DFG Deutsche Forschungsgemeinschaft

QUTIF

Quantum Dynamics in Tailored Intense Fields

Young Researcher Meeting
5th December – 7th December 2016

Venue:
HVHS Mariaspring e.V.
Rauschenwasser 78
37120 Bovenden

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

Leibniz Universität Hannover

Dear participants,

We're happy to welcome you to the first Young Researcher Meeting of the DFG priority programme 1840 "Quantum Dynamics in Tailored Intense Field" is in Bovenden nearby Göttingen! This meeting is dedicated exclusively to Master and PhD students and PostDocs and thus gives all of us the opportunity to present and discuss our work in a relaxed and informal atmosphere.

For the oral presentations, the presenter of the previous contribution will chair the next talk, so please be prepared to introduce the following speaker. There will be a poster session, however everybody is encouraged to discuss their work at any time. Therefore please put up your posters already now and leave it on display until the end of the seminar.

We are happy to announce two invited speakers, Mr. Christoph Neuser vom ABB Team GmbH and Mr. Torsten Rudolf from Carl Zeiss Microscopy GmbH, who will share their experiences as a physicist in the business world with us and will be available for your questions after their talks.

On Monday, we'll have an excursion to the Göttingen city center with a guided tour "From Gauss to the Measurement Valley". Afterwards, you'll have time to walk about the Christmas market before we head back to Mariaspring for dinner.

On Wednesday, we will have guided tours in three research groups. The tour will begin at the Max-Planck-Institute for biophysical chemistry with the groups of Prof. Dr. Stefan Hell (Nanobiophotonics) and Prof. Alex Wodtke (Dynamics at surfaces) and continues at the Faculty of Physics in the group of Prof. Dr. Claus Ropers (Nanooptics and ultrafast dynamics).

In the evenings, we'll have a club room with table soccer and table tennis available, as well as a bowling alley.

Please note that alcoholic beverages and any drinks you buy beyond the meals and coffee breaks have to be paid by yourself on the day of departure.

We are looking forward to a stimulating seminar with you!
The organizing team

Florian Oppermann and Katharina Priebe

Monday, 5th December 2016

08:00 – 09:00	Breakfast
09:00 – 09:20	Opening Remarks
09:20 – 09:55	Emilio Pisanty *High harmonic interferometry of the Lorentz force in strong mid-infrared laser fields*
09:55 – 10:30	Álvaro Jiménez *The circular w+2w scheme: symmetry breaking and ways to control the ellipticity of attosecond bursts*
10:30 – 11:00	Coffee Break
11:00 – 11:35	Daniel Reich *Illuminating Molecular Symmetries with Bicircular High-Order-Harmonic Generation*
11:35 – 12:10	David Ayuso *Recollision with spin-polarized electrons in tailored laser fields*
12:10 – 12:45	Evangelos Karamatskos *Optimisation of strong field-free alignment using tailored light fields*
12:45 – 13:50	Lunch break
14:20	Bus transfer
15:00 – 18:30	Excursion to Göttingen: Guided Tour and Christmas market
18:30	Bus transfer
19:00	Dinner

Tuesday, 6th December 2016

08:00 – 09:00	Breakfast
09:00 – 09:35	Carlos Granados *Interaction of Optical Vortices with Atoms and Molecules*
09:35 – 10:30	Physicists in Business I: Christoph Neuser (ABB Team GmbH)
10:30 – 11:00	Coffee Break
11:00 – 11:35	Florian Oppermann *Dissociation of HeH^+ in intense laser pulses*
11:35 – 12:10	Philipp Wustelt *Laser-subcycle control of sequential double-ionization dynamics of Helium*
12:10 – 12:45	Nicolas Eicke *A heuristical model for strong-field ionization of diatomic molecules*
12:45 – 13:50	Lunch break
13:50 – 14:25	Sajal Kumar Giri *Single-photon ionization in intense, stochastically fluctuating pulses*
14:25 – 15:00	Katharina Priebe *Free-electron quantum optics*
15:00 – 15:35	Daniel Würzler *Velocity map imaging of scattering dynamics in orthogonal two color fields*
15:35 – 16:05	Coffee Break and Group Photo
16:05 – 18:00	Poster Session
18:00	Dinner

