Investigation of low lying states of ^{124}Te

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Introduction

The spectroscopic study of transitional nuclei is a subject of interest because band structures of these nuclei show a variety of structural phenomena, such as signature splitting, signature inversion, deformation aligned rotation bands, magnetic and anti-magnetic rotational band, wobbling band etc. Transitional nuclei from the A $\sim$ 130 mass region, are known for triaxial behaviour. Triaxiality is induced due to the availability of $\nu h_{11/2}$ and $\pi g_{7/2}$, $\pi h_{11/2}$ orbitals, near Fermi surface. These orbitals induce triaxiality, due to opposite shape driving forces. In this mass region, low lying states of Te-nuclei showed vibrational as well rotational behaviour. In tellurium nuclei, the case of ^{124}Te nucleus is most important, because the $E(5)-$critical point symmetry was predicted [1]. Previously, the low lying states were suggested to be associated with the vibrational character and states above that showed successive alignment of pairs of two protons of $g_{7/2}$orbital and two neutrons from $h_{11/2}$ orbitals, respectively.

Recently, the $\gamma-$soft behaviour of ^{124}Te was predicted, due to the observation of even and odd spin members of quasi-γ bands [2]. Also, the $E(5)-$critical point symmetry was observed, based on the energy staggering factors of quasi$-\gamma$ band. This study was based on positive parity band structures. However, to add a value to the band structure of ^{124}Te, investigation of negative parity bands is also required. Hence, negative parity states were investigated in the present work.

Experimental Details

High spin states of ^{124}Te were populated using ^{122}Sn(^{9}Be, α3n)^{124}Te fusion evaporation reaction. The ^{9}Be beam with 48 MeV beam energy, were accelerated using 15UD tandem accelerator facility [3, 4] at IUAC, New Delhi. The experiment was performed on INGA array [5] containing 14 Compton suppressed Clover detectors. The data were recorded with two or higher fold coincidence relationship. Off-line data analysis has been carried out using the INGA-sort [6] and Radware analysis packages. The details of experimental set-up and analysis procedure were given in *refs.* [2, 7]

Results and Discussion

The placement of energy levels has been done using the $\gamma - \gamma-$coincidence relationship. The spin and parity of levels have been assigned using the results of angular correlations and linear polarization asymmetry measurements. The partial level scheme obtained from the present analysis is shown in figure 1. At present, 5 new sequences of negative parity states were established, as marked band 2

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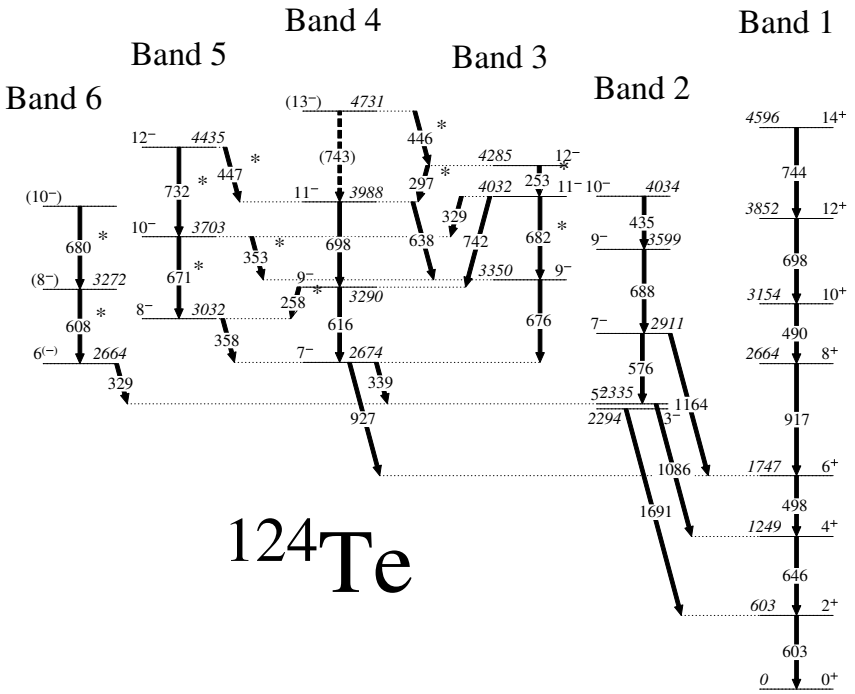

FIG. 1: Partial level scheme of ^{124}Te, established from the present work, here asteriks (∗) marked are newly placed transitions.

to band 6 in figure 1. The positive parity is shown for establishing connecting transitions decaying from the negative parity states, although the properties of this band were discussed earlier [2]. New results will be discussed during the symposium.

The present study of negative parity states is useful, to provide further information regarding the involvement of multi-quasiparticles configurations.

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