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A new mass of the electron

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The g factor of an electron bound to a nucleus depends on the frequency ratio between the Larmor frequency of the electron and the cyclotron frequency of the ion, the ion mass and the electron mass. The high precision g factor measurement on hydrogen-like silicon 28Si13+ with a relative uncertainty of 8.5*10ˆ-10 perfectly agrees with the bound-state quantum electrodynamical calculations (BS-QED) [1]. The uncertainty on the theoretically predicted g factor is dominated by not yet calculated higher order contributions in (Z alpha)ˆn. Due to the relatively small Z of carbon the g factor of hydrogen-like carbon 12C5+ can be predicted with a relative uncertainty of at least 1.5*10ˆ-11. Improvements in our measurement principle [2] enabled the determination of the frequency ratio between Larmor- and cyclotron frequency of 12C5+ to so far unrivalled precision. Trusting in the theoretically predicted g factor this measurement determines the electron mass in atomic units, which is at least one order of magnitude more precise than the current CODATA value.
The experimental setup with two different Penning traps, the measurement principle and preliminary results are presented.

[1] S. Sturm et al., Phys.Rev.Lett., 107, 023002 (2011)
[2] S. Sturm et al., Phys.Rev.Lett., 107, 143003 (2011)

Primary author: Mr KÖHLER, Florian (GSI)

Co-authors: Dr WAGNER, Anke (Max Planck Institut für Kernphysik); Prof. WERTH, Günter (Institut für Physik, Universität Mainz); Prof. BLAUM, Klaus Blaum (Max Planck Institut für Kernphysik); Dr STURM, Sven (Max Planck Institut für Kernphysik); Dr QUINT, Wolfgang (GSI)

Presenter: Mr KÖHLER, Florian (GSI)

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