A 7 Atoms and Ions in Ultra Short and Strong laser Fields I

Zeit: Samstag 08:30–10:00 Raum: HU 3094

Hauptvortrag A 7.1 Sa 08:30 HU 3094

Quantum Path Control Using Attosecond Pulse Trains — •Jens Biegert[1], Arne Heinrich[1], Christoph P. Hauri[1], Wouter Kornelis[1], Philip Schlup[1], Marcel Anscombe[1], Ursula Keller[1], Mette Gaarde[2], and Kenneth J. Schafer[2] — [1]Physik Department, Swiss Federal Institute of Technology (ETH), Zürich, Switzerland — [2]Department of Physics and Astronomy, Louisiana State University, Baton Rouge, LA 70803, U.S.A.

We show that attosecond pulse trains are a natural tool for controlling strong field processes such as high order harmonic generation and rescattering. When used in combination with an intense infrared laser field, the timing of the pulse train with respect to the IR laser field can be used to microscopically select a single quantum path contribution to a process that would otherwise consist of several interfering components. We demonstrate this strong field control mechanism by manipulating the time-frequency properties of high order harmonics at the single atom level. We then show that the qualitative features remain when investigating the same effect in the strong field approximation including macroscopic propagation. Furthermore we show first experimental results on enhancement of the photon spectrum of high order harmonics.

Fachvortrag A 7.2 Sa 09:00 HU 3094

A high harmonic laser source for XUV photoionization studies in a cold target recoil ion momentum spectrometer — •Martin Böttcher[1], H. Rottke[1], N. Zhavoronkov[1], P. Agostini[2,1], and W. Sandner[1] — [1]Max-Born-Institut, Max-Born-Str. 2a, D-12489 Berlin — [2]DRECAM/SPAM, Centre d'Etudes de Saclay, 91191 Gif-sur-Yvette, France

We have set up a high harmonic laser source for investigating gas phase photoionization in a cold target recoil ion momentum spectrometer (COLTRIMS) in the extreme ultraviolet (XUV) wavelength range down to, presently, $\approx 30\,\mathrm{nm}$. High order harmonic radiation is generated by focusing ultra-short Ti:Sapphire laser pulses (pulse width $\approx 40\,\mathrm{fs}$) into Argon gas as the non-linear medium. For efficient generation a laser system is used which deliveres up to 6 mJ pulses at 1 kHz repetition rate. Single harmonics are selected with a grazing incidence monochromator and focused with a toroidal mirror on the gas target in our COLTRIMS setup. The target gas is supplied in a well collimated cold atomic beam (density $\approx 5 \times 10^{10}\,\mathrm{cm}^{-3}$). We will present first experimental results on correlated electron-ion momentum spectroscopy after single- and double-(Xe) photoionization of several noble gas targets using this short pulse, table top XUV light source.

Fachvortrag A 7.3 Sa 09:15 HU 3094

Transverse momentum balance in strong-field ionization of atoms — •Artem Rudenko[1], Karl Zrost[1], Claus Dieter Schröter[1], Bernold Feuerstein[1], Thorsten Ergler[1], Vitor L.B. de Jesus[2], Robert Moshammer[1], and Joachim Ullrich[1] — [1]Max-Planck-Institut für Kernphysik, Heidelberg, Germany — [2]Centro Federal de Educacao Tecnologica, Rio de Janeiro, Brasil

The motion of reaction fragments emerging from ionization of atoms in strong linearly polarized laser fields is naturally separated into a longitudinal part, which is parallel to the field polarization, and a transverse part, perpendicular to the field. Since the laser field does not act in the transverse direction, the analysis of electron and ion transverse momenta is particularly suited to explore the role of the final-state Coulomb interaction between one or more electrons as well as the parent ion. Using a Reaction-Microscope we performed high-resolution measurements of transverse momentum distributions of ions and electrons for single and multiple ionization of atoms by intense ultrashort (7-25 fs) laser pulses. For single ionization, the experimental distributions exhibit a sharp cusp at zero transverse momentum, similar that observed in ion-atom collisions but in contradiction to a Gaussian shape predicted by standard tunneling theory [1]. The results are in good agreement with recent semiclassical calculations [2], where it was shown that the cusp appears due to the Coulomb interaction of the outgoing electron with its parent ion. In addition, results for double and multiple ionization will be presented.

[1] N.B. Delone and V.P. Krajnov, Phys. Usp. 41, 469 (1998)
[2] K. Dimitriou et al, Phys. Rev. A, in press (2004)

Hauptvortrag A 7.4 Sa 09:30 HU 3094

DFG: Nachwuchsprogramme und Neuigkeiten — •Stefan Krückeberg — Deutsche Forschungsgemeinschaft, Bonn

Die Deutsche Forschungsgemeinschaft (DFG) fördert den wissenschaftlichen Nachwuchs in verschiedenen Programmen, die kurz in ihrem aktuellen Stand vorgestellt werden sollen. Dazu gehören Forschungsstipendien, die Einwerbung der Eigenen Stelle, Nachwuchsgruppen im Emmy Noether-Programm, der European Young Investigator (EURYI) Award sowie das Heisenberg-Programm. Außerdem soll über Veränderungen in anderen Förderverfahren der DFG, wie beispielsweise bei Schwerpunktprogrammen, berichtet werden.