

**Princeton Plasma Physics Laboratory
NSTX Experimental Proposal**

Title: LITER Characterization and ELM Mitigation

OP-XP-826

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

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(2 yrs. unless otherwise stipulated)

PROPOSAL APPROVALS

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Date

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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: **LITER Characterization and ELM Mitigation**

No. **OP-XP-826**

AUTHOR: **H. Kugel**

DATE: **4/04/08**

1. Overview of planned experiment

This XP will characterize 2 LITER operation and ELM mitigation with increasing lithium deposition rate and total deposition.

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). Proceed if H-mode and ELMs are 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 in the range of 1 gram/shot.
 - a. If locked modes start to occur increase LFS gas in steps of 10 Tl/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 with 3 NBI.

HeGDC during LITER operation as specified in Table 1.

5. Planned analysis

UEDGE, TRANSP, etc.

6. Planned publication of results

PSI08, POP, Nucl. Fusion, IAEA08

Table 1. XP826 Experimental Sequence

XP826 Shot No.	LITER-F g/m	LITER-K g/m	Total Lithium (g)	HeGDC (min)
Ref #1	0	0	0	5
Ref #2	0	0	0	5
Ref #3	0	0	0	5
1	0.01	0	0.1	5
2	0.01	0	0.2	5
3	0.01	0	0.3	5
4	0.01	0	0.4	5
5	0.01	0	0.5	5
6	0.01	0	0.6	5
7	0.01	0	0.7	5
8	0.02	0	0.9	5
9	0.02	0	1.1	4
10	0.02	0	1.3	4
11	0.02	0	1.5	3
12	0.02	0	1.7	3
13	0.02	0	1.9	2
14	0.02	0	2.1	2
15	0.02	0.02	2.5	1
16	0.02	0.02	2.9	1
17	0.02	0.02	3.3	0
18	0.02	0.02	3.7	
19	0.02	0.02	4.1	
20	0.02	0.02	4.5	
21	0.02	0.02	4.9	
22	0.02	0.02	5.3	
23	0.02	0.02	5.7	
24	0.02	0.02	6.1	
25	0.02	0.02	6.5	
26	0.02	0.02	6.9	
27	0.02	0.02	7.3	
28	0.02	0.02	7.7	
29	0.02	0.02	8.1	
30	0.02	0.02	8.5	
31	0.02	0.02	8.9	
32	0.02	0.02	9.3	
33	0.02	0.02	9.7	
34	0.02	0.02	10.1	
35	0.02	0.02	10.5	
36	0.02	0.02	10.9	
37	0.02	0.02	11.3	
38	0.02	0.02	11.7	
39	0.02	0.02	12.1	
40	0.02	0.02	12.5	

XP826 Shot No.	LITER-F g/m	LITER-K g/m	Total Lithium (g)	HeGDC (min)
41	0.02	0.02	12.9	
42	0.02	0.02	13.3	
43	0.02	0.02	13.7	
44	0.02	0.02	14.1	
45	0.02	0.02	14.5	
46	0.02	0.02	14.9	
47	0.02	0.02	15.3	
48	0.02	0.02	15.7	
49	0.02	0.02	16.1	
50	0.02	0.02	16.5	
51	0.04	0.04	17.3	
52	0.04	0.04	18.1	
53	0.04	0.04	18.9	
54	0.04	0.04	19.7	
55	0.04	0.04	20.5	
56	0.04	0.04	21.3	
57	0.04	0.04	22.1	
58	0.04	0.04	22.9	
59	0.04	0.04	23.7	
60	0.04	0.04	24.5	
61	0.04	0.04	25.3	
62	0.04	0.04	26.1	
63	0.04	0.04	26.9	
64	0.04	0.04	27.7	
65	0.04	0.04	28.5	
66	0.04	0.04	29.3	
67	0.04	0.04	30.1	
68	0.04	0.04	30.9	
69	0.04	0.04	31.7	
70	0.04	0.04	32.5	
71	0.04	0.04	33.3	
72	0.04	0.04	34.1	
73	0.04	0.04	34.9	
74	0.04	0.04	35.7	
75	0.04	0.04	36.5	

PHYSICS OPERATIONS REQUEST

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Machine conditions: 125269

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 κ : Triangularity δ :

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 with 3 NBI**

Or: Sketch the desired time profiles, including inner and outer gaps, κ , δ , 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		