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X-ray diffraction at Matter in Extreme Conditions endstation ZHOU XING, ERIC GALTIER, HAE JA LEE, BOB NAGLER, SLAC National Accelerator Laboratory — Understanding dynamic response at the atomic level under extreme conditions is highly sought after goal to science frontiers studying warm dense matter, high pressure, geoscience, astrophysics, and planetary science. Thus it is of importance to determine the high pressure phases or metastable phases of material under shock compression. In situ X-ray diffraction technique using LCLS free electron laser X-ray is a powerful tool to record structural behavior and microstructure evolution in dense matter. Shock-induced compression and phase transitions of material lead to changes of the lattice spacing or evolution of new X-ray diffraction patterns. In this talk, we describe a platform dedicated for the X-ray diffraction studies at Matter in Extreme Conditions (MEC) [1], which can be used to reconstruct a complete diffraction pattern from numerous detectors, optimize detector positioning in a timely manner, extract the lattice spacing profiles and texture features. This platform is available to the user community for real-time analysis. We will also discuss experimental results, using this platform, on the crystalline silicon phase transitions up to 60 GPa.

[1] B. Nagler et al. J. Synchrotron Rad. 22 (2015)

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