A 9: Poster Session - Atomic Physics I

Time: Monday 16:00–18:00 Location: Empore Lichthof

A 9.1 Mon 16:00 Empore Lichthof

Two-center dielectronic recombination and interatomic coulombic electron capture in slow atomic collisions — •Andreas Jacob, Carsten Müller, and Alexander B. Voitkiv — Institute for Theoretical Physics I, Heinrich-Heine-Universität Düsseldorf, 40225 Düsseldorf, Germany

We study recombination of a free electron with an atomic species A, which move in a gas of another species B [1,2]. Recombination proceeds via resonant transfer of energy excess to B which either becomes excited and then stabilizes via spontaneous radiative decay [1] (two-center dielectronic recombination; 2CDR) or becomes ionized [2] (interatomic coulombic electron capture; ICEC). We compare these processes with each other and with the well-known single-center process of radiative recombination and discuss under which conditions they can outperform the latter.

[1] A. Jacob, C. Müller, and A. B. Voitkiv, Phys. Rev. A 100, 012706 (2019).

[2] A. Jacob, C. Müller, and A. B. Voitkiv, J. Phys. B 52, 225201 (2019).

A 9.2 Mon 16:00 Empore Lichthof

Formation of the positive ion of antihydrogen via radiative attachment of a positron to antihydrogen — •Andreas Jacob[1], Carsten Müller[1], Alexander B. Voitkiv[1], Shaofeng Zhang[2], and Xinwen Ma[2] — [1]Institute for Theoretical Physics I, Heinrich-Heine-Universität Düsseldorf, 40225 Düsseldorf, Germany — [2]Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou 730000, China

The formation of positive ions of antihydrogen ($\bar{H}^+$) via radiative attachment of free positrons (e^+) to antihydrogen ($\bar{H}$) is studied [1]. The attachment mechanisms considered include: (i) spontaneous radiative attachment in which an incident e^+ is captured into the ground state of $\bar{H}^+$ via photo emission; (ii) induced radiative attachment in which $\bar{H}^+$ is formed due to photo emission induced by a laser field; (iii) two-center dileptonic attachment where an incident e^+ is captured by $\bar{H}$ moving in a gas of matter atoms B and capture proceeds via resonant transfer of energy excess to B which becomes excited and then stabilizes via spontaneous radiative decay [2]. We compare these mechanisms with each other and show that (ii) and (iii) can strongly dominate over (i).

[1] A. Jacob, C. Müller, A. B. Voitkiv, S. F. Zhang and X. Ma (2019), submitted to Phys. Rev. Research.

[2] A. Jacob, C. Müller, and A. B. Voitkiv, Phys. Rev. A 100, 012706 (2019).

A 9.3 Mon 16:00 Empore Lichthof

Mass defect of electronic transitions, in atoms, ions and atomic clocks — •Víctor José Martínez Lahuerta[1], Simon Eilers[1], Marius Schulte[1], Jan Kiethe[2], Tanja Mehlstäubler[2], Piet Oliver Schmidt[2,3], and Klemens Hammerer[1] — [1]Institute for Theoretical Physics and Institute for Gravitational Physics (Albert-Einstein-Institute), Leibniz University Hannover, Appelstrasse 2, 30167 Hannover, Germany — [2]Physikalisch-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig, Germany — [3]Institute for Quantum optics, Leibniz University Hannover, Welfengarten 1, 30167 Hannover, Germany

In this work we present a low-order relativistic correction to the multipolar atom-light Hamiltonian for two bound particles corresponding to a simple model for Hydrogen like atoms and ions. From this result, we can systematically predict frequency shifts in atomic clocks based on trapped ions due to the mass defect. We also take into account non perfect traps, finding accordance with previous results and new corrections.

