Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Shock compression of precompressed deuterium MICHAEL ARMSTRONG, Lawrence Livermore National Laboratory, JONATHAN CROWHURST, JOSEPH ZAUG, ALEXANDER GONCHAROV, SORIN BASTEA, BURKHARD MILITZER — Hydrogen and deuterium are predicted to exhibit a number of exotic phenomena at high pressure ($>$ 50 GPa) and low temperature ($<<$ 1 eV), including a roll over in the melt temperature and metallization. Experimental work to confirm these predictions is challenging for both static and dynamic techniques. Hydrogen is difficult to contain in diamond anvil cells at high pressure and $\sim$1000 K, and reaches very high temperatures ($>$ 1 eV) under single shock compression to pressures greater than 50 GPa. We address these issues via shock compression of highly precompressed ($>$ 20 GPa) deuterium in a diamond anvil cell. Generally, this method enables variation of the final state over a two dimensional region of thermodynamic phase space through independent control of the precompression and the shock compression. For deuterium, this method enables access to high pressure, $\sim$ 1000 K temperature in deuterium by shock heating from a high pressure, but low temperature initial state achievable in a DAC. We generate and characterize the shocked state using an ultrafast method which enables direct measurement of both shock and particle velocity in a single shot. Here we present the results of our first experiments.

Michael Armstrong
Lawrence Livermore National Laboratory

Date submitted: 17 Feb 2011 Electronic form version 1.4