Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Lattice Dynamics of Shocked, Single-Crystal Tantalum Characterized using Dynamic White-Light Laue X-ray Diffraction[1] A.J. COMLEY, AWE / LLNL, B.R. MADDOX, J.A. HAWRELIAK, H.-S. PARK, S.T. PRISBREY, R.E. RUDD, B.A. REMINGTON, LLNL, P.A. ROSEN, S. ROTHMAN, N. PARK, J.M. FOSTER, AWE, A. HIGGINBOTHAM, M. SUGGIT, J.S. WARK, University of Oxford — We report on recent experiments at the Omega laser facility that demonstrate the use of broadband x-ray diffraction to probe the lattice dynamics of tantalum crystals under a range of shock-loaded conditions (1 – 2.2MBar). In the experiments, an implosion capsule x-ray backlighter (approx 150 ps duration) driven by 44 Omega beams (22 kJ total in a 1 ns square pulse) was employed to produce the white light diffraction pattern. VISAR was employed simultaneously to infer the high-pressure conditions in the shocked Ta crystal. We show how the residual strain present in a 1D-to-3D relaxed lattice can be obtained from the x-ray diffraction data. This information, when combined with an elastic constant calculated from first principles for the pressure as determined from VISAR, allows the strength of the crystal to be inferred.

[1]This work was performed under the auspices of the Lawrence Livermore National Security, LLC, (LLNS) under Contract No. DE-AC52-07NA27344. IM Release No. LLNL-ABS-490764

A.J. Comley
AWE / LLNL

Date submitted: 15 Jul 2011 Electronic form version 1.4