



Contribution ID: 62

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Few-cycle probing of laser and electron driven plasma wakefield accelerator experiments

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Laser and plasma wakefield acceleration is a two-stage process. Electron bunches are accelerated to relativistic velocities and then tailored to specific characteristics. In depth understanding and control of the involved acceleration mechanisms is crucial. Femtosecond probing gives insight into plasma dynamics during acceleration. Spectrally broadened and compressed probe pulses with a length of a few optical cycles are capturing high resolution shadowgrams showing the interaction between gas and laser or electron beam. The plasma oscillations, periodic modulations of the electron density, are captured for the laser and electron driven wakefields. The wavelength of these oscillations relates directly to the local density and is a valuable parameter for online diagnostics. It is extracted easily via Fourier transform. Applying a continuous wavelet transform determines the local densities along the propagation axis. Besides this longitudinal resolution, the shadowgrams, which are phase contrast images, also allow reconstruction of a quasi-3D, quantitative density distribution. From shadowgrams taken in multiple image planes the accumulated phase is calculated. Assuming rotational symmetry, a reverse transformation reveals the local refractive index, which is proportional to the density. Various probe beam diagnostics have been integrated and the first data shots were taken with a multiplane and multispectral imaging system.

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