Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Model for Effect of Non-Resonant Error Field on Resonant Error Field Locking in Ohmic Plasmas in DIII-D[1] R.J. LA HAYE, E.J. STRAIT, General Atomics, M.J. LANCTOT, Lawrence Livermore National Laboratory, C. PAZ-SOLDAN, Oak Ridge Institute for Science Education — Relatively small resonant ($m/n = 2/1$) static error fields B_{res} are shielded in Ohmic plasmas by the natural rotation at the electron diamagnetic drift frequency. However at low enough density and/or high enough B_{res} the drag due to B_{res} lowers rotation such that a bifurcation results going from shielding to an amplified state, a locked mode [1]. The empirically well-known Ohmic scaling is locking density $\sim B_{res}$; this breaks down at lower density in DIII-D with either optimized error field correction by the $n = 1$ C-coil (no handedness) or at yet lower density with the $n = 1$ I-coil (with "dominantly" resonant field pitch). Relatively larger non-resonant error fields $B_{non-res}$ also exert drag on the plasma rotation but pull the rotation in the ion diamagnetic drift direction [2]. An analytic model that includes both resonant and non-resonant drag accounts for the limit on low density. The possibility of improved correction, i.e. less drag, by using both coil sets will be considered.

[1] J.T. Scoville and R.J. La Haye, Nucl. Fusion **43**, 250 (2003).
[2] R.J. La Haye, S. Guenter, D.A. Humphreys, J. Lohr, T.C. Luce, *et al.*, Phys. Plasmas **9**, 2051 (2002).

[1]Work supported in part by US DOE under DE-FC02-04ER54698, DE-AC52-07NA27344, and DE-AC05-00OR23100..

Rob La Haye
General Atomics

Date submitted: 12 Jul 2012 Electronic form version 1.4