



H-mode Pedestal Comparison Experiments between NSTX and DIII-D

T. Osborne
General Atomics

Presented at
NSTX Research Forum, PPPL
2004 September 22–24

H-mode Pedestal Comparison Experiments between NSTX and DIII-D

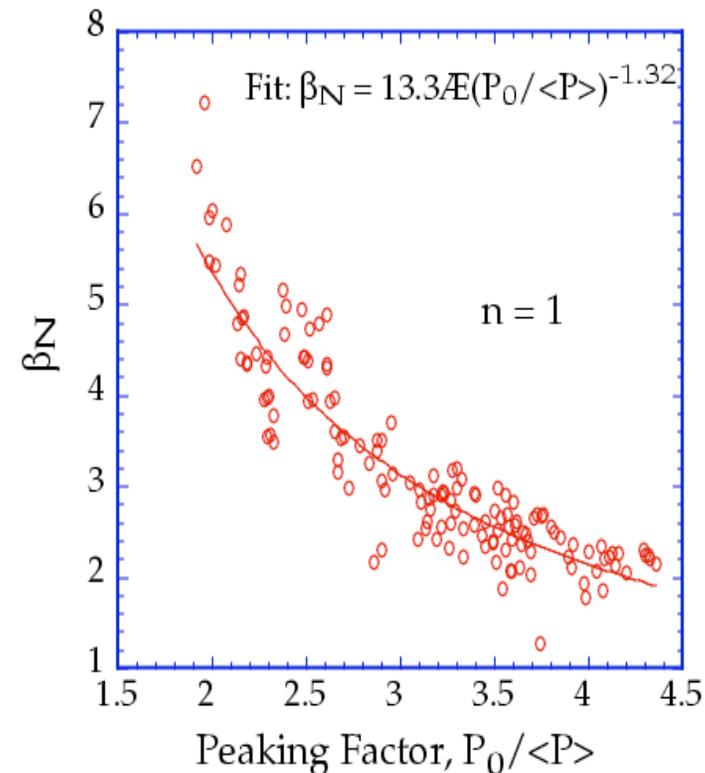
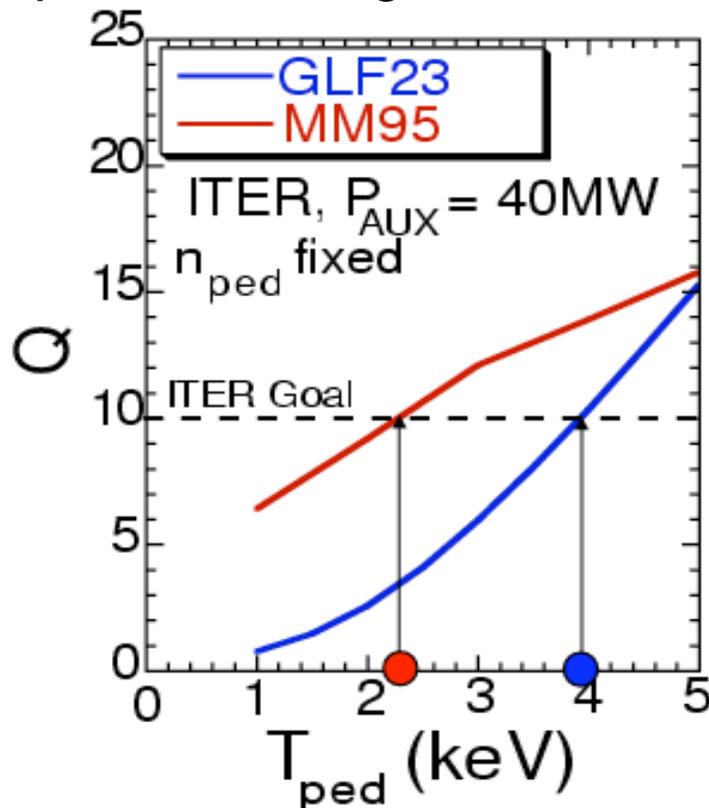


- ◆ Improved understanding of H-mode pedestal physics through NSTX/DIII-D comparison experiments will benefit entire tokamak program as well as specific NSTX goals.
 - Fusion performance in future tokamaks expected to depend strongly on H-mode pedestal height.
 - Pedestal height effects core high beta stability through pressure profile.
 - ELM divertor power flux may be a serious problem for reactor scale tokamaks.
 - ELMs can generate seed islands and trigger NTMs at high beta.
- ◆ Unique similarity between NSTX and DIII-D in parameters other than aspect ratio and good pedestal diagnostics in both devices allows testing of aspect ratio dependence in theories and scaling laws for H-mode pedestal.

