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[ ] Theory [X] Experiment

The role of parallel and poloidal heat flux in setting the detachment threshold in DIII-D* D.N. Hill, S.L. Allen, C.J. Lasnier, A.G. McLean, *LLNL*; T.W. Petrie, A.W. Leonard, *GA*; M. Groth, *Aalto University* — Experimental results show that the threshold density for divertor detachment is reduced even as the parallel scrape-off-layer (SOL) heat flux ($q_{//}$) is more than doubled, contrary to expectation. The work is part of a systematic study to identify the physics basis for obtaining detached divertors in future high power burning plasma experiments, consistent with requirements for high confinement steady-state operation. Parallel heat flux [P_{SOL}*(B_{tor}/B_{pol})/$2\pi R\lambda_q$; λ_q is the SOL width] is independent of poloidal flux expansion and is commonly used to quantify the divertor heat flux challenge. In these experiments, the parallel heat flux was varied either by changing the heating power (thereby P_{SOL}), plasma current (the SOL width), or toroidal field (the projection of P_{SOL} onto B_{tor}). The data point to poloidal-field physics effects (e.g., neutral penetration field, line length, and impurity radiation volume) playing a dominant role in setting the detachment threshold. Comparison with 2D simulation will be shown.

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