Contribution ID: **97** Type: **Oral presentation**

Penning trap PENTATRAP for fundamental physics

Thursday 25 May 2023 12:10 (15 minutes)

The Penning-trap mass spectrometer Pentatrap [1] located at the Max Planck Institute for Nuclear Physics in Heidelberg is performing mass-ratio measurements with a relative uncertainty in the 10ˆ−11 regime. One of the unique features of the Pentatrap experiment is the external ion source producing a wide range of charge states from gaseous or solid-state samples down to only 10ˆ15 atoms. the detection systems with single-ion sensitivity and the simultaneous measurements of two out of three eigenfrequencies in two adjacent traps.

Due to its versatility and high accuracy, Pentatrap can contribute to a variety of topics of fundamental physics. Among them are a test of bound-state QED in strong fields, a search for atomic long-lived metastable states in highly charged ions [2], and a search of dark matter by means of isotope shift spectroscopy. The setup overview and the latest results at Pentatrap will be presented.

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1. Repp, J. et al. Appl. Phys. B 107 (2012) 983.
2. Schüssler, R. et al. Nature 581 (2020) 46.

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Session Classification: Thursday 2

Track Classification: precision measurements in fundamental physics, astrophysics and cosmology