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Studies of Highly Charged Ion Ensembles in the ARTEMIS trap and Direct Mass Measurements of Radio-nuclides at SHIPTRAP at GSI, Germany

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Penning traps are high-precision tools for mass spectrometry and spectroscopy experiments. Two such experiments based on Penning traps at the GSI Helmholtz Centre for Heavy Ion Research are: ARTEMIS and SHIPTRAP. The ARTEMIS Penning trap experiment aims to measure the magnetic moment of an electron bound to heavy, highly charged ions using the laser-microwave double-resonance spectroscopy technique with 10^{-9} level of accuracy. These high-precision g-factor measurements would be the most stringent test of QED in the limits of extreme electromagnetic fields of the nucleus. $^{40}Ar^{13+}$ is the first candidate for these high-precision measurements followed by $^{209}Bi^{82+}$. In order to perform the double-resonance spectroscopy, a pure cooled cloud of Ar^{13+} ions needs to be prepared in the spectroscopy trap of ARTEMIS.

The SHIPTRAP mass spectrometer enables high-precision measurements of superheavy and exotic nuclei with rather short half-lives of about 200\,ms and above. These mass measurements are performed using the phase-imaging ion-cyclotron-resonance technique. This talk will present the studies of highly charged argon ions produced in ARTEMIS and high-precision mass measurements of radio-nuclides obtained from the recoil-ion sources: ^{225}Ac and ^{223}Ra, installed in the cryogenic gas cell of SHIPTRAP.

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