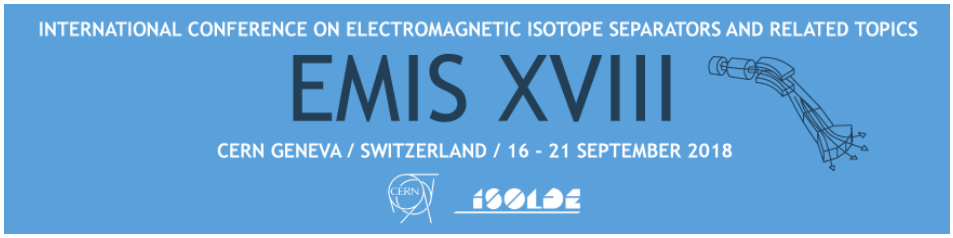

Contribution ID: **70** Type: **Submitted Oral**

Phase-Imaging Ion-Cyclotron-Resonance measurements at JYFLTRAP

Tuesday, 18 September 2018 11:30 (20 minutes)

The studies of short-lived nuclides,far from the valley of stability, require fast and precise mass measurements to elucidate fundamental nuclear properties related to the nuclear mass and binding energy. Many exotic nuclides have isomeric states, therefore, it is necessary to have a high resolving power, sufficient for their separation. The Phase-Imaging Ion-Cyclotron-Resonance (PI-ICR) technique, where the radial ion motion in a Penning trap is projected onto a position-sensitive detector [1], can be used for the separation of states with an energy difference of a few tens of keV in singly-charged ions with half-lives of several 100 ms. The PI-ICR method, implemented at the Penning-trap mass spectrometer JYFLTRAP [2], in combination with the conventional Time-of-Flight Ion-Cyclotron-Resonance (ToF-ICR) technique, allows the exploration of short-lived nuclides for the purposes of nuclear physics, astrophysics, fundamental tests for physics beyond the Standard Model and for rare or weak decays. The PI-ICR method has been used for the identification of isomeric states in ^{88}Tc and ^{76}Cu, and for mass measurements of ^{88m}Tc and ^{48}Mn at JYFLTRAP. The phase dependent cleaning method for preparing isomerically pure beams was developed at JYFLTRAP and demonstrated for the ions $^{127m}Cd^{+}$ and $^{127}Cd^{+}$. This newly developed technique provides new opportunities for post-trap decay spectroscopy measurements. Isotopic yield ratio (IYR) measurements in proton-induced fission of natural uranium using PI-ICR technique at JYFLTRAP have been performed for the first time. The advantage of the PI-ICR method in the IYR determination is that the measurement is done through direct ion counting, which makes it chemically independent and independent of the knowledge of the decay scheme.

[1] S. Eliseev et al., Phys. Rev. Lett. 110, 082501 (2013).
[2] T. Eronen, et al., Eur. Phys. J. A 48, 46 (2012).

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Session Classification: Session 6 - Ion traps and laser techniques

Track Classification: Ion traps and laser techniques