^{157}Er, ^{155}Dy ^{157}Ho were studied up to high spins, band termination phenomenon was also established. The present nucleus ^{155}Ho (Z=67, N=88) is also a candidate to check the different structural features observed in this region. ^{155}Ho was studied previously by H. Helppi.et al. [1]. They extended both the negative parity favored and unfavored sequences up to 59/2- and 61/2- respectively. Other side bands were also established but they could not assign the spin and parities. Hence the present study aimed to explore the high spin structures of ^{155}Ho and is interested in searching the possibility of band terminating structures.

Experimental Procedure:

The reaction ^{124}Sn(^{35}Cl,4n) was used to produce high spin states in ^{155}Ho with a target of thickness 1 mg/cm^2 on Pb backing of 12mg/cm^2 using the 15-UD Pelletron Accelerator at Inter University Accelerator Center, New Delhi. The experiment utilized the Indian National Gamma Array (INGA)[2] consisting of 18 clover detectors. Singles γ-ray spectra were collected at beam energies of 150 and 145 MeV for excitation function measurement. The γ- γ coincidences were recorded with a beam energy of 145 MeV and the beam current was 0.5 pnA . Total of around 1.4 million 2-fold events were collected using online data acquisition system CANDLE [3].

Data analysis & Results : A two fold coincidence matrix with energy dispersion 0.5 keV was constructed after proper gain matching and Doppler correction using **CANDLE** software, and the data is being analyzed using **RADWARE**, several gates were set on different

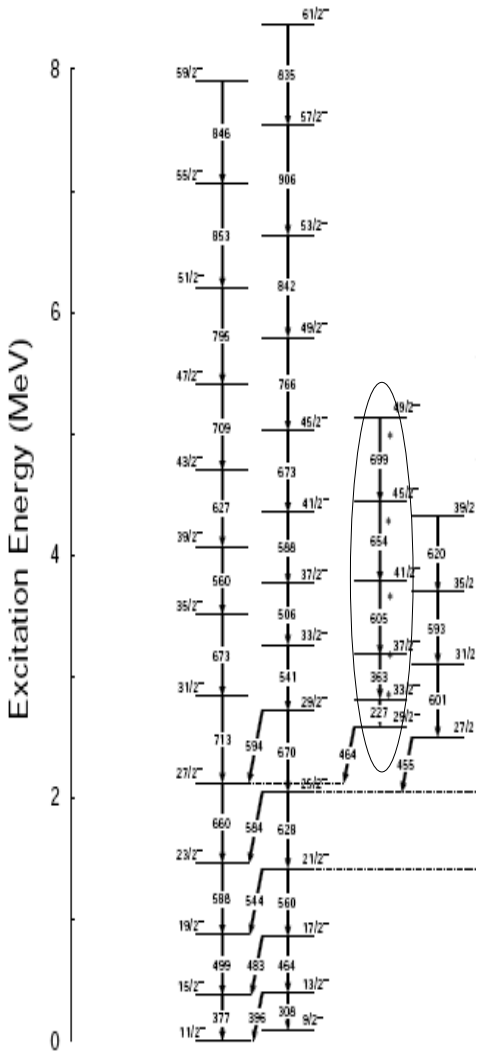

Fig 1: Partial level scheme of ^{155}Ho

γ energies to construct level scheme of ^{155}Ho. A two-dimensional angular correlation matrix was also constructed from coincidence data with 148 degree detectors on one axis and a 90 degree detectors on the other axis to obtain the DCO ratios.

The partial level schme obtained in the present work is shown in Fig 1. The de-excited gamma rays were placed in the level scheme based on the coincidence, energy summing, intensity relationship. The present study conforms all the levels reported by the H.Helppi.et al . A new side band was established connecting to yrast negative parity band at 29/2- with level energy 2588keV. This side band is extended to (45/2-). The data analysis of polarization matrix are in progress. Further analysis is in progress regarding alignment plots and CNS calculations which will be more helpful in discussion about the structural changes of the present nucleus.

Aknowledgement

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