Integrated LSP Modeling of Fast-electron Production and Transport in a Wire Target

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— Integrated simulations using the implicit PIC code LSP# have been performed to study the production of relativistic electrons from ultra-intense (I \( \sim 7 \times 10^{19} \) W/cm\(^2\)) sub-picosecond laser solid interactions including a preformed plasma and the transport of such beam in a thin (50 \( \mu \)m in diameter), 100’s \( \mu \)m long wire target. Our 3D simulations show that greater than 40% of laser energy is transferred to fast electrons whose energy spectrum can be fitted to a two-temperature Maxwellian distribution. The fast electrons have a typical propagation length of about 100 \( \mu \)m inside the wire target. A very small fraction of the fast electrons is confined in the wire target surface by strong electric and magnetic fields and these electrons have a much longer range. The simulation results agree well with recent Titan wire experiments [1], as well as with other collisional PIC modeling.


This work is supported by USDOE under DE-FC02-04ER54789, DE-FG02-05ER54834, and DE-FG03-00ER54606. This work is also partially supported by the NCSA under TG-PHY050034T, TG-PHY060020T.

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Date submitted: 24 Jul 2007

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