Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Investigating the Dynamics of Canonical Flux Tubes[1] JENS VON DER LINDEN, EVAN CARROLL, YU KAMIKAWA, ERIC LAVINE, KEON VEREEN, SETTHIVOINE YOU, University of Washington — Canonical flux tubes are defined by tracing areas of constant magnetic and fluid vorticity flux. This poster will present the theory for canonical flux tubes and current progress in the construction of an experiment designed to observe their evolution. In the zero flow limit, canonical flux tubes are magnetic flux tubes, but in full form, present the distinct advantage of reconciling two-fluid plasma dynamics with familiar concepts of helicity, twists and linkages. The experiment and the DCON code [1] will be used to investigate a new MHD stability criterion for sausage and kink modes in screw pinches that has been generalized to magnetic flux tubes with skin and core currents. Camera images and a 3D array of $\dot{B}$ probes will measure tube aspect-ratio and ratio of current-to-magnetic flux, respectively, to trace these flux tube parameters in a stability space. The experiment's triple electrode planar gun is designed to generate azimuthal and axial flows. These diagnostics together with a 3D vector tomographic reconstruction of ion Doppler spectroscopy [2] will be used to verify the theory of canonical helicity transport [3].

[1] A. H. Glasser, M. C. Chance Bull. Am. Phys. Soc., 42 (1997)
[2] S. You et al., J. Fusion Energy, 29 (2010)
[3] S. You, Phys. of Plas., 19 (2012)

[1]This work was sponsored in part by the US DOE Grant DE-SC0010340.

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Date submitted: 12 Jul 2013 Electronic form version 1.4