Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Ultra-High Energy Density Relativistic Plasmas by Ultrafast Laser Irradiation of Aligned Nanowire Arrays[1] J.J. ROCCA, M.A. PURVIS, V.N. SHLYAPTSEV, R.C. HOLLINGER, C. BARGSTEN, Colorado State University, A. PUKHOV, Institut für Theoretische Physik, Heinrich-Heine-Universität Düsseldorf, D. KEISS, A. TOWNSEND, A. PRIETO, Y. WANG, L. YIN, S. WANG, B. LUTHER, M. WOOLSTON, Colorado State University — Long-lived plasmas that are simultaneously dense and hot (multi-keV) have been created by spherical compression with the world's largest lasers, and by supersonic heating of volumes with densities on the order of N_{ec} using multi-kJ lasers pulses. We demonstrate volumetric heating of near-solid density plasmas to keV temperatures using ultra-high contrast $\lambda = 400$ nm femtosecond laser pulses of only 0.5 J energy to irradiate arrays of vertically aligned nanowires with 12% average solid density. X-ray spectra show that irradiation of Ni and Au nanowires arrays with relativistic intensities ionizes plasma volumes several micrometers in depth to the He-like and Co-like (Au 52+) stages respectively. He-α line emission greatly exceeds that of the Ni Kα line. This volumetric plasma heating approach creates a new laboratory plasma regime in which extreme plasma parameters can be accessed with table-top lasers. The increased hydrodynamic-to-radiative lifetime ratio is responsible for a great increase in the x-ray emission.

[1]Work supported by Defense Threat Reduction Agency grant HDTRA-1-10-1-0079 and by the HEDLP program of the Office of Science of the U.S Department of Energy. Equipment developed under NSF grant MRI-ARRA 09-561. A.P was supported by DFG-funded project TR18

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Date submitted: 12 Jul 2013 Electronic form version 1.4