

Working Group "Young DPG" Arbeitskreis junge DPG (AKjDPG)

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Be welcome to this year's program of the Working Group young DPG!

To those, who are new to the conference and are feeling lost in view of the various sessions, we want to offer the chance to build a solid foundation and to learn about the hot topics of the conference on a MSc level. You are cordially invited to visit the tutorials on Sunday!

With our PhD-Symposium we want to explore the current Trends in Atom Interferometry. The symposium is especially designed to give an introduction into the topic and will feature well known experts on the field.

For participants at the end of their PhD and young PostDocs we offer a Lunch Talk on Tuesday in collaboration with the Working Group on Industry and Business (AIW). In this talk Dr. Holger Lubatschowski, a physicist who founded his own company, will share his knowledge about becoming an entrepreneur. The talk will be given in German.

Last but not least, we want to ease the scientific program and offer you the opportunity to connect with your peers. Be welcome to join the tower building contest on Tuesday right after the plenary talk and to explore Hannover's night life during the pub crawl on Tuesday evening.

We are looking forward to seeing you at our events!

Overview of Invited Talks and Sessions

Tutorials

AKjDPG 1.1	Sun	16:00–17:00	b305	Photoionization with polarization-shaped ultrashort laser pulses — •MATTHIAS WOLLENHAUPT
AKjDPG 1.2	Sun	17:00–18:00	b305	The orbital angular momentum of light — •GIACOMO SORELLI
AKjDPG 2.1	Sun	16:00–17:00	b302	Molecular quantum states and their detection by spectroscopy. — •EBERHARD TIEMANN
AKjDPG 2.2	Sun	17:00–18:00	b302	Attosecond and femtosecond spectroscopy at extreme limits — •HANIEH FATTAHI
AKjDPG 3.1	Sun	16:00–17:00	a310	Plasmas at atmospheric pressure: Overview on Physics and Applications — •RONNY BRANDENBURG
AKjDPG 3.2	Sun	17:00–18:00	a310	Introduction to High-Temperature Plasma Physics — •GOLO FUCHERT

Lunch Talk

AKjDPG 4.1	Tue	13:10–13:55	f303	Ein Physiker als Unternehmer? Kann der das? — •HOLGER LUBATSCHOWSKI
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Invited talks of the joint symposium SYAI

See SYAI for the full program of the symposium.

SYAI 1.1	Mon	14:00–14:30	e415	Atom interferometry and its applications for gravity sensing — •FRANCK PEREIRA DOS SANTOS, LUC ABSIL, ROMAIN CALDANI, XIAOBING DENG, ROMAIN KARCHER, SÉBASTIEN MERLET, RAPHAËL PICCON, SUMIT SARKAR
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SYAI 1.2	Mon	14:30–15:00	e415	Atom interferometry for advanced geodesy and gravitational wave observation — ●PHILIPPE BOUYER
SYAI 1.3	Mon	15:00–15:30	e415	Fundamental physics with atom interferometry — ●PAUL HAMILTON
SYAI 1.4	Mon	15:30–16:00	e415	Atoms and molecules interacting with light — ●LUCIA HACKERMÜLLER

Sessions

AKjDPG 1.1–1.2	Sun	16:00–18:00	b305	Tutorial Chirality (joint session AKjDPG/Q)
AKjDPG 2.1–2.2	Sun	16:00–18:00	b302	Tutorial Modern spectroscopy
AKjDPG 3.1–3.2	Sun	16:00–18:00	a310	Tutorial Plasma Physics (joint session AKjDPG/P)
AKjDPG 4.1–4.1	Tue	13:10–13:55	f303	Lunch Talk: Ein Physiker als Unternehmer? Kann der das?

