

## β decay of $^{140}\text{Sb}$ : level scheme of $^{140}\text{Te}^\dagger$

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We report the first observation of the level structure of  $^{140}\text{Te}$  through the β-delayed γ-ray spectroscopy of  $^{140}\text{Sb}$ . The structure of Te with  $N > 82$ , two protons beyond  $Z = 50$ , is expected to provide a wealth of information on the shell evolution in extreme proton-neutron imbalanced environments. Besides, the present work provides valuable inputs for modelling the nucleosynthesis since the  $^{140}\text{Sb}$  decay process is one of important paths along the rapid neutron capture process.

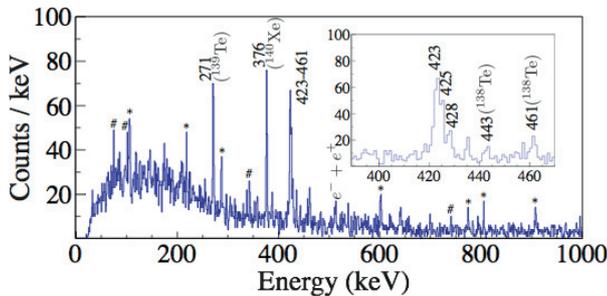


Fig. 1. Singles γ-ray spectrum associated with the β decay of  $^{140}\text{Sb}$  obtained in 2000 ms time interval after ions are implanted on the active target. The inset is a zoomed spectrum in representing the 380 to 470 keV region. Peaks with an asterisk are room- and beam-induced backgrounds from random coincidence with β events. Peaks with a # mark represent unassigned γ rays after decays of Te nuclides.

The parent  $^{140}\text{Sb}$  nuclides were produced by the in-flight fission of a 345 MeV per nucleon  $^{238}\text{U}$  beam on a  $^9\text{Be}$  target and selected by the first stage of the BigRIPS separator. During the beam time, a total of  $7.8 \times 10^3$  ions for  $^{140}\text{Sb}$  were collected among about  $10^7$  total ions. Emitted γ rays, following the β decay of  $^{140}\text{Sb}$  were collected by EURICA, the HPGe array, surrounding the active double-side stripped Si stopper array WAS3ABI<sup>1)</sup>. Figure 1 shows the β-delayed γ-ray spectrum of  $^{140}\text{Sb}$ . The broad peaks around 425 keV are composed of triple photo-peak as shown in the inset of Fig. 1; 423, 425, and 428 keV. On the basis of the γγ coincidence data and γ-ray intensities in the singles spectrum, we propose that the 423- and 425-keV peaks should be assigned as γ-ray transitions in  $^{140}\text{Te}$ .

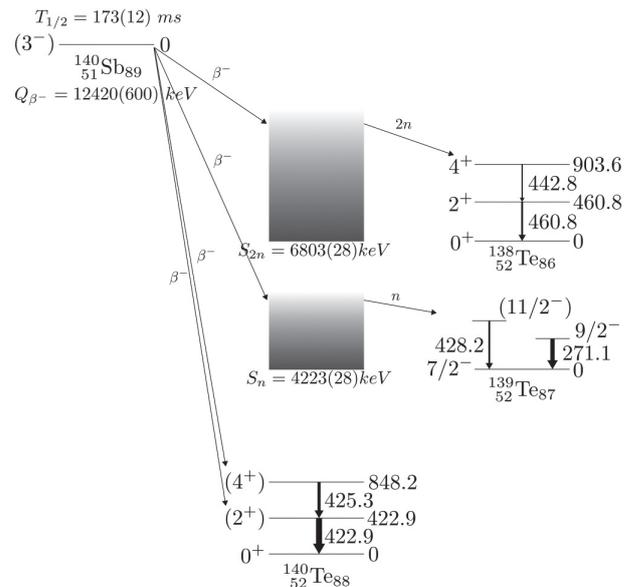


Fig. 2. The β-decay scheme of  $^{140}\text{Sb}$  deduced from the present work. The thicknesses of each transition represent the relative intensities to the 423 keV transition.

As shown in Fig. 2, we successfully identified β-decay scheme, β-delayed one-neutron emission, and β-delayed two-neutron emission channels from the decay of  $^{140}\text{Sb}$ .

### Reference

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