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Measurements of elastic and plastic waves in polycrystalline diamond under shock compression MICHAEL MACDONALD, Univ of Michigan, SLAC, LUKE FLETCHER, JAN VORBERGER, MAXENCE GAUTHIER, ELISEO GAMBOA, SLAC National Accelerator Lab, ALESSANDRA RAVASIO, SLAC, Ecole Polytechnique, HAE JA LEE, ERIC GALTIER, ZHIJIANG CHEN, SLAC National Accelerator Lab, DOMINIK KRAUS, BEN BARBREL, Univ of California - Berkeley, R PAUL DRAKE, Univ of Michigan, SIEGFRIED GLENZER, SLAC National Accelerator Lab — Direct measurements of the crystal structure of materials under dynamic compression can be obtained using angularly resolved x-ray scattering at the MEC end station of the LCLS facility. In this experiment the 40 fs LCLS x-ray beam enabled time resolved measurements of elastic and plastic waves in polycrystalline diamond, the behavior of which are important to understand for the early stages of compression in inertial confinement fusion targets and planetary interiors. In this experiment two 527 nm optical lasers focused to 4×10^{14} W/cm^2 were used to compress 20 and 40 μm polycrystalline diamond foils. Compression and lattice deformation measurements were made directly from angularly resolved x-ray scattering and compared to DFT simulations. This material is based upon work supported by the National Science Foundation Graduate Research Fellowship Program under Grant No. 2013155705, DOE Office of Science, Fusion Energy Science under FWP 100182, by DOE/NNSA under grant number DE-NA0001840, and was performed at the MEC instrument of LCLS under contract No. SF00515. The target work was supported by a Laboratory Directed Research and Development grant.

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