Graduate School Seminar

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Dynamik molekularer Systeme

Analysis of Laser-Induced Plasma Dynamics by Coherent Diffractive Imaging

Studying the dynamics of laser-induced solid-density plasmas is of central interest for understanding the response of condensed matter targets to intense laser radiation, e.g. for optimizing laser machining. Furthermore, corresponding experiments open a route to investigate the properties of warm dense matter. Here we describe a technique to analyze the spatio-temporal evolution of laser plasmas in thin metallic foils with high resolution by combining ultrafast pump-probe techniques with two-dimensional diffractive imaging. From the recorded diffraction pattern a lateral 2D-map of the complex transmittance is obtained by inverting the holographic phase problem. From the temporal evolution of the resulting 2D-optical parameter maps details of the ionization, heating and ablation dynamics realized in the microplasma will be extracted. A dense laser plasma is generated by exciting a 30 nm thick gold foil with tightly focused pulses at 800 nm (τ_{pump} = 50 fs).
The plasma evolution is probed by delayed 400 nm pulses in transmission and the resulting diffraction pattern of the probe beam is recorded by a CMOS camera. By compressing the probe pulses, a time resolution of 50 fs is achieved. The experimentally observed diffraction patterns exhibit changes between 0 and 2000 ps, reflecting the temporal evolution of the plasma.

Talk: English
Slides: English

Location: Institute of Physics, Albert-Einstein-Str. 24, HS1

Talks in SS 2016

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