Contribution ID: **92** Type: **Contributed poster**

First User Experiments at FLASH2 FL24

Monday 25 June 2018 18:45 (15 minutes)

The variable micro-focus beamline FL24 of the Free-electron LASer in Hamburg FLASH consist of a bending mirror focusing system. This Kirkpatrick-Beaz Active Optics System (KAOS) is a product of Fermi@Elettra. The open port beamline FL24 of the second SASE FEL branch of FLASH with variable gap undulators is designed to deliver the full fundamental wavelengths range of 4-90nm, distinguished repetitions rates of 1MHz down to 40kHz, single photon beam energies between 1-1000µJ, and standard to ultra-short pulses (150fs to below 10fs). KAOS is able to manipulate the photon beam spot along the full experimental area, starting at the minimal-accessible focal lengths of 2m up to 6m behind the horizontal focusing mirror. Depending on the fundamental wavelength, electron beam energy, and further machine settings, minimal spot sizes of 3-10µm (fwhm) are feasible. The high flexibility in the experimental setups, the high amount of different machine setting including special schemes, and the stochastic instabilities of a SASE FEL require repeatedly alignment of the optical system as well as detailed online photon diagnostics to indicate possible drifts. In addition to the preferred wave-front sensor (WFS) setup behind an experiment and/or further optimization on the experimental signal itself, the beamline is equipped with a second WFS branch in 90 degree in case the experiment do not allow for the first. The WFS measuring and evaluation of foci at FLASH is under constant development, a co-operation with the group of K. Mann of the Laser Laboratory Göttingen. A recent comparison study between PMMA imprints and WFS back-propagation calculations shows the possibility to shape the photon beam not only to a minimal focus at the desired point and the reduction of aberration effects but also to other forms which may be in favorite for an experiment, e.g. line foci, rectangular profiles >100µm, convergent beams.

We report on the first user experiment cases to demonstrate the advantages of this instrument and to illustrate the challenges the photon diagnostics and photon optics have to face. Ultra-fast demagnetization as well as multiple-photon effects in clusters and gases are examples for the benefit of fast and user controlled wavelengths optimization, the use and flexibility of the ultra-short gun laser, target depletion or heat effects due to high repetition rates, and variable foci at the desired interaction region.

Primary authors: Dr KUHLMANN, Marion (DESY); Dr KEITEL, Barbara (FLASH@DESY); Dr RUIZ-LOPEZ, Mabel (FLASH@DESY); Dr PLÖNJES, Elke (DESY); RAIMONDI, Lorenzo; ZANGRANDO, Marco (Elettra Sincrotrone Trieste)

Presenter: Dr KUHLMANN, Marion (DESY)

Session Classification: Poster session