Lifetime measurement and decay spectroscopy of ^{132}I

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The structure of odd-odd nuclei around doubly magic ^{132}Sn is important to understand and develop the effective proton-neutron interaction near the major shell closure. In the present work, the low lying states of odd-odd ^{132}I, which has three proton particles and three neutron holes with respect to the closed shell configuration of ^{132}Sn, have been characterized from decay spectroscopy. From the systematics of odd proton isotopes in this region, the first excited state of ^{132}I is expected to have contribution from the configurations of ($\pi g_{7/2} \otimes \nu d_{3/2}^{-1}$) and ($\pi d_{5/2} \otimes \nu d_{3/2}^{-1}$). Presence of a high spin isomer in ^{132}I is also reported [1], which appears mainly due to the involvement of unique parity intruder $\nu h_{11/2}$ orbital. The life times of the low lying states of ^{132}I, reported in the literature [2,3], have been found to have wide variations. Recently, the half life measurement has been carried out with BaF_2 scintillators from the decay of ^{132}Te radioactive beam [4]. However, BaF_2 detectors, though have a very good time resolution, energy selection is difficult as these detectors do not have a very good energy resolution. The latest generation $LaBr_3$(Ce) scintillators, with its good time resolution as well as good energy resolution can overcome this problem. In the present work, the life times of excited states of ^{132}I have been measured from the decay of ^{132}Te, ($T_{1/2}$=3.204 d) using $LaBr_3$(Ce) scintillators. ^{132}Te was produced as fission product of alpha induced fission of ^{235}U. Alpha beam of 40 MeV was obtained from K-130 cyclotron of Variable Energy Cyclotron Centre (VECC), Kolkata. Radiochemical separation of Te from other fission products was carried out and γ-γ-t coincidence data were collected in LIST mode with a setup of three LaBr3(Ce) detectors. The TAC spectrum corresponding to 228-49 keV cascade is shown in Fig.1. The lifetime of the 49 keV level has been extracted by slope method and was found to be 1.002(7) ns. The decay of the high spin isomer (8^-), which cannot be populated from the decay of ^{132}Te, has been precisely measured by separating Iodine from the fission products and following its IT decay with a Low Energy Photon Spectrometer (LEPS) of segmented planar Ge detector. A representative LEPS spectrum is shown in Fig.2, where 96.7 keV is identified as the isomeric decay transition. The details of the decay properties will be presented.

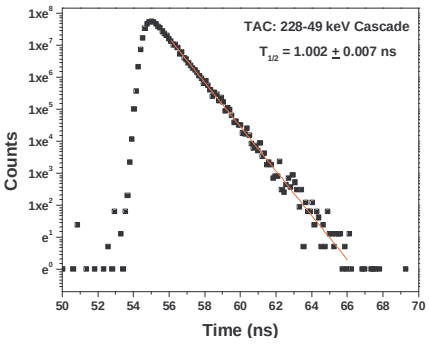

Figure 1: *$LaBr_3$(Ce) TAC spectrum of 228-49 keV*

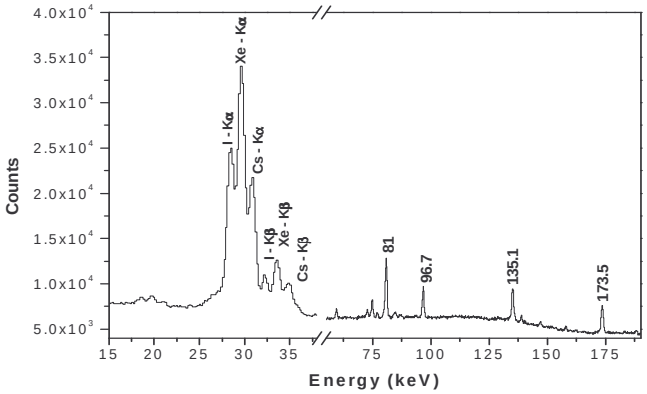

Figure 2: *LEPS spectrum for ^{132}I IT decay*

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