Understanding factors controlling H-mode pedestal height is important as it effects energy confinement and high beta stability



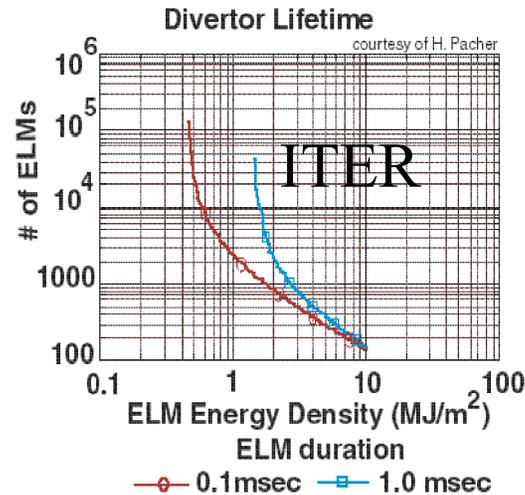
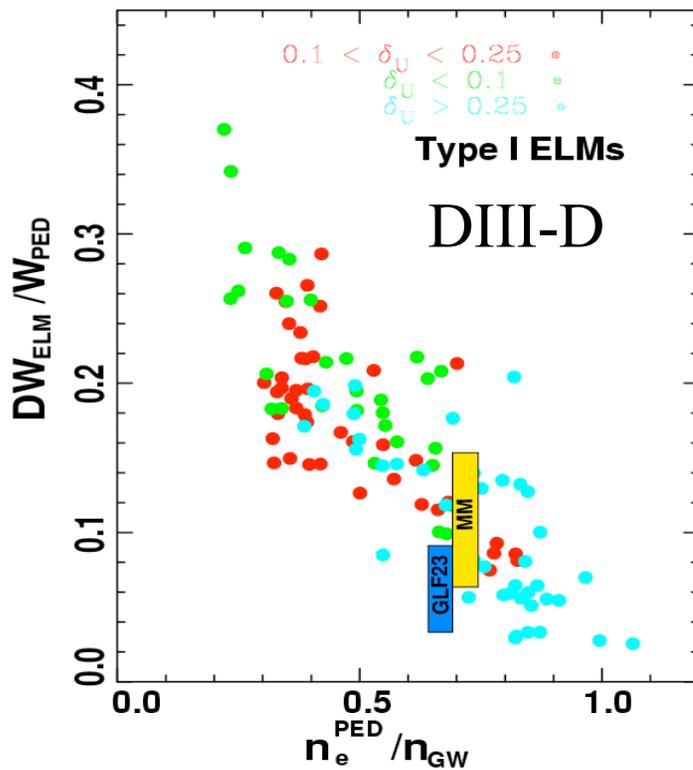
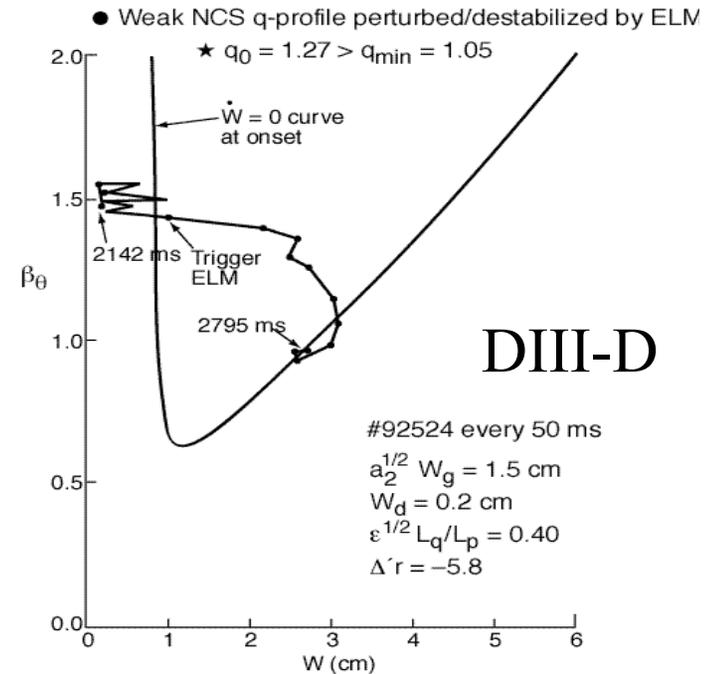
- ◆ Turbulent transport models and experiments indicate strong dependence of core energy confinement on pedestal height as the result of temperature profile stiffness
- ◆ Increase pedestal height can broaden the pressure profile and improve core high beta stability.



