Abstract Submitted
for the SHOCK15 Meeting of
The American Physical Society

Dynamic Multi-frame X-ray Phase Contrast Imaging of Impact Experiments at the Advanced Photon Source BRIAN JENSEN, ANTHONY FREDENBURG, Los Alamos National Laboratory, ADAM IVERSON, CARL CARLSON, National Security Technologies, KAMEL FEZZAA, Argonne National Laboratory, BRADFORD CLEMENTS, MARK SHORT, Los Alamos National Laboratory — Recent advances in coupling synchrotron X-ray diagnostics to dynamic compression experiments are providing new information about the response of materials at extremes conditions. For example, propagation based X-ray Phase Contrast Imaging (PCI) which is sensitive to differences in density (or index of refraction) has been successfully used to study a wide range of phenomena including jet-formation in metals, crack nucleation and propagation, and detonator dynamics. These experimental results have relied, in part, on the development of a robust, optically multiplexed detector system that captures single X-ray bunch images with micrometer spatial resolution on the nanosecond time scale. In this work, the multi-frame PCI (MPCI) system is described along with experiments designed to examine the compression of an idealized system of spheres subjected to impact loading. Additional advances to the detector system will be presented that are designed to retrieve phase information from the X-ray images for fast tomography applications. Experimental results, implications, and future work will be discussed.

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Date submitted: 28 Jan 2015 Electronic form version 1.4