Princeton Plasma Physics Laboratory

NSTX Experimental Proposal

Dependence of the H-mode Pedestal Structure on Aspect Ratio

OP-XP-529	Revision: **2**	Effective Date: *(Approval date unless otherwise stipulated)* Expiration Date: *(2 yrs. unless otherwise stipulated)*

PROPOSAL APPROVALS

Responsible Author:	Date
ATI – ET Group Leader:	Date
RLM - Run Coordinator:	Date
Responsible Division: Experimental Research Operations	

Chit Review Board (designated by Run Coordinator)

MINOR MODIFICATIONS (Approved by Experimental Research Operations)

NSTX EXPERIMENTAL PROPOSAL

TITLE: **Dependence of the H-mode Pedestal on Aspect Ratio** No. **OP-XP-529**

AUTHORS: **R. Maingi, T. Osborne, A. Kirk** DATE: **4/18/2008**

1. Overview of planned experiment

We propose to study the dependence of pedestal structure (heights, widths, and gradients) on aspect ratio. The basic idea is to match certain dimensionless parameters (ρ_*, ν_*^e, and certain shape parameters) between DIII-D, NSTX and MAST to determine if the pedestal structure, i.e. height, width and gradient, is dependent on the aspect ratio. More specifically we hope to resolve the dependence of the T_e width and the pressure pedestal height on aspect ratio. This experiment was originally executed on 4/25/06, and we are requesting new data based on analysis of the old data.

2. Theoretical/ empirical justification

Profile and stability analysis of the NSTX discharges has been completed for discharges from 4/25/06. The natural ELM frequency obtained for 120190-120205 was ~ the Thomson d/acq frequency. i.e. 60 Hz, such that only a few profiles just before the ELM triggering were obtained. Here we propose to change the Thomson timing to be 5 ms apart, and to take repeat shots to insure sufficient profile resolution for optimum stability analysis. The profile analysis will be performed in the control room to judge when repeat shots are sufficient.

3. Experimental run plan

I. Reproduce 120200, which has the Ip=0.73 kA, Bt=0.5 T. SGI @ 2400 torr from 100-300ms was used to reduce the CS gas to 200 torr. (2-3)

II. Repeat the discharge until a sufficient number of profiles are obtained to allow profile fitting of the last 20% of the ELM cycle using Osborne's tools. (3-5)

III. Repeat with 6 MW, as in 120202 (3-5)

IV. Time permitting, repeat with 50% higher SGI rate to get rapid ELMs (3-5)

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

This XP requires an operational NBI system, as well as the capability of DND discharges with the plasma control system. We desire HeGDC between shots of ~ 6.5 minutes for a 12.5 minute repetition rate.

5. Planned analysis

Profile analysis and edge stability calculations will be done with a number of codes.

6. Planned publication of results

APS 2008.

PHYSICS OPERATIONS REQUEST

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Machine conditions (specify ranges as appropriate)

I_{TF} (kA): **59** Flattop start/stop (s): See #120200

I_P (MA): **0.73** Flattop start/stop (s):

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

Outer gap (m): **0.1** Inner gap (m): **0.05**

Elongation κ: **1.8** Upper/lower triangularity δ: 0.5-0.6

Z position (m): **0.0**

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

NBI Species: **D** Sources: D Voltage (kV): 90 Duration (s): <1.0

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

CHI: **On / <u>Off</u>** Bank capacitance (mF):

LITER: On / <u>Off</u>

Previous shot numbers for setup: **120200, 120202**

DIAGNOSTIC CHECKLIST

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Note special diagnostic requirements in Sec. 4

Diagnostic	**Need**	**Want**
Bolometer – tangential array		√
Bolometer – divertor		√
CHERS – toroidal	√	
CHERS – poloidal		√
Divertor fast camera		√
Dust detector		
EBW radiometers		
Edge deposition monitors		
Edge neutral density diag.		√
Edge pressure gauges		√
Edge rotation diagnostic		√
Fast ion D_alpha - FIDA		
Fast lost ion probes - IFLIP		
Fast lost ion probes - SFLIP		
Filterscopes	√	
FIReTIP		√
Gas puff imaging		√
Hα camera - 1D		√
High-k scattering		
Infrared cameras		√
Interferometer - 1 mm		
Langmuir probes – divertor		√
Langmuir probes – BEaP		√
Langmuir probes – RF ant.		
Magnetics – Diamagnetism	√	
Magnetics – Flux loops	√	
Magnetics – Locked modes		√
Magnetics – Pickup coils	√	
Magnetics – Rogowski coils	√	
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	√	
NPA – ExB scanning		
NPA – solid state		
Neutron measurements		
Plasma TV		√
Reciprocating probe		
Reflectometer – 65GHz		√
Reflectometer – correlation		√
Reflectometer – FM/CW		
Reflectometer – fixed f		
Reflectometer – SOL		
RF edge probes		
Spectrometer – SPRED		√
Spectrometer – VIPS		
SWIFT – 2D flow		
Thomson scattering	√	
Ultrasoft X-ray arrays		√
Ultrasoft X-rays – bicolor		√
Ultrasoft X-rays – TG spectr.		
Visible bremsstrahlung det.		√
X-ray crystal spectrom. - H		
X-ray crystal spectrom. - V		
X-ray fast pinhole camera		
X-ray spectrometer - XEUS		