Princeton Plasma Physics Laboratory

NSTX Machine Proposal

Title: **Baseline operation of the high-k scattering system**

OP-XMP-44	Revision**:** **0**	Effective Date: *(Ref. OP-AD-97)* Expiration Date: *(2 yrs. unless otherwise stipulated)*

Procedure Approvals

Responsible authors: D. Smith	Date 9/2/05
ATI (NSTX Physics Ops):	Date
RLM (NSTX Experimental Research Ops):	Date

Responsible Division: **Experimental Research Operations**

Procedure Requirements
designated by RLM

	NSTX Work Permit (TBD)		Lockout/Tagout (OP-AD-61)
	TFTR Work Permit (OP-AD-09)		Door Permit (OP-G-93)
	Tritium Work Permit (OP-AD-49)		T-MOD (OP-AD-03)
	RWP (HP-OP-20)		Lift Procedure (ENG-021)
	Confined Space Permit		DCA/DCN (OP-AD-104)
	Pre-job brief (OP-AD-79)		ATI Walkdown
	USQD (OP-AD-63)		Independent Review
	Master Equip. List Mod (OP-AD-112)		ES&H Review (NEPA, IH, etc)

MINOR MODIFICATIONS

REVIEWERS (designated by RLM)
ATI
Test Director
Independent Reviewer
D-Site Shift Supervisor
NSTX
TFTR Caretaking
Vacuum
Computer
Tritium
QA/QC
AC Power
FED
ECS/MG
FED
ERWM
Water
NB
RF
Diagnostics

TRAINING (designated by RLM)

Training required: No ■ Yes ☐ Instructor _____

Personnel (group, job title or individual name)	Read Only	Instruction	Hands-On

Training Rep. _____

RLM _____

NSTX MACHINE PROPOSAL

TITLE: **Baseline operation of the high-k scattering system** No. **OP-XMP-44**

AUTHORS: D. Smith, D. Johnson, E. Mazzucato, and H. Park (PPPL) C. Domier, L. Lin, and N.C. Luhmann, Jr. (UC-Davis) DATE: 8/26/05

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1. Overview of experiment:

The objective of this XMP is to establish the baseline operation scenario of the high-k scattering system. The system has two configurations: inboard launch with probe beam tangency at R=110 cm and outboard launch with probe beam tangency at R=140 cm. The target plasma for the baseline scenario is the Ohmic L-mode shot 115326 developed by V. Soukhanovskii in XP-516 on 4/27/05. The density profile is similar to the high-Te, L-mode, RS shot 116978 developed by F. Levinton in XP-522 on 7/11/05.

Controlled access is required during this experiment to adjust the launch and collection mirror orientations. If a single run day were devoted to this XMP, several controlled accesses, maybe up to 10, would be needed before an acceptable baseline scenario was found. To avoid this, we propose executing this XMP over the course of several days. The basic plan is to adjust mirror orientations as needed when controlled accesses occur and then reproduce shot 115326. This should have minimum impact on scheduled plasma operations. This plan also allows us to power down the BWO for extended periods if deemed prudent to conserve tube lifetime.

2. Justification:

It is desirable to establish baseline operation scenarios for planning future experiments.

3. Plan:

1. Configure system for outboard launch. Feedthru actuators and exit window rotation stages should be set accordingly: X axis actuator 1.6050 inch, Y axis actuator 1.2305 inch, Bay K actuator 0.8295 inch, window 1 stage -5.5°, window 2 stage -4.0°, window 3 stage -2.0°, window 4 stage +0.5°, window 5 stage +2.5°. Ensure source and detectors are operating and phase-lock loop is tracking.

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Test Director

2. Run successive reference shots with the target 115326. Adjust feedthru actuator positions and exit window mirror rotation stages between shots with guidance from ray tracing simulations of shot 115326 and previous measurements. A successful operation scenario should include the receiving beams intersecting the probe beam near the probe beam tangency and satisfying $k_{\parallel} << k_{\perp}$.

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Shot Numbers Test Director

3. Configure system for inboard launch. Feedthru actuators and exit window rotation stages should be set accordingly: X axis actuator 1.1080 inch, Y axis actuator 1.2020 inch, Bay K actuator 2.2960 inch, window 1 stage -7.0°, window 2 stage -6.0°, window 3 stage -4.5°, window 4 stage -2.5°, window 5 stage +0.5°. Ensure source and detectors are operating and phase-lock loop is tracking.

