Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Super H-mode: Prediction and Discovery of a New High Performance Regime[1] P.B. SNYDER, E.A. BELLI, K.H. BURRELL, A.M. GAROFALO, R.J. GROEBNER, T.H. OSBORNE, GA, W.M. SOLOMON, PPPL, H.R. WILSON, U. of York — Fusion performance of tokamak plasmas increases strongly with the pressure at the top of the edge transport barrier (or "pedestal height"). As understanding of the physics controlling the pedestal improves, this can be used not only to predict performance in existing regimes, but also to uncover new regimes of operation. The EPED model predicts pedestal height by combining calculated peeling-ballooning and kinetic ballooning mode constraints, and has been extensively tested. EPED predicts that, for strongly shaped plasmas, the pedestal bifurcates at high density into the usual H-mode solution, and a very high pressure "Super H Mode" solution. Prediction of Super H-Mode access via dynamic variation of the density has led to its recent discovery on DIII-D, including observations of bifurcation and very high pedestal pressure. We discuss pedestal theory, DIII-D observations, and coupling to core physics to globally optimize Super H-Mode.

[1]Work supported by the US DOE under DE-FG02-95ER54309, DE-FC02-04ER54698, and DE-AC02-09CH11466.

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Date submitted: 11 Jul 2014 Electronic form version 1.4