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Investigation of single-particle states in the 132Sn region: study of the Beta decay of 133In and 134In

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The region of the chart of nuclei close to the doubly-magic nucleus 132Sn has been the object of enormous interest in both experimental and theoretical investigations for the last several years. This activity is well-motivated by the fact that nuclei with large neutron excess are an ideal playground to verify the reliability of shell model predictions for nuclei far from stability. Crossing of the major neutron (N=82) and proton (Z=50) shell closures allows for investigation of single-particle states and interaction strengths in this neutron-rich region.
Our studies focus on the closest neighbours of 132Sn in order to investigate neutron single-particle states: one-neutron particle 133Sn and two-neutron particle 134Sn. A better understanding of the neutron-rich 132Sn region requires not only more data but also more precise.
In June 2016 fast timing and spectroscopy were employed together at the ISOLDE Decay Station to study doubly magic 132Sn and its neighbours, including 132Sn,133Sn and 134Sn nuclei. Sn nuclei were populated in decay of In isomers, produced from a UCx target unit equipped with a neutron converter. Selective isomer ionisation provided by ISOLDE RILIS for odd-A 133In enabled to extend knowledge about the structure of 133Sn, which is the main player to deduce single-particle states in this region. In particular, the analysis of decay branch of 133In in conjuction with -n decay branch of 134In can bring more information about the position of the p1=2 single-particle orbit, for which a strong candidate was proposed [1], while the question about the position of i13=2 still remains open for investigation.
Details of experimental setup and preliminary results will be presented. In comparison to previous measurements exploring 132Sn region, the sensitivity was enhanced thanks to the use of highly efficient clover-type Ge detectors and a new generation of fast timing detectors with LaBr3(Ce) crystals.
[1] P. Hoff et al., Phys. Rev. Lett. 77, 1020 (1996).

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