SYUF 2: SYUF II

Zeit: Mittwoch 16:30–18:30 Raum: VMP 8 HS

Hauptvortrag SYUF 2.1 Mi 16:30 VMP 8 HS

Pump-probe experiments at FLASH — •Stefan Düsterer — DESY, Hamburg, Germany

The free-electron laser FLASH is a unique tool to explore ultra-high intense XUV region. Besides the unrivalled intensity, the ultra-short pulse duration of only 10fs- 50 fs enables a wide field of time-resolved experiments. Several different pump-probe schemes have been implemented in the last years at FLASH. Besides XUV+XUV and the novel XUV+THz option, so far mainly XUV+optical pump-probe experiments have been performed. Besides a short overview of the various developments of the pump-probe infrastructure the talk will mainly focus on recent results of time-resoled experiments combining the FLASH-XUV radiation with optical femtosecond pulses.

Hauptvortrag SYUF 2.2 Mi 17:00 VMP 8 HS

Chemistry with Free Electron Laser Radiation: Proof of Principle — •Simone Techert — Max Planck Institute for Biophysical Chemistry, 37077 Goettingen, Germany

With their unique properties of brilliance, coherence and time-resolution free electron lasers open new possibilities for x-ray science. We will discuss the possibility of using FEL soft x-ray radiation for photo-inducing chemical reactions in the solid state. Recent ultrafast studies at the FLASH facility in Hamburg suggest that element specific excitations with FEL radiation lead to specific product states which can not be created by other methods. These states have been investigated by ultrafast optical reflectometry in a FLASH pump / optical light probe configuration. Furthermore, we have studied the ultrafast structural response function of supramolecular nanocrystals with a structural periodicity of 5.6 nm. These systems fulfil the Bragg condition in the soft x-ray regime and allow femtosecond time-resolved x-ray diffraction experiments. To our knowledge these are the first diffraction experiments on periodic structures with FEL radiation (down to a resolution of 0.2 Å) and confirm the possibility of using FEL radiation in crystallographic studies. By photon absorption from ultrafast optical laser sources elementary silver is formed in organic - inorganic composite nanocrystals. We have investigated the initial, ultrafast structural steps underlying this chemical reaction.

Hauptvortrag SYUF 2.3 Mi 17:30 VMP 8 HS

Ultrafast processes and single shot imaging of clusters with intense soft x-ray radiation from the FLASH free electron laser — •Christoph Bostedt — Insitut f. Optik und Atomare Physik, Technische Universität Berlin

For many potential experiments with free electron lasers it is of fundamental importance to study the absorption and ionization properties of nanoscale systems in the short-wavelength strong-field domain.

We have performed first experiments about the soft x-ray laser pulse - cluster interaction with a combined spectroscopy and imaging approach. The new data show qualitatively different processes for (soft) x-ray pulses from the optical strong field regime. Electrons are emitted from the clusters in a direct multistep photoionization process and plasma type absorption is not significant. Resonant excitation of Xe clusters at 90 eV and power densities exceeding 10^{14} W/cm^2 yield high charge states of up to 9^+. The investigation of core - shell systems gives evidence for efficient charge redistribution within the cluster, leading to explosion of the cluster outer layers and recombination of the nanoplasma core.

For single-shot imaging of clusters with intense short wavelength radiation a new detector system has been developed. Mie calculations indicate that the optical constants of the clusters, which are inherently coupled to its electronic structure and thus charge states, change during the femtosecond pulse. The results show that ultra fast scattering is a promising approach to study transient states of matter on a femtosecond time scale.

Hauptvortrag SYUF 2.4 Mi 18:00 VMP 8 HS

Ultrafast Coherent Diffractive Imaging at FLASH — •Henry Chapman — CFEL, DESY, Hamburg, Germany

We have carried out high-resolution single-pulse coherent diffractive imaging at the FLASH free-electron laser. The intense focused FEL pulse gives a high-resolution low-noise coherent diffraction pattern of an object before that object turns into a plasma and explodes. We are developing imaging of biological specimens beyond conventional radiation damage resolution limits, developing imaging of ultrafast processes and testing methods to characterize and perform single-particle imaging. In particular our method of time-delay holography gives measurements of the dynamics of materials irradiated with intense FEL pulses, with 1 fs temporal resolution.