Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

**Time-dependent behavior of the quasi-single-helicity state in the RFP** G.G. WHELAN, P.W. TERRY, University of Wisconsin-Madison and Center for Momentum Transport and Flow Organization — A recent theory treats the quasi-single-helicity (QSH) state of the reversed field pinch as a core fluctuation structure tied to a tearing mode of the same helicity and shows that strong magnetic and velocity shears in the structure suppress the nonlinear interaction with other fluctuations.[1] The theory has temporally evolving, nonlinearly coupled equations for the core fluctuation and the fluctuations of other helicities. The QSH core becomes long-lived and equilibrium-like when plasma current is large, as observed in experiment. By summing the multiple helicity fluctuation energies over toroidal wavenumber, we reduce the theory to a predator-prey model. The suppression of the nonlinear interaction is goverened by the single helicity energy, which, for fixed radial structure controls the magnetic and velocity shearing rates. It is also controlled by plasma current, which in the theory, sets the shearing threshold for suppression. The model shows a limit cycle oscillation in which the system toggles between quasi-single helicity and multiple helicity states, with the single helicity phase becoming increasingly long-lived relative to the multiple helicity phase as plasma current increases.

[1]J.-H. Kim and P.W. Terry, Phys. Plasmas **19**, 122304 (2012).

Paul Terry
University of Wisconsin-Madison

Date submitted: 12 Jul 2013 Electronic form version 1.4