Wednesday, 7th December 2016

08:00 – 09:00	Breakfast
09:00 – 09:35	Lennart Seiffert *Real-time Access to Electron Scattering in Dielectrics*
09:35 – 10:30	Physicists in Business II: Thorsten Rudolf (Carl Zeiss Microscopy GmbH)
10:30 – 11:00	Coffee Break
11:00 – 11:35	Arohi Jain *Attosecond-streaking spectroscopy on a liquid-water microjet*
11:35 – 12:00	Closing Remarks
12:00 – 13:00	Lunch break
13:00 – 13:30	Bus transfer
13:30 – 14:40	Institute Tours Wodtke / Hell (Faßberg)
14:40 – 15:00	Bus transfer
15:00 – 15:45	Institute Tour Ropers
16:00	Departure

Abstracts

High harmonic interferometry of the Lorentz force in strong mid- infrared laser fields

Emilio Pisanty[1,2], Daniel D. Hickstein[3], Benjamin R. Galloway[3], Charles G. Durfee[3,4], Henry C. Kapteyn[3], Margaret M. Murnane[3], and Misha Ivanov[1,2,5]

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High harmonic radiation is a useful source of short pulses of high-frequency XUV radiation, and the cutoff frequency should increase when the driving field is stronger and has a longer wavelength. Unfortunately, in those regimes the magnetic field of the driver acts to deflect the electron excursion and prevent its recollision with the core, thus inhibiting harmonic emission, as a result of a breakdown of the dipole approximation in the long-wavelength regime.

We show that the combination of two non-collinear counter-rotating circularly polarized beams produces a small forwards ellipticity, and that this can be used to probe, measure, control, and cancel the effect of this magnetic field. Thus we obtain a flexible scheme to re-enable harmonic emission deep in the long-wavelength and strong field regimes. We show, moreover, that the beam configuration can be used with currently-available sources to demonstrate clear traces, in the form of even harmonics, of the breakdown of the dipole approximation.

[1] E. Pisanty, D.D. Hickstein, B.R. Galloway et al. High harmonic interferometry of the Lorentz force in strong mid-infrared laser fields. arXiv:1606.01931.

The circular w+2w scheme: symmetry breaking and ways to control the ellipticity of attosecond bursts

Álvaro Jiménez-Galán[1], Marcel Schloz[1], David Ayuso[1], Felipe Morales[1], Olga Smirnova[1], Mikalai Zhavarankau[1] and Misha Ivanov[1,2,3]

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Generation of coherent light sources with attosecond duration and controllable ellipticity will enable studies on chiral-sensitive systems at ultrafast time-scales [1,2]. An elegant approach to the generation of such pulses consists of combining a circularly polarized fundamental field with a counter-rotating second harmonic [3]. This scheme leads to harmonic peaks at (3N+1) and (3N+2) lines, with the helicity of the fundamental field and the second harmonic, respectively, while 3N harmonics are absent due to symmetry. Suppression of one of the lines will thus yield highly elliptical pulses. Several studies [4,5] have investigated this possibility, but control over such ellipticity is still to be achieved. Moreover, recent experiments have reported the appearance of forbidden 3N harmonics even for perfectly three-foil-symmetric pulses, implying a breaking of the symmetry that is yet to be explained.

In this work, we outline the physical mechanism responsible for the different strengths of the lines observed in the harmonic spectrum and the reasons behind the breaking of the symmetry in the system. We do so by solving the time-dependent Schrödinger equation in the single-active electron approximation for both helium and neon, and compare our results to experiments. Additionally, we derive ionization and recombination propensity rules in the harmonic process, and show how they can be used to control the ellipticity of the generated attosecond bursts.

[1] C. Lux et al., Angew. Chem. Int. Ed., 51: 5001-5005 (2012)
[2] R. Cireasa et al., Nat. Phys. 11 654-658 (2015)
[3] D.B. Milosevic et al., Phys. Rev. A 61 063403 (2000)
[4] O. Kfir et al., Nat. Phot. 9 99 (2014)
[5] L. Medisauskas et al., Phys. Rev. Lett. 115 153001 (2015)

Illuminating Molecular Symmetries with Bicircular High-Order Harmonic Generation

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I will present a general theory of bicircular high-order-harmonic generation from N-fold rotationally symmetric molecules that has recently been formulated [1]. Using a rotating frame of reference it is possible to predict the complete structure of the high-order-harmonic spectra for arbitrary driving frequency ratios and molecular symmetries can be directly identified from the high-harmonic signal. These findings reveal that a characteristic fingerprint of rotational molecular symmetries can be universally observed in the ultrafast response of molecules to strong bicircular fields.

