Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Density measurements of dynamically-compressed, melting phase silicon via simultaneous in-situ x-ray diffraction and x-ray contrast imaging using the LCLS x-ray free electron laser at MEC SHAUGHNESSY BRENNAN BROWN, Stanford University, HAE JA LEE, BOB NAGLER, ERIC GALTIER, ZHOU XING, ARIANNA GLEASON, EDUARDO GRANADOS, INHHYUK NAM, FRANK SEIBOTH, SLAC National Accelerator Laboratory, ANDREAS SCHROPP, DESY, Germany, ANDREW HIGGINBOTHAM, Univ. York, UK, AKEL HASHIM, BRICE ARNOLD, ALAN FRY, SLAC National Accelerator Laboratory — Studies of compressed silicon have extracted lattice parameters from in situ x-ray diffraction data [1, 2]. However, density measurements during high-pressure liquid melt remain difficult as the sample becomes amorphous and enters the warm dense matter regime. X-ray contrast imaging offers a powerful tool to resolve changes in density during laser-driven shock compression and enables imaging of regions before, between, and after elastic and plastic waves [3, 4]. This experiment utilizes the LCLS x-ray free electron laser and the Matter in Extreme Conditions instrument to obtain simultaneous x-ray diffraction and x-ray contrast imaging during dynamic shock loading. VISAR measurements on LiF and Si show the accessible pressure exceeding 1MBar. In this talk, we will present images of the elastic and plastic waves and discuss determination of the density profile of high-pressure melting phase silicon following the plastic deformation wave. [1] Wark et al. Phys. Rev. B 40(8) (1989) [2] Daisenberger et al. Phys. Rev. B 75(22) (2007) [3] Nagler et al. J. Synchrotron Rad. 22 (2015) [4] Schropp et al. Scientific Reports 5, 11089 (2015)

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Date submitted: 15 Jul 2016 Electronic form version 1.4