Princeton Plasma Physics Laboratory **NSTX Experimental Proposal**		
Title: Impact of improved confinement with lithium on scenario development		
OP-XP-937	Revision:	Effective Date: *(Approval date unless otherwise stipulated)* Expiration Date: *(2 yrs. unless otherwise stipulated)*

PROPOSAL APPROVALS	
Responsible Author: David Gates	Date
ATI – ET Group Leader: J. Menard (Deputy)	Date
RLM - Run Coordinator: R. Raman	Date
Responsible Division: Experimental Research Operations	

Chit Review Board (designated by Run Coordinator)

MINOR MODIFICATIONS (Approved by Experimental Research Operations)

NSTX EXPERIMENTAL PROPOSAL

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AUTHORS: David Gates | DATE: 4/10/09

1. Overview of planned experiment

Recent results on NSTX have shown very good confinement. This experiment will investigate whether this improved confinement is robust to variations in plasma shape, field and current. Particularly as the shape factor is increased and the field and current are raised.

2. Theoretical/ empirical justification

Historically the best performance on NSTX has been achieved at high shape factor, toroidal field and plasma current. If the confinement improvements observed with strong lithium evaporation can be extended to the high performance regimes, this will have profound effects on planned scenario developments for this run campaign.

3. Experimental run plan

Starting with the fiducial plasma and LITER at ~40mg/min, perform the following scans

1. Vary the plasma current from 1MA to 1.4MA in 100kA steps. (4shots)
2. Vary the toroidal field from 4.5kGauss to 5.5kGauss in 0.5kGauss steps, dropping Ip in steps in order to maintain Ip*Bphi <6.6kGauss*MA (4 shots)
3. Vary drsep from 0 to -1.5cm in 0.5cm increments (4 shots)
4. Raise beam voltage to 100kV, time permitting and if indicated.

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

See below.

5. Planned analysis

We will require EFIT analysis and eventually TRANSP analysis.

6. Planned publication of results

The results will be published in “Fusion Engineering and Design” and presented at the 7th Technical Meeting on "Control, Data Acquisition and Remote Participation for Fusion Research” at Cadarache, France.

PHYSICS OPERATIONS REQUEST

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(use additional sheets and attach waveform diagrams if necessary)

Describe briefly the most important plasma conditions required for the experiment:

High performance with LITER

Previous shot(s) which can be repeated: 120001

Previous shot(s) which can be modified:

Machine conditions *(specify ranges as appropriate, strike out inapplicable cases)*

I_{TF} (kA): 54-66kA Flattop start/stop (s): 0/max

I_P (MA): 1-1.4MA Flattop start/stop (s): Variable

Configuration: **Limiter / DN / LSN / USN**

Equilibrium Control: **Isoflux** (rtEFIT)

Outer gap (m): **0.1** Inner gap (m): **0.06** Z position (m): **0**

Elongation κ: **2.4** Upper/lower triangularity δ: 0.4/0.8

Gas Species: **D** Injector(s): Source A/B/C

NBI Species: **D** Voltage (kV) **A:** 90 **B: 90-100** **C:** 90-100 Duration (s): Variable

ICRF Power (MW): Phase between straps (°): Duration (s):

CHI: **Off** Bank capacitance (mF):

LITERs: On Total deposition rate (mg/min): **40**

EFC coils: On Configuration: **Odd** *as per fiducial*

DIAGNOSTIC CHECKLIST

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Note special diagnostic requirements in Sec. 4

Diagnostic	**Need**	**Want**
Bolometer – tangential array		**X**
Bolometer – divertor		**X**
CHERS – toroidal	**X**	
CHERS – poloidal		**X**
Divertor fast camera		**X**
Dust detector		**X**
EBW radiometers		
Edge deposition monitors		**X**
Edge neutral density diag.		**X**
Edge pressure gauges		
Edge rotation diagnostic		
Fast ion D_alpha - FIDA		**X**
Fast lost ion probes - IFLIP		
Fast lost ion probes - SFLIP		
Filterscopes		**X**
FIReTIP		**X**
Gas puff imaging		**X**
Hα camera - 1D		**X**
High-k scattering		
Infrared cameras		
Interferometer - 1 mm		**X**
Langmuir probes – divertor		
Langmuir probes – BEaP		
Langmuir probes – RF ant.		
Magnetics – Diamagnetism	**X**	
Magnetics – Flux loops	**X**	
Magnetics – Locked modes	**X**	
Magnetics – Pickup coils	**X**	
Magnetics – Rogowski coils	**X**	
Magnetics – Halo currents		
Magnetics – RWM sensors		
Mirnov coils – high f.		
Mirnov coils – poloidal array		
Mirnov coils – toroidal array		
Mirnov coils – 3-axis proto.		

Note special diagnostic requirements in Sec. 4

Diagnostic	**Need**	**Want**
MSE	**X**	
NPA – E||B scanning		**X**
NPA – solid state		**X**
Neutron measurements		**X**
Plasma TV		**X**
Reciprocating probe		
Reflectometer – 65GHz		
Reflectometer – correlation		
Reflectometer – FM/CW		
Reflectometer – fixed f		
Reflectometer – SOL		
RF edge probes		
Spectrometer – SPRED		**X**
Spectrometer – VIPS		**X**
SWIFT – 2D flow		
Thomson scattering	**X**	
Ultrasoft X-ray arrays	**X**	
Ultrasoft X-rays – bicolor		**X**
Ultrasoft X-rays – TG spectr.		**X**
Visible bremsstrahlung det.	**X**	
X-ray crystal spectrom. - H		**X**
X-ray crystal spectrom. - V		**X**
X-ray fast pinhole camera		**X**
X-ray spectrometer - XEUS		**X**