Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Analysis of m/n=2/1 locked mode disruption database on the DIII-D Tokamak[1] R. SWEENEY, W. CHOI, K.E.J. OLOFSSON, F.A. VOLPE, Columbia U., R.J. LA HAYE, GA, S. MAO, UW — A study of ∼2,800 m/n=2/1 locked modes (LMs) with rotating precursors at DIII-D reveals that LMs near the plasma edge are the most disruptive, and a period of exponential growth with $\tau \approx 10$ ms precedes the disruption. LM durations are also correlated with edge proximity, with modes near the core living longer and/or not disrupting. Non-disruptive LMs are on average larger than disruptive LMs, but the latter degrade the normalized plasma beta more throughout their evolution. The edge proximity, smaller island size, and larger reduction in plasma beta characteristic of disruptive LMs, are all consistent with the observed linear dependence of island width on $(r/a)\beta_\theta/(dq/dr) \propto \beta_\theta\ (a^2/r)$ (β_θ is poloidal beta, q is safety factor, a is minor radius). The disruptive exponential growth is consistent with the radiation-driven tearing mode model, or alternatively, might be explained by the evolution of the classical stability index. This work suggests a basis for scenario design and profile control in ITER and future devices, as a simple means to avoid locked mode disruptions.

[1]Supported in part by US DOE under DE-SC0008520 and DE-FC02-04ER54698.

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Date submitted: 23 Jul 2015 Electronic form version 1.4