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Dynamics of Magnetic Flux Ropes in a Laboratory Plasma[1] ERIC LAWRENCE, WALTER GEKELMAN, UCLA — The behavior and interaction of magnetic flux ropes have long been a topic of interest to solar and space plasma physicists. (Gekelman, et al. IEEE Trans. Plasma Sci. **20**, 614. Furno, et al. Phys. Plasmas **12**, 055702.) Very few laboratory experiments have been performed as it is necessary to have a relatively collisionless plasma and currents with significant self-generated fields. Movable lanthanum hexaboride (LaB_6) cathodes have been developed to study the 3D dynamics of flux ropes in the Large Plasma Device (LaPD). Each 2.5 cm LaB_6 cathode can produce current densities of 5-20 A/cm^2 and $\Delta B/B \sim 10\%$. The background plasma ($n \sim 2 \times 10^{12}$ cm^{-3}, $d \sim 60$ cm, $L \sim 18$ m, and $\tau_{\rm rep} = 1$ s) is produced with a DC discharge using a pulsed barium oxide-coated cathode. The two or more current channels are created by biasing the LaB_6 cathodes with respect to a grid anode at the opposite end of the chamber. They are emitted parallel to each other and the guide field. $\mathbf{J} \times \mathbf{B}$ forces cause the currents to move across the field and interact. Each cathode can be positioned freely within a transverse plane of the cylindrical LaPD. We plan to make detailed volumetric measurements of the magnetic fields and flows generated by the current channels. Diagnostics include $\dot{B}$, Langmuir, and Mach probes, and laser induced fluorescence.

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