MHD Task Group Planning Session

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MHD Stability ET Group Planning Session

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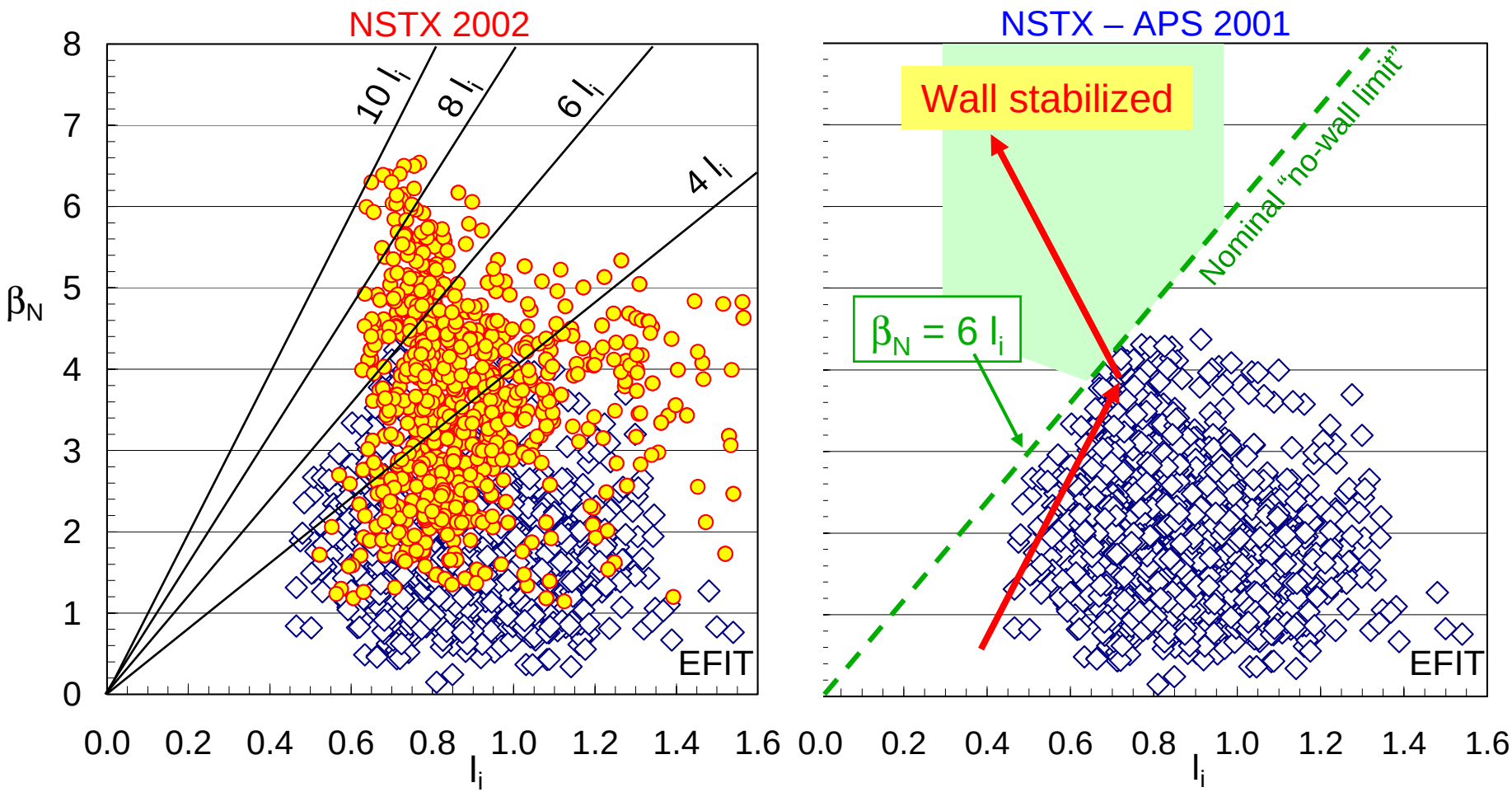
Group asked to develop both milestones and XPs

- Many future milestones are already completed
  - Milestones as stated for FY03
    - *Explore and characterize plasmas with high beta near the no-wall stability limit simultaneously with high energy confinement for durations greater than the energy confinement times.*
    - *Assess interactions between plasma resonant field responses, correction field, and plasma rotation.*
  - Milestones as stated for FY04
    - *Avoid or suppress beta-limiting modes in high beta NSTX plasmas.*
    - *Characterize energetic particle-magnetosonic wave interactions.*
- Proposed research in XPs continues to be advanced physics
  - Management wants to hear the group's vision of research goals
  - NSTX can provide advanced, high β ST plasmas for MHD studies

CY02 plasma operation now in wall-stabilized space



- Normalized beta, $\beta_N = 6.5$, with $\beta_N/l_i > 9.5$; $\beta_N > 30\%$ over $\beta_{N\ \text{no-wall}}$
- Toroidal beta has reached 34%

Physics Research Guidance for CY 2003

- Physics topics
  - Beta-limiting modes, identification and physics
  - Ideal kink/ballooning (full toroidal mode number spectrum)
  - Resistive wall modes
  - Classical / neoclassical tearing modes
  - Fast-ion induced MHD and consequences (i.e. particle loss)
  - Passive / active stabilization
  - *AE mode structure at low aspect ratio
  - Rotation shear stabilization
  - Impact of static error field

Demonstrate NSTX fast progress toward MHD science goals

- 5 Year FESAC IPPA Goals
  - Develop detailed predictive capability for macroscopic stability, including resistive and kinetic effects
    - Progress measured by the level of agreement between predicted and observed stability regimes and by improvements in the stability of operating confinement devices
- 10 Year FESAC IPPA Goals
  - Develop fully integrated capability for predicting the performance of externally-controlled systems including…macroscopic stability…
  - Develop qualitative predictive capability for transport and stability in self-organized systems
  - Advance the forefront of non-fusion plasma science and technology…
- Implementation Approaches
  - Stability analysis of intermediate-*n* number mode
  - RWM theory development and experimental investigation
  - Improve usefulness of resistive stability predictions by extended theory / simulation
  - Physics of external control: boundary / profile shaping; instability feedback stabilization
  - Extend MHD: FLR physics, suprathermal particle effects, rotation effects
- NSTX progress toward 5 year goal (one example)
  - between-shots diagnostics available for quantitative, between-shots ideal stability analysis; Plans to include rotation, resistive effects; plan for kinetic effects

Run Plan Guidance for CY 2003

- Constraints
  - Six experimental task groups
  - 21 run weeks is the present guidance
  - MHD ET slated to have 13 run days out of 21 run weeks
    - RF and CHI to be given more time
  - The 13 run days does *not* include our contingency allotment
    - 3 extra contingency days
- Similarity experiments with tokamaks are encouraged

Scheduled Presentations

- Presentations
  - SOL Current during ELMS / MHD destabilization (Takahashi)
  - Stability limits at increased elongation and reduced li (Menard)
  - Ohmic locked mode studies with short duration NBI (Menard)
  - Chirping beam-ion driven instabilities (Heidbrink)
  - Beta limit dependence on triangularity (Gates)
  - Resistive wall mode physics experiments (Sabbagh)
  - ELM physics in NSTX (Bush)
  - Fishbones, TAE, CAE, NTM (Fredrickson)
- MHD milestones discussion
- MHD XP priority discussion