Total absorption gamma spectroscopy studies around ^{100}Sn

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The region around ^{100}Sn in the nuclide chart is considered of great interest. There are several reasons for that: the shell structure of nuclei in the vicinity of the $Z = N = 50$ doubly-closed shell, the possibility of studying the heaviest accessible particle bound $N = Z$ nucleus ^{100}Sn, the study of the quenching of the Gamow-Teller resonance[1,2] and the astrophysical relevance of decays in this region for the rapid proton-capture process (see[3,4] and references therein).

Among the studied nuclei in the region, ^{100}Sn plays a key role. The beta decay of this nucleus and that of nuclei located south east of ^{100}Sn is dominated by the single particle Gamow-Teller transition of $\pi g_{9/2} \to \nu g_{7/2}$, which is expected to be accesible inside the Q_β window of the decay. This can provide a clear case for studying the origin of the quenching of the Gamow-Teller strength (B(GT)), a topic that has attracted considerable attention over many years.[1,2,5,6]

For these kind of studies it is mandatory to use a technique that provides beta decay data that do not suffer from the Pandemonium effect.[7] This is the main motivation of the NP1612-RIBF147 experiment in which we used the total absorption spectrometer DTAS[8] developed for DESPEC (FAIR) for measurements in combination with the implantation detector AIDA.[9]

The beta decay of ^{100}Sn has been previously studied using high resolution experiments at GSI and at RIKEN,[10,11] showing that it has the largest B(GT) value measured in the nuclide chart. The limited statistics and the probable presence of a low-energy gamma ray not identified in previous experiments constrain the reliability of the determination of the excitation energy of the 1^+ state in ^{100}In, the state that should be mainly populated in the beta decay of ^{100}Sn. The excitation energy of this state, as well as the β end-point energy of this transition is crucial for the determination of the B(GT) value. The high efficiency of DTAS and its granularity can contribute to solve this question as shown by Monte Carlo simulations. In this experiment we will also have access to exotic decays that were not previously studied with the total absorption technique at the Mass Separator (MSEP) at GSI because of the limited production. In Fig. 1 we show the particle identification in BigRIPS obtained during our experiment. Due to technical problems we were able to run only 4 days from a total of 10 approved days. The continuation of the experiment is expected in 2020. The analysis of the partial set of data is on going.

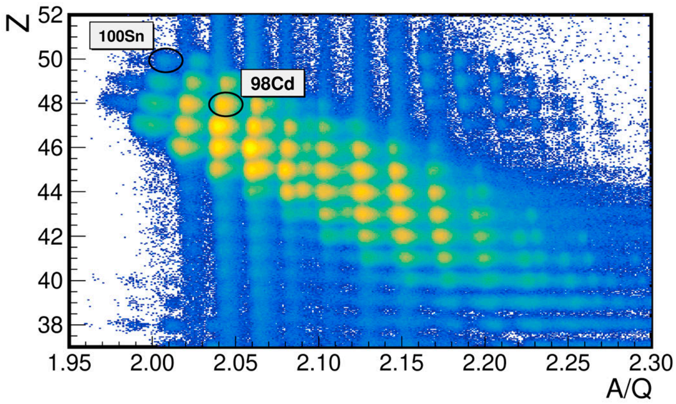

Fig. 1. Particle ID in BigRIPS from the experiment.

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