Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Simulations for the Elucidation of Electron Beam Properties in Laser-Wakefield Acceleration Experiments via Betatron and Synchrotron-Like Radiation PAUL CUMMINGS, ALEC THOMAS, University of Michigan Center for Ultrafast Optical Sciences — A promising application of laser-wakefield acceleration (LWFA) technology is as a tunable source of x-ray and gamma radiation via synchrotron radiation. Such a source could have many potential applications. Consequently, the generation of synchrotron radiation in LWFA experiments is investigated computationally using the particle-in-cell simulation code OSIRIS 2.0. In LWFA systems, electrons are accelerated by the wake structure produced by a propagating laser pulse up to the dephasing length. The wake fields not only accelerate, but axially focus the beam; consequently the electron beam naturally undergoes betatron motion while being accelerated. Once the beam passes the dephasing length, it slows and re-enters the plasma, undergoing a hosing instability. This dramatically increases the magnitude of the beam's betatron oscillations. Consequently, radiation emission in LWFA experiments can be controlled by varying the propagation distance of the laser pulse. The particle-in-cell code OSIRIS 2.0 was modified with a novel model for explicitly simulating synchrotron radiation to investigate this phenomena computationally. A parameter sweep was performed, varying the propagation distance of the simulation. The results of this parameter sweep are presented and discussed.

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Date submitted: 12 Jul 2013 Electronic form version 1.4