Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Investigation of current sheet disruptions using laser-produced diamagnetic bubbles[1] STEPHEN VINCENA, WALTER GEKELMAN, PAT PRIBYL, UCLA Department of Physics and Astronomy — Rapid temporal changes in the magnetic field topology of current-carrying plasmas can enhance or disrupt these currents and trigger magnetic reconnection. A clear natural example of this can be found in the earth's magnetotail during a magnetic substorm. In this laboratory study, preliminary results are presented of an effectively steady-state current sheet which is disrupted by the production of an impulsive diamagnetic bubble. The process is impulsive in that it occurs on a timescale less than the ion cyclotron period. The experiments are performed on UCLA's Large Plasma Device (LAPD). This is a linear device with L=17m, d=60cm, 300G< B_0 <2kG, n_e=2×10^{12}cm^{-3}, T_e=6eV,T_i ≈1eV, and He, H, or Ar). The diamagnetic cavity is produced by a pulsed (8ns, 1J) Nd:YAG laser-solid target ablation. The current sheet is produced using a CeB_6 cathode, embedded within the main plasma column,(h=10cm, w=1cm). In the current sheet, the plasma has higher density, $n \approx 4 \times 10^{12}$cm^{-3}, yielding scaled cross-field dimensions of $h = 0.9c/\omega_{pi}$ and $w = 3.8c/\omega_{pe}$ for a H plasma. Results will be presented which include fast camera imaging, magnetic field probe data, and the resulting time varying currents during the event.

[1]These experiments were conducted at UCLA's Basic Plasma Science Facility, which is jointly funded by the US DoE and the NSF.

Stephen Vincena
UCLA

Date submitted: 17 Jul 2012 Electronic form version 1.4