Bulgarian Journal of Physics vol. **XX** (20XX) 1–5

High Spin Spectroscopy of ^{105}In

G. Gayathri, **D. Negi***, and **INGA collaboration**
Department of Physics, Manipal Institute of Technology,
Manipal Academy of Higher Education, Manipal 576104, Karnataka, India
*Corresponding author Email: dinesh.negi@manipal.edu

Received *24 April 2024*

Abstract. In the present work, a study of the magnetic dipole bands in ^{105}In is carried out. High-spin states of ^{105}In have been investigated using gamma-ray spectroscopic methods. Experiment was carried out using the INGA setup at TIFR, India. Data from the above experiment were sorted and analysed using the RADWARE package. We have identified few new transitions belonging to ^{105}In.

1 Introduction

A perfect quantum sphere does not rotate, since it has no preferred direction for measuring orientations according to quantum mechanics. The discovery of rotation-like band of magnetic dipole (M1) transitions in near spherical nuclei indicates the presence of breaking of rotational symmetry [1, 2]. The discovery of magnetic dipole (M1) transitions indicates that the states in such bands possessed similar parity. One of the earliest instances of such sequences discovered were in Pb isotopes. Similar bands have now been discovered in nuclei in different mass regions across the nuclear chart. Shear mechanism has been put forward in explaining these new nuclear excitations. According to this mechanism protons- and neutrons-particles/holes form configurations called as blades. The angular momenta of these blades are aligned perpendicular to each other at the band-head, and gradually align towards each as we move up the band in excitation energy. This work reports on the analysis of results on ^{105}In obtained from an experiment performed at TIFR using the INGA setup [3]. The present level scheme has been analysed and compared with the latest one [4].

2 Experimental Procedure/Methodology

The experimental procedure involves rolling a 1 mg/cm^2 thick ^{92}Mo on a 10 mg/cm^2 gold (Au) backing. Using the pelletron-LINAC facility at TIFR, Mumbai, a ^{16}O beam at 75 MeV was directed onto the ^{92}Mo target. Around the target chamber, 15 Clover type HPGe detectors were arranged to detect gamma-rays emitted

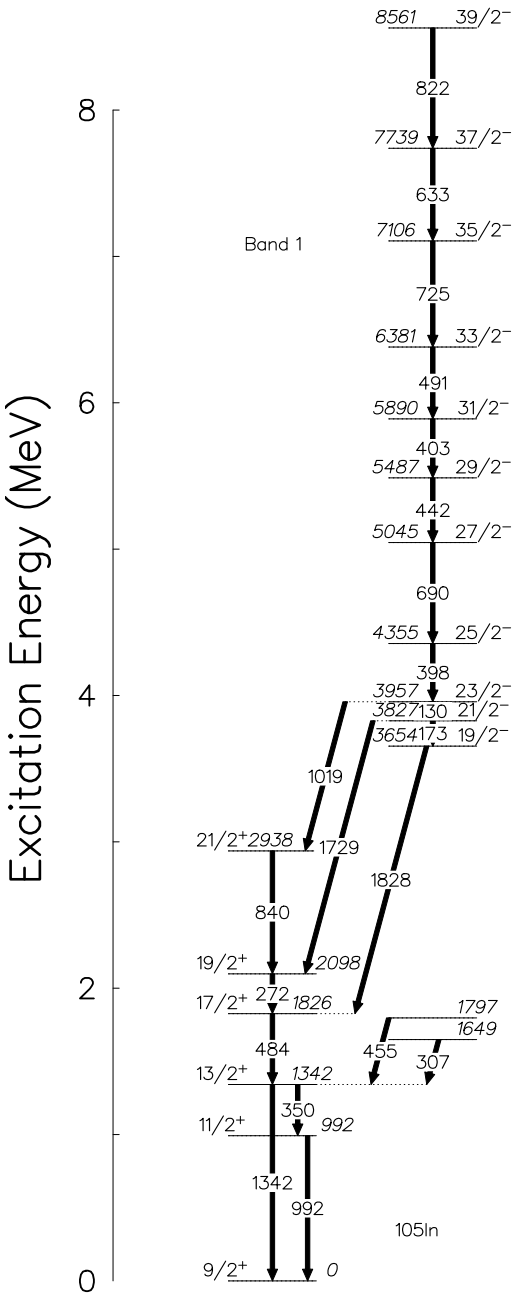

Figure 1. Level scheme of ^{105}In.

from the reaction. After data sorting and gain matching, gamma-ray coincidence spectra are analysed to identify transitions belonging to ^{105}In and other nuclei. Gamma-gamma coincidence analysis was carried out using the software package RADWARE.

3 Results and Discussion

A partial level scheme from the current analysis is shown in Figure 1. This is in overall agreement with the level scheme published earlier [4]. Coincidence spectrum showing the gamma transitions of the band are also shown in Figure 2, where the gate has been placed on the 1342-keV transition. For the extension of the band 1 (see Figure 1), search for new transitions is made. Two such candidate transitions are 455- and 307-keV. These transitions are observed in coincidence with all the transitions of band 1. However, both these transitions are observed not to be in coincidence with the 1730-keV transition (see Figures 3 and 4). This indicates their placement below the bandhead of band 1, thereby introducing two new levels at 1649 and 1797 keV.

