Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Experiment to Study Alfven Wave Propagation in Plasma Loops
MARK KENDALL, PAUL BELLAN, Caltech — Arched plasma-filled twisted magnetic flux tubes are generated in the laboratory using pulsed power techniques (J.F. Hansen, S.K.P. Tripathi, P.M. Bellan, 2004). Their structure and time evolution exhibit similarities with both solar coronal loops and spheromaks. We are now developing a method to excite propagating torsional Alfven wave modes in such plasma loops by superposing a ∼10kA, ∼100ns current pulse upon the ∼50kA, 10μs main discharge current that flows along the ∼20cm long, 2cm diameter arched flux tube. To achieve this high power 100ns pulse, a magnetic pulse compression technique based on saturable reactors is employed. A low power prototype has been successfully tested, and design and construction of a full-power device is nearing completion. The full-power device will compress an initial 2μs pulse by a factor of nearly 20; the final stage utilizes a water-filled transmission line with ultra-low inductance to attain the final timescale. This new pulse device will subsequently be used to investigate interactions between Alfven waves and the larger-scale loop evolution; one goal will be to directly image the wave using high-speed photography. Attention will be paid to wave propagation including dispersion and reflection, as well as dissipation mechanisms and possible energetic particle generation.

Mark Kendall
Caltech

Date submitted: 16 Jul 2010 Electronic form version 1.4