Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Dynamic Yield Strength of Single Crystal Tantalum Measured from in-Situ Bragg Diffraction[1] CHRIS WEHRENBERG, BRIAN MADDOX, Lawrence Livermore National Laboratory, ANDREW COMLEY, Atomic Weapons Establishment, HYE-SOOK PARK, SHON PRISBREY, ROBERT RUDD, JAMES HAWRELIAK, Lawrence Livermore National Laboratory, JUSTIN WARK, ANDREW HIGGINBOTHAM, University of Oxford, NATHAN BARTON, ALLEN ELSHOLZ, RICHARD GROSS, BRUCE REMINGTON, Lawrence Livermore National Laboratory — Laser driven shock experiments featuring in situ Bragg diffraction were performed at the Omega EP facility on single crystal Tantalum to study the dynamic yield strength and lattice dynamics. Polished tantalum samples were shocked along the [111] direction to peak stresses in the range of ∼20-90 GPa and probed using a 22 keV x-ray source foil driven using the Omega EP petawatt beam. Diffraction from (222) and (231) lattice planes was obtained and the patterns recorded on time-integrating image plate detectors using the Lawrence Livermore Diffraction Imager (LLDI). The diffraction profiles were analyzed using the profile synthesis method to infer the detailed strain profile in the shock compressed material. Yield strength inferred from the data is compared with predictions from various rate-independent and rate-dependent models, including the LLNL multi-scale strength model for Ta.

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

Christopher Wehrenberg
Lawrence Livermore National Laboratory

Date submitted: 13 Jul 2012 Electronic form version 1.4