[1] Daniel M. Reich and Lars Bojer Madsen, Phys. Rev. Lett. 117, 133902

Recollision with spin-polarized electrons in tailored laser fields

David Ayuso[1], Álvaro Jiménez-Galán[1], Felipe Morales[1], Misha Ivanov[1,2,3] and Olga Smirnova[1,4]

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Ionization of noble gases by strong infrared circularly-polarized laser pulses can produce electron currents with a controllable degree of spin polarization [1-4]. Spin polarization arises as a result of (1) entanglement between the emitted electron and the parent ion, and (2) sensitivity of ionization to the sense of electron rotation in the initial state. The use of two-color counter-rotating bi-circular fields [5] opens new opportunities for introducing the spin degree of freedom into attosecond science [6], since the liberated electron can be driven back towards the parent ion within one optical cycle. We show that electrons recolliding with the ionic core upon tunnel ionization of xenon atoms driven by strong bi-circular fields are spin polarized and that their degree of polarization depends strongly on the recollision time (energy). We have found that the level of polarization can be modified by tailoring the driving fields, opening the door for attosecond control of spin-resolved dynamics.

[1] I. Barth and O. Smirnova, *Phys. Rev. A* 84, 063415 (2011)
[2] I. Barth and O. Smirnova, *Phys. Rev. A* 87, 013433 (2013)
[3] I. Barth and O. Smirnova, *Phys. Rev. A* 88, 013401 (2013)
[4] A. Hartung et al., Nat. Phot. 10, 526 (2016)
[5] D. B. Milošević and W. Becker, *Phys. Rev. A* 62 011403 (2000)
[6] D. B. Milošević, *Phys. Rev. A* 93, 051402(R) (2016)
[7] O. Smirnova and M. Ivanov, *Multielectron High Harmonic Generation: simple man on a complex plane*, chapter 7 in *Attosecond and XUV physics*, edited by T. Schultz and M. Vrakking, Wiley (2013)

Optimization of strong laser field-free alignment using tailored light fields

Evangelos T. Karamatskos[1,2], A. Trabattoni[1], T. Mullins[1], K. Dlugolecki[1], S. Trippel[1,3] and J. Küpper[1,2,3], S. Raabe[4], M.J.J. Vrakking[4,5], A. Rouzée[4], R.R. Johansen[6] and H. Stapelfeldt[6,7]

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Alignment of molecules with respect to the laboratory fixed frame enables the realization of a large variety of experiments such as the determination of molecular frame photoangular distribution (MFPAD's) or laser induced electron diffraction (LIED) where typically a strong degree of alignment is needed. We present a combined theoretical and experimental effort to optimise the degree of laser field-free alignment of molecules in the gas phase. We start by solving the time-dependent rotational Schrödinger equation coupled to a non-resonant laser field and a static electric field and use an iterative learning-loop algorithm to determine the ideal pulse shape that optimises the degree of alignment. These calculations serve as a guide to complement the experiments where the alignment laser pulse form is optimally tailored. We discuss the simulation results and the experimental realization of two-pulse impulsive alignment on the example of the linear molecule carbonyl sulfide (OCS) and give an outlook for the use of pulse shaping techniques to achieve strongly aligned asymmetric top molecules.

Interaction of Optical Vortices with Atoms and Molecules

Carlos M. Granados Castro, J. Berakdar

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Over the last decades, the study of photoionization of atoms and molecules has been an active field in physics, and quite a few theoretical methods have been proposed and applied successfully [1,2]. Most of these studies were carried considering interaction with photons —specially described by plane waves or short laser pulses— within the dipolar approximation only (transferring only one unit of angular momenta). However, in recent years, light beams carrying orbital angular momentum (OAM), such as Laguerre–Gaussian beams, become available, allowing one to go beyond the dipolar approximation. Then, some extensions to the current theoretical methods are needed, in order to explore this new framework in nonlinear and quantum optics.

In this contribution we explore the implementation of the Sturmian approach [2,3], based on the use of generalized Sturmian functions, to the study of ionization of atoms and molecules by the interaction with electromagnetic fields carrying OAM. We investigate the new emergent selection rules and the different mechanisms of transfer of angular momenta with the target.

[1] C. M. Granados-Castro et al, Adv. Quantum Chem. 73, 3 (2016).
[2] C. M. Granados-Castro, Application of Generalized Sturmian Basis Functions to Molecular Systems, Ph.D. thesis, Université de Lorraine, Metz (2016).
[3] G. Gasaneo et al, Adv. Quantum Chem. 67, 153 (2013).