A 9.4 Mon 16:00 Empore Lichthof

Continuum-Continuum Recombination in High-Order Harmonic Generation — •Fermin Rodriguez Hernandez[1], Frank Grossmann[2], and Jan Michael Rost[1] — [1]Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany — [2]Institut für Theoretische Physik, Technische Universität Dresden, Dresden, Germany

The generation of high-order harmonics (HHG) in a model atomic system is investigated using both: the traditional ground state scheme and the laser-assisted collision scenario. We find strong signatures of continuum-continuum transitions in the HHG spectra when the laser intensity is sufficiently high, i.e., in the over-the-barrier ionization regime. They consist in a double plateau structure with a characteristic first cutoff frequency $\omega_{CC} = 1.85U_p$ in the ground state scheme and $\omega_{CC} = 1.67U_p$ in the laser-assisted collision scenario. We demonstrate analytically that $\omega_{CC} = 1.85U_p$ originates by the coherent interference of the second and first collision of electronic wavepackets generated every half of the laser period, respectively. In the laser-assisted collision scenario, $\omega_{CC} = 1.67U_p$ rises after the interference of two components of the continuum wavepacket, which can be associated with two classes of recolliding trajectories known as free and stranded trajectories, respectively. Differences between 1D and 3D realizations will be discussed.

A 9.5 Mon 16:00 Empore Lichthof

Supersonic Molecular Beam for Velocity Map Imaging Experiments: Model Simulations and Design Concept — •Philipp Thurau, Kevin Eickhoff, Lars Englert, Tim Bayer, and Matthias Wollenhaupt — Carl von Ossietzky Universität Oldenburg, Institut für Physik, Carl-von-Ossietzky-Str. 9-11, 26129 Oldenburg

The spatial phase shift in a focused laser beam, known as the Gouy phase, is a limiting factor for carrier envelope phase (CEP) sensitive experiments using velocity map imaging (VMI) techniques due to the large acceptance volume of VMI spectrometers. In order to minimize focal CEP averaging, we plan to utilize a skimmed supersonic molecular beam to confine the interaction region of our VMI spectrometer. Employing a well-established Monte Carlo method (see G. A. Bird & J. M. Brady, *Molecular gas dynamics and the direct simulation of gas flows*, Clarendon Press, Oxford (1994)), we simulate flow trajectories of a supersonic beam through different instrumental geometries, including a differentially pumped multi-chamber configuration and a VMI design where the nozzle is integrated in the repeller electrode (Ghafur *et al.*: Rev. Sci. Instrum., **80**, 033110 (2009)). In view of future studies of the photoelectron circular dichroism of chiral molecules, we optimize the system parameters for particle density and beam temperatures. Initial simulation results and design concepts are presented.

A 9.6 Mon 16:00 Empore Lichthof

Control of free electron wave packets by polarization-tailored ultrashort bichromatic laser fields — Stefanie Kerbstadt[1,2], Kevin Eickhoff[1], •Lea-Christin Feld[1], Tim Bayer[1], and Matthias Wollenhaupt[1] — [1]Carl von Ossietzky Universität Oldenburg, Institut für Physik, Carl-von-Ossietzky-Str. 9-11, 26129 Oldenburg — [2]Center for Free-Electron Laser Science (CFEL), Deutsches Elektronen-Synchrotron DESY, Hamburg

We use polarization-shaped bichromatic laser pulses to control three-dimensional photoelectron momentum distributions from atomic multiphoton ionization. To analyze the underlying physical mechanisms, we consider two bichromatic control schemes based on intra-pulse frequency mixing and inter-band N- vs. M-photon interference, respectively. In the first scheme, interferometric ($\omega : 2\omega$) fields are used to select or suppress specific ionization channels in the resonance-enhanced two-photon ionization of potassium atoms by second-order intra-pulse frequency mixing. In the second scheme, we utilize a white light polarization pulse shaper to generate carrier-envelope phase-stable ($3\omega : 4\omega$) fields in order to manipulate the symmetry properties of photoelectron wave packets from 3- vs. 4-photon ionization of sodium atoms. In both cases, bichromatic polarization control of free electron wave packets is based on the creation of a superposition of multiple angular momentum states with different kinetic energy spectra. We show that the latter are determined by the bichromatic multiphoton spectra, emphasizing the close relationship between bichromatic multiphoton ionization and nonlinear optical spectroscopy.

