Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

Diagnosis of laser produced shocks in metals using short pulse probes WILL GRIGSBY, STEPHAN BLESS, MICHAEL DOWNER, ERIC TALEFF, TODD DITMIRE, Texas Center for High Intensity Laser Science, The University of Texas, 1 University Station C1510, Austin TX 78712, KIM BUDIL, JEFF COLVIN, WAYNE KING, Chemistry and Materials Science, Lawrence Livermore National Laboratory, Livermore, CA 94550 — We are studying extreme states of matter using laser produced shock waves in metal foils. At pressures on the order of 0.5 to 1 Mbar, the material behavior is complicated by various phase transitions such as melting. To study these dynamics we are using short pulse lasers in high time resolution pump-probe experiments to develop a real time diagnostic on the phase of a shocked material. This can enable a probing of the entire phase history of a material as it shock compresses and then releases from the back surface. In particular, we are interested in studying metals shock-melted on the Hugoniot. Our initial studies focus on driving 100-500 kbar shocks in tin and 1.6 Mbar shocks in aluminum using various lasers with energies of 1 to 1000J. Reflectivity of the metal is used to diagnose the state of the material in optical pump probe measurements, while two-dimensional interferometry is used to determine the shock parameters.

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Date submitted: 08 Apr 2005 Electronic form version 1.4