High Spin Spectroscopy of ^{105}Pd

Niyaz Rather[1],* P. Datta[2], Santosh Roy[1], S. Chattopadhyay[1], A. Goswami[1], S. Nag[3], R. Palit[4], S. Saha[4], and T. Trevadi[4]
[1]*High Energy Nuclear and Particle Physics Division,SINP Kolkata-700064, India*
[2]*Ananda Mohan College, Kolkata-700009, India.*
[3]*IIT Kharagpur, West Bengal, India and*
[4]*Tata Institute of Fundamental Research, Mumbai-400005, India*

The high spin behaviour of nuclei in mass∼100 region has been studied extensively in recent times. These studies seem to indicate that the lower boundary for the observation of magnetic rotation is the Ag isotopes [1]. On the other hand the upper boundary for chirality seems to be the Rh isotopes as no chiral bands have been found in ^{105}Ag [2]. Thus, it is interesting to study the odd mass isotopes of the intermediate nuclei, namely Pd. In the present communication, we report the high spin structure of ^{105}Pd.

The high spin states of ^{105}Pd were populated via $^{96}Zr(^{13}C, 4n)$ reaction using the TIFR-BARC accelerator. The 63 MeV ^{13}C beam was bombarded on enriched target of thickness 1 mg/cm^2 of ^{96}Zr which was backed by Pb of thickness 9 mg/cm^2. The γ-rays were detected in the INGA spectrometer [3] which consisted of eighteen Compton suppressed clover detectors.

The coincidence data has been arranged in a symmetrized matrix and in a cube. The simultaneous analysis of the cube and the matrix were used to develop the level scheme as shown in fig. 1. The relative intensities of the γ rays were obtained from the detectors placed in the 90° ring. The spins and the parities of excited levels were obtained from DCO and PDCO ratios, respectively. It is to be that the low spin levels are consistent with the previously known level scheme [4].

Band 1 is a positive parity band built on $\nu(g_{7/2}, d_{5/2})^1$ configuration which shows a sharp alignment with a large gain of 6$\hbar$. This is consistent with EF alignment and thus the high spin states beyond $27/2^+$ level has a neutron configuration of $\nu[(g_{7/2}, d_{5/2})^1 \otimes h^2_{11/2}]$. It is worth noting to note that AMR band in ^{105}Cd has been reproduced with similar neutron configuration with two proton holes in $g_{9/2}$. Thus, it will be interesting to investigate whether ^{105}Pd can exhibit AMR with four proton holes in $g_{9/2}$. Measurements of level lifetimes of this band using DSAM is currently being pursued.

The negative parity Band 3 is built on $\nu h^1_{11/2}$ configuration. It exhibits a delayed crossing at $\hbar\omega$ ∼0.5 MeV as compared to Band 1 but has similar alignment gain. Thus, the probable high spin configuration for this band is $\nu h^3_{11/2}$. The observed FG crossing frequency is consistent with CSM calculation. Band 2 is a 3-qp band which displays a slow alignment with small gain and this may be related to proton AB crossing. Thus the high spin configuration is expected to be $\nu[(g_{7/2}, d_{5/2})^2\ h^1_{11/2} \otimes \pi g^2_{9/2}$.

Band 4 and 5 are also negative parity bands but due to inadequate data they can not be established to higher spins. Therefore, to establish their single particle configurations, we need additional spectroscopic information which may come from level lifetime measurements.

Bands 6 and 7 are quasi-γ bands which are associated with γ-soft triaxial deformation. Similar bands have been found in ^{102}Ru [5] and ^{104}Pd [6].

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*Electronic address: niyaz.rather@saha.ac.in

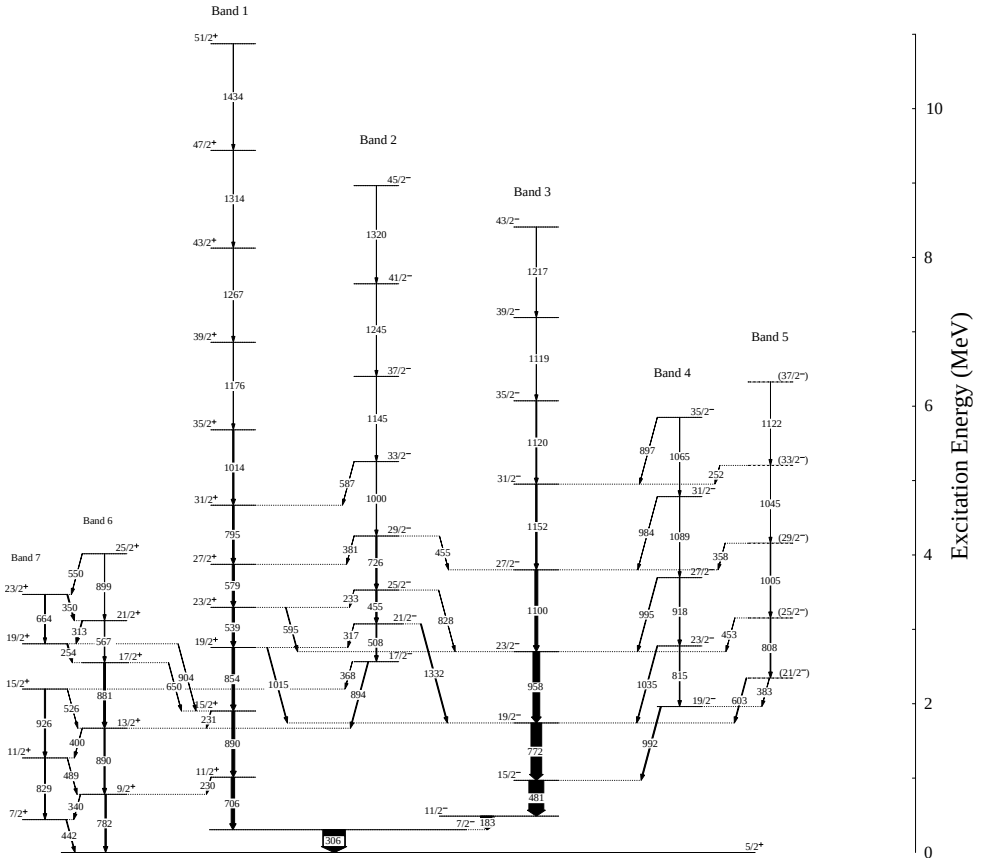

FIG. 1: Partial level scheme of ^{105}Pd.

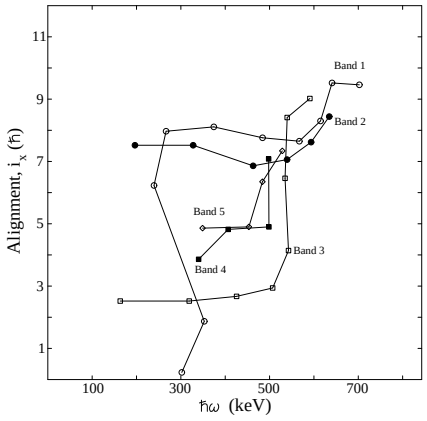

FIG. 2: Alignment plot for negative party bands of ^{105}Pd.

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