A 9.7 Mon 16:00 Empore Lichthof

Spatial phase modulation of electron beams meets spectral interference of electron wave packets — •Darius Köhnke[1], Christopher Rathje[1], Kevin Eickhoff[1], Stefanie Kerbstadt[1,2], Tim Bayer[1], Sascha Schäfer[1], and Matthias Wollenhaupt[1] — [1]Carl von Ossietzky Universität Oldenburg, Institut für Physik, Carl-von-Ossietzky-Str. 9-11, 26129 Oldenburg — [2]Center for Free-Electron Laser Science (CFEL), Deutsches Elektronen-Synchrotron

DESY, Hamburg

Recently, vortex beams have attracted significant attention. We compare the generation and manipulation of tailored free electron vortices via atomic multiphoton ionization (MPI) by polarization-shaped ultrashort laser pulses on the one and transmission electron microscopy (TEM) with customized diffraction masks (Verbeeck *et al.*, Nature **467**, 301-304 (2010)) on the other hand, focussing here on the creation of free electron vortices with c_7 rotational symmetry (Kerbstadt *et al.* Nat. Comm. **10**, 658 (2019)). Photoelectron vortices are generated by MPI of Na atoms using counterrotating bichromatic ($3\omega : 4\omega$) laser pulses created by a white light polarization shaper. The electron vortex beams are generated in a TEM using Au masks on a SiN substrate. Although ultrafast polarization shaping is performed in frequency domain while electron beam shaping operates in momentum space, the two techniques are strongly related. Important analogies and differences are discussed. In addition, we analyze the topological charge of the tailored free electron vortices and investigate the respective capabilities of the different technical approaches.

A 9.8 Mon 16:00 Empore Lichthof

Solving the semiclassical propagator via Bayesian quadrature — •Benjamin Rabe and Jan-Michael Rost — Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

Semiclassical approximations to the quantum mechanical propagator have shown to give intuitive insight of the dynamics of atomic and molecular systems. One formulation of the semiclassical propagator is the initial value representation (IVR) first derived by Herman and Kluk. [1] This IVR makes use of an expression of the initial state in terms of fixed width coherent states, which form N-dimensional fixed width Gaussian wavepackets in position space. Each wavepacket starting from (q_i, p_i) represents a classical trajectory.

The integration over initial conditions (q_i, p_i) of classical trajectories is commonly done via Monte-Carlo integration, which requires the inclusion of a tremendous amount of trajectories. As an alternative approach, we propose the integration of an approximation to the Herman-Kluk propagator done by complex valued Gaussian process regression, which can be done analytically for certain choices of covariance functions. This procedure is referred to as Bayesian quadrature. [2] This approach should reduce the number of trajectories needed significantly and therefore allow for a better solution especially for evolution to larger times.

[1] Michael F Herman and Edward Kluk. Chemical Physics, 91(1):27-34, 1984.

[2] Anthony O'Hagan. Journal of statistical planning and inference, 29(3):245-260, 1991.

A 9.9 Mon 16:00 Empore Lichthof

Generation of Entanglement in Spin Chains through the Presence of External Fields — •Darvin Wanisch — Theoretisch-Physikalisches Institut, Friedrich-Schiller-Universität Jena, Fröbelstieg 1, 07743 Jena

Systems of interacting spins are potential candidates for quantum information processing tasks, such as the transfer and distribution of entanglement. Here, we investigate how – static or dynamic – external fields can enhance the end-to-end entanglement in interacting Heisenberg spin chains and how they may affect the reliability and efficiency of this process considering potential practical implementations.

