Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Validation of theoretical models of intrinsic torque in DIII-D[1]
B.A. GRIERSON, W.X. WANG, D.J. BATTAGLIA, PPPL, C. CHRYSTAL, W.M. SOLOMON, J.S. DEGRASSIE, G.M. STAEBLER, General Atomics, J.A. BOEDO, UCSD — Plasma rotation experiments in DIII-D are validating models of main-ion intrinsic rotation by testing Reynolds stress induced toroidal flow in the plasma core and intrinsic rotation induced by ion orbit losses in the plasma edge. In the core of dominantly electron heated plasmas with T_e=T_i, the main-ion intrinsic toroidal rotation undergoes a reversal that correlates with the critical gradient for ITG turbulence. Residual stress arising from zonal-flow ExB shear and turbulence intensity gradient produce residual stress and counter-current intrinsic torque, which is balanced by momentum diffusion, creating the hollow profile. Quantitative agreement is obtained for the first time between the measured main-ion toroidal rotation and the rotation profile predicted by nonlinear GTS gyrokinetic simulations. At the plasma boundary, new main-ion CER measurements show a co-current rotation layer and this is tested against ion orbit loss models as the source of bulk plasma rotation.

[1]Work supported by the US Department of Energy under DE-AC02-09CH11466 and DE-FC02-04ER54698.

B.A. Grierson
PPPL

Date submitted: 15 Jul 2016 Electronic form version 1.4