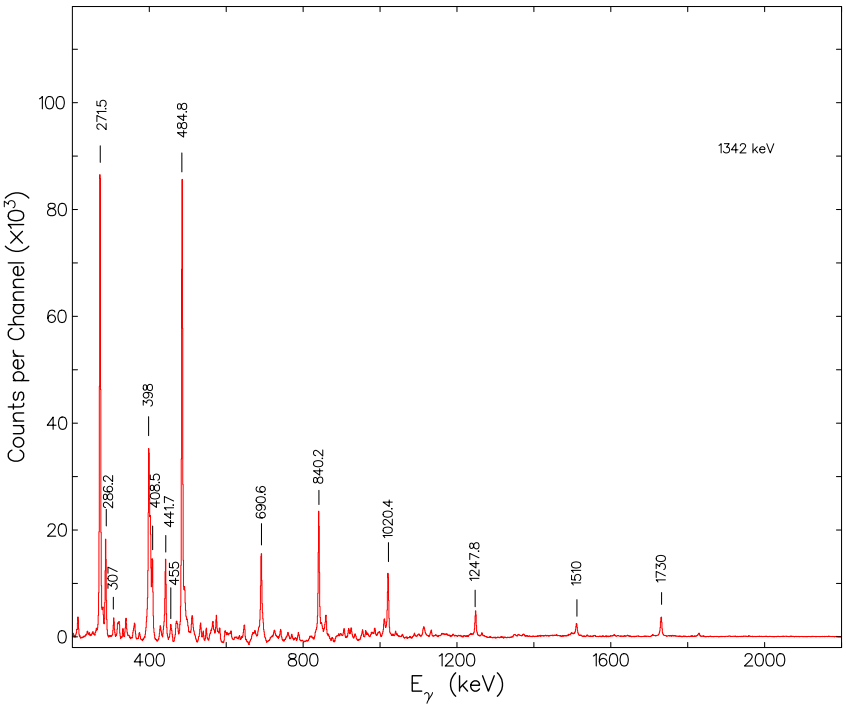

Figure 2. Gamma-ray spectrum with gate on 1342-keV transition.

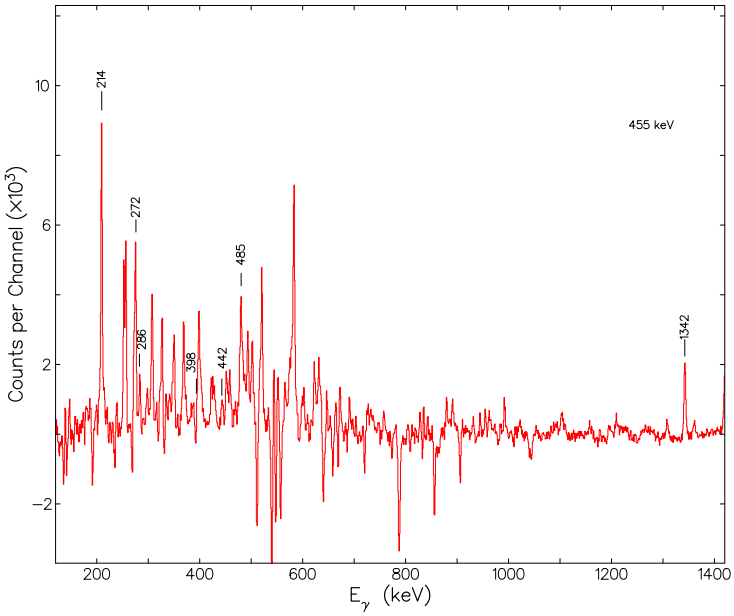

Figure 3. Gamma-ray spectrum with gate on 435-keV transition.

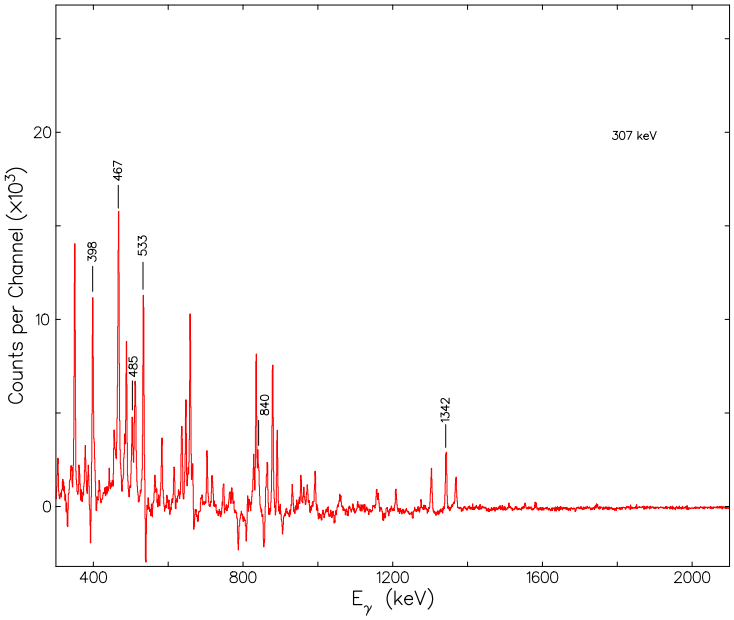

Figure 4. Gamma-ray spectrum with gate on 307-keV transition.

4 Conclusion

We have verified the level scheme of Ref. [4]. Two new levels are added to the level scheme.

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