



Proposal and Attendance Form for NSTX Research Forum 2001

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Please write in the boxes below a one-page abstract of your proposal to be presented:

Title: Study of H-modes in NSTX and their use to aid in accomplishing the goals of the NSTX program: YR2001

Abstract:

This is a proposal to study H-modes on NSTX. For the purpose of the Forum, the proposal will be presented in 2 parts: The first part is an Overview of the program and initial experiments for the present, 2001, run. The second part will be presented in the second half of the Forum where the 2002-2005 Research Opportunities are to be addressed.

Overview: H-mode experiments on NSTX are important from three perspectives: (1) As experiments which provide general contributions of information to the international H-mode database, (2) As experiments on the role of H-modes in advanced tokamak scenarios and operation, and (3) Use of H-modes to realize high beta toroidal, proof of reactor relevance, and other goals of the NSTX program. This proposal is aimed at a proactive approach to H-mode studies on NSTX – a multi-year planning and dynamic scheduling of experiments, rather than the usual random approach. The research task is to trigger, sustain and to investigate the physics of H-modes on a small aspect ratio tokamak. This would include the whole spectrum of H-mode issues, but with emphasis on transition thresholds (power, T, n), sustainment (back transitions), external trigger techniques, edge and core transport barriers, and their control and use in other advanced tokamak (AT) regimes. This would ensure proper planning for diagnostics and hardware for triggering H-modes and for detecting and assessing the resulting phenomena. H-mode plasmas are especially relevant to NSTX. They would provide a physics testbed for further investigation of the effects of unique features of the NSTX concept on a regime well documented on the usual large aspect ratio tokamak. Reactors will require enhanced confinement, and development of long duration high performance H-modes on NSTX would further demonstrate its reactor relevance. H-modes may also be useful in broadening and thus stabilizing the predicted strong magnetic well, high pressure gradient, small fusion core of an ST device. Effect of the natural strong edge magnetic shear on the threshold power could be compared with strong edge shear obtained through current rampdown triggering of H-modes on other tokamaks. Experiments to understand and control ELMs would be especially important on NSTX, where heat dumps by giant ELMs could cause high heat loads on the small surface area of the inboard limiter.

Yr2001: The experimental emphasis for the current run-year would be access to H-modes on NSTX. This would include initial experiments on power and other parametric threshold dependencies and obtaining H-modes of long duration. H-modes have been obtained on NSTX using 0.9 to 1.5 MW of neutral beam power. Experiments using RF heating would also be carried out. Based on the ITER H-mode database scaling, ohmic heating alone should also allow access to the H-mode on NSTX. This proposal for Yr2001 would address the following 4



specific issues as follows: (1) Pthreshold studies to determine heating source dependence including NBI source (source A vs B vs C) and type heating (NBI vs RF vs OH and combinations) and I_p magnitude and I_p /rampdown. Also, initial efforts will be made to determine if there are local parametric effects, e.g. edge T_e threshold. (2) ExB shear physics/barrier formation. (3) Initial ELM studies (Note: Many early H-modes have been ELM free). (4) Qualitative look at data obtained to determine if there may be ST specific effects on H-mode access and characteristics (should not require dedicated run time). There is significant interest in H-modes on NSTX and proposals by other physicists are expected (not included in this proposal) This includes complementary XPs by Maingi on Pthreshold (n,B,S) and extending H-mode duration. Other proposals on H-mode transport and on confinement are expected. The author of this proposal would be available to help on other H-mode proposals. Initial assessment of effects of wall conditioning on H-mode access and performance would also be done. Initial comparisons would be made to H-mode results on MAST and other STs and to large aspect ratio tokamaks (mainly via the H-mode database). Results from the Yr2001 experiments would be used to further develop the initial experiment plans and scheduling proposed in the multi-year H-mode program for Yr2002-2005 (also included in the Forum).

Choose only one topical session by inserting X for each proposal (Use separate forms for separate proposals)	<u>2000 Results</u> (mbell@pppl.gov) <u>& 2001 Research Program</u> (esynakowski@pppl.gov) (Please submit by January 10, 2001) __ET1: Macroscopic Stability X_ET2: Transport & Turbulence __ET3: High Harmonic Fast Wave & Electron Bernstein Wave __ET4: Coaxial Helicity Injection __ET5: Boundary Physics
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Select a presentation option by inserting X:

- Oral presentation in person
- Remote presentation via ShowStation and speakerphone
- Ask discussion leader to include in discussion
- No need to present, but include in meeting summaries
- Attend Forum only (in person or with remote access)

Special Requests for your proposal (projector type, time constraints, etc.):

Please return this document via e-mail attachment to jrobinson@pppl.gov, jsavino@pppl.gov, and the corresponding organizer listed above. Please e-mail questions or comments to the organizers listed above.