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The Lundquist number scaling of nonlinear MHD fluctuations in MST RFP plasmas S.Z. KUBALA, D.J. DEN HARTOG, K.J. MCCOLLAM, J.S. SARFF, P.D. VAN METER, University of Wisconsin - Madison, WISCONSIN PLASMA PHYSICS LABORATORY COLLABORATION — Nonlinear MHD fluctuations appear in both natural and magnetic confinement settings, such as the solar wind, self-organization dynamics in the RFP and spheromak, and current disruptions in tokamak plasmas. Here we describe parameter scaling experiments aimed at understanding the underlying nonlinear MHD dynamics in RFP plasmas. Data have been gathered spanning a wide range of parameter space characterized by Lundquist number, $S \sim 10^4 - 10^7$, and density, $\bar{n_e}/n_G$, where n_G is the empirical density limit. A new programmable power supply allows low-current operation at low S, which overlaps with parameters available in numerical modeling. Quantitative comparisons are made with results from the nonlinear MHD codes DEBS and NIMROD. A transition from quasi-continuous sustainment to discrete sawtoothing events is observed going from low to high S. The spectral properties of the magnetic fluctuations reveal the transition to sawtoothing. The threshold between the two regimes is around $S \sim 10^5$. Work supported by U.S. DoE.

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