Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Laser Wakefield Acceleration in Gas Cell Targets[1] C. MCGUFFEY, W. SCHUMAKER, F. DOLLAR, C. ZULICK, V. CHVYKOV, G. KALINTCHENKO, V. YANOVSKY, A.G.R. THOMAS, A. MAKSIMCHUK, K. KRUSHELNICK, Center for Ultrafast Optical Science, Univ. of Michigan, Z. NAJMUDIN, Imperial College London — Electron beams produced from laser wakefield acceleration (LWFA) may be a suitable injection source for TeV electron accelerators, having already demonstrated beam charge > nC with GeV energy in just ∼cm length. Additionally, the LWFA process has produced x-ray beams with peak spectral brightness comparable to third generation light sources. One of the most promising LWFA methods to date has been acceleration within a preformed plasma to guide a high-power laser. However, nonlinear effects in the plasma, such as self focusing and self phase modulation, may allow the use of simpler quiescent gas cell targets. Channeling with cm scale has been observed in a gas cell using 100 TW laser power from the HERCULES laser (Ti:Sapphire, 30 fs, 0.1 Hz). Accelerated protons were observed in the radial direction, which may be produced when the electron beam passes through the plasma, causing a Coulomb explosion. Experimental results are presented showing the effect of gas mixing and focusing geometry on channeling, acceleration, and x-ray generation.

[1]This research was funded by DHS/DNDO.

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Date submitted: 26 Jul 2010 Electronic form version 1.4