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Test Director

4. Run successive reference shots with the target 115326. Adjust feedthru actuator positions and exit window mirror rotation stages between shots with guidance from ray tracing simulations of shot 115326 and previous measurements. A successful operation scenario should include the receiving beams intersecting the probe beam near the probe beam tangency and satisfying $k_{\parallel} << k_{\perp}$.

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Shot Numbers Test Director

4. Required machine, beam, ICRF and diagnostic capabilities:

EFIT, MPTS, – see next page and shot 115326

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Verification, if appropriate

5. Sign-off and Documentation

5.1 Permission to Proceed:

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Head, Experimental Research Operations Division

5.2 Documentation of results:

Documentation of the results completed, attached to proposal and sent to Ops. Center with copies to Cognizant Physicist and Head of Boundary Physics.

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Test Director

PHYSICS OPERATIONS REQUEST

OP-XMP-44

Machine conditions

I_{TF} (kA): -53 kA Flattop start/stop (s): -0.02 – 0.6 sec

I_P (MA): 750 kA Flattop start/stop (s): approx. 0.15 – 0.35 sec

Configuration: LSN Z (m): 0.0

Gas Species: D

NBI: n/a

ICRF: n/a

CHI: n/a

Previous shot numbers for setup: **→ reload shot 115326 ←**

DIAGNOSTIC CHECKLIST

OP-XMP-44

Diagnostic	Need	Desire	Instructions
Bolometer – tangential array			
Bolometer array - divertor			
CHERS			
Divertor fast camera			
Dust detector			
EBW radiometers			
Edge pressure gauges			
Edge rotation spectroscopy			
Fast lost ion probes - IFLIP			
Fast lost ion probes - SFLIP			
Filterscopes			
FIReTIP	x		
Gas puff imaging			
H_α camera - 1D			
Infrared cameras			
Interferometer - 1 mm			
Langmuir probe array			
Magnetics – Diamagnetism	x		
Magnetics - Flux loops	_		
Magnetics - Locked modes	x		
Magnetics - Pickup coils	_		
Magnetics - Rogowski coils	_		
Magnetics - RWM sensors			
Mirnov coils – high frequency	x		
Mirnov coils – poloidal array			
Mirnov coils – trooidal array			
MSE	x		
Neutral particle analyzer			
Neutron measurements			
Plasma TV	x		
Reciprocating probe			
Reflectometer – core		x	
Reflectometer - SOL			
RF antenna camera			
RF antenna probe			
SPRED			
Thomson scattering	x		
Ultrasoft X-ray arrays	x		
Ultrasoft X-ray arrays – bicolor	x		
Visible bremsstrahlung det.	x		
Visible spectrometer (VIPS)			
X-ray crystal spectrometer - H		x	
X-ray crystal spectrometer - V			
X-ray fast pinhole camera			

XMP-44 High-k Scattering March 20-21, 2006

All shots Ohmic He with NBI blips.

Avoid H-mode to maintain density control. H-mode is rare, maybe non-existent, for OH He shots. If H-mode occurs, reduce inner gap. If necessary, reduce P_{OH} by reducing Ip scan range (see below).

Maintain density below 2×10^{13} cm^{-3} with low He pre-fill pressure.

Employ 10 ms, 2 MW NBI blips with 20 ms between blips for CHERS and transport analysis. Use Source A at 91.4 kV. If possible, tweak V_{beam} to put stark lines within MSE filter range.

Scan k_parallel by 1) sweeping scattered beams along probe beam using collection mirror and 2) scanning pitch angle profile with Ip scan.

Shot list – use 117260 as a template, except use He and add NBI blips.

1-2: Ip=900 kA; Bt=4.0 kG with step to 4.5 kG at 250 ms. If Bt step is problematic, abandon attempts and use Bt=4.5 kG.

3-6: Scan Ip from 900-600 kA

Controlled access to adjust collection mirror

7-10: Scan Ip from 900-600 kA

Controlled access to adjust collection mirror

11-14: Scan Ip from 900-600 kA