Dissociation of HeH^+ in intense laser pulses

Florian Oppermann, Manfred Lein

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HeH^+ is the simplest asymmetric molecule and therefore an ideal candidate to study the effects of short laser pulses on dissociation and ionization. Short laser pulses themselves show a significant asymmetry when the CEP is varied. We've tuned a 1D single-active-electron model to reproduce some physical key properties and use it to calculate dissociation properties as a function of laser parameters by solving the TDSE. The (1D) nuclear dynamic is completely included.

Laser-subcycle control of sequential double-ionization dynamics of Helium

Philipp Wustelt[1, 2], Max Möller[1, 2], Markus S. Schöffler [3], Xinhua Xie[3], Vaclav Hanus[3], A. Max Sayler[1, 2], Andrius Baltuska[3], Markus Kitzler[3] and Gerhard G. Paulus[1, 2]

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We investigate sequential double-ionization of helium by intense near-circularly polarized few-cycle laser pulses using a classical trajectory-based model with two independent electrons. Simulated $He2^+$ ion momentum distributions are compared to those obtained in recent benchmark experiments. By comparison to semi-classical trajectory simulations we succeed in assigning the corresponding structures in the measured distributions to certain two-electron emission dynamics. We investigate the influence of a number of pulse parameters such as peak intensity, carrier-envelope phase, pulse duration and second- and third-order spectral phase on the shape of the ion momentum distributions. Good agreement is found in the main features of these distributions and of their dependence on the laser pulse duration, peak intensity and carrier-envelope phase. We demonstrate that the sequential double ionization dynamics can be sensitively controlled with the pulse duration and the laser peak intensity. Furthermore, we observe that for explaining certain fine-scale features observed in the measurement, it becomes important to consider subtle timing-variations in the two-electron emissions introduced by small values of chirp. This result highlights the possibility of measuring and controlling multi-electron dynamics on the attosecond time-scale by fine-tuning the field-evolution of intense close to single-cycle laser pulses.

A heuristical model for strong-field ionization of diatomic molecules

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We present a model describing the interaction of neutral diatomic molecules with strong laser fields in terms of a two-level system coupled to a free electron. The model is applied to ionization of Neon-2 molecules and compared with recent measurements by the Dörner-Group from Frankfurt.

Single-photon ionization in intense, stochastically fluctuating pulses

Sajal Kumar Giri, Ulf Saalmann, Jan M. Rost

Max-Planck-Institute for the Physics of Complex Systems, Dresden

High intensities in laser-matter interaction drive nonlinear processes. Whereas at low frequencies thereby multi-photon absorption and above-threshold ionization emerges, in the case of high frequencies single-photon absorption remains prevailing. However, multiple absorption and emission of photons renders this single-photon ionization sensitive to energy and shape of the laser pulse. This becomes relevant for intense, fluctuating pulses as generated in existing and upcoming free-electron laser sources. We study their effect on the ionization of a model atom numerically and formulate suitable parameters to characterise the evolution from the linear response at low intensity to the intricate dynamics at high intensities.

Free-electron quantum optics

Katharina E. Priebe, Armin Feist, Sergey Yalunin, Sascha Schäfer, and Claus Ropers

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In the last decade, electron microscopy, one of the most powerful and versatile techniques for the study of materials properties on atomic length scales, has been propelled to the realm of ultrafast dynamics. In an ultrafast transmission electron microscope (UTEM), ultrashort laser pulses are employed to pump a sample, which is then probed at a later time by ultrashort electron pulses. Besides time-resolved measurements of nanoscale dynamics, this allows for a quantum coherent manipulation of free electron beams with optical near-fields. The otherwise forbidden inelastic scattering between the free electrons and light is enabled by near-field confinement. Traversal of an optical near-field imprints a sinusoidal phase modulation on the electron wavefunction, such that the energetically narrow incident electron beam develops photon sidebands in its kinetic energy spectrum [1-3].

In this contribution, I will demonstrate coherent control schemes using free electrons. First, an electron-light interferometer is realized, in which the momentum distribution generated by a first near-field is further broadened or recompressed to the initial distribution depending on the relative near-field phase [4]. Second, phase-controlled two-color excitation allows for tailoring complex phase modulations and strongly asymmetric electron energy spectra [5]. These results open up a new path in the active manipulation of free electron beams, with the opportunity to generate specific transverse profiles and arbitrary temporal electron pulse structures. In the future, such schemes may enable new forms of time-resolved electron microscopy with sub-femtosecond precision.