Understanding ELMs is important due to large ELM power flux expected in large tokamaks and ELM as NTM trigger



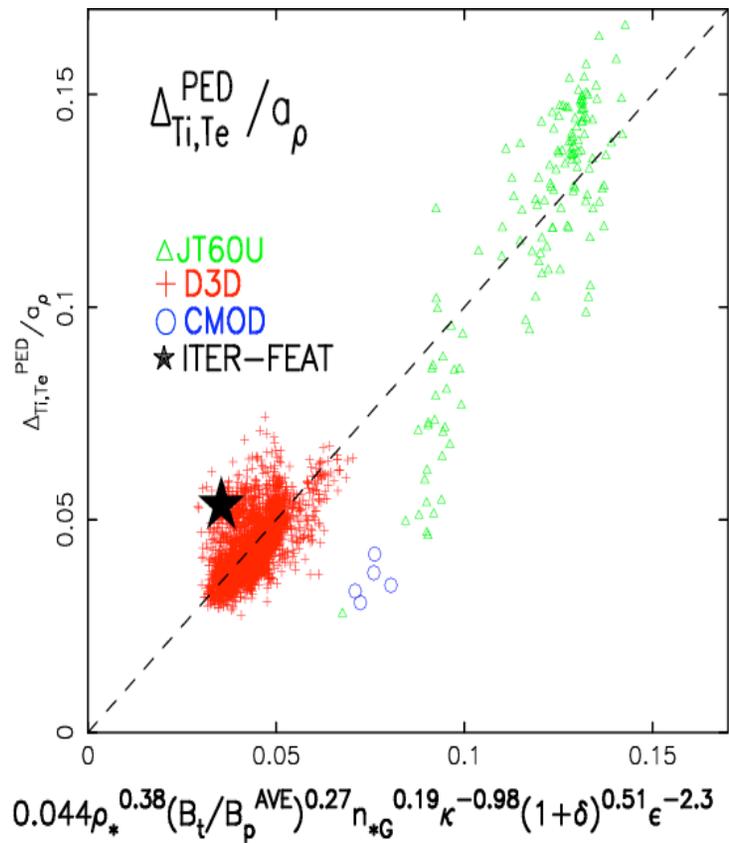
- ◆ Current experiments suggest very large ELMs at reactor scale (10s of MJ/ELM) which may quickly erode the divertor plates in a reactor.
- ◆ ELMs can provide seed islands triggering NTMs.



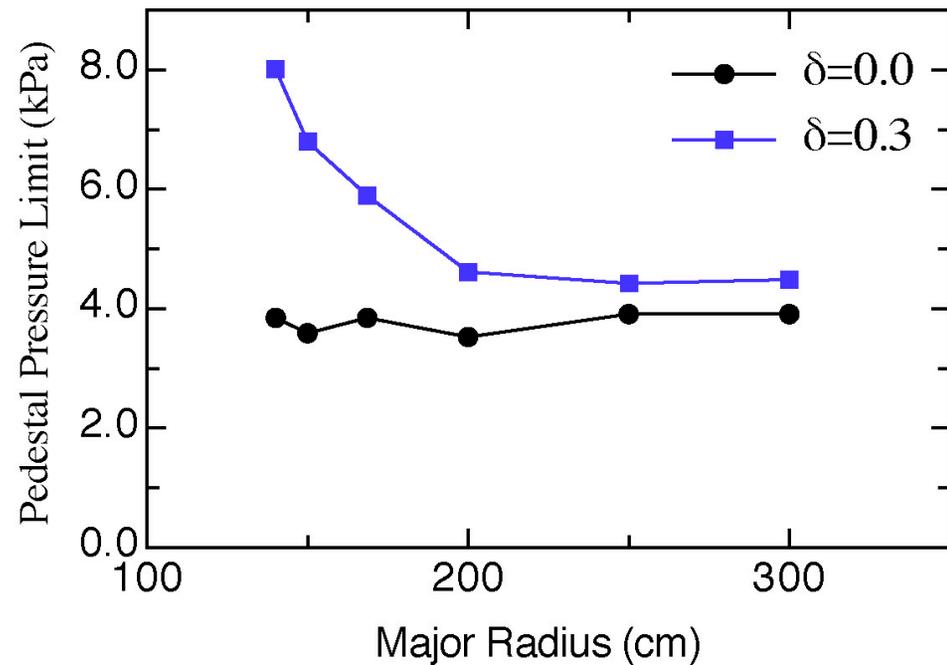
Calculations and experiments suggest possible strong dependence of pedestal parameters on aspect ratio



- ◆ Scaling of ETB width of moderate aspect ratio tokamaks to higher aspect ratio JT-60U suggests possible strong dependence on aspect ratio



- ◆ ELITE code calculations of edge peeling/ballooning mode stability show strong aspect ratio dependence at moderate triangularity. (P. Snyder)



Possible NSTX/DIII-D H-mode pedestal experiments



- ◆ Test peeling/ballooning mode model for ELM instability predictions of aspect ratio dependence.
- ◆ Examine scaling of H-mode transport barrier with aspect ratio in experiments where other dimensionless parameters are matched.
 - This data would also be useful when turbulent transport models are extended through the pedestal since aspect ratio should also effect microstability.
- ◆ Attempt to suppress ELMs with the NSTX saddle coil set as was done with the DIII-D I-Coil.