Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Experiments on material dynamics at extreme pressures and strain rates[1] BRUCE REMINGTON, LLNL — Solid state, materials dynamics experiments at extreme pressures, 10-100 GPa (0.1-1 Mbar) and strain rates (1.e6 - 1.e8 1/s) are being developed on high-energy laser facilities. A quasi-isentropic, ramped-pressure (shockless) drive is being developed to reach the highest pressures in the solid state. Constitutive models for material strength of aluminum and vanadium under these conditions are tested with experiments measuring perturbation growth due to the Rayleigh-Taylor instability in solid-state samples. Lattice compression, phase, and temperature are deduced from extended x-ray absorption fine structure (EXAFS), and from dynamic x-ray diffraction measurements. Large-scale MD simulations elucidate the microscopic dynamics of the lattice response to the high pressure, high strain rate compression. Deformation mechanisms, such as the slip-twinning transition in shocked single-crystal Cu are examined using recovery techniques. Designs are being developed to reach much higher pressures, greater than 1000 GPa (10 Mbar), in the solid state on the NIF laser. Highlights from this work will be presented.

[1]This work was performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract No. W-7405-ENG-48.

Bruce Remington
LLNL

Date submitted: 21 Jul 2006 Electronic form version 1.4