Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Sausage Instabilities on top of Kinking Lengthening Current-Carrying Magnetic Flux Tubes[1] JENS VON DER LINDEN, SETTHIVOINE YOU, Univ of Washington — Observations indicate that the dynamics of magnetic flux tubes in our cosmos and terrestrial experiments involve fast topological change beyond MHD reconnection. Recent experiments suggest that hierarchies of instabilities coupling disparate plasma scales could be responsible for this fast topological change by accessing two-fluid and kinetic scales. This study will explore the possibility of sausage instabilities developing on top of a kink instability in lengthening current-carrying magnetic flux tubes. Current driven flux tubes evolve over a wide range of aspect ratios $\bar{k}$ and current to magnetic flux ratios $\bar{\lambda}$. An analytical stability criterion and numerical investigations, based on applying Newcomb's variational approach to idealized magnetic flux tubes with core and skin currents, indicate a dependence of the stability boundaries on current profiles and overlapping kink and sausage unstable regions in the $\bar{k}$ - $\bar{\lambda}$ trajectory of the flux tubes. A triple electrode planar plasma gun (Mochi.LabJet) is designed to generate flux tubes with discrete core and skin currents. Measurements from a fast-framing camera and a high resolution magnetic probe are being assembled into stability maps of the $\bar{k}$ - $\bar{\lambda}$ space of flux tubes.

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

Jens von der Linden
Univ of Washington

Date submitted: 23 Jul 2015 Electronic form version 1.4