Angular Correlation Measurements of ^{128}Te

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Introduction

Excited states of even mass Tellurium isotopes have been extensively studied by β- and γ-spectroscopic techniques and also by neutron capture and inelastic scattering experiments [5,10]. Te nuclei have two protons lying in $\pi g_{7/2}$ or $\pi d_{5/2}$ orbitals, outside of the major shell at Z= 50. The two protons are assumed to move in the field of spherical core, and perform harmonic oscillations around it [1]. The observation the triplet 0^+, 2^+, 4^+ states at twice the energy of the first 2^+ state in $^{114\text{-}134}$Te nuclei also indicate about the vibrational nature of these nuclei. Several negative parity states have also been observed in $^{122\text{-}130}$Te nuclei [4]. The 5^- and 7^- states in these nuclei are suggested to have non collective nature based on the trend of the energy difference between them similar to the trend of energy difference of the neutron $s_{1/2}$ and $d_{3/2}$ states in the neighbouring odd mass Te nuclei [5]. There is no other study about the structure of the negative parity states in Te nuclei and no much data exist about the band structure above these states. The aim of the present work is to investigate the band structures of the negative parity states in ^{128}Te.

Experimental Details

In-beam γ-ray spectroscopy of ^{126}Te has been carried out using the ^{7}Li beam from the 15UD Pelletron accelerator facility at Inter University Accelerator Center, New Delhi [6,7]. The high spin states were populated via ^{124}Sn(^{7}Li, p4nγ)^{126}Te fusion-evaporation reaction at 33 MeV. Fifteen Compton suppressed clover detectors of Indian National Gamma Array (INGA) [8] were used to detect the de-exciting γ-rays. The offline data analysis has been carried out using the computer code INGA-sort [9]. A number of matrices have been formed by sorting of the gain matched list mode data in order to carry out the γ-γ coincidence and angular correlation data analysis.

Results and Analysis:

Several energy gates were made from the γ-γ coincidence matrix in order to place the γ-rays in the levels scheme of ^{128}Te. A typical energy gated spectrum of the 753 keV γ-ray has been shown in figure 1, in which γ-transitions of ^{128}Te have been marked.

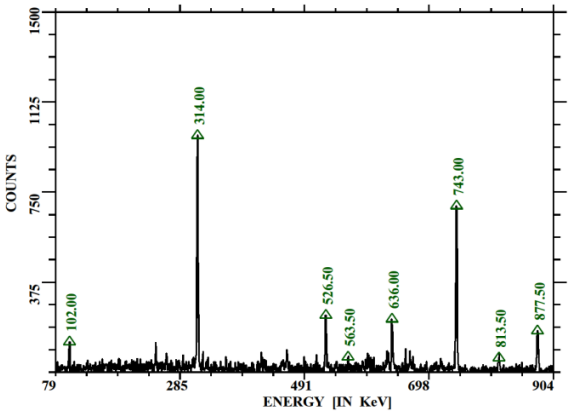

Figure 1. Plot shows coincidence γ-transitions of ^{128}Te gated with 753 keV γ-transition.

The multi-polarity of several γ-rays have been determined from the Directional Correlation of Oriented states (DCO) ratio which is obtained from angular correlation measurement as per following:

$$R_{DCO} = \frac{I_{\gamma 1} at\ \theta_1\ gated\ by\ \gamma_2\ at\ \theta_2}{I_{\gamma 1} at\ \theta_2\ gated\ by\ \gamma_2\ at\ \theta_1}$$

where, θ_1 is extreme forward angle of the clover detectors in the INGA array and θ_2 is 90°. The present values of R_{DCO} is obtained about 1 753, 314 and 813 keV γ-transitions from the gate on the stretched quadrupole transition of 743 keV(as shown in figure 2.). These results confirm the quadrupole nature of 753, 314 and 813 keV γ-transitions which

also agrees with the previous angular distribution measurements. The R_{DCO} values is found to be less than 1 for 526, 636 keV γ-transitions and confirm the dipole nature of these transitions. [5].

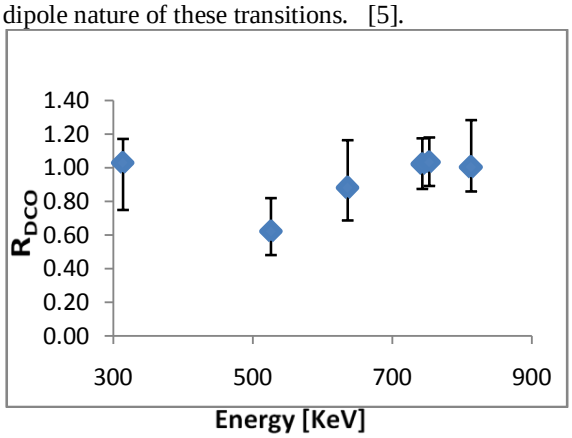

Figure 2. Plot shows the R_{DCO} values of several transitions belonging to ^{128}Te, determined from the energy gate on the 743 keV streched quadrupole transition.

Further analysis of the experimental data for R_{DCO} and polarization measurement is under way and results will be shown during the symposium.

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