Contribution ID: **304** Type: **Invited Presentation**

Charting New Ground with ISOLTRAP: A Survey of Recent Nuclear Binding-energy Studies

Friday, 2 June 2017 11:05 (25 minutes)

In the last years the main experimental approach to the complex nuclear many-body problem has been to track the variation of nuclear properties with the number of protons and neutrons. This justifies the ever-growing number of radioactive ion beam experiments and the great importance of binding energies, which are among the first observables reaching into unexplored regions of the nuclear chart. Their trends are sensitive to a wide range of nuclear-structure phenomena of single-particle or collective type and hence they constitute, for virtually every model, an essential input quantity.
In pioneering the techniques of on-line Penning-trap mass spectrometry, the ISOLTRAP experiment [1] at ISOLDE/CERN has dedicated many years of research to the study of exotic systems at various frontiers of the nuclear chart. In this work some of the most recent results will be presented. The masses of neutron-rich cadmium isotopes around 130Cd are an incursion into the effect of the N = 82 magic number below the tin isotopic chain and its impact on r-process nucleosynthesis [2], while the masses of neutron-rich copper isotopes up to 79Cu give important insight into the evolution of the Z = 28 and N = 50 "shell closures" and the double magicity of 78Ni. Midway between magic numbers, the masses of strontium, rubidium and krypton isotopes beyond N = 60 delineate the "nuclear-shape transition" in the region of nuclides of mass A = 100.
Most of these new measurements have demonstrated the importance of ISOLTRAP's multi-reflection time-of-flight mass spectrometer (MR-TOF MS) [3], either as beam purifier or as mass-measurement apparatus. Since its implementation in the ISOLTRAP setup the MR-TOF MS has become a versatile beam-analysis tool. The variety of applications of the MR-TOF MS, as well as recent advances in the implementation of the phase-imaging ion-cyclotron-resonance technique [4] at ISOLTRAP, will be presented.
References:
[1] Mukherjee et al., Eur. Phys. J. A 35, 1-29 (2008).
[2] D. Atanasov et al., Phys. Rev. Lett. 115, 232501 (2015).
[3] R. Wolf, F. Wienholtz et al., Int. J. Mass. Spectrom. 349-350, 123-133 (2013).
[4] S. Eliseev et al., Phys. Rev. Lett. 110, 082501 (2013).

Primary author: MANEA, Vladimir (CERN, Geneva, Switzerland)

Co-authors: WELKER, Andree (CERN/ TU Dresden); DE ROUBIN, Antoine (MPIK, Heidelberg/ CEN Bordeaux Gradignan); CAKIRLI, Burcu (MPIK, Heidelberg/ Istanbul University); LUNNEY, David (CNRS, Universite de Paris Sud, Orsay); NEIDHERR, Dennis (GSI, Darmstadt, Germany); Mr ATANASOV, Dinko (Max-Planck Institute for Nuclear Physics); KISLER, Dmitry (MPIK, Heidelberg); MINAYA-RAMIREZ, Enrique (MPIK, Heidelberg); Mr HERFURTH, Frank (GSI Helmholtzzentrum für Schwerionenforschung); WIENHOLTZ, Frank (CERN); KARTHEIN, Jonas (MPIK, Heidelberg); ZUBER, Kai (TU Dresden); Prof. BLAUM, Klaus (Max-Planck-Institut für Kernphysik); SCHWEIKHARD, Lutz (University of Greifswald, Germany); Dr KOWALSKA, Magdalena (CERN); Dr ROSENBUSCH, Marco (RIKEN Nishina Center for Accelerator-based Science); Dr BREITENFELDT, Martin (CERN); Mr MOUGEOT, Maxime (CSNSM); ALTHUBITI, Numa (Manchester University, United Kingdom); ASCHER, Pauline (CEN Bordeaux--Gradignan, Gradignan Cedex, France); Dr WOLF, Robert (Max-Planck-Institut für Kernphysik); GEORGE, Sebastian (MPIK, Heidelberg); KREIM, Susanne (MPIK, Heidelberg); Dr COCOLIOS, Thomas Elias (KU Leuven - Instituut

voor Kern- en Stralingsfysica); LITVINOV, Yuri (GSI, Darmstadt, Germany)

Presenter: MANEA, Vladimir (CERN, Geneva, Switzerland)