

## Polarization Asymmetry Measurements for the Yrast Band of $^{85}\text{Rb}$

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### Introduction

The mass  $A \approx 80$  transitional nuclei have recently been the focus of many experimental and theoretical studies. Interesting phenomena such as the magnetic rotation, superdeformation, loss of collectivity, band termination, and shape related effects have been identified in many of these nuclei. The structure of the Rb isotopes has been seen to vary from collective to nearly spherical with the increase in the neutron number towards  $N = 50$ . We note that the previous information in  $^{85}\text{Rb}$  for spin and parity (yrast band) is incomplete [1, 2]. We, therefore, obtained the structure information of  $^{85}\text{Rb}$  in order to understand the evolution of nuclear structure in  $Z = 37$  isotopes. The results of the nuclear structure (spin and parity) of  $^{85}\text{Rb}$  obtained from present study are reported here.

### Experimental Detail

The high spin states of  $^{85}\text{Rb}$  were populated in the  $^{76}\text{Ge}(^{13}\text{C},p3n)^{85}\text{Rb}$  reaction at a beam energy of 45 MeV obtained from the 14 UD Pelletron Linac Facility at TIFR Mumbai. A  $^{76}\text{Ge}$  target of thickness  $\approx 850\mu\text{g}/\text{cm}^2$  (isotopically enriched to 99.90%) with a backing of  $^{181}\text{Ta}$  (thickness  $\approx 7.04\text{ mg}/\text{cm}^2$ ) was used. The gamma-rays were detected using Indian

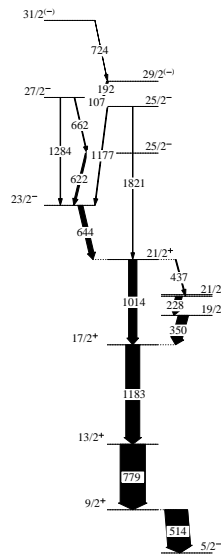


FIG. 1: Partial nuclear structure of Rb-85 obtained from the present work.

National Gamma Array (INGA). The array consists of 15 Compton-suppressed clover detectors arranged in spherical geometry with 3, 2, 2, 4, 2 and 2 number of clovers placed at  $157^\circ$ ,  $140^\circ$ ,  $115^\circ$ ,  $90^\circ$ ,  $65^\circ$  and  $40^\circ$  with respect to the beam direction, respectively. The distance from the target to crystal is 25 cm. The two fold clover coincidence events were recorded in a fast digital acquisition (DDAQ) system based on Pixie-16 modules by XIA-

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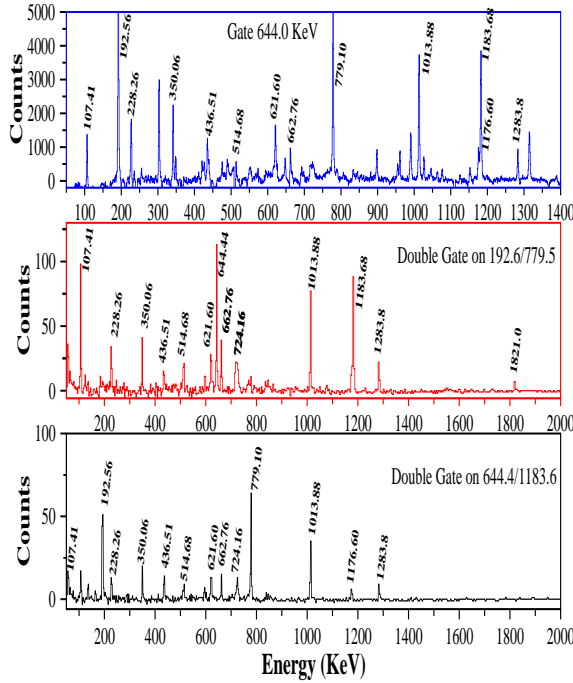


FIG. 2: Example of double gated spectrum for the  $\gamma$ -rays belong to  $^{85}\text{Rb}$ .

LLC Software. A total of about  $1.2 \times 10^9$  two and higher fold events were recorded. The data was sorted using in-house programs and analysed by using the software DAMM. The coincidence events were sorted into a  $\gamma-\gamma$  matrices and cubes matrices and were analyzed with the RADWARE software package. The other matrices were made to get DCO and polarization asymmetry.

### Results and Discussion

We have confirmed previous known level scheme and assigned spin parity for the partial level scheme of  $^{85}\text{Rb}$  upto 6.0 MeV excitation energy and spin value around  $31/2^{(-)}$ , as shown in Fig. 1. The high-spin part of the  $^{85}\text{Rb}$  level scheme, as shown in Fig. 1, consists of the  $\gamma$ -rays above  $21/2^{+}$ . The cascade of 779-1183-1014  $\gamma$ -rays belongs to the ground band. The level scheme above  $21/2^{+}$ , comprising the negative parity states, is shown in Fig. 1 whose spin and parity has been assigned

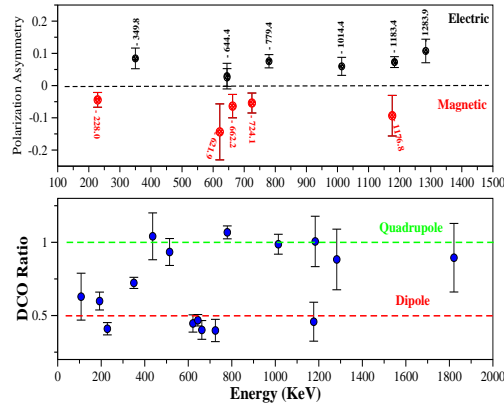


FIG. 3: Figure shows the polarization asymmetry ( $\Delta$ ) of various transitions.

in this work. These comprise seven states located between 3.0 and 6.0 MeV and constitute a group of levels consisting of 644, 621, 662, 1821, 1176, 107.0, 1284, 192, and 724  $\gamma$ -rays. Most of the transitions have been observed to be in coincidence with the 779-keV, depopulating the lower level. These transitions have also been seen in the gates (as shown in Fig. 2), and are placed above the 3.0 MeV level from coincidence relationships, anti-coincidence relationships and intensity balance considerations. The spins and parities of these high spin states were assigned from DCO and polarization asymmetry as shown Fig. 3.

### Acknowledgments

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### References

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