Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

An Absorption Mechanism for High Intensity Lasers at a Steep Overdense Plasma[1] J. MAY, J. TONGE, W.B. MORI, UCLA, F. FIUZA, R. FONSECA, L.O. SILVA, IST — In both fast ignition (FI) and the radiation pressure acceleration (RPA) of ions it is essential to understand how electrons are accelerated and reabsorbed at a sharp overdense plasma interface by very intense lasers. To investigate this question, we use the PIC code OSIRIS to model the interaction of high intensity lasers ($I \geq 5 \times 10^{19} W/cm^2$) with a sharp boundary of an overdense plasma ($n \gg n_c$). These results indicate that the commonly proposed absorption mechanisms (Brunel, JxB) cannot explain the acceleration of the electrons. Through the use of particle tracking and a test particle model, we propose a new mechanism in which only electrons which can resonantly interact with the standing wave in vacuum can gain energy. Heating can only occur if the plasma temperature is sufficiently high such that electrons leaving the plasma at large angles are able to interact with the peak electric field. For circularly polarized lasers, the surface B field of the standing wave prevents electrons from leaving the plasma leading to significantly less heating. The process is conformed in test particle simulations. Applications to FI and RPA will be discussed.

[1]Work supported by the DOE Fusion Science Center and NSF under NSF PHY-0904039.

Joshua May

Date submitted: 20 Jul 2010 Electronic form version 1.4