Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

X-Divertor Geometries for Deeper Detachment Without Degrading the DIII-D H-Mode[1] BRENT COVELE, M.T. KOTSCHENREUTHER, P.M. VALANJU, S.M. MAHAJAN, U. Texas at Austin, A.W. LEONARD, A.W. HYATT, A.G. MCLEAN, D.M. THOMAS, H.Y. GUO, GA, J.G. WATKINS, SNL, M.A. MAKOWSKI, D.N. HILL, LLNL — Recent DIII-D experiments comparing the standard divertor (SD) and X-Divertor (XD) geometries show heat and particle flux reduction at the divertor target plate. The XD features large poloidal flux expansion, increased connection length, and poloidal field line flaring, quantified by the Divertor Index. Both SD and XD were pushed deep into detachment with increased gas puffing, until core energy confinement and pedestal pressure were substantially reduced. As expected, outboard target heat fluxes are significantly reduced in the XD compared to the SD under similar upstream plasma conditions, even at low Greenwald fraction. The high-triangularity (floor) XD cases show larger reduction in temperature, heat, and particle flux relative to the SD in all cases, while low-triangularity (shelf) XD cases show more modest reductions over the SD. Consequently, heat flux reduction and divertor detachment may be achieved in the XD with less gas puffing and higher pedestal pressures. Further causative analysis, as well as detailed modeling with SOLPS, is underway. These initial experiments suggest the XD as a promising candidate to achieve divertor heat flux control compatible with robust H-mode operation.

[1]Work supported by US DOE under DE-FC02-04ER54698, DE-AC52-07NA27344, DE-FG02-04ER54754, and DE-FG02-04ER54742.

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Date submitted: 20 Jul 2015 Electronic form version 1.4