Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Time Resolved Ni K Shell Spectroscopy of Nanowire Arrays Irradiated at Highly Relativistic Intensities[1] R. HOLLINGER, S. WANG, H. SONG, Y. WANG, A. MOREAU, M. CAPELUTO, V. SHLYAPTSEV, J.J. ROCCA, Colorado State University, A. PUKHOV, Heinrich-Heine-Universitat Dusseldorf, J. CLARK, Florida AM University, RONNIE SHEPHERD, Lawrence Livermore Natl Lab — Ni K shell emission from near-solid density nanowire arrays and solid density foils was spectrally and temporally resolved using an x-ray streak camera with sub-picosecond temporal resolution coupled to a Von Hamos crystal spectrometer. The targets were 100nm diameter Ni arrays with various fractions of solid density (7%, 15% and 24%) and were irradiated with high contrast ($>10^{12}$), = 400nm, 45fs laser pulses focused to intensities $>10^{21}$Wcm^{-2}. These results were compared to the emission from solid density Ni foils. The duration of the Ni He- line was measured to decrease from 21 ps for an initial electron density of 1.6x10^{23}cm^{-3} to 5 ps for a solid foil with an initial electron density of 2.4x10^{24}cm^{-3}. The increased time duration of the x-ray emission from the lower density nanowire arrays is shown to be a consequence of the increased volumetric heating of the plasma which delays the hydrodynamic expansion. These results are in good agreement with hybrid three-dimensional particle-in-cell/radiative hydrodynamic simulations.

[1]This work was performed under the auspices of the DOE by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.The experiments were conducted using the CSU ALEPH laser facility supported by LaserNetUS DE-SC0019076. R.H. was supported by the DOE FES Postdoctoral Research Program.

Reed Hollinger
Colorado State University

Date submitted: 08 Jul 2020 Electronic form version 1.4