

**Princeton Plasma Physics Laboratory
NSTX Experimental Proposal**

Title: Evaluate Boronization Applied During High Temperature Bakeout

OP-XP-???

Revision:

Effective Date:

(Ref. OP-AD-97)

Expiration Date:

(2 yrs. unless otherwise stipulated)

PROPOSAL APPROVALS

Author: H.Kugel

Date

ATI – ET Group Leaders: H.Kugel, R. Kaita

Date

RLM - Run Coordinator: S. Kaye

Date

Responsible Division: Experimental Research Operations: M. Bell

Chit Review Board (designated by Run Coordinator)

MINOR MODIFICATIONS (Approved by Experimental Research Operations)

NSTX EXPERIMENTAL PROPOSAL

Title: Evaluate Boronization Applied During High Temperature Bakeout
OP-XP-???

1. Overview of planned experiment
 - International Fusion Experiments Use Boronization to Control Impurities
 - ASDEX, ASDEX-UG, TCA, TFTR, NSTX, MAST and other machines deposit boron on PFCs at room temperature
 - D-III D, JT-60, JET, TEXTOR perform boronization at PFC temperatures up 350°C
2. Theoretical/ empirical justification
 - Deposition on Hot Substrates
 - Films grown at high temperatures are less porous and more uniform (J.Winter)
 - This could reduce impurity traps and recycling*
 - NSTX Room Temperature Deposition is Very Effective
 - Will deposition on hot surfaces *further enhance plasma performance?*
3. Experimental run plan for High Temperature Boronization (HTB)
 - Wait for clean machine conditions mid-run (after ~3rd std boronization)
 - 6 Fiducials before HTB (0.2 day), 6 Fiducials after HTB (0.2 day)
4. Required machine, NBI, RF, CHI and diagnostic capabilities
 - Same as for evaluation of room temperature boronization, i.e. OP-XMP-09, "NSTX Boronization".
5. Planned analysis
 - Spectroscopic data, bolometry, x-ray, Tau-E, Tau-P*, stored energy.
6. Planned publication of results
 - The results will be presented at PSI 2004.

DIAGNOSTIC CHECKLIST

Title: Evaluate Boronization Applied During High Temperature Bakeout

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

PHYSICS OPERATIONS REQUEST

Title: Evaluate Boronization Applied During High Temperature Bakeout
No. (from OP-XMP-09, Rev.1)

Machine conditions (indicate range where appropriate):

TF: Flattop (kA) 35 Flattop start/stop (s) 0-0.4

I_p: Flattop (kA) 750 Flattop start/stop (s) 0.03-0.23

Position: Outer gap 7cm Z (m) 0 Inner wall / Single null / Double null

Gas: Prefill He,0.0 Puff He, 0.0

NBI:Power (MW) N/A Start / stop (s) _____ Voltage (kV) _____

RF:Power (MW) N/A Start / stop (s) _____ Frequency (MHz) _____

CHI: Off / Start-up / Ramp-up / Sustainment

If this is a continuation of a previous run or if shots from a previous run are similar to those needed, provide shot numbers for setup

102885 (He)

Outer Gap may need mod

If shots are new and unique, sketch desired time profiles and shapes. Accurately label the sketch so there is no confusion about times or values. Attach additional sheets as required.

PHYSICS OPERATIONS REQUEST

Title: Evaluate Boronization Applied During High Temperature Bakeout
No. (from OP-XMP-09, Rev.1)

Machine conditions (indicate range where appropriate):

TF: Flattop (kA) 35 Flattop start/stop (s) 0-0.4

I_p: Flattop (kA) 750 Flattop start/stop (s) 0.03-0.23

Position: Outer gap 7cm Z (m) 0 Inner wall / Single null / Double null

Gas: Prefill D2,0.0 Puff D2, 0.0

NBI:Power (MW) N/A Start / stop (s) _____ Voltage (kV) _____

RF:Power (MW) N/A Start / stop (s) _____ Frequency (MHz) _____

CHI: Off / Start-up / Ramp-up / Sustainment

If this is a continuation of a previous run or if shots from a previous run are similar to those needed, provide shot numbers for setup

D2, typ.

Outer Gap may need mod.

If shots are new and unique, sketch desired time profiles and shapes. Accurately label the sketch so there is no confusion about times or values. Attach additional sheets as required.