Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Using x-ray-free-electron lasers to generate and probe high-energy-density matter ALEXANDER GRAF, STEFAN HAU-RIEGE, RICH LONDON, TILO DOEPPNER, MATTHIAS FRANK, SIEGFRIED GLENZER, CARSTEN FORTMANN, LLNL, KLAUS SOKOLOWSKI-TINTEN, University of Duisberg, Essen, ADRIYAN MILEV, University of Western Sydney, JACEK KRZYWINKSI, MARC MESSERSCHMIDT, SEBASTIEN BOUTET, MARVIN SEIBERT, CHRISTOPH BOSTEDT, SLAC, DANIEL ROLLES, ARTEM RUDENKO, BENEDIKT RUDEK, Max Planck ASG — The world's first hard x-ray free electron laser, the Linac Coherent Light Source (LCLS) has become available, providing 10 to 500 fs x-ray pulses in the 2.5 and 0.15 nm wavelength range and 4 mJ pulse energies. Utilizing this laser, we studied ultrafast processes in warm dense matter, including ionization, energy transfer, and atomic motion. We used the unique high peak-brightness radiation to heat carbon solids isochorically to up to 50 electron volts. We then used the LCLS pulses to probe the state of the material via by Bragg and x-ray Thomson scattering. Elastic Bragg scattering provides ionic properties and structural information about the crystal, while the inelastic Compton and plasmon scattering spectrum reflects the electrical/optical properties, and further provides temperature and density information. In this presentation, we will report on the first experimental results and compare them to model calculations

Alexander Graf
LLNL

Date submitted: 16 Jul 2010 Electronic form version 1.4