Abstract Submitted
for the DPP97 Meeting of
The American Physical Society

Sorting Category: 5.1.1.2 (experimental)

Edge Instabilities and Termination of DIII–D High Performance Discharges with an H-mode Edge[1] L.L. LAO, V.S. CHAN, M.S. CHU, J.R. FERRON, R.L. MILLER, T.H. OSBORNE, E.J. STRAIT, T.S. TAYLOR, A.D. TURNBULL, General Atomics, B.W. RICE, Lawrence Livermore National Laboratory, S.A. SABBAGH, Columbia University — The performance of DIII–D high perfomance discharges with an H–mode edge is often limited by edge instabilities driven by the large edge pressure gradient and the associated large edge bootstrap current density. The instabilities are often preceded by a magnetic perturbation with toroidal mode number n>1 and a fast growth time $\gamma^{-1} = 20 - 150\mu$s. They have been observed in discharges with various poloidal cross sections and over a wide range of β_N =2.5–5.0 including discharges with negative or weak central magnetic shear and high ℓ_i. The attainable β values decrease when the average current density increases in the outer edge region and is consistent with the previously observed operational limit of $\beta_N \simeq 4\ell_i$. The results of ideal stability calculations are consistent with many observed features of the instability and suggest that the performance degradation may depend on the radial thickness of the steep pressure gradient region.

[1]Work supported by U.S. Department of Energy under Contracts DE-AC03-89ER51114, W-7405-ENG-48, and Grant DE-FG02-89ER53297.

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Date submitted: July 7, 1997 Electronic form version 1.2