Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Laboratory studies of magnetized collisionless flows and shocks using accelerated plasmoids[1] T.E. WEBER, Los Alamos National Laboratory, R.J. SMITH, University of Washington, S.C. HSU, Los Alamos National Laboratory — Magnetized collisionless shocks are thought to play a dominant role in the overall partition of energy throughout the universe, but have historically proven difficult to create in the laboratory. The Magnetized Shock Experiment (MSX) at LANL creates conditions similar to those found in both space and astrophysical shocks by accelerating hot (100s of eV during translation) dense (10^{22} – 10^{23} m^{-3}) Field Reversed Configuration (FRC) plasmoids to high velocities (100s of km/s); resulting in $\beta \approx 1$, collisionless plasma flows with sonic and Alfvén Mach numbers of ≈10. The FRC subsequently impacts a static target such as a strong parallel or anti-parallel (reconnection-wise) magnetic mirror, a solid obstacle, or neutral gas cloud to create shocks with characteristic length and time scales that are both large enough to observe yet small enough to fit within the experiment. This enables 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 capabilities of MSX will be presented, including diagnostics, selected recent results, and future directions.

[1]Supported by the DOE Office of Fusion Energy Sciences under contract DE-AC52-06NA25369.

Thomas Weber
Los Alamos National Laboratory

Date submitted: 24 Jul 2015 Electronic form version 1.4