Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Electron Response to a Charged Particle Beam Propagating through a Warm Background Plasma[1] BRENDAN C. LYONS, IGOR D. KAGANOVICH, PPPL, Princeton University — The propagation of ion beams through a background plasma has broad applications including astrophysics, particle accelerators, and inertial confinement fusion (ICF). In particular, ion beam drivers offer an attractive alternative to high-intensity lasers for ICF. Previous analytical and numerical studies of beam propagation in cold background plasmas have demonstrated near-complete charge neutralization for long beam pulses and current neutralization for beam pulses wider than the electron skin depth. By solving Maxwell's equations in Fourier space, the self-electric and self-magnetic field of the beam pulse has been determined. Particular attention was paid to the effects of electron temperature of the background plasma on the degree of current and charge neutralization. Visualizations of the electron dynamics in the beam's self-electric and self-magnetic fields have been produced. For large ratios of the beam to background plasma densities, the electron density in the beam decreases more rapidly than the current density near the beam's edge, causing a sharp increase in the electron velocity along the radial direction. Analytical formulae will be tested against particle-in-cell simulation results.

[1]Research supported by the US Department of Energy.

Igor D. Kaganovich
PPPL

Date submitted: 18 Jul 2008 Electronic form version 1.4