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Atomic physics with highly-charged heavy ions at GSI/FAIR

Saturday 19 August 2017 15:30 (30 minutes)

Highly charged ions (HCI) combine extremely strong electromagnetic fields and a simple electronic structure, which makes them ideal testing grounds for fundamental theories such as quantum mechanics, relativity and quantum electrodynamics (QED) in the domain of strongest electromagnetic fields available for experimental investigation. In the heaviest one- and few-electron ions, such as hydrogen-like uranium, the field strength exposed on the electron in the ground-state is already very close to the Schwinger limit. Therefore, the structure (and also the dynamics) of highly-charged ions is significantly influenced by the effects of the quantum vacuum.

The new international accelerator Facility for Antiproton and Ion Research (FAIR) which is currently under construction in Darmstadt, offers a wide range of exciting new opportunities in the field of atomic physics and related fields. These include (among others); cooled and stored heavy-ion beams of excellent quality and intensity, with a very broad energy range; from relativistic down to virtually at rest.

In this presentation, an overview of the program of the Stored Particle Atomic Research Collaboration (SPARC) at the FAIR facility will be given. Particular emphasis will be on precision experiments with highly-charged heavy ions devoted to stringent tests of Quantum Electrodynamics in extreme electromagnetic fields as well as to the experimental program aimed to study low-energy (near-)symmetric ion-atom/ion collisions in storage rings at GSI and FAIR. One of the main (long-term) goals here is to gain better insight into the details of heavy quasi-molecular systems formed in such encounters and thereby access the physics of critical electromagnetic fields.

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Topic:

Memorial session for W. Greiner

Summary

Author: GUMBERIDZE, Alexandre

Presenter: GUMBERIDZE, Alexandre

Session Classification: W. Greiner Memorial Session

Track Classification: Walter Greiner Memorial session