

Abstract Submitted
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Beta Limit Due to $m/n = 2/1$ Tearing Mode Onset in the DIII-D Hybrid Scenario¹ R.J. LA HAYE, P.A. POLITZER, GA, D.P. BRENNAN, U. Tulsa, FOR THE DIII-D HYBRID SCENARIO FOR ITER THRUST TEAM — The ultimate performance of hybrid scenario plasmas in DIII-D ($\beta_N \approx 3$, $q_{95} \approx 4.4$, $f_{BS} \approx 0.5$, $H_{89} > 2$) is limited by $m/n = 2/1$ tearing modes. Unlike conventional plasmas [1], the scaling of the instability onset global beta on local ρ_i^* at $q = 2$ is much less than linear. The weak ρ_i^* scaling suggests that small island neoclassical tearing mode (NTM) threshold physics does not dominate the tearing criterion. The hybrid scenario tends to go unstable just at or below the no wall $n = 1$ ideal kink beta limit of about $4 \ell_i$. Experimentally $4 \ell_i$ decreases with beta as $4 \ell_i \approx 7.4^* \beta_N^{-5/6}$. Thus the “ceiling” in beta due to coupling of tearing to the ideal kink comes down as beta is increased. Scaling of the tearing unstable beta that combines both NTM threshold physics and a pole in $\Delta'r$ due to coupling to the ideal kink will be presented. Also shown will be an experimental example of “pre-emptive” electron cyclotron current drive to operate stably at the no wall ideal kink limit.

[1] T.C. Hender, et al., Nucl. Fusion **44**, **798** (2004).

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