High spin spectroscopy of ^{106}Ag

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Introduction

It has already been established that the observed signature splitting in the ground state bands of ^{109,110}Ag can only be accounted by assuming triaxial deformation in these nuclei [1]. In addition, all the Ag isotopes have doublet bands and in most of the cases their moments of inertia are different. But in none of these bands, the transition rates have been measured. It may also be noted that the ground state band of ^{104}Ag was found to originate due to Shears mechanism [2] while the same band in ^{110}Ag originates due to collective rotation of a triaxial core [1]. So it is also interesting to measure the transition rates in the ground state band of ^{106}Ag in order to ascertain whether it originates due to the Shears mechanism or due to the collective rotation. With this motivation high spin states of ^{106}Ag were populated.

Experiment

The high spin states of ^{106}Ag were populated through ^{96}Zr(^{14}N, 4n) reaction using the 68 MeV ^{14}N beam from the 14-UD Pelletron at TIFR. The target was made of 1 mg/cm^2 85% enriched ^{96}Zr on 9 mg/cm^2 ^{206}Pb backing. The beam current was about 9 nA. The γ rays were detected in the upgraded Indian National Gamma Array (INGA) which consisted of 20 Compton suppressed clover detectors arranged in six rings with three at 23°, two at 40°, two at 60°, four at 90°, three at 120°, three at 140° and three at 157° with respect to the beam direction. Two or higher fold coincidences were collected by a fast data acquisition system based on Pixie-16 modules of XIA LLS [3]. A total of 5×10^8 $\gamma-\gamma-\gamma$ coincidences were collected. The time stamped data were sorted using the data sorting routine, MARCOS, developed at TIFR with a time window of 200 ns to construct $\gamma-\gamma$ matrices and $\gamma-\gamma-\gamma$ cube.

Data Analysis

The partial level scheme established from the present analysis has four high spin bands of which the positive parity ground state band has been established up to I^π=25$^+$ while the three negative parity bands have been established up to I^π=19$^-$ (Band 1), 22$^-$ (Band 2) and 24$^-$ (Band 3).

The intensities, multipolarities and the parities of the γ transitions were established. There is a high degree of correlation among the different excited levels of the four bands as each band de-excites to the low spin levels through multiple transitions and for all the high spin states, the cross over $E2$ transition corresponds to a pair of $M1$ transitions. Thus, the present partial level scheme has been well established and is shown in Fig. 1. The lifetimes of all the high spin levels have been measured using the DSAM technique [4]

Discussion

Bands 1 and 2 form a doublet. The comparison of experimental values with TPSM for these two bands seem to indicate that these 2-*qp* bands arise due to a triaxial deformed core. The comparison between the numerical results of SPAC and the experimental routhians and the transition rates of Band 3 seems to indicate that the Band 3 originates due to an interplay of shears mechanism and the collective rotation. This band exhibits a band crossing

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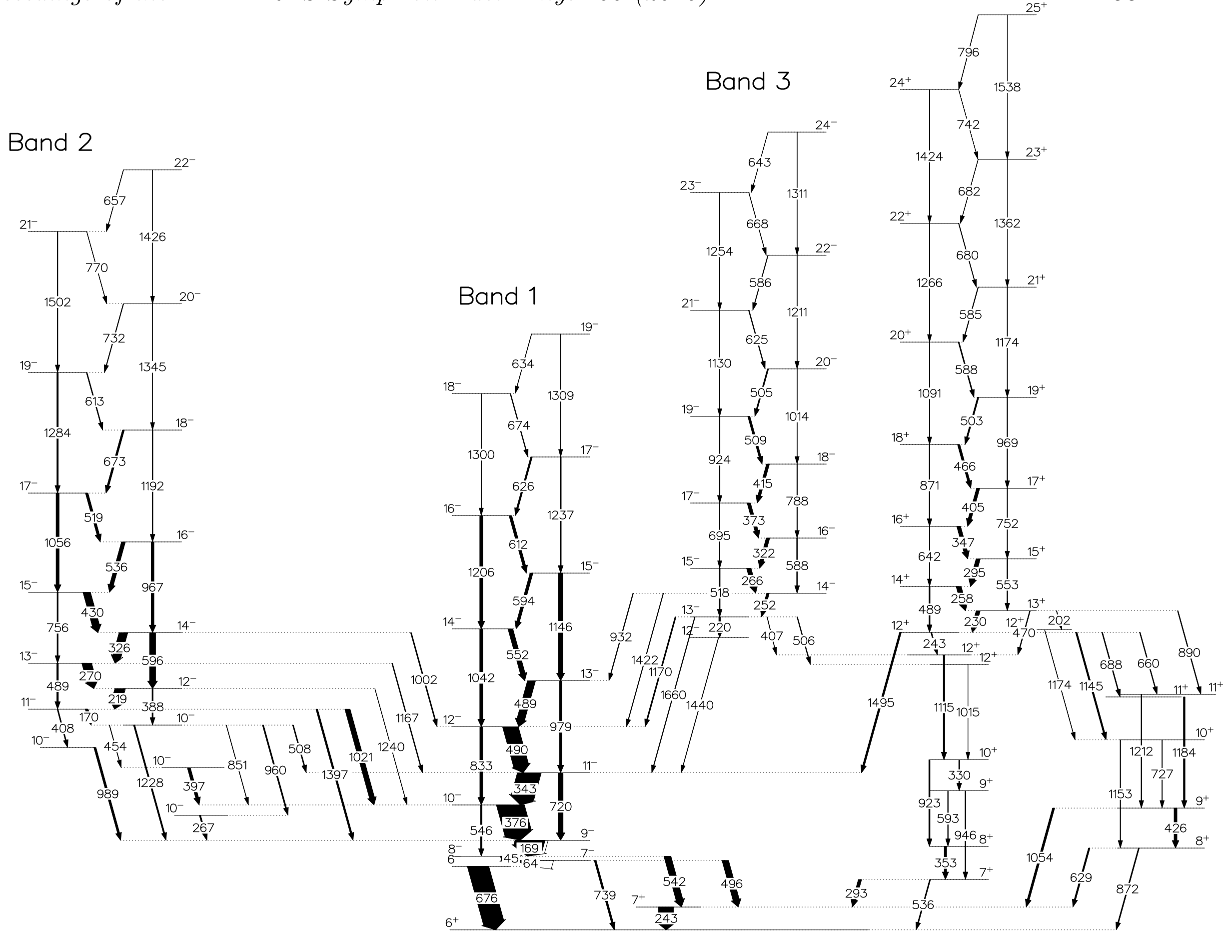

FIG. 1: The partial level scheme of ^{106}Ag established from the present work.

at I=19 $\hbar$ which is also reproduced by SPAC calculations. The positive parity Band 4 also originates from this interplay but does not exhibit any band crossing till the observed spin 26 $\hbar$. For the SPAC calculations, a prolate core with $\beta \sim$0.14 has been assumed for both Band 3 and Band 4 which gives the collective contribution to the angular momentum generation in these bands.

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