

Report of NSTX Program Advisory Committee (PAC-26 – Conference Call)

July 24, 2009

Committee Members Present:

Ronald H. Cohen (Lawrence Livermore National Laboratory)
Donald L. Hillis (Oak Ridge National Laboratory)
Bruce Lipschultz (Massachusetts Institute of Technology)
Michael E. Mauel (Columbia University)—chair
Hendrik Meyer (UKAEA Culham)
Richard P. Majeski (Princeton Plasma Physics Laboratory)
John S. Sarff (University of Wisconsin)
Mickey Wade (General Atomics)

Ex-officio:

Stephen A. Eckstrand (DOE Office of Fusion Energy Sciences)
Stan Kaye (Princeton Plasma Physics Laboratory)
Jon Menard (Princeton Plasma Physics Laboratory)

Committee Members Absent:

Riccardo Betti (University of Rochester)
Paul Bonoli (Massachusetts Institute of Technology)
Jeffrey Brooks (Purdue University)
Xavier Garbet (CEA Cadarache)
Jiangang Li (Institute of Plasma Physics, Hefei, China)
Haruyuki Kimura (Japan Atomic Energy Agency)
James W. Van Dam (University of Texas)
Hartmut Zohm (Max-Planck Institute for Plasma Physics)

1. Introduction

The NSTX Program Advisory Committee (PAC) held its 26th meeting via teleconference on July 20, 2009. The purpose of the meeting was to give advice and comment regarding the NSTX Program Letter for multi-year research collaborations involving national laboratories. The PAC reviewed the Program Letter and made constructive comments to improve the letter's clarity and to provide additional information useful for those considering preparing collaboration research proposals.

The Program Letter consisted of two main parts: (1) an introduction to NSTX collaboration and to the NSTX mission, and (2) a description of priorities and key collaboration opportunities within each of six topical research areas. Overall, the PAC considered the draft program letter to be very well written and finds that it offers important information to those preparing proposals. We appreciate the efforts by the NSTX Team in both preparing it and soliciting PAC comments.

During the PAC-26 teleconference, Jon Menard updated the PAC on facility operations, ARRA (*i.e.* "stimulus") funding, and research milestones. We congratulate the NSTX Team for

completing the installation of the high-harmonic fast wave (HHFW) heating upgrade, the installation of the dual lithium shaker, and the good progress to date fabricating the liquid lithium divertor (LLD).

After a brief discussion, the PAC made three introductory recommendations aimed to strengthen this and future Program Letters and five helpful comments and suggestions pertaining to the research priorities detailed in the Program Letter.

2. Introductory Recommendations

The PAC suggests three additions be made to the general descriptions and guidelines that begin the section describing research priorities and key collaboration opportunities in the Program Letter. These are:

1. Explicitly include the role of experimental-based simulation and analysis in your general call for proposals. The PAC recognizes the importance of simulation in the analysis, interpretation, and planning of experiments. Simulation is especially valuable to NSTX research in the topical areas of Multi-scale Physics and Plasma Boundary Interfaces.
2. Summarize the new capabilities and research tools that will be available to collaborators. As Jon Menard described, NSTX has installed, or will be installing, many important research tools and diagnostics. The PAC suggests that mention be added of these new capabilities, and the related physics, in the opening statements of research priorities and opportunities, as a way to motivate and inform research collaborators.
3. When specific collaboration research needs are known, avoid using general terms in the descriptions of research priorities and key opportunities. The PAC believes both potential collaborators and the NSTX Program will benefit from focused guidance presented in the Program Letter, resulting in more responsive proposals and effective collaboration research plans.

3. Recommendations Regarding Key Collaboration Opportunities

The PAC suggests the following minor additions or changes to the draft wording within the NSTX priority research and collaboration areas in order to strengthen and clarify the Program Letter. These are briefly summarized below:

1. Macroscopic Plasma Physics. Clarify the key opportunity involving the study of fast particle effects on RWM and NTM stability and show a better connection between this study and the broader research priority described with I-1.
2. Plasma Boundary Interfaces. Expand the description of the opportunity to investigate the effect of externally applied 3D fields (RMP) on ELMs and edge phenomena. The PAC suggests that the Letter note the need for basic understanding of 3D effects on the plasma edge and note the opportunity for discovery that is made possible by comparing and

contrasting the 3D edge response observed on NSTX with the similar effects seen on other devices.

3. Waves and Energetic Particles. Focus the description of the key opportunity associated with fast-particle instability, by noting that HHFW and NBI are research tools that should be used to advance energetic particle physics (and not of themselves key research opportunities). When describing the opportunity to study Bernstein, X-mode, and O-mode (B-X-O) transmission and emission, deemphasize motivations for EBW heating and emphasize the potential for B-X-O studies as a plasma diagnostic.
4. Plasma Start-up and Ramp-up without a Solenoid. In the key opportunity concerning HHFW current ramp-up, eliminate the first sentence so that proper emphasis is given to the physics of HHFW current drive during ramp-up scenarios. Additionally, consider ways to broaden the basic scientific questions asked by both research opportunities. In addition to work on the current-ramp-up tools, HHFW and CHI, NSTX should invite collaborators in a separate opportunity to investigate physics more broadly related to start-up, including the study of impurity accumulation, plasma-surface interactions, and recycling during current ramp-up.
5. Physics Integration. The PAC found the background paragraph in Research Priority VI-1 to be well written and to correctly describe integration as the simultaneous achievement of research objectives from other topical areas. However, the PAC suggests that each key collaboration opportunity for physics integration more clearly identify one or more integration goals (*e.g.*, integrate startup with regular discharges). Additionally, the PAC recommends that at least one key opportunity explicitly mention the use of the LLD as a means to achieve physics integration.