Abstract Submitted
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Saturated external kink instability of a laboratory plasma column[1] J. SEARS, T.P. INTRATOR, G. WURDEN, T.E. WEBER, W. DAUGHTON, J. KLARENBEEK, K. GAO, Los Alamos National Laboratory — A column of plasma generated in a longitudinal magnetic field in the Reconnection Scaling Experiment suffers from a catastrophic external kink instability when sufficient current density is driven along its length. At slightly lower current density but still above the Kruskal-Shafranov stability limit, we observe the amplitude of the kink to saturate at $\approx a$, where a is the radius of the current distribution, and the column to gyrate at a steady rate for many periods. We evaluate how saturation of the kink mode is influenced by axial flow and shear therein, by rotation and Coriolis force, and by kinetic effects beyond the fluid regime. The plasma column of length l = 0.48 m has electron temperature T_e = 10 eV and density n_e = 1e19 m^{-3}. The background axial field is B = 0.01 T, and the saturated steady state occurs for current I = 300 A. We measure the vector magnetic field and the plasma temperature and density in a cubic volume measuring 0.1 m on a side with resolution on the order of the electron skin depth. From these measurements we derive the flow. We present also results of a 2D numerical model simulated with the VPIC code. Study of the saturated kink mode in laboratory plasma may offer clues to the long lifetime of astrophysical jets.

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