Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

**Volumetric Heating of Ultra-High Energy Density Relativistic Plasmas by Ultrafast Laser Irradiation of Aligned Nanowire Arrays**[1]
CLAYTON BARGSTEN, REED HOLLINGER, VYACHESLAV SHLYAPTSEV, Colorado State University, ALEXANDER PUKHOV, Heinrich-Heine-Universität Düsseldorf, DAVID KEISS, AMANDA TOWNSEND, YONG WANG, SHOUJUN WANG, AMY PRIETO, JORGE ROCCA, Colorado State University — We have demonstrated the volumetric heating of near-solid density plasmas to keV temperatures by ultra-high contrast femtosecond laser irradiation of arrays of vertically aligned nanowires with an average density up to 30% solid density. X-ray spectra show that irradiation of Ni and Au nanowire arrays with laser pulses of relativistic intensities ionizes plasma volumes several micrometers in depth to the He-like and Co-like (Au 52+) stages respectively.[2] The penetration depth of the heat into the nanowire array was measured monitoring He-like Co lines from irradiated arrays in which the nanowires are composed of a Co segment buried under a selected length of Ni. The measurement shows the ionization reaches He-like Co for depth of up to 5 $\mu$m within the target. This volumetric plasma heating approach creates a new laboratory plasma regime in which extreme plasma parameters can be accessed with table-top lasers. Scaling to higher laser intensities promises to create plasmas with temperatures and pressures approaching those in the center of the sun.[3]

[1]Work supported by the U.S Department of Energy, Fusion Energy Sciences and the Defense Threat Reduction Agency grant HDTRA-1-10-1-0079. A.P was supported by of DFG-funded project TR18.
[2]M. Purvis *et al.*, Nature Photonics 7, 796 (2013).
[3]Purvis (2013)

Clayton Bargsten
Colorado State University

Date submitted: 11 Jul 2014 Electronic form version 1.4