

The Structure and Development of the NSTX Experimental Program

E.J. Synakowski
NSTX Research Forum
January 15, 2001



**At this time of rapid progress, it is essential
that we have a flexible and accessible
program structure**

- Forum charge regarding the near-term program
- Experimental Task Groups
- How the run schedule is developed
- Outside of the ET lines: the role of “enabling” experiments
- Aims for the remainder of the 2001 run

A successful Forum requires your input

- There are several facets of this meeting
 - Convey information about program status and process
 - Receive broad input regarding new research
 - ***Receive broad input regarding how we do business***
- We will respond to suggested changes (both technical and in how we do business) in a follow-up Team Meeting
 - CHIT forms available if you wish to ensure a record of your comments

Most of the experimental proposals (XPs) are generated in five task groups

- ET Group, Leaders PAC-endorsed emphasis, FY '01
 - MHD (Sabbagh, Menard) 18%
 - Transport and Turbulence (Kaye, LeBlanc) 18%
 - HHFW (Wilson, Swain) 13%
 - CHI (Raman, Gates) 13%
 - Boundary Physics (Maingi, Skinner) 8%
- Also:
 - Cross-ET (e.g. 1st NBI, commissioning, early NBI) 10%
 - Contingency 20%
- XMP's (machine proposals) executed for commissioning of capabilities, control work

Prior to NBI, the three original ET's executed their research plan in FY 2000

FY 2000

- Ohmic optimization ==> MHD, T&T
- CHI startup
- HHFW

Their results will be folded into the presentations from the FY 2001 ET's and the Operations discussion (Mueller)

The upcoming ET talks will feed into discussions of 2001 plans; topical discussions for longer term will follow

- Monday morning
 - ET presentations on research 'til now, plans for the remainder of 2001.
- Monday afternoon:
 - ET discussions of plans and needs for remainder of 2001.
- Tuesday afternoon - Wednesday afternoon:
 - Working Group (WG) topical discussions on 2002 - 2005 directions

Each ET is developing research to reach FY '01, '02, or '03 milestones

- FY '01 Milestones
 - Transport and turbulence: global scaling
 - HHFW: assess heating physics
- FY '02: Milestones
 - MHD: global limits without external feedback control
 - CHI: innovative startup and maintenance (CHI + Ohmic)
- FY '03 Milestones
 - Boundary Physics: edge heat fluxes, plasma facing component needs
 - Integration: the whole package for $t > \tau_E$

ET groups consider milestones, program guidance for run time, and then hear and prioritize XP ideas

The primary method for getting into the loop:

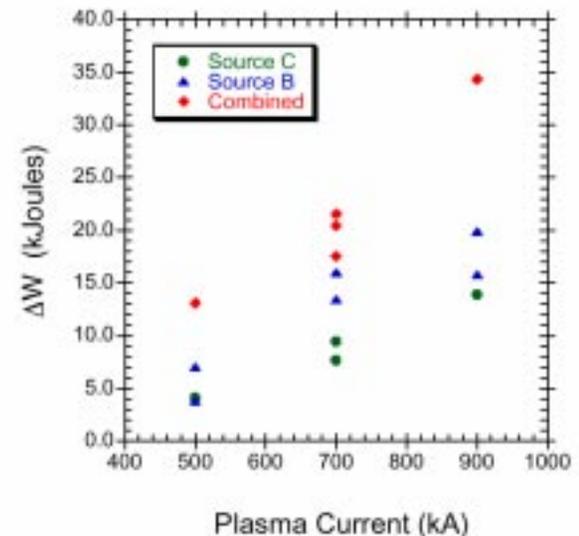
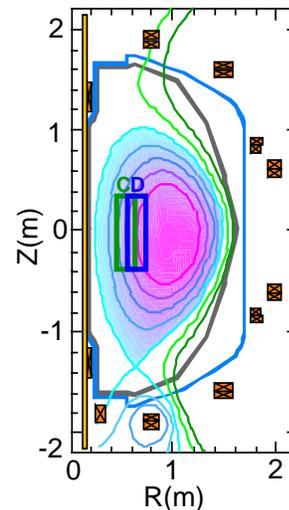
- ET group calls meeting before the run to hear ideas, considering program goals and milestones
 - Attempting to make generally available on Web
 - Prioritization should evolve with time
- ET leaders and group prioritize XP's
 - Iterate depending on facility capability
- ET groups develop an XP with discussions prior to XP review by NSTX Team