A 9.10 Mon 16:00 Empore Lichthof

Competition of photon and electron emission in interatomic decay of heterogeneous noble gas clusters — •Lutz Marder[1], André Knie[1], Christian Ozga[1], Christina Zindel[1], Clemens Richter[2], Uwe Hergenhahn[2,3], Arno Ehresmann[1], and Andreas Hans[1] — [1]Institute of Physics, University of Kassel, Kassel, Germany — [2]Leibniz Institute of Surface Modification, Leipzig, Germany — [3]Max Planck Institute for Plasma Physics, Greifswald, Germany

Noble gas clusters represent prototype systems for the investigation of fundamental atomic and molecular processes. Van-der-Waals bonds enable new relaxation pathways not available in isolated systems. In recent years many of these have been studied, often using coincidence measurement techniques.

Here, we present our state-of-the-art experiment where both electrons and photons were detected in coincidence, which allows for investigation of multi-particle decay pathways after excitation with synchrotron radiation. The results show that the addition of krypton to pure neon clusters strongly alters the emission by the opening of a faster ionizing decay channel compared to the radiative decay.

A 9.11 Mon 16:00 Empore Lichthof

The influence of nitrogen on interatomic processes in argon clusters: quenching of radiative decay — •Catmarna Küstner-Wetekam[1], Philipp Schmidt[1], Christian Ozga[1], Arno Ehresmann[1], Uwe Hergenhahn[2,3], André Knie[1], and Andreas Hans[1] — [1]Institut für Physik und CINSaT, Universität Kassel, Heinrich-Plett-Str. 40, 34132 Kassel, Germany — [2]Max Planck Institute for Plasma Physics Wendelsteinstr. 1, 17491 Greifswald, Germany — [3]Fritz-Haber-Institut der Max-Planck-Gesellschaft, Faradayweg 4-6, 14195 Berlin, Germany

To understand fundamental processes of radiation chemistry in realistic samples it is necessary to study prototypical systems, where a molecule or atom is surrounded by neighbours.

Weakly bound van-der-Waals clusters are one possible system, in which novel relaxation pathways occur. In contrast to isolated atoms electronically excited states may now decay via different interparticle processes such as radiative charge transfer (RCT) and interatomic Coulombic decay (ICD). Here we investigate these processes in different environments by gradually increasing the amount of nitrogen in argon clusters.

A 9.12 Mon 16:00 Empore Lichthof

Simulation of wide-angle single-shot x-ray scattering via the propagation multislice method — •Paul Tuemmler, Björn Kruse, Christian Peltz, and Thomas Fennel — Institut für Physik, Universität Rostock

Single-shot wide-angle x-ray scattering has enabled the three-dimensional characterization of free nanoparticles from a single scattering image [1,2]. Key to this method is the fact, that the scattering patterns contain information of density projections on differently oriented projection planes. Wide-angle scattering typically requires XUV photon energies where absorption and attenuation cannot be neglected in the description of the scattering process [3,4]. The multislice Fourier transform (MSFT) method, which provides a fast scattering simulation within the Born approximation, can be extended to also include these propagation effects. In this presentation the performance of conventional MSFT and propagation MSFT will be discussed and compared to full simulations using FDTD for typical scenarios relevant for wide-angle x-ray scattering [1,5].

[1] I. Barke *et al.*, Nat. Commun. **6**, 6187 (2015).
[2] K. Sander *et al.*, J. Phys. B **48**, 204004 (2015).
[3] D. Rupp *et al.*, Nat. Commun. **8**, 493 (2017).
[4] B. Langbehn *et al.*, Phys. Rev. Lett. **121**, 255301 (2018).
[5] C. Peltz *et al.*, Phys. Rev. Lett. **113**, 133401 (2014).

