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Abstract for an Invited Paper
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Fundamental tests of nature and a precision measurement of the electron mass¹

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The presentation will provide an overview on recent fundamental 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 neutrino physics and for testing fundamental symmetries. 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. 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 symmetry. Among others a substantial 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 will be presented. The achieved precision of the atomic mass of the electron surpasses the current CODATA value by a factor of 13.

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