

The 2001 Base Research Plan and Guidance for ET Discussions

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There is much work to be done to meet major milestones and goals

- More about milestones and goals to be met by October '01
- Brief mid-run summary of ET's and research goals for remainder of run
- Other enabling research needed
- Broad outline of run schedule
- Questions for ET discussions
 - Are we missing big elements?
 - Are there suggestions for fine tuning?
 - How will data be used to pull together a physics picture?

Forum ET discussions of the near-term program should ask: Are we in a position to meet our milestones and goals?

- Milestones, FY '01, to be met by Oct. 2001:
 - Transport and turbulence: global scaling
 - “Measure and interpret the containment of plasma energy and fuel within externally heated NSTX plasmas.”
 - HHFW: assess heating physics
 - “Measure and interpret how high radiofrequency power interacts with and heats high-temperature spherical torus plasmas...”

Forum ET discussions should also ask:
are we properly positioned to reach goals
beyond the '01 milestones?

- Local physics: developing capability in '01 to assess local plasma properties key
 - Diagnostics: pulling together the kinetic/magnetics story
 - Analysis: is our tool box complete enough?
- Control development central to meeting many of our goals and milestones
 - rtEFIT
 - Controlling a CHI discharge central for FY '02 milestone
- Are there XP ideas for using device differences that will illuminate physics of low A, high β ?

Transport and Turbulence group is in position to meet and go beyond the '01 milestone

- Milestone: Global scaling effort underway
 - More time will be given

Other foci that are not “milestones” but are central:

- Neoclassical resistivity
 - Progress, but additional work required; one of the basics
- H mode characterization will continue
 - Enabling tool; good physics in own right
- Local power balance a high priority
 - Requires resolution of kinetics v. magnetics differences
- Fast ion transport a basic element requiring attention
 - Beam blips; lost ion detectors will be in place

There are other opportunities for transport work in '01

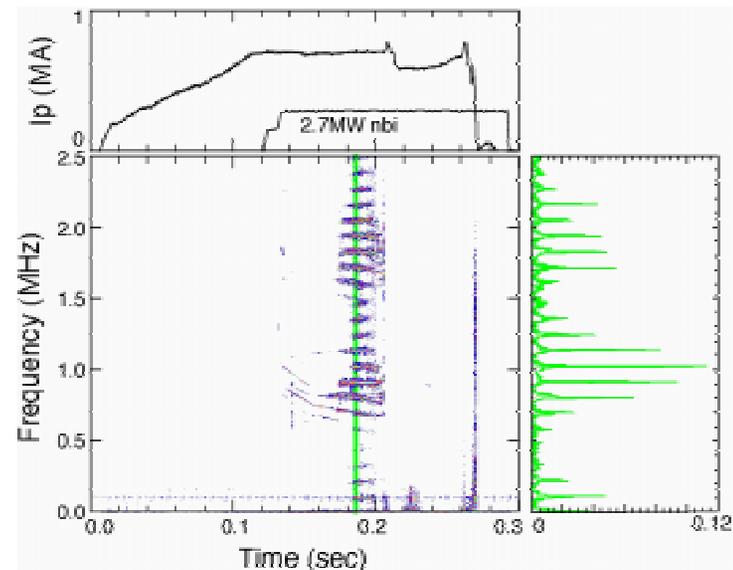
- Edge transport
 - Do we have supporting data and analysis tools in place?
 - What are plans for edge fluctuation measurements and analysis?
- Perturbation studies
 - Do we have necessary diagnostic and analysis capability?
- Search for core enhanced confinement modes
 - What tools can we use? What do we need?
- Aspect ratio comparisons
 - DIII-D/NSTX comparison studies have been proposed

HHFW milestone: physics understanding will require local power balance capability

- Milestone: Understanding heating with HHFW
 - Much early success with Thomson Scattering
 - Scientifically satisfying story requires power balance and kinetics/magnetics resolution
- Laying groundwork for phasing capability will receive run time
 - Look for evidence of current drive: changes in V_{loop}
- Interaction of HHFW with NB ions
 - Requires successful NPA, completion of installation of fast ion probes

