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**Nonlinear self stabilization of a kinking plasma current channel**[1] J. SEARS[2], Lawrence Livermore National Laboratory, Y. FENG, T.P. INTRATOR, H. SWAN, K. GAO, L. CHAPDELAINE, Los Alamos National Laboratory — A plasma column with plasma pressure, axial magnetic field and current has helically twisted field lines that form a screw pinch. If the current density exceeds the kink threshold, this current driven ideal MHD instability is expected to grow explosively on an Alfvén time scale and destroy the equilibrium. In the Reconnection Scaling Experiment (RSX) we use a plasma gun to generate a single plasma column which terminates on an external anode. We then drive an axial plasma current at the limit of marginal kink stability. We observe a deformation to a new dynamic equilibrium with finite gyration amplitude, where the currents and magnetic fields that support the force balance have surprising axial structure. Three dimensional measurements of magnetic field $B$, plasma density $n$, plasma potential $\varphi$, and ion flow velocity $v_i$ in the deformed plasma column show variation in the axial direction of the instability parameter $J \cdot B/B^2$ and in the momentum balance terms $J \times B$ and $\nabla p$. The field line curvature which should correspond to a restoring force and the pitch of the kink also vary along the axis. In addition there is an induced return current antiparallel to the driven plasma current that is localized in the axial direction.

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[2]Work performed while at LANL.

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