Tower Building Contest

Tuesday, 10 March 2019 10:30 e415

Pub Crawl

Tuesday, 10 March 2019 20:00 Meeting point: Main Entrance of University Building

AKjDPG 1: Tutorial Chirality (joint session AKjDPG/Q)

Time: Sunday 16:00–18:00

Location: b305

Tutorial AKjDPG 1.1 Sun 16:00 b305
Photoionization with polarization-shaped ultrashort laser pulses — ●MATTHIAS WOLLENHAUPT — Carl von Ossietzky Universität Oldenburg, Institut für Physik, Oldenburg

Nowadays, multiphoton ionization (MPI) using advanced light sources and sophisticated detection techniques is investigated to observe and control ultrafast quantum dynamics. In this tutorial, we present an introduction to the coherent control of photoionization with ultrashort laser pulses and give an overview on experimental techniques for femtosecond laser pulse shaping and tomographic reconstruction of 3D photoelectron momentum distributions. Based on relevant experiments, we will discuss the underlying physical mechanisms of controlled MPI. In the first experiment, phase-locked double pulse sequence laser pulses are used to control interferences in the momentum distribution of free electron wave packets [1]. We introduce non-perturbative control by manipulation of dressed state population dynamics through the optical phases. The main part of the tutorial deals with 3D control of the momentum distribution of free electron wave packets. We discuss the creation of vortex-shaped photoelectron momentum distributions with counterrotating circularly polarized femtosecond laser pulses [2] and highlight experiments with bichromatic carrier-envelope phase-stable polarization-tailored laser pulses to generate c_7 rotationally symmetric and asymmetric momentum distributions [3].

[1]M. Wollenhaupt et al., Phys. Rev. Lett. 89, 173001 (2002)

[2]D. Pengel et al., Phys. Rev. Lett. 118, 053003 (2017)

[3]S. Kerbstadt et al., Nat. Comm. 10, 658 (2019)

Tutorial AKjDPG 1.2 Sun 17:00 b305
The orbital angular momentum of light — ●GIACOMO SORELLI — Département ElectroMagnétisme et Radar, Onera - Palaiseau - France — Laboratoire Kastler Brossel, Sorbonne Université, CNRS, ENS-Université PSL, Collège de France, Paris, France

Light carries energy, as well as linear and angular momenta. While the energy and the linear momentum were already understood in the second half of the nineteenth century, the history of the angular momentum of light is more recent. The angular momentum of an electromagnetic wave can be decomposed into two parts: a spin contribution associated with the vectorial nature of the electromagnetic field, and an orbital contribution which is related to the light's spatial intensity and phase profiles. The spin component of light was already studied in the thirties by Beth, who established a connection between angular momentum and circular polarisation. On the contrary, the orbital contribution was not investigated before the 1990s when Allen and coworkers showed that some paraxial light beams carry a well defined orbital angular momentum (OAM). These beams have a very peculiar spatial profile, which is characterised by a central dark area around the beam axis and a spiral phase front. In this talk, I first introduce the angular momentum of the electromagnetic field from a classical electrodynamics' viewpoint and present some paraxial light beams carrying OAM. I then quantise the electromagnetic field and discuss some quantum properties of the angular momentum of photons. Finally, I describe how OAM-carrying photons are produced in the laboratory and discuss some of their applications in quantum information.

AKjDPG 2: Tutorial Modern spectroscopy

Time: Sunday 16:00–18:00

Location: b302

Tutorial AKjDPG 2.1 Sun 16:00 b302
Molecular quantum states and their detection by spectroscopy. — ●EBERHARD TIEMANN — Institut für Quantenoptik, Leibniz Universität Hannover

In this tutorial I will assume that the participant has a solid knowledge on atomic physics. From there I will add the rotational and vibrational motion to the electronic structure of a system of two or few atoms. I introduce simple models for describing the molecular quantum states and open the view to more advanced and generalized approaches.

In an experimentally oriented part I give examples for rotational, vibrational and electronic spectroscopy and their analysis. How can we use such results for the studies of ultracold atomic and molecular

ensembles?