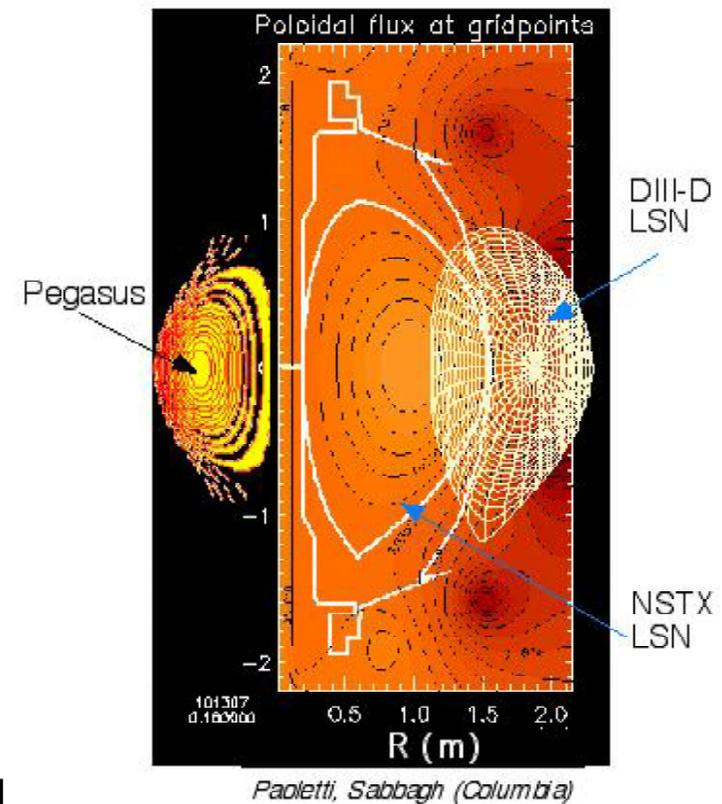
MHD group is laying groundwork for FY '02 milestone and exploiting local analysis and control

- Troyon scaling, global stability changes with $J(r)$ will continue
- Wide variety of TAE/BAE-like modes seen
- Current-driven kink XP approved
- Kinetic profiles will allow local stability analysis with codes
- Improved control capability will allow near- and far-wall stability assessment
 - magnetics permit eddy currents in wall to be measured



Inter-machine research will add to scientific strength of program

- DIII-D: similar cross section shape, size
 - RWM assessment work in place
 - Transport: ideal for aspect ratio studies
 - Beam-induced MHD
 - Edge heat flux scalings: role of aspect ratio
- MAST: What are the possibilities?
 - Wall/no wall influence on MHD
 - Differences in neutral density
- What can we develop in the near or long term?



CHI has the challenge of assessing flux closure, developing control

- FY '02 milestone: coupling CHI startup to ohmic
 - We have a group consensus: flux closure must be assessed; are the right analysis tools in place?
 - Is increased control capability likely to give a CHI target that is viewable by Thomson scattering?
- What control tool development is required to enable coupling of a CHI-only startup to an ohmic plasma?
- Adding small amounts of CHI to an ohmic plasma:
XP approved

Boundary physics ready to address the physics of edge influxes

- Significant wall conditioning/“service” work already in place
 - Boronization, spectroscopic assessments of influxes
 - Significant growth in spectroscopy capability
 - Wall coupons providing valuable data
- Edge heat flux scaling studies expected in remainder of FY ‘01
 - Are diagnostics and analysis tools in place to bring together a self-consistent story?
- Is there a sensible cross-machine comparison to consider developing for this spring or fall?

Beyond the ET's: are the right cross-cutting, program-enabling efforts in place?

- Examples of what we have done: first NBI, long pulse development, control system development, early HHFW
- Commissioning time will continue to be set aside for diagnostics, control
 - XMP's
 - XP's born in ET's
 - e.g. optimize conditions for kinetic documentation (LeBlanc)
- Operational scenario development that crosses ET lines will receive additional run time
- Program should stay flexible enough to react to exciting physics and *explore*

For the afternoon ET discussions: Go beyond a laundry list

- ET leaders state plans, priorities, and goals in place
- Listen to new ideas proposed for CY 2001
 - Identify major items we are missing, danger spots
- Incorporate new ideas into existing priorities
 - What would you do if you had 30% more run time?
- Identify analysis needs for new experiments or diagnostics
- Priority: use the differences between NSTX and other devices to scientific advantage
 - What are we ready to propose?

Boundary conditions for the run

- Assume about eight weeks of run time left this spring; several weeks this fall
- Approximate allotment for FY '01, endorsed by PAC, as a guide:
 - MHD (Sabbagh, Menard) 18%
 - Transport and Turbulence (Kaye, LeBlanc) 18%
 - HHFW (Wilson, Swain) 13%
 - CHI (Raman, Gates) 13%
 - Boundary Physics (Maingi, Skinner) 8%
 - Cross-ET enabling activity 10%
 - Contingency 20%