

**Princeton Plasma Physics Laboratory
NSTX Experimental Proposal**

Title: LITER Characterization and ELM Mitigation

OP-XP-827

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Effective Date: **4/30/08**

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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-827**

AUTHOR: **H. Kugel, D. Mansfield**

DATE: **4/30/08**

1. Overview of planned experiment

This XP will characterize 2 LITER operation and ELM mitigation with increasing lithium deposition rate and total deposition. Tables 1 and 2 show the experimental sequence.

2. Theoretical/ empirical justification

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

3. Experimental run plan

1. Before introduction of lithium, establish the Day-1 and Day-2 baseline conditions. First perform 2 reference discharges for Day-2 (128026), and then 2 reference discharges for Day-1(125269). Keep fueling the same.

2. If H-mode and ELMs are obtained reliably in the Day-1 reference discharges (125269) proceed with the sequence shown in Table 1.

3. On Day-2 (128026) follow the experimental sequence shown in Table 2.). Keep fueling the same as Day-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.

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.

c) Choose best experimental conditions for maintaining a flat density waveform. Use density normalized to fueling as a figure of merit.

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

On Day-1, D LSND H-mode shot 125269 with 3 NBI (Day-1) and on Day-2, D LSND H-mode shot 128026 with 3 NBI. HeGDC during LITER operation as specified in Tables 1 and 2.

5. Planned analysis

UEDGE, TRANSP, etc.

6. Planned publication of results

PSI08, POP, Nucl. Fusion, IAEA08

Table 1. XP-827 Day-1 Experimental Sequence

Day-1 Reference Discharge = 125269 (Fig.1)

XP827 Shot No.	LITER-F g/min	LITER-K g/min	Total Lithium (g) For 10 min Depositions	HeGDC (min)
Day-2 ref 128026	0	0	0	5
Day-2 ref 128026	0	0	0	5
Day-1 ref 125269	0	0	0	5
Day-1 ref 125269	0	0	0	5
1	0.01	0	0.10	5
2	0.01	0	0.20	5
3	0.01	0	0.30	5
4	0.01	0	0.40	5
5	0.01	0	0.50	5
6	0.01	0	0.60	5
7	0.01	0	0.70	5
8	0.02	0	0.90	5
9	0.02	0	1.10	5
10	0.02	0	1.30	5
11	0.02	0	1.50	5
12	0.02	0	1.70	5
13	0.02	0	1.90	5
14	0.02	0	2.10	5
15	0.04	0.04	2.30	5
16	0.04	0.04	3.10	5
17	0.04	0.04	3.90	5
18	0.04	0.04	4.70	5
19	0.04	0.04	5.50	5
20	0.04	0.04	6.30	5
21	0.04	0.04	7.10	5
22	0.04	0.04	7.90	5
23	0.04	0.04	8.70	5
24	0.04	0.04	9.50	5
25	0.04	0.04	10.30	5

Table 2. XP-827 Day-2 Experimental Sequence

Day-2 Reference Discharge = 128026 (Fig.2)

XP826 Shot No.	LITER-F g/min	LITER-K g/min	Total Lithium (g) For 10 min Depositions	HeGDC (min)
Day-2 ref 128026	0	0	0	5
Day-2 ref 128026	0	0	0	5
26	0.04	0.04	11.10	5
27	0.04	0.04	11.90	5
28	0.04	0.04	12.70	5
29	0.04	0.04	13.50	4
30	0.04	0.04	14.30	4
31	0.04	0.04	15.10	3
32	0.04	0.04	15.90	3
33	0.04	0.04	16.70	2
34	0.04	0.04	17.50	2
35	0.04	0.04	18.30	1
36	0.04	0.04	19.10	1
37	0.04	0.04	19.90	
38	0.04	0.04	20.70	
39	0.04	0.04	21.50	
40	0.04	0.04	22.30	
41	0.04	0.04	23.10	
42	0.04	0.04	23.90	
43	0.04	0.04	24.70	
44	0.04	0.04	25.50	
45	0.04	0.04	26.30	
46	0.04	0.04	27.10	
47	0.04	0.04	27.90	
48	0.04	0.04	28.70	
49	0.04	0.04	29.50	
50	0.04	0.04	30.30	

PHYSICS OPERATIONS REQUEST

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Machine conditions: Day-1: 128026 fiducial, 125269 fiducial, 125269 operation

Day-2: 1282026 fiducial, 128026 operation

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, B, C** Voltage (kV): **90** Duration (s): **0.8**

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

CHI:

Either: List previous shot numbers for setup **125269 and 128026 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-827

Diagnostic	Need	Desire	Instructions
Bolometer – tangential array	X		
Bolometer array - divertor		X	
CHERS	X		
Divertor fast camera		X	
Dust detector		X	
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		

