Abstract Submitted
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X-ray Emission Characteristics of Ultra-High Energy Density Relativistic Plasmas Created by Ultrafast Laser Irradiation of Nanowire Arrays[1] R.C. HOLLINGER, C. BARGSTEN, V.N. SHLYAPTSEV, Colorado State University, A. PUKHOV, Heinrich-Heine-Universitat Dusseldorf, M.A. PURVIS, A. TOWNSEND, D. KEISS, Y. WANG, S. WANG, A. PRIETO, J.J. ROCCA, Colorado State University — Irradiation of ordered nanowire arrays with high contrast femtosecond laser pulses of relativistic intensity creates volumetrically heated near solid density plasmas characterized by multi-KeV temperatures and extreme degrees of ionization.[2] The large hydrodynamic-to-radiative lifetime ratio of these plasmas results in very efficient X-ray generation. Au nanowire array plasmas irradiated at I $5\mathrm{x}10^{18}$ Wcm^{-2} are measured to convert $\sim$ 5 percent of the laser energy into hν>0.9 KeV X-rays, and >1 x 10^{-4} into hν>9 KeV photons, creating bright picosecond X-ray sources. The angular distribution of the higher energy photons is measured to change from isotropic into annular as the intensity increases, while softer X-ray emission (hν >1 KeV) remains isotropic and nearly unchanged. Model simulations suggest the unexpected annular distribution of the hard X-rays might result from bremsstrahlung of fast electrons confined in a high aspect ratio near solid density plasma in which the electron-ion collision mean free-path is of the order of the plasma thickness.

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[2]M.Purvis et al Nature Photonics **7**,796 (2013).

Reed Hollinger
Colorado State University

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