A 13: Atomic Systems in External Fields II

Zeit: Dienstag 16:30–18:00 Raum: VMP 6 HS-B

Hauptvortrag A 13.1 Di 16:30 VMP 6 HS-B

The total break-up of two-electron atoms: from highly doubly excited states to double ionization of helium — •Javier Madroñero[1,2], Johannes Eiglsperger[1], and Bernard Piraux[2] — [1]Physik Department, TU München, Germany — [2]PAMO, UC Louvain, Belgium

The complete breakup of an atomic system involving three or more particles is a very complex process, mostly due to the long range nature of the Coulomb interactions between the electrons. Close to the break-up-threshold of two-electron atoms the spectrum is strongly influenced by the underlying classical mixed regular-chaotic dynamics and typical signatures of quantum chaos, e.g., Ericson fluctuations or scaling laws for the fluctuations of the spectrum, are expected to become observable. Under the action of an electromagnetic field, electronic correlations are brought about by the kinematics of the double ionization, i.e., in two-photon processes, or they might manifiest directly in two-electron nondispersive wave packets which are expected to be observed under near-resonant periodic driving of highly doubly excited states localized in stable regions of the classical system.

In this contribution we give a brief review of our most important recent achievments in the understanding of these issues, namely fluctuations in the photoionization cross sections of planar helium up to the 20th ionization threshold, the formation of two-electron nondispersive wave packets by near-resonant driving of highly doubly excited states and the electron dynamics in double ionization of helium by two XUV photons.

Fachvortrag A 13.2 Di 17:00 VMP 6 HS-B

Commissioning of the HITRAP Decelerator using a Single-shot Pepper Pot Emittance Meter: A Status Report — •Jochen Pfister[1,2], Winfried Barth[2], Ludwig Dahl[2], Peter Forck[2], Frank Herfurth[2], Oliver Kester[3], and Ulrich Ratzinger[1] — [1]Goethe Universität Frankfurt, Institut für Angewandte Physik, Max-von-Laue-Str. 1, 60438 Frankfurt am Main, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany — [3]NSCL, Michigan State University, 1 Cyclotron, East Lansing, MI 48824, USA

The Heavy Ion TRAP (HITRAP) project at GSI is in the commissioning phase. Highly charged ions up to U^{92+} provided by the GSI accelerator facility will be decelerated and injected into a large Penning trap for cooling to the meV/u energy level. A combination of an inversely operated IH- and a RFQ-structure combination decelerates the ions from 4MeV/u down to 6keV/u. In front of the decelerator a double drift-buncher-system is provided for phase focusing and a final de-buncher integrated in the RFQ-tank reduces the energy spread in order to improve the efficiency for beam capture in the cooler trap. This contribution concentrates on the beam dynamics simulations and corresponding measurements in the commissioning beam times for bunchers and IH structure. Single-shot emittance measurements, profile measurements as well as longitudinal bunch structure measurements are presented. Especially for low energy, low intensity beams a new single-shot emittance meter using Micro Channel Plate technology is under construction and will be discussed as well.

A 13.3 Di 17:30 VMP 6 HS-B

Hartree-Fock-Roothaan calculations of bound-bound transitions for medium-Z atoms in strong magnetic fields — •Akin Yildirim, Peter Diemand, and Günter Wunner — 1. Institut für theoretische Physik, Universität Stuttgart, 70550 Stuttgart

We present an enhanced algorithm to compute energy levels and oscillator strenghts of astrophysically relevant atoms and ions in the range Z=2,..,26 at neutron star magnetic field strenghts in different ionization stages. Single-particle orbitals are chosen as products of longitudinal wave functions with linear combinations of up to 8 landau levels, both of which are determined in a doubly self-consistent way solving the appropriate Hartree-Fock-Roothaan equations with the help of finite-element and B-spline techniques. In particular we discuss the problem of choosing "good" initial wave functions for excited orbitals.

A 13.4 Di 17:45 VMP 6 HS-B

Hartree-Fock-Roothaan calculations of the photoionization of medium-Z atoms in neutron star magnetic fields — •Peter Diemand, Akin Yildirim, and Günter Wunner — 1. Institut für theoretische Physik, Universität Stuttgart, 70550 Stuttgart

We calculate photoionization cross sections for astrophysically relevant atoms and ions in the range Z=2,...26 at neutron star magnetic field strenghts in different ionization stages. Exact continuum states are determined numerically taking into account the correct boundary conditions. Bound states are calculated by solving the Hartree-Fock-Roothaan equations using finite-element and B-spline techniques. The results are compared with those obtained using Born's approximation.