Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

**A Computational Investigation of the Impact of Non-Gaussian, "Low-Quality" Laser Pulses on Electron Beam Properties in Laser-Wakefield Acceleration Experiments**[1] PAUL CUMMINGS, ALEC THOMAS, University of Michigan Center for Ultrafast Optical Science — The impact of non-Gaussian, "low-quality," laser pulse profiles on the performance of laser-wakefield acceleration (LWFA) experiments is investigated computationally using the particle-in-cell simulation code OSIRIS 2.0. A baseline simulation of a $TEM_{00}$-mode (Gaussian) pulse is performed, and the properties of the electron beam produced by this pulse are measured. This pulse is then "mixed" with a TEM 10- mode pulse across a range of mixing percentages (while maintaining a constant total pulse energy), as a preliminary investigation into the effects of non-Gaussian pulse profiles on LWFA performance. Scalings relating the divergence, emittance, and peak pulse energy of the LWFA-produced electron beam to the mode mixing percentage are established. Using this simplified parameter sweep as a reference, more complex simulations of LWFA experiments with optical aberrations including comaticities, astigmatisms, and spherical aberrations are performed and analyzed. Modifications to OSIRIS to enable the explicit inclusion of these aberrations are discussed.

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Date submitted: 16 Jul 2010 Electronic form version 1.4