Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Hybrid particle-in-cell simulations of weakly collisional shock formation.[1] JACOB SPISAK, JULIO VALENZUELA, JOOHWAN KIM, FARHAT BEG, University of California, San Diego — Recently, we studied shock formation by the head on collision of supersonic plasma jets using a wire configuration on the compact current driver GenASIS (200 kA in 150 ns). We used two wire materials: aluminum, where radiative cooling is not significant, and copper, where radiation is important to shock dynamics. In both cases, when the jets collide a conical structure develops in time and moves towards the cathode at a speed of 20km/s. Radiation effects are apparent in the copper case, as the shock is thinner than in the Aluminum case and when it starts moving a prominent bow shock develops. Furthermore, the estimated inter jet ion mean free path is larger than the shock width, indicating a magnetic field may help mediate the shock. To investigate the physics of weakly collisional shock formation, we perform two dimensional simulations of two merging, counterpropagating jets using the initial conditions from the experiment. Electrons are treated as a fluid and ions are treated as kinetic particles using the hybrid particle in cell code LSP. We explore how shock formation is affected by radiative cooling and the presence of an external magnetic field. We also carried out simulations where both ions and electrons were treated as fluids.

[1]This work was partially financed by Department of Energy grant number DE-SC0014493.

Jacob Spisak
University of California, San Diego

Date submitted: 13 Jul 2016 Electronic form version 1.4