Abstract Submitted
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Two-dimensional axisymmetric and three-dimensional helical equilibrium in the line-tied screw pinch[1] CARLOS PAZ-SOLDAN, M.I. BROOKHART, A.J. CLINCH, D.A. HANNUM, C.B. FOREST, University of Wisconsin-Madison — The line-tying condition at a conducting anode is shown to provide a localized modification to the well-understood 1-D screw pinch equilibrium in the presence of bulk plasma diamagnetism. Diamagnetic currents cannot flow near the conducting anode and are measured to disappear in a localized boundary layer, causing a weak mirror configuration that breaks 1-D equilibrium and causes large parallel pressure gradients suggestive of significant radial outflows. For sufficiently large plasma currents, the paramagnetic nature of parallel current drives the equilibrium to paramagnetism and destroys the mirror effect. At a critical plasma current the axisymmetric equilibrium is found to transition to a long-lived, rotating, helical 3-D equilibrium state. Internal measurements of this state via multi-point correlation analysis techniques illustrate that it preserves the flux surfaces and pressure profile of the axisymmetric equilibrium. Measurements indicate that despite the fact that the flux surfaces wander at the anode, the line-tied boundary conditions are not necessarily violated.

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