[1] B. Barwick, D. J. Flannigan, and A. H. Zewail, Nature 462, 902-906 (2009).
[2] F. J. García de Abajo, A. Asenjo-Garcia, and M. Kociak, Nano Lett. 10 (5), 1859-1863 (2010).
[3] A. Feist, K. E. Echternkamp, J. Schauss, S. V. Yalunin, S. Schäfer, and C. Ropers, Nature 521, 200-203 (2015).
[4] K. E. Echternkamp, A. Feist, S. Schäfer, and C. Ropers. Nat. Phys. 12, 1000-1004 (2016).
[5] K. E. Priebe, A. Feist, S. Schäfer, and C. Ropers. In preparation.

Velocity map imaging of scattering dynamics in orthogonal two color fields

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In strong-field ionization processes orthogonal two-color laser fields are frequently used for controlling sub-cycle electron dynamics via the relative phase of the laser fields. Here this technique is applied to velocity map imaging spectroscopy by using an unconventional orientation with the polarization of the ionizing laser field perpendicular to and the steering field parallel to the detector surface. Phase-dependent measurements of the photoelectron momentum distribution of Neon and Xenon demonstrate control over direct and rescattered electrons. The results are compared with semi-classical calculations in three dimensions including elastic scattering at different orders of return and with three-dimensional time-dependent Schrödinger equation calculations.

Attosecond Electron Scattering in Dielectrics

Lennart Seiffert[1], Q. Liu[2,3], S. Zherebtsov[2,3], A. Trabattoni[4,5], P. Rupp[2,3], M. C. Castrovilli[6], M. Galli[4,6], F. Süßmann[2,3], K. Wintersperger[2], J. Stierle[2], G. Sansone[4,6], L. Poletto[7], F. Frassetto[7], I. Halfpap[8], V. Mondes[8], C. Graf[8], E. Rühl[8], F. Krausz[2,3], M. Nisoli[4,6], T. Fennel[1,9], F. Calegari[5,6,10] and M. F. Kling[2,3]

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Scattering of electrons in dielectric materials is at the heart of laser nanomachining, light-driven electronics, and radiation damage. Knowledge of low-energy electron transport involving elastic and inelastic electron scattering is key to the accurate prediction of clustered damage following high-energy radiation exposure. Here, we report real-time access to electron scattering in dielectrics. Photoelectrons are generated inside isolated dielectric nanoparticles by an attosecond extreme ultraviolet pulse and streaked by a synchronized intense near-infrared field. We develop the theoretical framework for attosecond streaking in dielectrics and identify that the presence of the internal field cancels the influence of elastic scattering, enabling the selective characterization of the inelastic scattering time. The metrology is demonstrated on silica, where an inelastic mean free path is extracted for 20-30 eV, and we show that it is applicable for a broad range of energies and dielectric solids and liquids including those relevant to tissue-damage after irradiation.

Attosecond-streaking spectroscopy on a liquid-water microjet

Arohi Jain[1], R. Heider[2], M. Wagner[2], A. Duensing[2], T. Gaumnitz[1], I. Jordan[1], J. Ma[1], J. Riemensberger[2], M. Mittermair[2], W. Helml[2], R. Kienberger[2], H. J. Wörner[1]

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Attosecond-streaking spectroscopy [1] has given real-time access to photoionization delays of atoms in the gas phase [2] and the additional effects of electron transport processes through atomic layers and interfaces of solid-state systems [3, 4]. Here, we report on the first attosecond-streaking experiments on liquid samples. We have realized attosecond-streaking photoelectron spectroscopy on water in the gas and liquid phases using a liquid microjet [5].

In our experiments, a carrier-envelope-phase-stabilized (~200 mrad rms), sub-5 fs, Ti: Sapphire laser system (4 kHz, 1.2 mJ, 790 nm) is used to generate isolated attosecond pulses by intensity gating, centered at 90 eV (~5 eV FWHM, 455 as Fourier transform-limited). The residual NIR and the generated as-XUV pulses are focused by a two-component mirror assembly onto the liquid microjet (25 µm diameter). Scanning the delay between the XUV pump and the NIR streaking pulse with a piezo linear stage allows us to measure time-dependent photoelectron spectra by means of a field-free time-of-flight (TOF) spectrometer. Successive measurements on gas-phase water evaporating from the liquid microjet and from liquid water inside the jet are performed by translating the jet away from the entrance of the TOF.

