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Developments at the IGISOL-4 facility

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The ion guide based isotope separator facility in the JYFL accelerator laboratory, the IGISOL, was recently moved to a new location next to the new high intensity proton cyclotron MCC30, thus becoming IGISOL-4, as reported in the previous EMIS conference [1]. The facility has now passed the commissioning phase, which is clearly indicated by more than 60 days of beam time delivered from the K-130 cyclotron for nuclear physics experiments at the IGISOL-4 during 2014. On top of this become the test beams from the new MCC30, which did not launch the scheduled beam delivery yet in 2014.

A major new development since [1] is the neutron converter, based on beryllium target bombarded with protons. The converter is designed to provide a high neutron flux with energy up to tens of MeV at the IGISOL-4 target position [2,3]. This is foreseen as the best way to fully utilize the intense beams from the MCC30 in the studies of exotic neutron rich nuclei [3]. The first tests of the converter have been performed in 2014.

At the IGISOL, the neutron rich, medium mass nuclei are produced for decay spectroscopy studies via charged particle induced fission of natural uranium and thorium. Neutron induced fission is expected to give improved yields of the most neutron-rich species.

We have recently completed independent fission product yield measurements of proton induced fission of uranium and thorium. In this work we have exploited a technique utilizing the unambiguous isotope identification with JYFLTRAP [4]. In the progress of this work we have also gained better understanding of the experimental constraints and the execution of the independent fission yield measurements. The technique is now challenged in the product yield measurements of neutron induced fission of uranium.

In the presentation, the most up-to-date developments of the IGISOL-4 facility will be summarized. The performance of the neutron converter as well as the results of the first neutron-induced fission product yield measurements will be presented.

[1] I.D. Moore, et al: Nucl. Instr. and Meth. in Phys. Res. B 317 (2013) 208-213.
[2] A. Mattera, et al: Nuclear Data Sheets 119, 416 – 418, 2014.
[3] H. Penttilä, et al: J. Korean Phys.Soc. 59 (2011) 1589 - 1592.
[4] H. Penttilä, et al: Nuclear Data Sheets 119, 334 – 337, 2014.

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