The ISOLTRAP electrostatic MR-TOF mass separator

Robert N. Wolf[1]*, Dietrich Beck[2], Klaus Blaum[3], Christine Böhm[3,4], Christopher Borgmann[3], Martin Breitenfeldt[5], R. Burcu Cakirli[3,6], Sebastian George[7], Frank Herfurth[2], Alexander Herlert[8], Magdalena Kowalska[9], Susanne Kreim[3], David Lunney[10], Gerrit Marx[1], Sarah Naimi[11], Dennis Neidherr[3], Marco Rosenbusch[1], Stefan Schwarz[7], Lutz Schweikhard[1], Juliane Stanja[12], Kai Zuber[12]

[1] University of Greifswald, Greifswald, Germany
[2] GSI Helmholtz Centre for Heavy Ion Research GmbH, Darmstadt, Germany
[3] Max Planck Institute for Nuclear Physics, Heidelberg, Germany
[4] ExtreMe Matter Institute, GSI, Darmstadt, Germany
[5] KU Leuven, Leuven, Belgium
[6] Department of Physics, University of Istanbul, Istanbul, Turkey
[7] NSCL, Michigan State University, East Lansing, USA
[8] University of Manchester, Manchester, UK
[9] CERN, Geneva, Switzerland
[10] CSNSM-IN2P3-CNRS, Orsay, France
[11] Nishina Center for Accelerator Based Science RIKEN, Wako, Japan
[12] TU Dresden, Dresden, Germany

Precision mass measurements reaching a relative mass uncertainty of $\delta m/m=10^{-8}$ are performed with ISOLTRAP [1] at the online-isotope separator ISOLDE/CERN. Nuclides with half-lives below 100ms and production yields of less than 1000 ions per second have been studied ranging from light systems – such as ^{17}Ne – to heavy ones – such as ^{229}Rn. The results give insight into numerous aspects of nuclear structure, nucleosynthesis and elementary particle physics.

Isobaric purification of rare-isotope ensembles is a crucial step of precision mass measurements with Penning-trap mass spectrometers. To enhance the purity of radioactive ion beams, a multi-reflection time-of-flight mass separator (MR-TOF MS) developed at the University of Greifswald has been implemented at the ISOLTRAP setup, see figure 1. The MR-TOF MS consists of two electrostatic ion-optical mirrors between which the ions of interest oscillate and are separated from contaminant ions of different mass-over-charge ratios *m/q* [2]. A mass resolving power of R=200,000 and a contaminant reduction of four orders of magnitude by use of a Bradbury-Nielsen ion gate [2,3] have been achieved.

The MR-TOF MS and the modifications of ISOLTRAP components required for its implementation will be described. In addition, the performance of the combined setup achieved in both off-line tests as well as in first applications with radioactive ion beams will be presented.

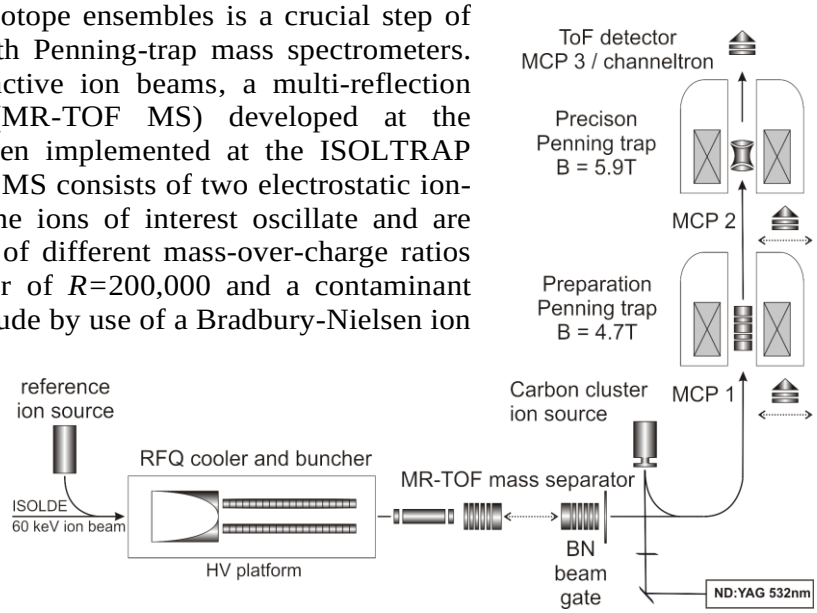

Figure 1. Overview of the ISOLTRAP setup including the MR-TOF MS.

References

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*E-mail: wolf@uni-greifswald.de