Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Physics of Double Pulse Irradiation of Targets For Proton Acceleration[1] S. KERR, M. MO[2], R. MASUD, L. MANZOOR, H. TIEDJE, Y. TSUI, R. FEDOSEJEVS, Univ. of Alberta, A. LINK, P. PATEL, H. MCLEAN, A. HAZI, H. CHEN, LLNL, L. CEURVORST, P. NORREYS, Univ. of Oxford — Experiments have been carried out on double-pulse irradiation of um-scale foil targets with varying preplasma conditions. Our experiment at the Titan Laser facility utilized two 700 fs, 1054 nm pulses, separated by 1 to 5 ps with a total energy of 100 J, and with 5-20% of the total energy contained within the first pulse. The proton spectra were measured with radiochromic film stacks and magnetic spectrometers. The prepulse energy was on the order of 10 mJ, which appears to have a moderating effect on the double pulse enhancement of proton beam. We have performed LSP PIC simulations to understand the double pulse enhancement mechanism, as well as the role of preplasma in modifying the interaction. A 1D parameter study was done to isolate various aspects of the interaction, while 2D simulations provide more detailed physical insight and a better comparison with experimental data.

[1]Work by the Univ. of Alberta was supported by the Natural Sciences and Engineering Research Council of Canada. Work by LLNL was performed under the auspices of U.S. DOE under contract DE-AC52-07NA27344.
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Date submitted: 20 Jul 2016 Electronic form version 1.4