

The high-precision Penning trap mass spectrometer PENTATRAP

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Currently, the high-precision Penning trap mass spectrometer PENTATRAP is being built up at the Max-Planck-Institut für Kernphysik, Heidelberg, Germany. It aims at mass-ratio measurements of medium- to high-Z elements with uncertainties of a few parts in 10^{12} . Mass-ratios will be determined by the measurement of cyclotron frequency-ratios in the strong magnetic field of the trap. This will be done with the image current technique: The ions' eigenfrequencies are determined through the detection of the image currents induced in detection circuits by the ions' eigenmotions in the trap. The experiment will host five identical cylindrical Penning traps and will allow for simultaneous cyclotron frequency determinations in all measurement traps. It will feature access to highly charged ions provided by electron beam ion traps. Much effort is invested to stabilize the electric and magnetic trapping fields.

Measurements at PENTATRAP will contribute to various fields of physics. For example, PENTATRAP will provide input parameters for neutrino mass determinations with measurements of Q -values of relevant β -transitions. As another example, it is planned to determine binding-energies in highly charged ions by measuring mass-differences between different charge states, thereby testing QED in the regime of extreme electric fields.

The current status of the experiment as well as future prospects will be outlined.

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