Princeton Plasma Physics Laboratory

NSTX-U Machine Proposal

Title: **Commissioning of the Thomson Scattering System**

OP-XMP-111	Revision**: 0**	Effective Date: **12/3/2015** Expiration Date: **12/3/2017** *(2 yrs. unless otherwise stipulated)*

Proposal Approvals

Responsible author: **Benoit LeBlanc**	Date
ATI (NSTX-U Physics Ops): **Dennis Mueller**	Date
RLM (NSTX-U Expt. Research Ops): **Stefan Gerhardt** Stefan Gerhardt Digitally signed by Stefan Gerhardt DN: cn=Stefan Gerhardt, o=Physics, ou=PPPL, email=sgerhard@pppl.gov, c=US Date: 2015.12.03 12:54:27 -05'00'	Date

Responsible Division: **Experimental Research Operations**

Procedure Requirements

designated by RLM

	NSTX Work Permit		T-MOD (OP-AD-03)
	Independent Review		ES&H Review

RESTRICTIONS AND MINOR MODIFICATIONS

Approved by RLM

REVIEWERS (designated by RLM)		
Organization/Position	Name	Signature
ATI	D. Mueller	
Test Director		
Independent Reviewer		
NB system		
RF systems		
FCPC systems		
Diagnostics		

TRAINING (designated by RLM)

Training required: No ■ Yes ☐ Instructor _____

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

RLM _____

NSTX-U MACHINE PROPOSAL

TITLE: **Commissioning of the Thomson Scattering System** No. **OP-XMP-111**

AUTHORS: **B. LeBlanc** DATE:

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1. Overview:

The goal of this XMP is the commission the full 42 channel Thomson scattering system. L-mode plasmas, H-mode plasmas, and possibly HHFW plasmas will be used.

2. Justification:

The multi-pulse Thomson scattering (MPTS) system is a critical diagnostic for NSTX-U machine operations and scientific progress; it provides the basic measures of the plasma electron density and electron temperature.

As a consequence, it is critical to commission this system.

3. Plan:

3.1 L-Mode w/ NBI heating:

Reference shot:

- L-mode D_2 plasma.
- Highest plasma current possible for the allowed TF at the time when this is run. This is likely in the range of an I_P/B_T ratio of 1.0-1.05 MA/T.
- 2-4 MW of neutral beam power.
- Outer gap of 10 cm

The exact shot number will be determined in consultation with the physics operations group.

Step 3.1.1:

Take reference shot, or record shot number if it already exists and can be used.

L-Mode Reference Shot #:_____

Step 3.1.2:

Reduce the outer gap to ~5 cm and repeat 5 times.

Shot #:_____
Shot #:_____
Shot #:_____
Shot #:_____

Shot #:_____

3.2 H-mode w/ NBI heating

Reference shot:

- H-mode D_2 plasma, likely the standard morning H-mode fiducial shot
- Outer gap of ~10 cm

The exact shot number will be determined in consultation with the physics operations group.

Step 3.2.1:

Take reference shot, or record shot number if it already exists and can be counted toward the XMP

H-mode Reference Shot #:_____

Step 3.2.2:

Reduce the outer gap to ~5 cm and repeat

Shot #:_____
Shot #:_____
Shot #:_____
Shot #:_____
Shot #:_____

3.3 HHFW heated H-mode

Reference shot

- RF-heated plasma with L-mode edge and steep core T_e profile.

Repeat shot five times:

Shot #:_____
Shot #:_____
Shot #:_____
Shot #:_____
Shot #:_____

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

L-mode reference shot must exist. This will likely be a 700 kA & 0.65 T scenario developed for other L-mode XMPs, but a different shot may be selected, potentially at lower I_p/B_T. Flat-top durations of greater than 0.5 seconds need to be achieved for this L-mode scenario.

For the H-mode shot, the morning fiducial shot will be used.

2-6 MW of NBI power must be available for steps 3.1 and 3.2. HHFW is required for step 3.3.

The MPTS system must also have demonstrated basic functionality.

5. Sign off at run time:

5.1 Permission to Proceed: _____

Physics Operations Branch Head or Research Operations Head

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 Physics Operations.

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Cognizant Physicist/Test Director