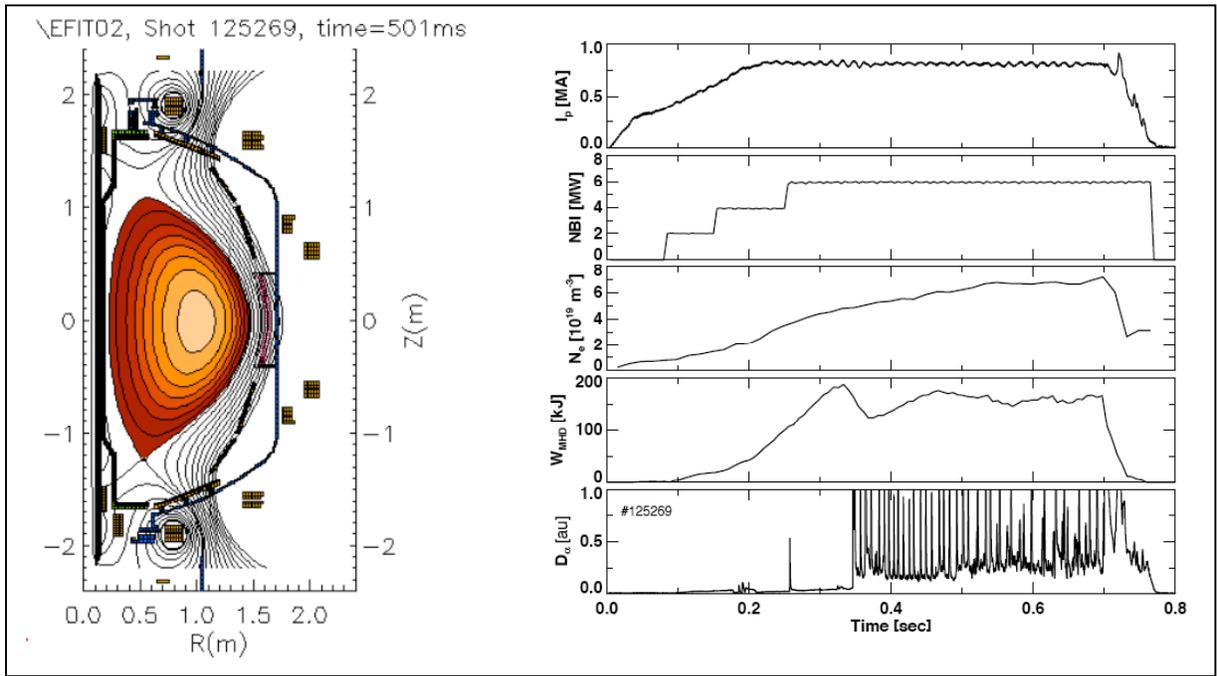


Fig.1 Reference discharge 125269 for Day-1.

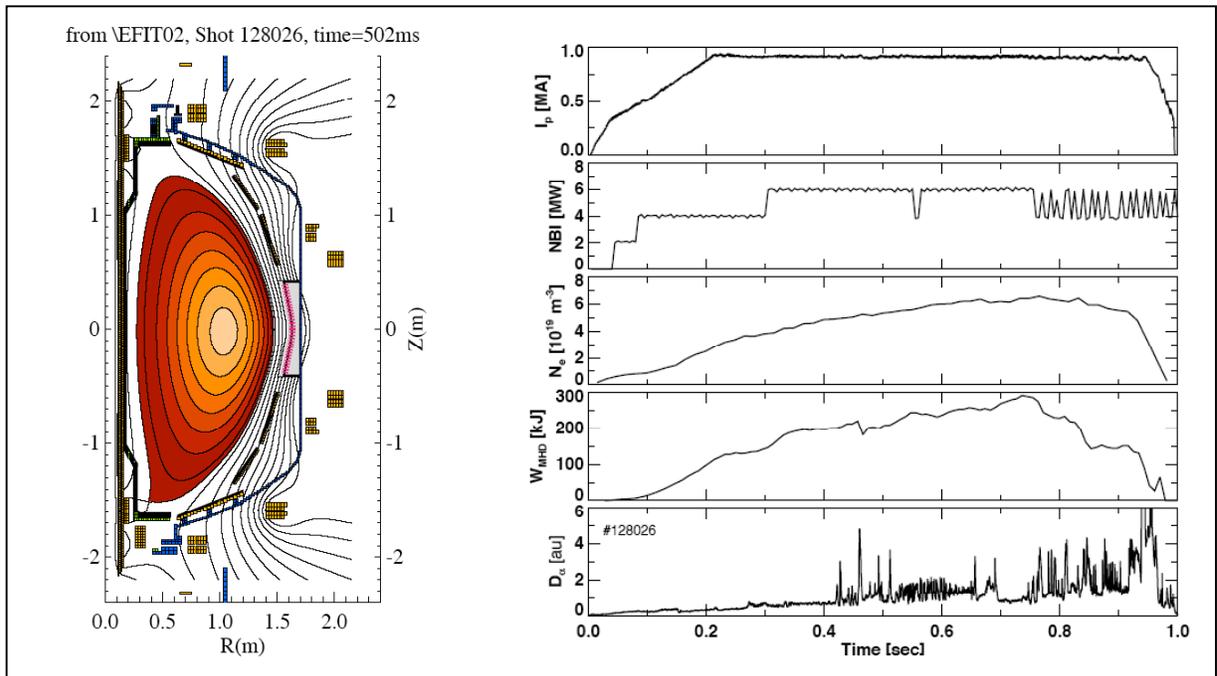


Fig.2 Reference discharge 128026 for Day-2.