Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Parameter Space for Self-Consistent High β_N, High ℓ_i Discharges in Steady-State[1] J.R. FERRON, T.C. LUCE, GA, C.T. HOLCOMB, LLNL, J.M. PARK, ORNL — A tokamak scenario with a peaked current profile (ℓ_i¿0.9), is a promising candidate for a high β_N and Q power plant because of the increased stability limits and confinement. Model equilibria have been used to show that the present DIII-D experiments in this range of ℓ_i, with β_N=5 and evolving current density (J) profile, can be extended to 100% noninductively driven current with stationary, self-consistent J and pressure (P) profiles. β_N=4, q_{95}¡6.5, bootstrap current fraction f_{BS}¡0.46 is predicted stable to ideal low-n modes without requirement for a conducting wall, while β_N=5, f_{BS}¡0.6 is predicted stable when the effect of the vacuum vessel is included. These results reflect the trade-off between high f_{BS} and high β_N that is required because, as β_N is increased, bootstrap current in the plasma outer half, from the H-mode pedestal and the broad pressure profile, reduces ℓ_i and the ideal stability limit. Full simulations using the TGLF transport model and the DIII-D current drive/heating sources yield similar parameters.

[1]Supported by US DOE under DE-FC02-04ER54698, DE-AC52-07NA27344, DE-AC05-00OR22725

J.R. Ferron
General Atomics

Date submitted: 15 Jul 2016 Electronic form version 1.4