Tutorial AKjDPG 2.2 Sun 17:00 b302
Attosecond and femtosecond spectroscopy at extreme limits — ●HANIEH FATTAHI — Max Planck Institut for the Science of Light

This tutorial is devoted to novel methods for attosecond and femtosecond laser spectroscopy, with an outlook on applications that require extreme spatial resolution. I give an overview of the fundamentals of spectroscopy, and techniques to resolve electron/molecular dynamics. The tutorial is concluded by discussing emerging spectroscopy techniques and their application in hyperspectral imaging.

AKjDPG 3: Tutorial Plasma Physics (joint session AKjDPG/P)

Time: Sunday 16:00–18:00

Location: a310

Tutorial AKjDPG 3.1 Sun 16:00 a310
Plasmas at atmospheric pressure: Overview on Physics and Applications — ●RONNY BRANDENBURG — Leibniz-Institut für Plasmaforschung und Technologie e.V., Greifswald, Germany — Universität Rostock, Rostock, Germany

Plasmas at atmospheric pressures gain more and more attention, both in research and industry. A variety of plasma sources exist and the applications span a wide spectrum from material processing and chemical conversion to surface treatment and therapeutic usage. Despite the wide use and application, there are still challenges from the fundamental point of view. These plasmas are often characterized by rapid gas breakdown, transient and erratic behaviour, and formation of instabilities.

The tutorial gives an introduction about plasmas at atmospheric pressure. The principles of plasma generation at elevated pressures, in particular the breakdown mechanisms will be explained in the first part of the tutorial.

Plasmas at atmospheric pressure span a wide range of types with

different parameters. The most general distinction is made between thermal and non-thermal plasmas. Both forms, its generation and the technological applications are explained.

Tutorial AKjDPG 3.2 Sun 17:00 a310
Introduction to High-Temperature Plasma Physics — ●GOLO FUCHERT — Max-Planck-Institut für Plasmaphysik, Greifswald, Deutschland

Although not always noticed in daily life, plasmas are surprisingly common, both in the universe and in the lab. A plasma is essentially a "gas" of electrons and ions with no net charge to the outside. This gives rise to collective behavior and complex dynamics of particles. This is especially true in the presence of magnetic fields, as it is often found in astrophysical plasmas and in magnetically confined plasmas for fusion research. In this tutorial lecture, after introduction the basic characteristics of plasmas, we are going to look at common examples of high-temperature plasmas, theoretical methods to describe their dynamics and experimental methods to study them.

AKjDPG 4: Lunch Talk: Ein Physiker als Unternehmer? Kann der das?

Time: Tuesday 13:10–13:55

Location: f303

Lunch Talk AKjDPG 4.1 Tue 13:10 f303
Ein Physiker als Unternehmer? Kann der das? — ●HOLGER LUBATSCHOWSKI — Rowiak GmbH, Hannover

Im Prinzip ja, aber in seiner Ausbildung lernt er das leider nicht. Marketing, Patentrecht, betriebswirtschaftliches Denken wird einem nicht in die Wiege gelegt und steht auch nicht auf dem Lehrplan der naturwissenschaftlichen Fachbereiche. Dennoch, der Sprung ins kalte Wasser ist ein Versuch wert. Wenn man die richtigen Berater und Freunde hat, kann das sehr erfolgreich werden und Spaß und Befriedigung bringt es

auch.

Holger Lubatschowski hat Physik an der Universität Bonn studiert. Nach seiner Promotion zog es ihn nach Hannover wo er die Abteilung Lasermedizin des Laser Zentrums Hannover (LZH) gründete und bis 2010 ausbaute. Im Jahr 2001 schloss er seine Habilitation für Physik an der Physikalischen Fakultät der Leibniz Universität Hannover ab. Seit 2003 ist er Geschäftsführer der ROWIAK GmbH. ROWIAK entwickelt neue Lasertherapien in der Augenheilkunde und führt Auftragsforschung für verschiedene internationale Ophthalmologie-Unternehmen durch.