Category Number and Subject:

[**X**] Theory   [ ] Experiment

Role of Magnetic Helicity in the Plasma Response to Non-axisymmetric Perturbations,* A.D. Turnbull, *GA*; N.M. Ferraro, *ORISE*; V.A. Izzo, *UCSD* – Plasma response to non-axisymmetric perturbations arising from external coils or linear instabilities can be treated as a dynamic stability problem using an extended MHD code or from a nearby perturbed equilibrium approach. The nearby equilibrium approach bypasses the detailed evolution and searches for the appropriate final state. However, there is no guarantee that the final state is the one among multiple states reached dynamically, or is even accessible. To assure final state accessibility, one needs to relate the 2D and nearby 3D system through a set of invariants or constraints. A suitable set of constraints may be obtained from considering the magnetic helicity, which is conserved exactly in ideal MHD but is broken at rational surfaces by non-ideal effects. Helicity has the advantage of a physical interpretation in terms of field line linkage that is conserved in ideal MHD but broken when the topology changes. The change can be calculated in principle from the topology changes and compared with solutions obtained from extended MHD calculations.