A 9.13 Mon 16:00 Empore Lichthof

Investigation of Frenkel excitons located in the valence shell of homogeneous and heterogeneous noble gas clusters — •Xaver Holzapfel, Andreas Hans, Gregor Hartmann, Christian Ozga, Philipp Schmidt, Arno Ehresmann, and André Knie — Institut für Physik und CINSaT, Universität Kassel, Heinrich-Plett-Str. 40, 34132 Kassel, Germany

Electronic excitations in the valence shell of homogeneous and heterogeneous clusters were studied by fluorescence spectroscopy. Information about excitonic states as well as the mean cluster size of the cluster distribution created by supersonic expansion were obtained by measuring the fluorescence excitation yield in the UV and VUV spectral range. Using a multidimensional fitting algorithm, the mean cluster size was determined from the surface and bulk contributions of all measured fluorescence spectra. Furthermore, differently shaped cluster distributions were included in the analysis of the mean cluster sizes. The comparison of measured mean cluster sizes to the scaling laws and to investigations on heterogeneous systems indicated excitonic states which are different from the commonly used assignment of solid state experiments.

A 9.14 Mon 16:00 Empore Lichthof

Time-resolved rescattering of slow photoelectrons by single-cycle terahertz radiation — Martin Ranke[1,2], Sophie Walther[1,2], Anastasios Dimitriou[1,2], Markus Pfau[1,2], •Mark J. Prandolini[1], Thomas Gebert[3], Andrey Kazansky[4], Nikolay Kabachnik[4], Marek Wieland[1,2], Markus Drescher[1,2], and Ulrike Frühling[1,2] — [1]Institut für Experimentalphysik, Universität Hamburg, 22761 Hamburg, Germany — [2]The Hamburg Centre for Ultrafast Imaging (CUI), 22761 Hamburg, Germany — [3]Max-Planck-

Institut für Struktur und Dynamik der Materie, 22761 Hamburg, Germany — [4]Ikerbasque - Basque Foundation for Science, Spain

Dynamics of low-energy photoelectrons, generated by multiphoton ionization from near-infrared (NIR) laser pulses, in the presence of intense near single-cycle carrier-envelope phase stable terahertz (THz) pulses, were experimentally investigated, using a velocity-map imaging spectrometer (VMIS). For certain time delays between the NIR and THz pulses, a strong modulation of the photoelectron momentum distribution was observed and attributed to rescattering from the ionic core. During the rescattering process, an additional momentum was transferred to the photoelectrons leading to a higher kinetic energy in the continuum in contrast to directly emitted photoelectrons that are not rescattered. A classical two-step (CTS) model, based on solving classical photoelectron trajectories, indicates that a few photoelectrons reach a distance on the order of 20 nm before they are retracted and rescattered from the ionic core.

A 9.15 Mon 16:00 Empore Lichthof

Influence of prepulses on pair production in strong oscillating electric fields — •Oliver Mathiak, Selym Villalba-Chavez, and Carsten Müller — Institut für Theoretische Physik I, Heinrich-Heine-Universität Düsseldorf

Production of electron-positron pairs from vacuum in strong electric fields oscillating in time is studied. The fields are assumed to consist of a main pulse of high intensity, which is preceded by a prepulse of much lower intensity. Pair production probabilities in this field configuration are obtained by solving the time-dependent Dirac equation numerically. We show that a range of field parameters exists where the prepulse, despite its relative weakness, can leave visible traces in the momentum spectra of created particles [1].

[1] L. F. Granz, O. Mathiak, S. Villalba-Chavez and C. Müller, Phys. Lett. B 793, 85 (2019)

A 9.16 Mon 16:00 Empore Lichthof

Numerical simulations of high-order harmonic generation: from atomic to extended systems — •Chuan Yu, Ulf Saalmann, and Jan-Michael Rost — Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

In recent years, research on high-order harmonic generation (HHG) has been extended from gas-phase atoms to bulk solids. Compared with the well-established three-step model for atoms, the HHG processes in extended systems are more complicated and still less understood. To further explore the connection between atomic and solid-state HHG, we perform time-dependent density functional theory (TDDFT) simulations for both finite and extended model systems. The TDDFT approach, accounting for many-electron effects in a self-consistent manner, has turned out to be flexible and useful in studying the effects of finite size, impurity and disorder. On the basis of numerical simulations within the TDDFT framework, we may better elucidate the transition from atomic to solid-state HHG.

