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[ ] Theory [X] Experiment

Stability Limits in High Performance, Negative Central Shear Discharges,[*] J.M. Hanson, J. Bialek, G.A. Navratil, K.E.J. Olofsson, F. Turco, *Columbia U*; M. Clement, *UCSD*; J.R. Ferron, A.M. Garofalo, R.J. La Haye, M.J. Lanctot, E.J. Strait, *GA*; C.T. Holcomb, *LLNL* – Exploration of negative central shear equilibria in DIII-D has yielded discharges that transiently achieve $\beta_N \simeq 4$. The discharges exhibit broad current density profiles, leading to a significant separation in the no- and with-wall ideal kink stability limits predicted by MHD theory. As the no-wall limit is approached and exceeded in experiments, performance is often limited by n=1 resistive wall mode (RWM) instabilities that lead to abrupt collapses of the plasma stored energy. In addition, instabilities with n=1 rotating tearing precursors are observed when minimum q value drops below 2. Theoretical calculations predict that magnetic feedback control using the in-vessel coils (internal coils) can provide RWM stabilization to β_N values approaching the n=1 ideal-wall limit. In experiments, applying I-coil control indeed facilitates access to increased β_N values above the no-wall limit.

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