Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Multi-GeV electron generation using Texas petawatt laser system

X. WANG, D. DU, S.A. YI, S. KALMYKOV, W. HENDERSON, R. ZAGDAJ, S. REED, A. BERNSTEIN, E. GAUL, M. MARTINEZ, G. DYER, G. SHVETS, T. DITMIRE, M. DOWNER, Dept. of Physics, UT Austin — The parameters of the Texas Petawatt (PW) laser system presently make it the unique facility that can accomplish self-guided multi-GeV electron acceleration. Simulation results [1] show that the PW laser beam can be self-guided up to 10cm in the plasma bubble regime of LWFA, significantly increasing the electron acceleration length. It is also shown that electrons can be self-injected into the plasma bubble; small admixture of high Z gas may be required in some regimes to assist self-injection. ∼7GeV with less than 10% energy spread and ∼1nC electron beams are expected to be generated with the above experimental conditions. Optical diagnostics include transverse Thomson scattering of the PW drive beam to observe laser self-guiding, and transverse shadowgraphy and interferometry to observe plasma morphology. Single-shot Frequency Domain Holography (FDH) [2] will also be employed in an off-axis geometry to visualize the formation and evolution of the plasma bubble.

[1] S. Y. Kalmykov et. al., Phys. Rev. Lett. 103, 135004 (2009)
[2] N. H. Matlis et. al., Nature Phys. 2, 749 (2006)

Xiaoming Wang
Dept. of Physics, UT Austin

Date submitted: 07 Sep 2010 Electronic form version 1.4