

**Princeton Plasma Physics Laboratory  
NSTX Experimental Proposal**

**Title: LITER Characterization and ELM Mitigation**

**OP-XP-827**

Revision: **0**

Effective Date: **4/04/08**

Expiration Date: **4/04/10**

*(2 yrs. unless otherwise stipulated)*

**PROPOSAL APPROVALS**

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Date

**ATI – ET Group Leader: V. Soukhanovskii**

Date

**RLM - Run Coordinator: M. Bell**

Date

**Responsible Division: Experimental Research Operations**

**Chit Review Board** (designated by Run Coordinator)

**MINOR MODIFICATIONS** (Approved by Experimental Research Operations)

# NSTX EXPERIMENTAL PROPOSAL

TITLE: **Injection and Characterization of Lithium Powder**

No. **OP-XP-827**

AUTHOR: **D. Mansfield**

DATE: **4/04/08**

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## 1. Overview of planned experiment

This XP will characterize the injection of lithium powder into the NSTX SOL with the aim of demonstrating particle pump out.

## 2. Theoretical/ empirical justification

TFTR, CDX-U, and NSTX demonstrated the ability of lithium to control density.

## 3. Experimental run plan

To establish baseline conditions before introduction of lithium, perform up to 3 reference discharges (125269 or perhaps 128026). Proceed if H-mode is obtained reliably.

Table 1 shows the nominal experimental sequence during evaporation.

1. Proceed until locked modes prevent suitable discharges, or the H-mode low density limit is reached, or as determined by experimenters from review of diagnostic data. Note: be cautious while increasing the input mass flux in steps of roughly 1 mg/sec.
  - a. If locked modes start to occur increase LFS gas in steps of 10 TI/s.
  - b. If H-mode density threshold problems occur increase SGI gas in 200 Torr steps and adjust timing as required.
2. Choose best experimental conditions for maintaining a flat density waveform. Use density normalized to fueling as a figure of merit.
3. Choose best condition from Step 3, and repeat at increasingly higher densities by using SGI to adjust density to be constant.

## 4. Required machine, NBI, RF, CHI and diagnostic capabilities

D LSND H-mode shot 125269 (or 128026) with at least 2 source NBI.

HeGDC during RAINDROPS operation as specified in Table 1.

## 5. Planned analysis

UEDGE, TRANSP, etc.

## 6. Planned publication of results

PSI09, POP, Nucl. Fusion, IAEA09

**Table 1. XP826 Experimental Sequence**

<b>XP826 Shot No.</b>	<b>Raindrops mg/s (Max)</b>	<b>Temporal Profile</b>	<b>Total Lithium (mg)</b>	<b>HeGDC (min)</b>
Ref #1	0	N/A	0	5
Ref #2	0	N/A	0	5
Ref #3	0	N/A	0	5
1	2	A	2	5
2	4	A	6	5
3	6	A	12	5
4	8	A	20	5
5	8	B	28	5
6	8	B	36	5
7	8	B	42	5
8	8	B	50	5
9	2	C	52	5
10	2	C	54	5
11	2	C	56	5
12	8	TBD	64	5
13	10	TBD	74	5
14	12	TBD	86	5
15	14	TBD	100	5



# PHYSICS OPERATIONS REQUEST

Title: LITER Characterization and ELM Mitigation

OP-XP-827

Machine conditions: 125269 (or 128026)

$I_{TF}$  (kA): **-53**                      Flattop start/stop (s): **-0.01/1.1**

$I_P$  (MA): **0.8**                         Flattop start/stop (s): **0.2/1.0**

Configuration: **LSN**

Outer gap (m):                              Inner gap (m):

Elongation  $\kappa$ :                                Triangularity  $\delta$ :

Z position (m):

Gas Species: **D**                              Injector(s): **CS mid, OM #2**

NBI - Species: **D**    Sources: **A, C**    Voltage (kV): **90**                      Duration (s): **0.8**

ICRF – Power (MW):                      Phasing:                                      Duration (s):

CHI:

*Either:* List previous shot numbers for setup: **125269 (or 128026) with 3 NBI**

*Or:* Sketch the desired time profiles, including inner and outer gaps,  $\kappa$ ,  $\delta$ , heating, fuelling, etc. as appropriate. Accurately label the sketch with times and values.

## DIAGNOSTIC CHECKLIST

### XP-719

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