Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Laser Snow Plough of Electrons in the Blow-Off Regime of Relativistic Laser Plasma Interaction C.S. LIU, Department of Physics, University of Maryland, College Park, V.K. TRIPATH, Physics Department, Indian Institute of Technology, India, S.H. CHEN, Chang Hwa Norman University, Taiwan — A relativistic short pulse laser, propagating through an underdense plasma, exerts a pondermotive force on electrons, piling up their density at the laser front and evacuating them from the rear, forming an ion bubble. As the self-focused laser amplitude approaches a critical value, the velocity of axial electrons at the laser front approaches the laser group velocity and large electron density buildup at the front occurs. The radial pondermotive force and space charge field accelerate these electrons radically outward, moving them along the boundary of the bubble. Eventually these electrons reconverge at the stagnation point of the bubble and re-enter the bubble axially. This in fact appears to be the injection mechanism for monoenergetic electrons, which are subsequently accelerated by the ion field as trapped electrons to energy $\varepsilon \simeq \mathrm{mc}^2\ \gamma_g^2(\mathrm{R}\omega_p/\mathrm{c})^2/3$, where $\gamma_g = (1 - v_g^2/c^2)^{-1/2}$, v_g is the laser group velocity and R is the bubble radius that scales as half power of laser amplitude. As the laser loses energy to the electrons it suffers nonlinear absorption over a scalelength $2(\omega^2/\omega_p^2)\tau_L c$, for normalized laser amplitude $\mathrm{a}_0 \geq 1$, τ_L is the laser pulse length.

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Date submitted: 21 Jul 2006 Electronic form version 1.4