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Experimental Study of Driven Magnetic Relaxation in a Laboratory Plasma S. HSU, T. MADZIWA-NUSSINOV, D. SIRAJUDDIN, M. LIGHT, LANL — The physics goal of the Driven Relaxation Experiment (DRX) is to form and sustain simply-connected driven-relaxed plasmas above the first Jensen-Chu linear resonance of the force-free equation (where the first resonance is the "flipped" Rosenbluth- Bussac spheromak). As shown recently by Tang & Boozer (PRL, 2005), the linear resonances are regularized in partially relaxed systems, thus removing the energy barriers which have been thought to constrain relaxed states to exist only below the first resonance. DRX will apply an "over-driven" boundary condition at the coaxial gun source, with $\lambda_{\rm gun} \approx 30$ m^{-1} $\approx 3\lambda_1$. The DRX power system (10 kV, 125 kJ) will form and sustain the ~ 10 eV plasma for about 0.5 ms, which is about 10 Sweet-Parker reconnection times and sufficient for the plasma to reach a driven-relaxed steady-state. We will measure the 2D structure of the equilibrium magnetic field and compare it with the first several linear eigenmodes of the force-free equation, and subsequently study the k-spectrum of the magnetic energy as well as the dynamics of relaxation. Other topics we will study include magnetic flux amplification and the role of boundary elongation on equilibrium/stability. Better understanding of these issues could lead to new ideas for confinement configurations. This poster will provide an overview of DRX and first experimental data. Supported by the LANL LDRD Program.

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