Abstract Submitted for the 55th **Annual Meeting**
Division of Plasma Physics
November 11–15, 2013
Denver, Colorado

Category Number and Subject: 6.19 Research in Support of ITER

[ ] Theory [x] Experiment

Error Field Detection and Mode Locking Avoidance by the Interaction of Applied Rotating 3D Fields With Otherwise Locked Modes,* D. Shiraki, K.E.J. Olofsson, F.A. Volpe, *Columbia U.*; R.J. La Haye, E.J. Strait, *GA*; C. Paz-Soldan, *ORISE*; N. Logan, M. Okabayashi, *PPPL*– The resonant interaction of locked modes (LMs) with non-axisymmetric magnetic fields is used to control the toroidal phase of LMs in DIII-D, with applications to error field (EF) detection as well as to disruption avoidance. The measured toroidal dynamics of LMs in the presence of rotating n=1 perturbations is understood by modeling the resonant torques applied by the coils. This technique is applied to EF detection, where the island dynamics is interpreted as satisfying a torque balance between the EF and applied perturbation. The optimal correction currents are inferred to be those which best cancel the EF torque. This optimization of EF correction is completed in a single discharge, without restriction to low-density. The technique is promising for initial ITER operation, when lack of full auxiliary heating systems make existing techniques based on rotation or plasma amplification unsuitable. The ability to control the toroidal phase of magnetic islands with rotating 3D fields was also used to control and sustain the rotation of decelerating islands to prevent locking.

*Work supported by the US DOE under DE-SC0008520, DE-FC02-04ER54698 and DE-AC02-09CH11466.