Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Development of High Non-Inductive Fraction High Poloidal Beta Discharges at ITER Q=5 Equivalent Performance on DIII-D[1] SIYE DING, Oak Ridge Associated Universities, ANDREA GAROFALO, JOSEPH MCCLENAGHAN, General Atomics, JINPING QIAN, XIANZU GONG, JUAN HUANG, Institute of Plasma Physics, Chinese Academy of Sciences — Modelling of DIII-D high poloidal beta scenario predicts new off-axis current drive capabilities will enable nearly 100% non-inductive operation at ITER Q=5 equivalent performance. Experiments on DIII-D have extended high energy confinement (H98>1.5), large radius internal transport barrier (ITB) operation from q95≥10 to lower q95˜7, which is more relevant for the ITER steady-state mission. While large Shafranov shift can stabilize all ion turbulence at betaN˜3 and q95≥10, some drift wave instabilities remain in the lower q95 regime. With betaN=3.8, gyrokinetic simulations predict a stronger ITB and better confinement in comparison with experimental data at betaN=3.1. Recent DIII-D upgrades, including additional off-axis NBI power, increase off-axis external current drive. This should increase stability and non-inductive fraction at higher betaN. 0D modelling predicts betaN˜4 and H98˜1.5 should enable f_NI˜90% with q95˜7. It gives G98=betaN*H98/q95ˆ2˜0.122, matching the normalized performance goal of ITER's Q=5, according to the latest ITER simulations using high betap concept (G98˜0.113, J. McClenaghan, NF 2017) Work supported in part by US DOE under DE-SC0010685, DE-FC02-04ER54698, and NNSF of China under Grant No11575248.

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Date submitted: 28 Jun 2019 Electronic form version 1.4