

Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Dr. Klaus Blaum
Max-Planck-Institut für Kernphysik,
Heidelberg, Germany



© Stefanie Aumiller / Max-Planck-Gesellschaft

Precision Tests of Fundamental Interactions and Their Symmetries using Exotic Ions in Penning Traps

The four fundamental interactions and their symmetries, the fundamental constants as well as the properties of elementary particles like masses and moments, determine the basic structure of the universe and are the basis for our so well tested Standard Model (SM) of physics. Performing stringent tests on these interactions and symmetries in extreme conditions at lowest energies and with highest precision by comparing e.g. the properties of particles and their counterpart, the antiparticles, will allow us to search for physics beyond the SM. Any improvement of these tests beyond their present limits requires novel experimental techniques.

An overview is given on recent mass and g -factor measurements with extreme precision on single or few cooled ions stored in Penning traps. On the one hand, mass measurements provide crucial information for atomic, nuclear and neutrino physics as well as for testing fundamental interactions and their symmetries. On the other hand, g -factor measurements of the bound electron in highly charged hydrogen-like

ions allow for the determination of fundamental constants and for constraining Quantum Electrodynamics. For example, the most stringent test of CPT symmetry in the baryonic sector could be performed by mass comparison of the antiproton with the H^- ion and the knowledge of the electron atomic mass could be improved by a factor of 13. Our latest results on precision measurements with exotic ions in Penning traps will be presented.

9.05.2023
16³⁰ Uhr
HS III

