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Monochromatic Kα imaging for beam monitoring of an XFEL and a high-power femtosecond laser H. SAWADA, J. TRZASKA, UNR, C.B. CURRY, M. GAUTHIER, L.B. FLETCHER, SLAC, S. JIANG, LLNL, H.J. LEE, E.C. GALTIER, E. CUNNINGHUM, G. DYER, SLAC, T.S. DAYKIN, L. CHEN, C. SALINAS, UNR, G.D. GLENN, M. FROST, S.H. GLENZER, SLAC, Y. PING, A.J. KEMP, LLNL, Y. SENTOKU, Osaka Univ. — The spatial overlap of an X-ray Free Electron Laser (XFEL) and a high-power femtosecond laser must be ensured in order to study the plasma condition of a laser-irradiated region in time-resolved pump-probe experiments. In an experiment at the Matter in Extreme Conditions (MEC) end-station of the Linac Coherent Light Source, we applied monochromatic x-ray imaging for determining positions of the beam-target interaction by measuring XFEL- and laser-induced Kα x rays with a spherical crystal imager (SCI). A thin titanium foil was irradiated by a MEC's 25-TW femtosecond laser, while a 7.0 keV XFEL beam was used to probe an isochorically heated plasma. Measured 4.51 keV Ti Kα x rays produced by various sizes of the XFEL pulses penetrating through the foil were ranged from $\sim$80 μm in diameter down to 20x40 μm^2. The laser-induced Kα spots were measured to be between 40 and 80 μm FWHM in diameter. Successful beam overlapping was observed on ˜58% of all two-beam shots for 10 μm thick samples. Results reveal that imprecise target positioning is a major cause of large beam offsets. Details of the experiment and results including a correlation between SCI and x-ray Thomson Scattering signals will be discussed. This material is based upon work supported by the National Science Foundation under Grant No. 1707357.

Hiroshi Sawada
University of Nevada, Reno

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