Weekly Program/Operations Update meeting used to help develop schedule

- An opportunity to be heard, either through your ET leader or directly through myself or the Run Coordinator (RC)
- RC (me, FY'01; Maingi, FY '02) develops schedule and proposes it to ET leaders and Program Head at Program/Ops meeting, Wednesday at 3 PM
 - discussion with Diagnostics, Beam group representative to assess facility ability to support plan
- Input from ET leaders has been vital for optimizing the schedule

Some of the program has depended on research that crosses ET lines

- First neutral beam injection experiments
 - Grisham, Gates, Darrow:
 - NB injection operational constraints consistent with expectations
- Long pulse development with NBI: born in MHD ET, but of benefit to entire group
 - Gates
 - Early NBI helps slow down current evolution,
 - In conjunction with XMP work



Experiments that cross ET lines help enable rest of research program (con't)

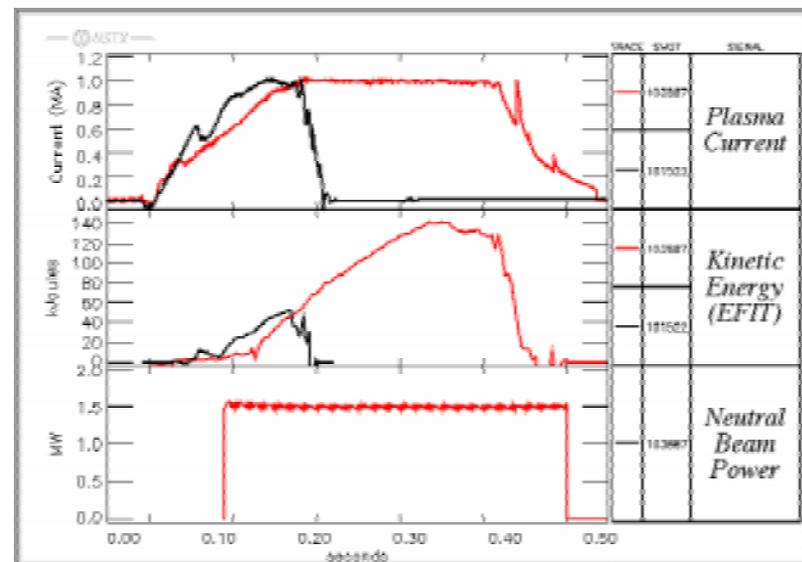
- Early RF injection (Menard)
 - Aim: Develop RF as a tool to heat early, modify $q(r,t)$
 - Surprising results, not clearly understood
 - Already used as a tool
- H mode search and characterization (Maingi)
 - Certainly a transport experiment at least
 - Also, development of H modes potentially a win from broad pressure profiles
 - Not at the “tool” stage yet, but will receive additional run time with this and transport physics in mind

Time will continue to be allocated for control system and boundary physics tool development

- Control work already absolutely key; additional work aimed at rtEFIT control
- Control essential for CHI development if startup is to be connected with ohmic and HHFW
- Boundary physics tools already essential and key
 - TMB: used several times already (Kugel)
 - More routine introduction of boron?
 - Between-shots HeGDC now routine

Cross-ET XP's and XMP's, control commissioning, boundary prep have all led to a much-improved baseline scenario

- 1 MA now routine; intend to strike for higher I_p soon
- Pulse length increased; reproducibility improved
- Inner-wall limited, LSN, DN all have been developed
- Will have 6 kG capability for experiments that need it; 4.5 kG routinely used



For this spring, developing capability to assess ***local physics*** is a high priority

High demands on diagnostic development, interpretation

- 10 Point, 30 Hz Thomson Scattering (LeBlanc)
- Magnetics progress has been essential (Menard)

An important discrepancy: magnetics vs. kinetic determination of stored energy, still unresolved

- CHERS will contribute to discussion: first light with 20 channel system (R. Bell)

Aim: local physics of stability, ion v. electron heat transport, ion and electron HHFW heating

Your input is being sought as to how to create the best program

- Research goals:
 - Are they about right?
 - What new directions should we consider?
- Program and ET structure
 - Is it responsive to new, good ideas? Is it accessible?
- ET categories
 - Are there more efficient ways of dividing the research?
- Connections and involvement
 - Are you obtaining the information you need regarding the program schedule, choices, XP development?