Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Nanostructure array plasmas generated by femtosecond pulses at highly relativistic intensities[1] R.C. HOLLINGER, Y. WONG, S. WONG, A. ROCKWOOD, J. GLASBY, V. SHLYAPTSEV, J.J. ROCCA, Colorado State University, M.G. CAPELUTO, Universidad de Buenos Aires, V. KAYMAK, A. PUKHOV, Heinrich-Heine-Universitat Dusseldorf — The irradiation of high aspect ratio ordered nanostructure arrays with ultra-high contrast femtosecond laser pulses of relativistic intensity provides a unique combination of nearly complete optical absorption and drastically enhanced light penetration into near-solid density targets. This allows the material to be volumetrically heated deep into the ultra-high energy density regime[1]. In previous experiments we have shown that irradiation of Ni and Au nanostructures with femtosecond pulses focused to an intensity of $5x10^{18}$ Wcm^{-2} generate multi-KeV near solid density plasmas in which atoms are ionized to the Ni^{+26} and Au^{+52} charge states[2]. Here we present the first results of the irradiation of nanostructure arrays with highly relativistic pulses of intensities up to $5x10^{21}Wcm^{-2}$. Silver and Rhodium nanowire arrays were irradiated with frequency-doubled pulses of 30 fs duration from a petawatt-class Ti:Sa laser. Time integrated x-ray spectra show the presence of He-like and Li-like emission. Results of experiments conducted with a variety of different nanowires diameters with a range of interwire spacings will be presented and compared to the result of 3D particle-in-cell-simulations. [1]Bargsten et al Sci. Advances Vol.3 No.1 (2017) [2]Purvis et al Nature Photonics 7, 769 (2013).

[1]This work was supported by the Fusion Energy Program, Office of Science of the U.S Department of Energy

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Date submitted: 14 Jul 2017 Electronic form version 1.4