Abstract Submitted
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Analysis of Ideal Stability Limits in DIII-D Discharges with High β_N and l_i[1] J.R. FERRON, T.C. LUCE, General Atomics, C.T. HOLCOMB, LLNL, J.M. PARK, ORNL, W.M. SOLOMON, PPPL — Broad pressure profiles in DIII-D discharges with high l_i enable stable access to high plasma pressure. As β_N increases, the pressure peaking factor $f_p = P(0)/\langle P \rangle$ decreases, from $f_p \approx 3.7$ at $\beta_N \approx 2.9$ to $f_p \approx 2.4$ at $\beta_N > 4.5$. Simultaneously, the ideal low-n stability limits calculated with a conducting wall increase from $\beta_N \approx 3.6$ to nearly 6, so that β_N remains below the limit. In addition, f_p decreases as l_i is increased. Thus, the high β_N stability limits result from both increased l_i and decreased f_p. In a steady-state discharge, though, increased β_N will limit the practical value of l_i because of the increase in the bootstrap current density, particularly in the H-mode pedestal. Reducing the pedestal pressure with an n=3 magnetic perturbation increases l_i but also increases f_p so there is no net increase in the β_N limit. A change in the discharge shape to reduce the pedestal pressure, to the single-null divertor ITER shape from a double-null, results in an ≈15% drop in the β_N limit.

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