^{100}Sn and Nuclei in its Neighbourhood ◇

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^{100}Sn is a unique case in the nuclear landscape, being doubly magic and the heaviest particle-stable N=Z nucleus. It had been produced and studied already in two FRS experiments [1,2] identifying together eight events. With the improved intensities from the SIS an experiment with good statistics became feasible. We have produced ^{100}Sn and nuclei in its neighbourhood by fragmentation of a 1 A·GeV beam of ^{124}Xe on a Be target. Using rapid cycling of the SIS the average intensity on target was more than 10^9 ions/s. Redundant measurements of energy loss, magnetic rigidity, and flight time in the second half of the FRS allowed a unique identification of the fragments as shown in Fig. 1 for the 15 days of data taking in a ^{100}Sn setting of the FRS. In addition to 244 nuclei of ^{100}Sn we identified for the first time the nuclides ^{95}Cd, ^{97}In and most probably ^{99}Sn. Although we see some events at the location of ^{103}Sb, its half life must be at least a factor of 3 shorter than the flight time through the FRS of 200 ns, in contrast to the literature [3]. The fragments were stopped in a stack of Si detectors. For the correlation of implantation position and time with subsequent decays we used three large area position sensitive Si strip detectors with a total of 7200 pixels. 10 1mm thick Si detectors in front and behind this implantation zone served as calorimeters to measure the β-spectrum and to determine its endpoint.

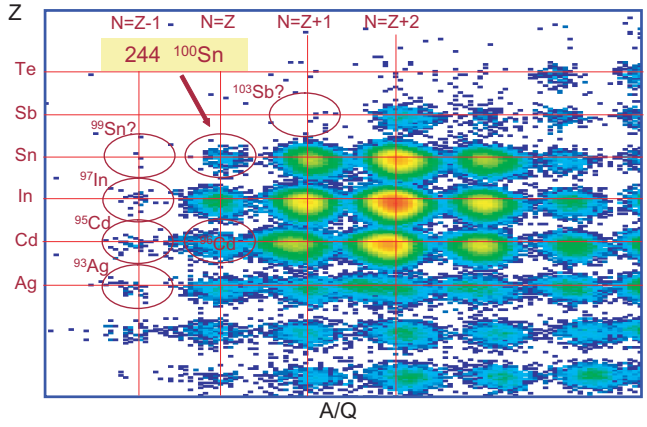

Fig. 1: Nuclides identified in the FRS during the 15 days irradiation in the setting for ^{100}Sn.

The implantation detector was surrounded by the 105 Ge detectors of the RISING array to observe isomeric decays as well as the γ-deexcitation following β-decays. A number of isomeric states was observed. As an example Fig. 2 shows a delayed γ-spectrum for ^{102}Sn, where we found a new isomeric transition. Analysis of the data for position-correlated γ-decays is in progress to extract half-life, β-endpoint energy and decay-γ information.

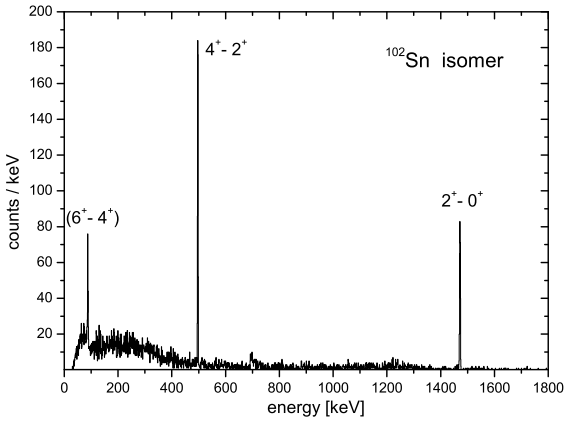

Fig. 2: Delayed γ-spectrum for ^{102}Sn events. The low energy transition was hitherto unknown and could be interpreted as the $6^+ - 4^+$ transition.

References

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