Abstract Submitted
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Unique X-ray emission characteristics from volumetrically heated nanowire array plasmas[1] J.J. ROCCA, C. BARGSTEN, R. HOLLINGER, V. SHLYAPTSEV, Colorado State University, A. PUKHOV, V. KAYMAK, Heinrich-Heine-Universitat Dusseldorf,Germany, G. CAPELUTO, University of Buenos Aires, Argentina, D. KEISS, A. TOWNSEND, A. ROCKWOOD, Y. WANG, S. WANG, Colorado State University — Highly anisotropic emission of hard X-ray radiation (hν >10 keV) is observed when arrays of ordered nanowires (50 nm diameter wires of Au or Ni [1]) are volumetrically heated by normal incidence irradiation with high contrast 50-60 fs laser pulses of relativistic intensity. The annular emission is in contrast with angular distribution of softer X-rays (hν >1 KeV) from these targets and with the X-ray radiation emitted by polished flat targets, both of which are nearly isotropic. Model computations that make use the electron energy distribution computed by particle-in-cell simulations show that the unexpected annular distribution of the hard x-rays is the result of bremsstrahlung from fast electrons. Volumetric heating of Au nanowire arrays irradiated with an intensity of 2 x 10 19 W cm-2 is measured to convert laser energy into hν>1KeV photons with a record efficiency of >8 percent into 2π, creating a bright picosecond X-ray source for applications.

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

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