Contribution ID: **218** Type: **Poster**

High-Precision Mass Measurements with PENTATRAP

Tuesday, 18 October 2016 17:52 (1 minute)

The high-precision Penning-trap mass spectrometer PENTATRAP [1] is currently being commissioned at the Max-Planck-Institut für Kernphysik, Heidelberg. It aims at mass-ratio measurements of stable and long lived highly charged ions with a relative uncertainty of below 10-11, a precision so far only achieved for a few relatively light elements [2].
A unique feature of PENTATRAP is the experimental setup consisting of five cylindrical Penning traps [3], making simultaneous storage of several ion species, the reduction of the systematic errors and simultaneous in-situ calibration as well as reference measurements possible. The mass-ratio measurement is carried out by determining the free-space cyclotron frequency in the strong homogeneous magnetic field of a superconducting magnet. Long storage times due to a cryogenic environment and dedicated image current detection systems [4] with single ion sensitivity will lead to high-precision determinations of cyclotron frequencies in all traps.
Mass data at this level of precision have numerous applications, especially for tests of fundamental interactions and their symmetries, among others in neutrino physics research [5]. One such example is the determination of the Q-value of the electron capture transition in 163Ho to 163Dy in the sub-eV range, where PENTATRAP can contribute to initiatives aiming for an electron-neutrino mass measurement with a few 100 meV uncertainty using microcalorimetric techniques. The later work will be carried out for example within the ECHo collaboration [6], which investigates the de-excitation spectrum following the electron capture in 163Ho. In order to determine the mass, 163Ho needs to be ionized. As this isotope can only be produced in minute quantities a new ion source with lower losses during the ionization process, an electron beam ion trap including the wire-probe technique [7], is being set up at the moment.
The status of PENTATRAP, its technical developments as well as its applications will be presented.

Primary authors: Mr RISCHKA, Alexander (Max-Planck-Insitute für Kernphysik); Ms SCHÜSSLER, Rima (Max-Planck-Insitute für Kernphysik)

Co-authors: Mr SCHWEIGER, Christoph (Max-Planck-Institut für Kernphysik); Mr BEKKER, Hendrik (Max--Planck-Institute für Kernphysik); Dr CRESPO, José (Max-Planck-Institut für Kernphysik); Prof. BLAUM, Klaus Blaum (Max Planck Institut für Kernphysik); Mr DOOR, Menno (Max-Planck-Institut für Kernphysik); Mr FILIANIN, Pavel (Max-Planck-Institut für Kernphysik); Dr ELISEEV, Sergey (Max-Planck-Institut für Kernphysik); Dr ULMER, Stefan (RIKEN); Mr STURM, Sven (Max-Planck-Institut für Kernphysik); Dr NOVIKOV, Yuri (Petersburg Nuclear Physics Institute)

Presenters: Mr RISCHKA, Alexander (Max-Planck-Insitute für Kernphysik); Ms SCHÜSSLER, Rima (Max--Planck-Insitute für Kernphysik)

Session Classification: Poster Session