Excited States in ^{96}Tc

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Introduction

The transitional nuclei with Z < 50 and A ~100 are characterized by a small quadrupole deformation and a γ-soft potential at low and moderate spin. For the nuclei approaching Z=50 from below, the proton Fermi surface lies near the oblate-driving high-Ω orbitals of the intruder $\pi g_{9/2}$ subshell. Strongly prolate-driving low-Ω $\upsilon h_{11/2}$ subshell orbitals are accessible at low excitation energies for the nuclei receding the N=50 shell closure. The phenomenon of band termination has been extensively studied. The Specific noncollective aligned states with the nuclear spin made up completely from angular momentum contribution of the particles and holes in open shells, are able to compete energetically with weakly deformed collective structures in the vicinity of the Z=50 shell closure. In this region the theoretically band termination has been analyzed mainly based on the configuration-dependent cranked Nillson-Strutinsky approach. As the $\nu h_{11/2}$ and $\nu d_{5/2}$ orbitals being near the Fermi surface, octupole collectivity is expected to be observed in this region [1].

Experimental Details

Excited states in ^{96}Tc nucleus were populated in the ^{75}As (^{28}Si, 4p3n) fusion-evaporation reaction at E_{lab}=120 MeV. The de-excitations have been investigated through in-beam γ-ray spectroscopic techniques. The ^{28}Si beam was delivered by the 15UD Pelletron accelerator at Inter University Accelerator Center (IUAC), New Delhi. The ^{75}As target of thickness 3 mg/cm^2 was prepared onto a 10 mg/cm^2 thick Pb backing by vacuum evaporation followed by rolling. The recoiling nuclei in the excited states were stopped within target and the deexciting γ-rays were detected using the Indian National Gamma Array (INGA) equipped with 18 clover [2]. A total of about 300 x 10^6 triple or higher- fold coincidence events were recorded in the detectors mounted in five-ring configuration experiment. The data were sorted offline using INGASORT program [2] to produce symmetrised E_γ-E_γ matrices and E_γ-E_γ-E_γ cubes. The clover detectors were calibrated for γ-ray energies and efficiencies using the ^{133}Ba and ^{152}Eu radioactive sources. The data analysis was performed using RADWARE analysis package [3] to establish coincidence relationships for various gamma transitions

Results and Discussion

The present level scheme of ^{96}Tc shown in Fig. 1 is built on the $I^\pi = 7^+$ ground state. The level scheme has been extended substantially with addition of about twenty five new transitions to the earlier reported ones [4-6]. The present level scheme is established up to ~10 MeV excitation energy. Four bands labeled B1-B4 could be identified. The present level scheme preserves major features of the previously observed bands B1-B3 by Ghugre *et al*. [4] and Bucurescu *et al*. [5]. The linking transitions observed in the present work confirm the ordering of the 282, 474 and 938 keV transitions in band B1 as reported by Ghugre *et al.* [4], which differs from that by Bucurescu *et al*. [5]. Multifragmentations observed in the positive parity bands at spins around 18$\hbar$ are indicative of presence of maximally spin aligned states similar to the ones observed recently in ^{101}Rh. The low-lying energy levels labeled as band B4 and reported by Dejesus et al., [6] are confirmed in the present work. Theoretical calculation for the ^{96}Tc nucleus is under process and will be discussed.

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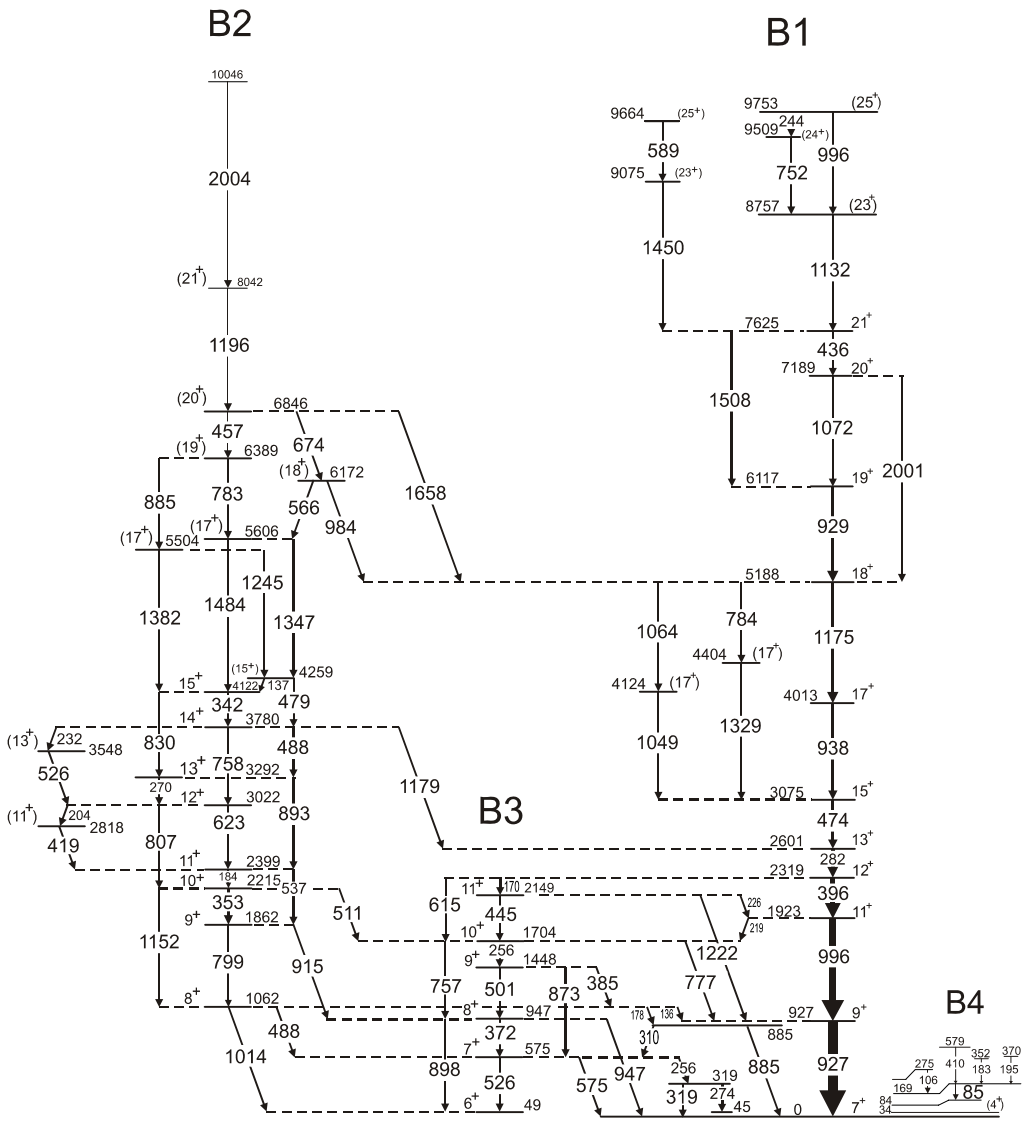

Fig.1. The partial level scheme of ^{96}Tc obtained in the present work.

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