Abstract Submitted
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Fast electron production in intense laser-plasma interaction of multi-picosecond time scales[1] A. SOROKOVIKOVA, B. QIAO, UC San Diego, M.S. WEI, R.B. STEPHENS, General Atomics, P.K. PATEL, H.S. MCLEAN, LLNL, F.N. BEG, UC San Diego — Intense ($I_{laser}>10^{18}$ W/cm^2) laser-plasma interaction offers a very efficient source of fast electrons at relativistic energies, which can be used for fast-ignition inertial confinement fusion, ultra-short x-ray sources and heating matter to warm dense states. We report theoretical and particle-in-cell simulation results for characterization of fast electron source produced from intense laser interaction with solid targets at the time scale of multi-picosecond and energy scale of kilojoule. A substantial increase in both fast electron average energy and laser-electron conversion efficiency has been observed when the laser pulse length was extended from 1 to 10 picoseconds. The enhanced electron acceleration is attributed to a significant thermal preplasma expansion on several picosecond time scale that forms a long flat "shelf" at near-critical ($0.1n_c$ - n_c) density region, and ponderomotive piling-up of electrons that leads to a sharp interface at relativistic critical density γn_c. Both of these eventually result in large amplitude increase and volume broadening of the electrostatic potential for electron acceleration.

[1] D. R. Welch et al., Phys. Plasmas 13, 063105 (2006).

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