Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Magnetic flux conversion in the DIII-D high-beta hybrid scenario[1] N.Z. TAYLOR, ORAU, T.C. LUCE, GA, R.J. LA HAYE, None, C.C. PETTY, GA, P. PIOVESAN, CONSORZIO RFX — In DIII-D hybrid scenario discharges, the rate of poloidal magnetic energy consumption is more than the rate of energy flow from the poloidal field coils. This is evidence that there is a conversion of toroidal flux to poloidal flux, which may account for a process known as flux pumping that leads to anomalous broadening of the current profile. The hybrid is a promising high confinement scenario for ITER. The broader current profile aids discharge sustainment by raising the minimum safety factor above unity thereby avoiding sawtooth-triggered 2/1 tearing modes that spoil energy confinement. During long (∼1.5s) stationary intervals with constant stored magnetic energy, a significant flux state deficit rate >10 mV was observed. This anomalous consumption of poloidal flux only occurred in discharges with β_N>2.5 and when a relatively benign 3/2 tearing mode was present. This suggests the tearing mode plays a critical role in flux conversion. Studies have shown that 3D core displacements can lead to flux conversion, suggesting that the 3/2 tearing mode and its 2/2 side band produce helical perturbations in the core velocity and magnetic field capable of producing a dynamo EMF that drives the observed current redistribution.

[1]Supported by the US DOE under DE-AC05-06OR23100 and DE-FC02-04ER54698.

N.Z. Taylor
ORAU

Date submitted: 15 Jul 2016 Electronic form version 1.4