International Nuclear Physics Conference INPC2013: 2-7 June 2013, Firenze, Italy

Establishing the neutron magic number $N = 32$ with mass measurements of ^{53,54}Ca using ISOLTRAP's MR-TOF MS

S. Kreim[1,2], D. Atanasov[2], D. Beck[3], K. Blaum[2], Ch. Böhm[2], Ch. Borgmann[2], M. Breitenfeldt[4], R. B. Cakirli[2,5], T. E. Cocolios[6], S. Eliseev[2], S. George[7], F. Herfurth[3], A. Herlert[8], M. Kowalska[1], Yu. A. Litvinov[3], D. Lunney[9], V. Manea[9], E. Minaya Ramirez[10,3], S. Naimi[11], D. Neidherr[3], M. Rosenbusch[7], L. Schweikhard[7], J. Stanja[12], F. Wienholtz[7], R. N. Wolf[7], K. Zuber[12]

[1] *CERN, CH-1211 Geneva, Switzerland*
[2] *Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg, Germany*
[3] *GSI Helmholtzzentrum für Schwerionenforschung GmbH, 64291 Darmstadt, Germany*
[4] *Katholieke Universiteit, 3000 Leuven, Belgium*
[5] *University of Istanbul, 334452 Istanbul, Turkey*
[6] *University of Manchester, M13 9PL Manchester, United Kingdom*
[7] *Ernst-Moritz-Arndt-Universität, Institut für Physik, 17487 Greifswald, Germany*
[8] *FAIR GmbH, 64291 Darmstadt, Germany*
[9] *CSNSM-IN2P3-CNRS, Université Paris-Sud, 91406 Orsay, France*
[10] *Helmholtz-Institut Mainz, 55099 Mainz, Germany*
[11] *RIKEN, Saitama 351-0198, Japan*
[12] *Technische Universität Dresden, 01069 Dresden, Germany*

Contact email: *skreim@cern.ch*

To understand the different components of the nuclear force, the investigation of structural effects towards the outskirts of the nuclear chart - like shell-quenching or the emergence of new magic numbers - are of utmost importance. The calcium isotopic chain with a closed proton shell and two doubly-magic nuclei is an ideal test-bench for nuclear shell evolution. It has been extensively studied experimentally as well as theoretically from the valley of stability to the verge of existence. The new mass values of ^{53,54}Ca reported here provide strong evidence for a shell closure at $N = 32$. Moreover, the new masses offer a stringent test for microscopic calculations with three-nucleon forces derived from state-of-the-art chiral effective-field theory.

Precision measurements on radioactive ions are performed with the mass spectrometer ISOLTRAP at CERN. Minute production rates, which are often mixed with huge amounts of isobaric contamination, and millisecond half-lives pose enormous challenges on the experimental setup and often require new experimental techniques. For the measurements discussed in this contribution, the recently installed multi-reflection time-of-flight mass separator (MR-TOF MS) has been used as a spectrometer. The measurements of the calcium isotopes will be presented together with an overview of the enhanced ISOLTRAP setup. It will be discussed how the masses of exotic calcium isotopes pin down nuclear forces.