



Contribution ID: 195

Type: **Invited Talk**

High-precision Penning-trap experiment PENTATRAP

Wednesday 19 October 2022 12:10 (30 minutes)

High-precision Penning trap mass spectrometry is the most precise technique employed to measure masses of nuclides with half-lives as short as a few ten ms. Currently, there are about a dozen high-precision Penning-trap mass spectrometers located in North America and Europe. The majority of them are part of various Rare Ion Beam (RIB) facilities and aim at measurements of masses of short-lived nuclides with fractional uncertainties down to $1\text{E-}9$. The other group encompasses four ultra-precise Penning trap mass spectrometers. Their major goal are mass-ratio measurements on long-lived and stable nuclides with fractional uncertainties of as small as a few ppt.

In this second group the PENTATRAP experiment is probably the most advanced. It is located at the Max-Planck Institute for nuclear physics and aims to perform mass-ratio measurements on a very broad range of long-lived nuclides to assist, e.g., experiments on the determination of the neutrino mass, on the search for the fifth force, on the investigation of atomic metastable states that can be suitable ion clock transitions and so on. In this talk I will (after a quite detailed introduction of Penning-trap mass spectrometry) present latest achievements and future plans with PENTATRAP.

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Session Classification: Session