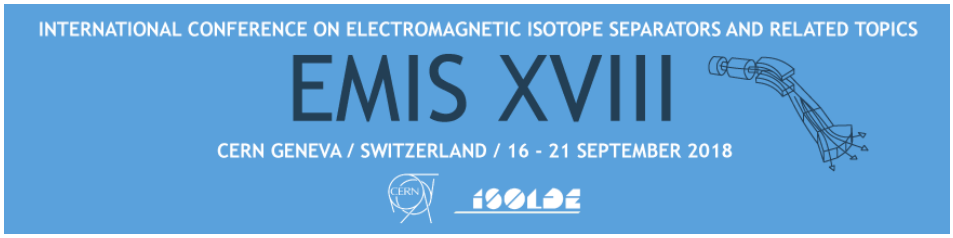

Contribution ID: **181** Type: **Poster**

FRS Ion Catcher: Results and Perspectives

Monday, 17 September 2018 18:18 (1 minute)

The FRS Ion Catcher experiment at GSI enables precision experiments with projectile and fission fragments. The fragments are produced at relativistic energies in the target at the entrance of the fragment separator FRS, spatially separated and energy-bunched in the FRS, slowed-down and thermalized in a cryogenic stopping cell (CSC). A versatile RFQ beamline and diagnostics unit and a high-performance multiple-reflection time-of-flight mass spectrometer (MR-TOF-MS) enable a variety of experiments, including high-precision mass measurements, isomer measurements and mass-selected decay spectroscopy. At the same time the FRS Ion Catcher serves as test facility for the Low-Energy Branch of the Super-FRS at FAIR.
In five experiments with ^{238}U and ^{124}Xe projectile and fission fragments produced at energies in the range from 300 to 1000 MeV/u the performance of the CSC has been characterized. The stopping and extraction efficiencies, the extraction times and the rate capability have been determined, and the charge states and the purity of the extracted ions have been investigated. Based on these studies, a novel concept for the CSC for the LEB has been developed. High-accuracy mass measurements of more than 40 projectile and fission fragments have been performed at mass resolving powers up to 450,000 with production cross-sections down to the microbarn-level and at rates down to a few ions per hour. A novel data analysis method for MR-TOF-MS measurements on rare nuclides has been developed, achieving mass accuracies as good as $6 \cdot 10^{-8}$.
Access to millisecond nuclides has been demonstrated by the first direct mass measurement and mass-selected half-life measurement of ^{215}Po (half-life: 1.78 ms). The versatility of the MR-TOF-MS for isomer research has been demonstrated by the measurements of 15 isomers, determination of excitation energies and the production of an isomeric beam. The isotope-dependence of proton-rich indium isomers has been measured. The determination of isomeric ratios gives access to the study of the mechanisms of projectile fragmentation and fission.
An overview of the latest results and proposed experiments to be carried out with the FRS Ion Catcher during the upcoming beam time period 2018 - 2019 covering mass measurements, beta-delayed neutron emission probabilities and reaction studies with multi-nucleon transfer will be presented.

Primary authors: DICKEL, Timo (GSI Darmstadt); Dr PLASS, Wolfgang R. (GSI Helmholtzzentrum für Schwerionenforschung GmbH, University of Giessen); AMANBAYEV, Daler (JLU Giessen); Mr AYET SAN ANDRES, Samuel (GSI, JLU-Giessen); BECK, Sönke (JLU Giessen); Mr BERGMANN, Julian (JLU-Giessen); CONSTAINTIN, Paul (ELI-NP); EBERT, Jens (JLU Giessen); Prof. GEISSEL, Hans (GSI Helmholtzzentrum für Schwerionenforschung GmbH, University of Giessen); GREINER, Florian (JLU Giessen); HAETTNER, Emma (GSI Helmholtzzentrum für Schwerionenforschung GmbH); Mrs HORNUNG, Christine (JLU); MARDOR, Israel (Soreq NRC); MISKUN, Ivan (JLU Giessen); PIETRI, Stephane (GSI); PURUSHOTHAMAN, Sivaji (GSI Helmholtzzentrum für Schwerionenforschung GmbH); REITER, Moritz Pascal (JLU Giessen); RINK, Ann-Kathrin (JLU Giessen); Prof. SCHEIDENBERGER, Christoph (GSI, JLU-Giessen); WEICK, Helmut (GSI Helmholtzzentrum für Schwerionenforschung); Dr WINFIELD, John S. (GSI Helmholtzzentrum für Schwerionenforschung GmbH); BALABANSKI, Dimiter (IFIN-HH Bucharest (RO)); BAGCHI, Soumya (GSI); DIWISCH, Marcel (JLU Giessen); Mr FINLAY, Andrew (TRIUMF, UBC); KARPOV, Alexander (JINR); KAUR, Satbir (Dalhousie University); KNOEBEL, Ronja (GSI); LIPPERT, Wayne (JLU Giessen); MEI, Bo (ELI-NP); MOORE, Iain (University of Jyväskylä); MÜNZENBERG, Gottfried (GSI Darmstadt); OTTO, Jan-Hendrik (JLU Giessen); PATYK, Zygmunt (National Centre for Nucl. Res., Warszawa); PIKHTELEV, Alexander (BINEP); POHJALAINEN, Ilkka (University of Jyväskylä); PROCHAZKA,

Andrej (GSI, Darmstadt); RAPPOLD, Christophe (GSI Helmholtz Centre for Heavy Ion Research); SAIKO, V. (JINR); SPATARU, Anamaria (ELI-NP); Dr TAKECHI, M. (GSI); Dr TANAKA, Yoshiki (GSI Helmholtzzentrum für Schwerionenforschung GmbH); TOERNQVIST, Hans (GSI & TU Darmstadt); Dr YAVOR, Mikhail (Institute for Analytical Instrumentation, Russian Academy of Science); XU, Xiaodong (GSI)

Presenter: HAETTNER, Emma (GSI Helmholtzzentrum für Schwerionenforschung GmbH)

Session Classification: Poster Session 1

Track Classification: Ion guide, gas catcher, and beam manipulation techniques