

## MHD Research Scientific Goals and Metrics

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Extend NTM stability database and compare with/validate theoretical models (2004-05)

- > Observe  $\beta_{onset}$  for 2/1 and 3/2 NTM for  $.01 < \nu_i / (\epsilon \omega_{*e}) < .2$  ,  $.005 < \rho^* < .02$
- > Compare to theoretical models and publish the results

Evaluate current drive stabilization of NTM using either LHCD or MCCD (2005-06)

- > Given prior information on CD efficiency, and theoretical estimate of required  $j(r_s)$  for stabilization, try each in regime most likely to show effect
- > Quantify the results: if it works, how well localized did the current have to be, how much was required; compare to prediction
- > Based on results, devise an NTM control algorithm and plan an experiment to test

Assess potential of active MHD spectroscopy to sense proximity to instability (2004)

- > Measure damping (resonance width) and correlate with onset of instability
- > Determine whether or not results are sufficiently predictive to propose a control scheme

Sawtooth stabilization – Demonstrate 1/1 mode control using RF (2005)

- > Sawtooth activity is suppressed

## Metrics for Burning Plasma Goals

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Assess potential of DN, High Triangularity configuration for NS BP Experiments (2002)

- > In a good performance EDA H-mode with high  $\delta \approx .7, n/n_G > .5$ , vary SSEP from SNB to DN to SNT and measure dependence of
  - ELM/EDA behavior
  - Pedestal height and width
  - SOL transport for particles and heat flux
  - Detachment
- > Results are incorporated into planning for FIRE

Identify Optimized Edge Relaxation mechanism with respect to core confinement, particle control, power exhaust (2006)

- > Requires results of a long series of experiments, theoretical and computational evaluations
- > A concrete proposal for a specific mechanism (or combination), together with plan for producing it in the BPX
- > An experiment in C-Mod is designed to demonstrate that the proposed solution can be produced and controlled and has the desired properties

## Metrics for Burning Plasma (continued)

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Test feedback stabilization of NTM in high performance H-mode plasma with with LHCD or MCCD (2007)

- > Based on results of MHD topical area experiments in (2005-2006), a feedback scheme suitable for high performance H-mode plasma with NTM activity is designed and carried out
- > Feedback is successful in identifying and suppressing NTM activity and increasing  $\beta$ ,  $nI\tau$  for multiple  $\tau_E$