Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Overview of results from the Caltech Spheromak Formation, Astrophysical Jet, and Solar Coronal Loop Simulation Experiments[1] P.M. BELLAN, D. KUMAR, G.S. YUN, A.L. MOSER, E.V. STENSON, R.J. PERKINS, S.K.P. TRIPATHI[2], Caltech — These experiments involve magnetized plasma guns with (i) coaxial symmetry (spheromak formation studies, astrophysical jet simulation) and (ii) bipole symmetry (coronal loop simulation experiment). Both experiments form MHD jets that fill magnetic flux tubes linking the electrodes with plasma ingested from sources at the electrodes. Diagnostics include high-speed photography, HeNe interferometry, optical spectroscopy (Stark broadening density, Doppler velocity, line ratio temperature), color-coded imaging of different gases, and magnetic probes. The observed flux tubes are bright, dynamic, plasma-filled, and collimated. Collimation is interpreted as due to a shock-like pile-up of azimuthal magnetic flux frozen into the current-carrying jet. Observations include (i) dependence of jet velocity on electric current, (ii) what happens when a jet impacts a gas target, (iii) spatial dependence of jet velocity and density, (iv) a non-MHD particle orbit instability. Jet ingestion of plasma has been vividly imaged using different gases on the cathode and anode of the coronal loop experiment.

[1]supported by USDOE and AFOSR
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Date submitted: 17 Jul 2007 Electronic form version 1.4