Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Narrow energy spread, 25MeV protons from the interaction of a time-structured CO_2 laser pulse with a gas target[1] D. HABERBERGER, S. TOCHITSKY, C. GONG, A. PAK, K.A. MARSH, C. JOSHI, F. TSUNG, W. MORI, UCLA, Los Angeles, California, USA, F. FIUZA, R. FONSECA, L. SILVA, Instituto Superior Tecnico, Lisbon, Portugal — Experimental results and 2D OSIRIS simulations of laser-driven proton acceleration from the interaction of a time-structured 10μm CO_2 laser pulse train and a gaseous target are presented. The wavelength of a CO_2 laser provides a unique opportunity to change the target density from 0.5 to 5n_{cr} in a controlled manner by changing the H_2 gas jet pressure. The CO_2 laser pulses consist of a train of 3ps pulses separated by 18ps with a peak power of ~4TW and a total energy of ~50J. The initial results show the production of proton energies of up to 25MeV, which far exceeds that predicted by ponderomotive force scaling for an $a_o \sim 2$. Furthermore, in the density range around 2n_{cr}, these high energy protons are contained within a narrow energy spread of $\Delta E/E \sim 10\%$. These results are attributed to the unique time structure of the CO_2 laser pulses, underdense LPI's such as self-focusing due to large P/P_{cr} values, and profile steepening/hole boring.

[1]This work is supported by DOE grant DE-FG02-92ER40727 and NSF grant PHY-0936266.

Dan Haberberger
UCLA

Date submitted: 15 Jul 2010 Electronic form version 1.4