Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Generating Multi-GeV Electron Bunches Using Laser Wakefield Acceleration in the Blowout Regime WARREN B. MORI, WEI LU, MICHAIL TZOUFRAS, FRANK TSUNG, CHAN. JOSHI, UCLA, JORGE VIEIRA, RICARDO FONSECA, LUIS SILVA, IST, UCLA TEAM, IST TEAM — The extraordinary ability of space-charge waves in plasmas to accelerate charged particles at gradients that are orders of magnitude greater than in current accelerators has been well documented. We show here that 100TW to 2000TW class lasers can excite large amplitude wakefields and be stably self-guided in very underdense plasmas to produce 1 to 10 GeV mono-energetic, self-injected electron beams with nCs of charge. For such powers the plasma wakes can be excited by the nearly complete blowout, i.e., expulsion, of plasma electrons by the radiation pressure of a short pulse laser. The proposed regime is distinct from the "bubble regime" in that it advocates using lower densities and wider spot sizes while keeping the intensity relatively constant in order to increase the output electron beam energy and keep the efficiency high. Our theoretical results are verified by three-dimensional particle-in-cell simulations.

Warren B. Mori
UCLA

Date submitted: 25 Jul 2006 Electronic form version 1.4