The measurements on gas-phase water molecules provide effective photoionization delays between the outer- (1b1, 3a1, 1b2) and inner-valence (2a1) shells. These delays contain information on the photoionization dynamics of the molecule and, possibly, electron-correlation phenomena that are known to play a role in inner-valence ionization. The measurements on liquid water additionally provide insight into the transport of electrons through liquid water on the attosecond time scale, including elastic and inelastic scattering of electrons with liquid-phase water molecules.

[1] F. Krausz and M. Ivanov, Review of Modern Physics 81(1), 163-234 (2009). [2] M. Schultze et al, Science, 328.5986, 1658-1662 (2010). [3] S. Neppl et al, Nature, 517.7534, 342-346 (2015). [4] R. Locher et al, Optica, 2.5, 405-410 (2015). [5] B. Winter and M. Faubel, Chem. Rev. 106, 1176 (2006). [6] I. Jordan et al, Review of Scientific Instruments 86, 123905 (2015). [7] B. Winter et al, J. Phys. Chem. A, 108.14, 2625-2632 (2004).

Posters

1. Arohi Jain (ETH Zürich)
   Attosecond-streaking spectroscopy on a liquid-water microjet

2. David Ayuso (MBI Berlin)
   Recollision with spin-polarized electrons in tailored laser fields

3. Birger Böning, Willi Paufler (Uni Jena)
   Pulse-Shape Effects in ATI using Strong Field Approximation

4. Jinghao Chen (Uni Essen)
   Laser induced ultrafast magnetization dynamics at the interfaces of a ferromagnet

5. Christian Markus Dietrich (Uni Hannover)
   THz radiation by strong tailored fields in a doubly resonant cavity design

6. Nicolas Eicke (Uni Hannover)
   Extracting trajectory information from two-color strong-field ionization

7. Christoph Jusko (Uni Hannover)
   Theoretical and experimental investigation of Kramers-Henneberger states

8. Sajal Kumar Giri (MPI Dresden)
   Single-photon ionization in intense, stochastically fluctuating pulses

9. Christoph Leithold (Uni Jena)
   Interferometric Measurement of Nonlinear Delays

10. Qingcao Liu (MPI Garching)
   Spatio-temporal control of electron emission from nanoparticles with two-color pulses

11. Tristan Müller (MPI Halle)
   Utrafast laser-induced demagnetization: An ab-initio perspective

12. Christopher Rathje, Armin Feist (Uni Göttingen)
   Structuring of free electron beams on the attosecond time scale

13. Nicolas Rendler (Uni Freiburg)
   A new He droplet spectrometer for nanoplasma experiments

14. Dominik Schomas (Uni Freiburg)
   Charging dynamics of dopants in helium nanoplasmas

15. Dominik Schulze (Uni Halle)
   Trapping of neutral atoms in structured light: Role of the light's orbital angular momentum

16. Jonas Wätzel, Alexander Schäffer (Uni Halle)
   Optomagnetism Based on Light Carrying Orbital Angular

17. Danilo Zille (Uni Jena)
   Towards a CE-Phasemeter in the sw-IR Regime

18. Jinzhen Zhu (Uni München)
   haCC calculations of the ionization HeH^+

Participants

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Schedule

Time	Sunday Dec 4th	Monday Dec 5th	Tuesday Dec 6th	Wednesday Dec7th
08:00		Breakfast	Breakfast	Breakfast
09:00		Opening Remarks	Carlos Granados	Lennart Seiffert
09:20		Emilio Pisanty		
09:35			Physicists in Business I	Physicists in Business II
09:55		Alvaro Jimenez		
10:30		Coffee Break	Coffee Break	Coffee Break
11:00		Daniel Reich	Florian Oppermann	Arohi Jain
11:35		David Ayuso	Philipp Wustelt	Closing Remarks
12:00				Lunch
12:10		Evangelos Karamatskos	Nicolas Eicke	
12:45		Lunch	Lunch	
13:00				Bus transfer
13:30				Institute Tours Wodtke/Hell (Faßberg)
13:50		Excursion to Göttingen: Guided Tour + Christmas market	Sajal Kumar Giri	
14:25			Katharina Priebe	
14:40				Bus transfer
15:00	Arrival		Daniel Würzler	Institute Tour Ropers
15:35			Coffee Break + Group Photo	Departure
16:05			Poster Session	
18:00	Dinner		Dinner	
19:00	Informal Discussions	Dinner	Informal Discussions	