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Investigation of Super-Ponderomotive Electron Generation Using the Texas Petawatt Laser[1] J. PEEBLES, S. ZHANG, C. MCGUFFEY, UC San Diego, M. S. WEI, General Atomics, D. MARISCAL, H. S. MCLEAN, H. CHEN, LLNL, E. MCCARY, C. WAGNER, M. SPINKS, B. M. HEGELICH, E. GAUL, G. DYER, M. MARTINEZ, M. DONOVAN, T. DITMIRE, UT Austin, S. KRASHENINNIKOV, F. BEG, UC San Diego — Relativistic laser plasma interactions (LPI) in conjunction with an underdense pre-plasma have been shown to generate extremely high energy "super-ponderomotive" electrons. We conducted an experiment at the Texas Petawatt Laser Facility with recent pre-pulse cleaning upgrades in order to better understand the conditions required to generate such high energy electrons. We created the pre-plasma by introducing a controlled injected pre-pulse via a secondary beam prior to the main high intensity ($I > 10^{20} W/cm^2$) beam's arrival. The pulse length of the main beam was varied from 150 - 600 fs. The experimental data demonstrated that super-ponderomotive electrons require a pulse of at least 450 fs to be generated. Such interactions generated electrons with energies greatly exceeded 150 MeV, which also corresponded to an unexpected drop in lower energy electron count. We present these experimental findings along with subsequent 1 and 2D PIC simulations examining the results.

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