K 6: Laser-Materie-Wechselwirkung und Laseranwendungen III

Time: Tuesday 16:30–17:15 Location: SPA SR203

K 6.1 Tue 16:30 SPA SR203

Direct observation of self-compression and pulse-splitting dynamics along a filament — •Martin Kretschmar[1,2], Carsten Brée[3], Ayhan Demircan[1], Tamas Nagy[1,4], Heiko G. Kurz[1,2], Uwe Morgner[1,2], and Milutin Kovacev[1,2] — [1]Leibniz Universität Hannover, Institut für Quantenoptik, Welfengarten 1, D-30167 Hannover, Germany — [2]QUEST, Centre for Quantum Engineering and Space-Time Research, Welfengarten 1, D-30167 Hannover, Germany — [3]Weierstraß-Institut für Angewandte Analysis und Stochastik, Mohrenstr. 39, 10117 Berlin, Germany — [4]Laser-Laboratorium Göttingen e.V., Hans-Adolf-Krebs-Weg 1,37077 Göttingen, Germany

Filamentation has become a versatile tool for pulse shortening, making it applicable for attosecond science. The evolution of the pulses undergoing filamentation are strongly influenced by complex spatio-temporal dynamics, leading to few-cycle pulse generation directly inside the filament. We present a setup, which directly investigates the fundamental pulse dynamics along the filamentary propagation direction. The analysis of the unperturbed pulse structures reveals pulse-splitting dynamics and self-compression to 5.30 fs. Simulations according to the experimental conditions are performed and show a good agreement with the experimental findings.

K 6.2 Tue 16:45 SPA SR203

Real Time Observation of Transient Electron Density in High Bandgap Dielectrics Irradiated with Tailored Femtosecond Laser Pulses — •Nadine Götte[1], Thomas Winkler[1], Cristian Sarpe[1], Bastian Zielinski[1], Jens Köhler[1], Thomas Kusserow[2], Tamara Meinl[2], Yousuf Khan[2], Hartmut Hillmer[2], Matthias Wollenhaupt[1], Arne Senftleben[1], and Thomas Baumert[1] — [1]University of Kassel, Institute of Physics and CINSaT, D–34132 Kassel, Germany — [2]University of Kassel, Institute of Nanostructure Technologies and Analytics and CINSaT, D–34132 Kassel, Germany

The generation of a high density free electron plasma is the first step in the laser ablation of dielectric materials. We have demonstrated that tailored ultrashort laser pulses are suitable for robust manipulation of optical breakdown, increasing the precision of ablation to one order of magnitude below the optical diffraction limit [1].

In this study ionization mechanism in dielectrics irradiated with bandwidth-limited and temporally asymmetric femtosecond laser pulses are investigated via ultrafast spectral interferometry [2]. An extremely stable common-path interferometer is used to extract accurate information about the electron plasma and its dynamics. Our measurements directly prove that temporally, asymmetric shaped pulses control the ionization mechanism through which the free electrons are generated in high band gap transparent dielectrics.

[1] L. Englert *et al.*, J. Laser Appl., **24**, 042002 (2012)
[2] C. Sarpe *et al.* NJP **14**, 075021, (2012)

K 6.3 Tue 17:00 SPA SR203

Visualization of ultrafast two-dimensional atomic motions in a single crystal of bismuth — •Eeuwe Zijlstra and Martin Garcia — Theoretische Physik, Universität Kassel, Deutschland

A new method to optically control two-dimensional atomic motions in a bulk solid has recently been demonstrated [1]. In addition, the controlled motions were quantitatively visualized by density functional theory calculations [1]. The newly developed visualization scheme, which is based on the calculation of optical properties in two independent atomic directions, allows to follow the real-space atomic motions from time-resolved optical reflectivity measurements only. Here, details of the optical calculations are presented and the conditions of validity of our novel scheme are discussed.

[1] H. Katsuki et al, Nature Communications 4, 2801 (2013).