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Laboratory studies of stagnating plasma flows with applications to inner solar system and stellar bow shocks[1] T.E. WEBER, LANL, R.J. SMITH, U. Washington, S.C. HSU, LANL — Supercritical magnetized collisionless shocks are thought to play a dominant role in the overall partition of energy throughout the universe by converting flow kinetic energy to other forms such as thermal and supra-thermal populations, magnetic field enhancement, turbulence, and energetic particles. The Magnetized Shock Experiment (MSX) at LANL creates conditions similar to those of inner solar system and stellar bow shocks by accelerating hot (100s of eV during translation) dense (10^{22} – 10^{23} m^{-3}) Field Reversed Configuration (FRC) plasmoids to 100s of km/s; resulting in $\beta \approx 1$, collisionless plasma flows with M_{sonic} and $M_{Alfvén} \approx 10$. The drifting FRC can be made to impinge upon a variety of static obstacles including: a strong mirror or cusp magnetic field (mimicking magnetically excited shocks such as the Earth's bow shock), plasma pileup from a solid obstacle (similar to the bow shocks of Mercury and the Moon), and a neural gas puff (bow shocks of Venus or the comets). Characteristic shock length and time scales that are both large enough to observe yet small enough to fit within the experiment, enabling study of the complex interplay of kinetic and fluid processes that mediate cosmic shocks and can generate non-thermal distributions, produce density and magnetic field enhancements much greater than predicted by fluid theory, and accelerate particles. An overview of the experimental program will be presented, including recent results.

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