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

Category Number and Subject: 6.20 DIII-D Tokamak

[ **X** ] Theory [ ] Experiment

**3D Equilibrium Reconstructions in DIII-D,*** L.L. Lao, N.W. Ferraro, E.J. Strait, A.D. Turnbull *GA*; J.D. King, *ORISE*; S.P. Hirshman, E.A. Lazarus, A.C. Sontag, *ORNL*; J. Hanson, *AU*; G. Trevisan, *RFX* — Accurate and efficient 3D equilibrium reconstruction is needed in tokamaks for study of 3D magnetic field effects on experimentally reconstructed equilibrium and for analysis of MHD stability experiments with externally imposed magnetic perturbations. A large number of new magnetic probes have been recently installed in DIII-D to improve 3D equilibrium measurements and to facilitate 3D reconstructions. The V3FIT code has been in use in DIII-D to support 3D reconstruction and the new magnetic diagnostic design. V3FIT is based on the 3D equilibrium code VMEC that assumes nested magnetic surfaces. V3FIT uses a pseudo-Newton least-square algorithm to search for the solution vector. In parallel, the EFIT equilibrium reconstruction code is being extended to allow for 3D effects using a perturbation approach based on an expansion of the MHD equations. EFIT uses the cylindrical coordinate system and can include the magnetic island and stochastic effects. Algorithms are being developed to allow EFIT to reconstruct 3D perturbed equilibria directly making use of plasma response to 3D perturbations from the GATO, MARS-F, or M3D-C1 MHD codes. DIII-D 3D reconstruction examples using EFIT and V3FIT and the new 3D magnetic data will be presented.

*Work supported in part by US DOE under DE-FC02-04ER54698, DE-FG02-95ER54309 and DE-AC05-06OR23100.