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Numerical Simulations of Collisionless Shock Formation in Merging Plasma Jet Experiments[1] CARSTEN THOMA, DALE WELCH, ROBERT CLARK, Voss Scientific, SCOTT HSU, Los Alamos National Laboratory — In upcoming experiments at the Plasma Liner Experiment (PLX) facility at Los Alamos National Laboratory, two high Mach number plasma jets, composed of gases such as H and Ar, will be collided. We describe numerical simulations using particle-in-cell (PIC) and hybrid-PIC methods using the code Lsp. Using expected experimental plasma conditions ($n \sim 10^{14} - 10^{17}$ cm^{-3}), large scale transport simulations demonstrate that the jets are essentially collisionless at the merge point. In smaller-scale 1D and 2D simulations we show that collisionless shocks are generated by the merging jets when immersed in applied magnetic fields ($B \sim 0.1 - 1$ T). Unmagnetized collisionless shocks are not found in simulations at the expected jet velocities ($\sim 10 - 100$ km/s). Considerably higher velocities are required to see this effect. The orientation of the magnetic fields and the axial and transverse gradients of the jets are shown to have a strong effect on the nature of the interaction.

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