

Spin assignment of a dipole band in ^{104}Ag

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Introduction

Nuclei in $A \approx 100$ region have drawn lot of attention in recent times due to existence of various dynamical symmetries. For example, collective excitations like wobbling, chirality, magnetic and antimagnetic rotation have been reported in these nuclei along with non-collective single-particle excitations, mainly associated with $\pi g_{9/2}$ and $\nu(d_{5/2}, g_{7/2}, h_{11/2})$ orbitals, available near Fermi surface.

The *odd-odd* Ag isotopes, having three proton-holes below the $Z = 50$ shell closure and few neutron-particles above $N = 50$ shell closure, exhibit small deformation. Previously, the structure of ^{104}Ag was studied via both light and heavy ions (*viz.*, ^4He , ^{11}B , ^{12}C and ^{35}Cl) induced fusion-evaporation reactions [1–4]. Various phenomenon like magnetic and electric quadrupole rotation, nuclear chirality and single particle excitation have been reported in ^{104}Ag nucleus [1, 3]. A dipole band of sequence of five γ -transitions has been reported above $I^\pi = 2^+$ state at 7 keV [1]. The spin and parity of the states are tentatively assigned, except the band-head. There-

fore, an attempt has been made to determine the DCO ratio of the γ -rays, so that, the spin of these states can be confirmed.

Experimental Details

The high spin states of ^{104}Ag were populated using $^{76}\text{Ge}(^{32}\text{S}, p3n\gamma)$ fusion-evaporation reaction at a beam energy of 110 MeV. The beam was delivered by TIFR-BARC Pelletron facility at Mumbai. Isotopically enriched ^{76}Ge ($500 \mu\text{g}/\text{cm}^2$) was evaporated on Au foil ($26 \text{mg}/\text{cm}^2$) to form the target. A thin layer of Al ($11 \mu\text{g}/\text{cm}^2$) was used in between the target and backing as an adhesive. The de-exciting γ rays were detected by the Indian National Gamma Array (INGA) at TIFR [5], having 18 clover detectors during this experiment. The detector were mounted at six different angles, *viz.*, 40° , 65° , 90° , 115° , 140° and 157° , with respect to beam direction.

Data Analysis and Results

The data were sorted in γ - γ matrix. The matrix is being analyzed using RADWARE program and all known γ is conformed in their previous placement. The asymmetric angular correlation matrix is formed in order to obtain directional correlation oriented states (DCO) ratio. The directional correlation ori-

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ented states ratio is defined as:

$$R_{\text{DCO}} = \frac{I_{\gamma_1} \text{ at } (140 \text{ or } 40)^\circ \text{ gated on } \gamma_2 \text{ at } 90^\circ}{I_{\gamma_1} \text{ at } 90^\circ \text{ gated on } \gamma_2 \text{ at } (140 \text{ or } 40)^\circ}$$

The DCO ratio helps to assign spins of levels. If the gate is on a stretched dipole transition, then DCO ratio for a stretched dipole (quadrupole) transition was found to be ≈ 1 (≈ 2). On the other hand, if the gate is on a stretched quadrupole transition, then DCO ratio for a stretched quadrupole (dipole) transition was found to be ≈ 1 (≈ 0.5). The band at excitation energy 7 KeV and band head spin of 2^+ might be mixing of the $\pi g_{9/2} \otimes \nu d_{5/2}$ and $\pi g_{9/2} \otimes \nu g_{7/2}$ configurations as reported in earlier study [1]. Band based on 2^+ states at 7 KeV excitation energy in ^{104}Ag is shown in Fig.1. Fig.2 shows γ ray spectrum showing members of the band in the gate on transition 124 KeV. The spin-parity assignment for this band was tentative. We have determined the spin-parity based on DCO measurements. The values of DCO ratios determined from this study is tabulated in Table I.

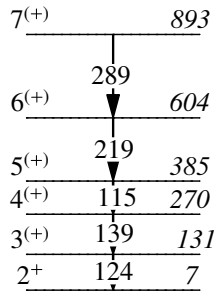


FIG. 1: Band based on 2^+ states at 7 KeV excitation energy in ^{104}Ag .

Present angular correlation measurement confirms the dipole nature of the γ rays of this band. Spin of five states, belong to the band of present interest, have been confirmed on the basis of present DCO ratios. Further data analysis is underway. Details of the results will be discussed during the symposium.

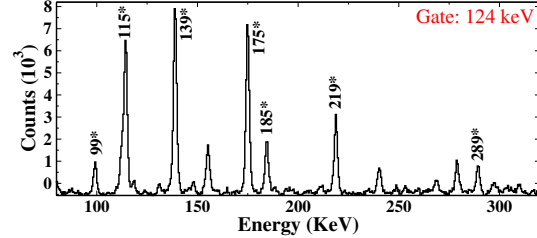


FIG. 2: γ - γ coincidence spectra with 124 KeV gate in ^{76}Ge ($^{32}\text{S}, p3n\gamma$) reaction.

TABLE I: γ -rays transition, level energy, DCO ratio and their assignment in ^{104}Ag

E_γ	E_{Level}	R_{DCO}	$J_i^\pi \rightarrow J_f^\pi$
115	385	1.08 ± 0.16	$4^+ \rightarrow 5^+$
124	131	1.35 ± 0.21	$2^+ \rightarrow 3^+$
139	270	0.99 ± 0.18	$3^+ \rightarrow 4^+$
219	604	0.76 ± 0.11	$5^+ \rightarrow 6^+$
289	289	1.04 ± 0.60	$6^+ \rightarrow 7^+$

Acknowledgement

We would like to acknowledge BARC-TIFR pelletron staff for delivering stable beam of ^{32}S during the experiment. We acknowledge the help of all INGA collaboration. Authors gratefully acknowledge Department of Science and Technology (DST) for INGA project (No.IR/S2/PF-30/2003-II) and CSIR for financial support. This work was supported by the National Science Foundation (Grant No. PHY-1068192 and PHY-1713857) and by the APS-IUSSTF Physics Student and Post-doc Visitation Program.

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