

## Dynamic Compression Studies at Pohang X-ray Free Electron Laser Facility (PAL-XFEL)

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We have successfully commissioned dynamic compression program at the Pohang X-ray Free Electron Laser facility (PAL-XFEL) in Korea by utilizing instrumentations at XSS (X-ray Scattering and Spectroscopy) and NCI (Nano Crystallography and Coherent Imaging) beamlines. As the first experiment, a polycrystalline iron foil has been illuminated by an 800 nm wavelength uncompressed optical laser with ~6 mJ in 150 ps pulse length, focused onto a 100  $\mu\text{m}$  FWHM spot. The shock-compressed sample has then been probed by ca. 50 fs quasi-monochromatic (bandwidth 0.4%) X-ray pulse at an energy of 10 keV with  $10^{11}$  photons per pulse, focused to ca. 30  $\mu\text{m}$  diameter using a

CRL optics. The sample is positioned normal to the X-ray pulse at a distance of ca. 12 cm from a Rayonix mx225 detector to cover  $2\theta$  angles up to ca. 65 degrees. Single-shot diffraction measurements were performed with ca. 100 ps. increment up to one nanosecond. In the follow-up beamtimes, we have optimized the dynamic compression setup by utilizing 12 keV, 25 fs, 30  $\mu\text{m}$  XFEL and 60  $\mu\text{m}$  optical laser and extended the measurement on iron to observe post-shock thermal effects. First time investigation on pre-compressed samples in DAC is also being commissioned in collaboration with Euro-XFEL program. We demonstrate that PAL-XFEL can provide a unique opportunity in probing ultrafast lattice dynamics with sufficient spatial and temporal resolution in intermediate and multi-dimensional pressure regime.