Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

The Caltech experimental investigation of fast 3D non-equilbrium dynamics: an overview PAUL BELLAN, Caltech, TAIICHI SHIKAMA, Caltech and Kyoto University, KILBYOUNG CHAI, BAO HA, VERNON CHAPLIN, MARK KENDALL, AUNA MOSER[1], EVE STENSON, ZACHARY TOBIN, XIANG ZHAI, Caltech — The formation and dynamics of writhing, plasma-filled, twisted open magnetic flux tubes is being investigated using pulsed-power laboratory experiments. This work is relevant to solar corona loops, astrophysical jets, spheromak formation, and open field lines in tokamaks and RFP's. MHD forces have been observed to drive fast axial plasma flows into the flux tube from the boundary it intercepts. These flows fill the flux tube with plasma while simultaneously injecting linked frozen-in azimuthal flux; helicity injection is thus associated with mass injection. Recent results include observation of a secondary instability (Rayleigh-Taylor driven by the effective gravity of an exponentially growing kink mode), color-coded plasmas manifesting bidirectional axial flows in a geometry similar to a solar corona loop, and spectroscopic measurements of the internal vector magnetic field. Experiments underway include investigating how an external magnetic field straps down a solar loop, investigation of the details of the Rayleigh-Taylor instability, development of a fast EUV movie camera, increasing the jet velocity, excitation of Alfven waves, and investigating 3D magnetic reconnection.

[1]Current address: Los Alamos National Lab

Paul Bellan
Caltech

Date submitted: 11 Jul 2012 Electronic form version 1.4