Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Forward directed x-ray from source produced by relativistic electrons from a Self-Modulated Laser Wakefield Accelerator[1] NUNO LEMOS, FELICIE ALBERT, Lawrence Livermore Natl Lab, JESSICA SHAW, Laboratory for Laser Energetics, PAUL KING, University of Texas, AVI MILDER, Laboratory for Laser Energetics, KEN MARSH, University of California Los Angeles, ARTHUR PAK, Lawrence Livermore Natl Lab, CHAN JOSHI, University of California Los Angeles — Plasma-based particle accelerators are now able to provide the scientific community with novel light sources. Their applications span many disciplines, including high-energy density sciences, where they can be used as probes to explore the physics of dense plasmas and warm dense matter. A recent advance is in the experimental and theoretical characterization of x-ray emission from electrons in the self-modulated laser wakefield regime (SMLWFA) where little is known about the x-ray properties. A series of experiments at the LLNL Jupiter Laser Facility, using the 1 ps 150 J Titan laser, have demonstrated low divergence electron beams with energies up to 300 MeV and 6 nCs of charge, and betatron x-rays with critical energies up to 20 keV. This work identifies two other mechanisms which produce high energy broadband x-rays and gamma-rays from the SMLWFA: Bremsstrahlung and inverse Compton scattering. We demonstrate the use of Compton scattering and bremsstrahlung to generate x/Gamma-rays from 3 keV up to 1.5 MeV with a source size of 50um and a divergence of 100 mrad. This work is an important step towards developing this x-ray light source on large-scale international laser facilities, and also opens up the prospect of using them for applications.

[1]This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under the contract DE-AC52-07NA27344. Lawrence Livermore National Security, LLC

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Date submitted: 24 Aug 2017 Electronic form version 1.4