Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Short-pulse, high-energy radiation generation using a laser wakefield accelerator[1] W. SCHUMAKER, M. VARGAS, Z. HE, V. CHVYKOV, B. HOU, V. YANOVSKY, A. MAKSIMCHUK, A.G.R. THOMAS, K. KRUSHELNICK, University of Michigan, G. SARRI, B. DROMEY, M. ZEPF, Queen's University of Belfast — Recent experimental results of laser wakefield acceleration (LWFA) of electrons and their subsequent radiation generation driven by the HERCULES laser with up to 200TW are presented. In LWFA, the plasma "bubble" structure forces trapped, off-axis electrons to undergo transverse oscillatory motion during acceleration, resulting in synchrotron-like betatron radiation in the keV X-ray regime. Measurements indicate that the beam source size can be as small as 1 micron and that the radiation exhibits spatial coherence, allowing phase-contrast imaging. Data from Cu K-α generated using an identical geometry are presented to give yield and source size comparisons. Alternatively, the high energy (>200 MeV) electron beam can be subsequently converted via Bremsstrahlung into low-divergence beams of high-energy photons and positrons. These photons are spectrally resolved using a Compton scattering-based, high-energy (30-80 MeV) photon spectrometer. All of these subsequent beams are presumed to retain the short-pulse characteristic of the electron beam, resulting in high peak flux, making the source an excellent candidate for ultrafast pump-probe applications in the keV and MeV photon range.

[1]Research Supported by DOE/NSF-PHY 0810979, NSF CAREER 1054164, DARPA AXiS N66001-11-1-4208, SF/DNDO F021166, and the Leverhulme Trust ECF-2011-383.

Will Schumaker
University of Michigan

Date submitted: 13 Jul 2012 Electronic form version 1.4