Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

Conceptual Design for Time-Resolved X-ray Diffraction in a Single Laser-Driven Compression Experiment[1] LAURA ROBIN BENEDETTI, J. H. EGGERT, Lawrence Livermore National Laboratory, J. D. KILKENNY, General Atomics, D. K. BRADLEY, P. M. BELL, N. E. PALMER, Lawrence Livermore National Laboratory, J. R. RYGG, T. R. BOEHLY, G. W. COLLINS, C. SORCE, Laboratory for Laser Energetics — Since X-ray diffraction is the most definitive method for identifying crystalline phases of a material, it is an important technique for probing high-energy-density materials during laser-driven compression experiments. We are developing a design for collecting several x-ray diffraction datasets during a single laser-driven experiment, with a goal of achieving temporal resolution better than 1ns. The design combines x-ray streak cameras, for a continuous temporal record of diffraction, with fast x-ray imagers, to collect several diffraction patterns with sufficient solid angle range and resolution to identify crystalline texture. Preliminary experiments will be conducted at the Omega laser and then implemented at the National Ignition Facility. We will describe the status of the conceptual design, highlighting tradeoffs in the design process. We will also discuss the technical issues that must be addressed in order to develop a successful experimental platform. These include: Facility-specific geometric constraints such as unconverted laser light and target alignment; EMP issues when electronic diagnostics are close to the target; X-ray source requirements; and detector capabilities.

[1]This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344, LLNL-ABS-725146

Laura Robin Benedetti
LLNL

Date submitted: 24 Feb 2017 Electronic form version 1.4