Abstract Submitted
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Efficient X-ray generation from volumetrically heated aligned nanowire arrays[1] R.C. HOLLINGER, C. BARGSTEN, M. PURVIS, V.N. SHLYAPTSEV, Colorado State University, A. PUKHOV, Institut für Theoretische Physik, Heinrich-Heine-Universität Düsseldorf, A. TOWNSEND, D. KEISS, A.L. PRIETO, Y. WANG, S. WANG, L. YIN, B. LUTHER, M. WOOLSTON, J.J. ROCCA, Colorado State University — The trapping of femtosecond laser pulses of relativistic intensity deep within ordered nanowire arrays can volumetrically heat dense matter into an ultra-hot, near-solid density plasma in which the increased hydrodynamic-to-radiative lifetime ratio results in very efficient X-ray generation. Using high contrast ($> 1\text{x}10^{11}$) pulses of 60fs FWHM duration from a frequency doubled ($\lambda = 400$ nm) high power Ti:Sa laser, arrays of 55nm and 80nm targets with 12% of solid density were irradiated with pulses of $5\text{x}10^{18}$ Wcm^{-2}. The Ni nanowire target produced strong He-like line emission that surpasses the Kα emission. Conversion efficiency of $> 5\%$ into photons with energy > 0.9 KeV in a hemisphere was measured. The Au nanowire spectrum displays strong Au M-shell emission with unresolved 4-3 lines from ions ranging from Co-like (Au^{+52}) to Ga-like Au (Au^{+48}). Filtered photodiode measurements show a $\sim$ 100X emission increase respect to smooth solid targets for photon energies > 9 keV.

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