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Precision measurements of fundamental properties of atomic particles

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This contribution will provide an overview on recent applications of precision measurements with cooled and stored ions in Penning traps. On the one hand, precision Penning-trap mass measurements provide indispensable information for atomic, nuclear and neutrino physics as well as for testing fundamental symmetries [1,2]. On the other hand, in-trap measurements of the bound-electron g -factor in highly-charged hydrogen-like ions allow for better determination of fundamental constants and for constraining Quantum Electrodynamics [3,4,5]. Furthermore, ongoing preparations for the experimental comparison of the proton and antiproton g -factors will allow us to achieve a crucial test of the Charge-Parity-Time reversal (CPT) symmetry [6,7]. Among others a 13-fold improvement of the atomic mass of the electron by combining a very accurate measurement of the magnetic moment of a single electron bound to a carbon nucleus with a state-of-the-art calculation in the framework of bound-state Quantum Electrodynamics [4] as well as the most stringent test of CPT symmetry on the baryonic sector by a charge-to-mass ratio comparison of the proton and antiproton [8] will be presented.

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