Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

**Strength of Iron Under Dynamic Compression** ARIANNA GLEASON, LANL/SLAC, CINDY BOLME, LANL, SEBASTIEN MERKEL, Universite Lille, France, KYLE RAMOS, LANL, BOB NAGLER, ERIC GALTIER, HAE JA LEE, EDUARDO GRANADOS, SLAC, AKEL HASHIM, Google, DYLAN RITTMAN, Stanford University, WENDY MAO, Stanford University/SLAC — Strength, defined as the maximum shear stress that can be sustained before plastic (ductile) flow, is a fundamental materials property that is difficult to measure directly or predict using theoretical calculations. Similarly, textures in polycrystals provide important information regarding the plastic behavior and identification of dominant twinning or slip mechanisms. Here we present experiments performed at the Matter in Extreme Conditions end-station at the Linac Coherent Light Source, SLAC combining a laser-driven dynamic compression pump and X-ray free electron laser (XFEL) probe to measure the strength of iron up to 220 GPa under dynamic compression. Adopting an experimental geometry similar to that of radial diffraction, we measured diffraction at  65° to the shock propagation direction and cover 180° azimuth range in an X-ray transmission geometry. From the time-resolved X-ray diffraction (XRD) we measure line-shifts in hcp-Fe and see the development of marked preferred orientation on compression following the principal Hugoniot. An assessment of our resolution for measuring the magnitude of deviatoric strain (Q) finds it to be  0.001. This enables the ability to resolve bulk strengths in iron as low as  1 GPa.

Arianna Gleason
LANL/SLAC

Date submitted: 23 Feb 2017 Electronic form version 1.4