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# Precision Penning-Trap Mass Measurements on Light Nuclei and Highly Charged Heavy Ions

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Masses of light nuclei provide a network of essential parameters used for the fundamental nature description. For example, the mass difference of tritium and helium-3 allows for an independent check of the limit on the electron-antineutrino mass.
The most precise mass measurements of the lightest nuclei, including helium-3, revealed considerable inconsistencies between the values reported by different experiments. In order to provide an independent cross-check, we have performed the most precise measurements of the atomic masses of the proton, the deuteron and the HD+ molecular ion using the multi-Penning trap mass spectrometer LIONTRAP.
PENTATRAP allows for ultra-precise mass measurements on highly charged heavy ions with relative uncertainties in the low 1E-12 region. Among others the excitation energies of low-lying metastable electronic states could be measured by their mass differences to the ground states. Thus, possible new clock transitions in the extreme ultraviolett (XUV) regime could be detected.
The most recent intriguing results by LIONTRAP and PENTATRAP as well as possible applications of these ultra-precise mass data will be presented.

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