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[ ] Theory [x] Experiment

The Tearing Stability of High-β_N Discharges is Directly Linked to the Ideal MHD Stability Boundary,* F. Turco, *Columbia U.*; T.C. Luce, A.D. Turnbull, *GA*; D. Brennan, *Princeton U.* – High-β_N scenarios in tokamaks are limited by tearing modes (TM) above the no-wall β_N limit. It has been shown that the calculated classical stability index Δ' has a pole at the β_N ideal-wall limit, due to the proximity to the 1/1 internal kink limit, destabilizing a m/n=3/2 or =2/1 TM. New modeling of several experimental DIII-D equilibria shows that this feature is common to all the types of scenarios, e.g. with q_{min}>>1 (no 1/1 internal kink), without a conducting wall, and with a wall in contact with the plasma surface. Systematic changes to the plasma current density and pressure profiles show that the Δ' trends with β_N for all the equilibria have a sharp increase at ~90% of the ideal (no-wall, with-wall, without vacuum) limit, independently from the proximity to the q=1 surface. In this β_N range, small perturbations in the ideal MHD boundary will cause large changes in the tearing stability. This effect may overwhelm the attempts to stabilize the TMs, e.g. with broad or direct ECCD injection.

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