A 9.17 Mon 16:00 Empore Lichthof

Controlling non-adiabatic ionization with ultra-short pulses — •Sajjad Azizi, Ulf Saalmann, and Jan-Michael Rost — Max Planck Institute for the Physics of Complex Systems, Nöthnitzer Straße 38, 01187 Dresden, Germany

Non-adiabatic ionization, a new channel in the photo-ionization with high-frequency lasers, occurs for strong and short pulses due to large gradients of the *pulse envelope*. This unusual dependence on the envelope derivative can be explored by manipulating the time profile of the pulse envelope. It is shown that the non-adiabatic ionization yield can be enhanced with particular shaped pulses in comparison to the yield of the corresponding Fourier-limited pulse (FLP). This is surprising since the FLP is the strongest and shortest pulses for a given spectral representation.

A 9.18 Mon 16:00 Empore Lichthof

Fast Nonequilibrium Green functions calculations for atomic systems — •Maximilian Rodriguez Rasmussen, Niclas Schlünzen, Jan-Philip Joost, and Michael Bonitz — Christian-Albrechts-Universität zu Kiel, Kiel, Germany

The Nonequilibrium Green Functions formalism (NEGF) [1] is well suited to accurately describe the dynamics of correlated quantum systems. A main cause of practical limitation is the high computational effort, manifest in a T^3 scaling with propagation time T. The scaling can be improved to T^2 by introducing the Generalized-Kadanoff–Baym Ansatz (GKBA) [2]. Its application to the description of atoms, where precise theoretical results on fast dynamical processes, such as laser excitations, are needed, is of particular interest [3,4]. Recently the G1-G2 formalism [5] based on the GKBA was developed. With this method a dramatically improved scaling proportional to T can be achieved. Here first results for atomic systems are presented.

[1] L. P. Kadanoff, G. Baym, *Quantum Statistical Mechanics* (1962)
[2] P. Lipavský et al., *Phys. Rev. B 34, 6933* (1986)
[3] E. Perfetto et al., *Phys. Rev. A 92, 3* (2015)
[4] R. Tuovinen et al., *The J. of Chem. Phys., 51, 17* (2019)
[5] N. Schlünzenet al., *submitted*, arXiv:1909.11489 [cond-mat.str-el]

A 9.19 Mon 16:00 Empore Lichthof

Phase-of-the-phase spectroscopy as a tool to calibrate a laser — •Felix Trepkau, Vasily Tulsky, and Dieter Bauer — University of Rostock, 18051 Rostock, Germany

We present a way to accurately calibrate a two-color bi-circular laser field. Such laser configurations have recently attracted special attention due to well-defined angular properties of photoelectrons that they create while interacting with matter. The calibration technique we propose is based on the phase-of-the-phase spectroscopy and relies on sharp intensity-sensitive features in the photoelectron signal [1-2].

[1] V. A. Tulsky, M. A. Almajid, and D. Bauer, Two-color phase-of-the-phase spectroscopy with circularly polarized laser pulses, Phys. Rev. A 98, 053433 (2018)

[2] V. A. Tulsky, B. Krebs, J. Tiggesbäumker, D. Bauer, Revealing laser-coherent electron features using phase-of-the-phase spectroscopy, arXiv:1911.0047 (2019) (submitted to J. Phys. B)

A 9.20 Mon 16:00 Empore Lichthof

Strong-field ionization driven by spatially structured laser fields — •Birger Böning[1], Willi Paufler[1], and Stephan Fritzsche[1,2] — [1]Helmholtz-Institut Jena, Germany — [2]Theoretisch-Physikalisches Institut, Friedrich-Schiller-Universität Jena, Germany

We theoretically investigate nondipole effects in the above-threshold ionization (ATI) of atoms using the strong-field approximation (SFA). To this end, we construct Volkov-like continuum wavefunctions of the photoelectron in laser fields with an arbitrary spatial dependence. We show how to find these solutions to the Schrödinger equation for an electron in a laser field that can be written as a continuous superposition of plane waves. This approach includes, for example, Gaussian or twisted laser fields and is therefore not limited to plane waves. As a first application, we compute peak offsets along the laser propagation direction in the ATI with mid-infrared plane-wave laser fields. As a second application, we consider the ATI driven by standing light waves, which gives rise to the so-called high-intensity Kapitza-Dirac effect.

