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*Title:* The PHELIX Liner Demonstration Experiment (PLD-1)

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## **The PHELIX Liner Demonstration Experiment (PLD-1)**

The PHELIX Liner Demonstration Experiment (PLD-1) took place in September of 2010 at Los Alamos National Laboratory. The PHELIX machine consists of a ~500 kJ single-marx capacitor bank cable-coupled to a toroidal 1:4 current step-up transformer which delivers multi-Mega-Ampere currents to a cm size load. In this experiment the load consisted of a ~3 cm radius, 0.8 mm thick, ~3 cm tall aluminum liner, copper glide planes, a thin polyethylene insulator, and a 0.5 cm thick aluminum return conductor. Two independent channels of fiber optic Faraday rotation measured a peak load current  $> 4$  MA with a pulse width of  $\sim 10$   $\mu$ s. Four linear Rogowski coils measured the output current of the 4 marx modules. High-resolution flash X-radiography imaged a stable, highly symmetric and uniform liner 14.5  $\mu$ s after current start. A 12 channel photon Doppler velocimetry (PDV) system tracked the inside surface of the liner throughout the experiment and showed a peak velocity before impact with probes of  $\sim 1$  km/s. The PDV probes were arrayed axially as well as azimuthally and confirmed the symmetry of the liner trajectory. Surprisingly, the PDV showed distribution of velocities of the inner liner surface late in time. PLD-1 is the first step towards utilizing the PHELIX pulsed-power system at the Los Alamos proton radiography facility.