Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Electron acceleration in collisionless shocks and magnetic reconnection by laser-produced plasma ablation JAEHONG PARK, ANATOLY SPITKOVKSY, Princeton University, WILL FOX, AMITAVA BHATTACHARJEE, PPPL — We perform particle-in-cell simulations of collisionless shocks and magnetic reconnection generated by ablated plasma expanding into a magnetized background plasma. We find: (1) The simulated proton radiography produces different morphology of the shock structure depending on the orientation of the magnetic field and can be used to identify a shock in the experiment. Electrons are accelerated by the whistler waves generated at oblique sites of the shock. (2) Forced collisionless magnetic reconnection is induced when the expanding plumes carry opposite magnetic polarities and interact with a background plasma. Electrons are accelerated at the reconnection X line and reveal a power-law distribution as the plasma beta is lowered, $\beta=0.08$. As the plasma beta is increased, $\beta=0.32$, the 1st order Fermi mechanism against the two plasma plumes contributes to the electron acceleration as well as the X line acceleration. Using 3-D simulations, we also explore the effect of 3-D instabilities (Weibel instability or drift-kink) on particle acceleration and magnetic field annihilation between the colliding magnetized plumes

Jaehong Park
Princeton University

Date submitted: 20 Jul 2016 Electronic form version 1.4