A 9.21 Mon 16:00 Empore Lichthof

Measuring the Zak phase of the SSH chain by HHG — •Daniel Moos, Christoph Jürss, and Dieter Bauer — University of Rostock, Rostock, Germany

In recent work [1,2], a many-order-of-magnitude enhancement in the high-harmonic generation (HHG) efficiency has been shown between different topological phases of a 1D chain with a time-dependent density functional theory calculation. Shortly thereafter [3] the same effect was observed using a much simpler model and the tight-binding approximation. The discovery that the simplest model known to exhibit topological effects, the Su-Schrieffer-Heeger (SSH) model, shows this feature raises the question which other effects this model might also contain. In this work we measure the Berry phase of the SSH model using the expression given by Zak, thereby showing that topological phases may be distinguished by all-optical means.

[1] Dieter Bauer, Kenneth K. Hansen, Phys. Rev. Lett. 120, 177401 (2018).
[2] Helena Drüeke, Dieter Bauer, Phys. Rev. A 99, 053402 (2019).
[3] Christoph Jürß, Dieter Bauer, Phys. Rev. B 99, 195428 (2019).

A 9.22 Mon 16:00 Empore Lichthof

ATAS of neon with tunable few-cycle SWIR pulses — •Patrick Rupprecht, Lennart Aufleger, Alexander Magunia, Thomas Ding, Marc Rebholz, Stefano Amberg, Nikola Mollov, Felix Henrich, Christian Ott, and Thomas Pfeifer — Max-Planck-Institut für Kernphysik, Heidelberg

Attosecond transient absorption spectroscopy (ATAS) has developed into an essential method to study excited-state coupling dynamics

in atomic and molecular systems. So far, most ATAS experiments have been carried out with femtosecond laser pulses of one specific central wavelength. In this poster contribution, we present first results of ATAS measurements on neon with few-cycle, approximately 15 fs FWHM, pulses centered around 1300 nm, 1400 nm and 1550 nm. These short-wave infrared (SWIR) pulses were used for high harmonic generation as well as for a time-delayed strong-field perturbation pulse altering the neon absorption lines using a passively stable split and delay line. The influence of the different central wavelengths on the neon resonances in the extreme ultraviolet (XUV) 40 eV to 60 eV photon-energy regime is shown by varying the intensity of the SWIR in time overlap as well as recording XUV–SWIR time-delay traces at different SWIR intensities. Implications for resonance lineshape changes as well as light-induced state observations are discussed.

A 9.23 Mon 16:00 Empore Lichthof

The laser-driven Kitaev chain — •Alexander Luther and Dieter Bauer — Institute of Physics, University of Rostock, 18051 Rostock, Germany

During the recent years, research on high-harmonic generation (HHG) in solid state systems experienced an increasing interest. Most of the often used tight-binding models to describe the interaction of laser fields with solid-state systems conserve the number of electrons. The Kitaev chain, a model for a one-dimensional p-wave superconductor, contains a pairing term that does not conserve the number of electrons and thus is usually treated in Bogolyubov-de-Gennes (BdG) representation. In our work, we study the role of electrons and holes on finite Kitaev chains in the HHG process using a time-dependent tight-binding approach in which the BdG Hamiltonian contains the coupling to the external driver in length gauge. Further, we investigate the laser-driven dynamics of the Majorana edge states, which appear at the ends of of the chain in the topological non-trivial phase of a Kitaev chain.