Princeton Plasma Physics Laboratory **NSTX Experimental Proposal**			
Title: **Poloidal extent and distribution of edge turbulence and intermittency**			
OP-XP-839	Revision:	Effective Date: *(Approval date unless otherwise stipulated)* Expiration Date: *(2 yrs. unless otherwise stipulated)*	
PROPOSAL APPROVALS			
Responsible Author: R. Maqueda			Date
ATI – ET Group Leader: V. Soukhanovskii			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: **Poloidal extent and distribution of edge turbulence** No. **OP-XP-839**
AUTHORS: **R. J. Maqueda** DATE: **6/30/2008**

1. Overview of planned experiment

The edge turbulence born blobs seen near the midplane on the low field side of NSTX have been observed to extend up to the divertor target plates. This XP intends to characterize this relationship between midplane and divertor blobs as well as explore theory predictions on X-point "disconnection" by flux tube squeezing due to the high shear near the X-point. At the same, the presence and characteristics of intrinsic (i.e., locally born) turbulence and intermittency near the divertor will be explored..

2. Theoretical/ empirical justification

Theoretical studies by Cohen and Ryutov have indicated that flux tube stretching due to the high magnetic shear near the X-point may cause the elongated filaments characteristic of blobs to be narrower than the ion gyro-radius. In such cases it is then expected that midplane blobs will be "disconnected" from the divertor (and *vice versa*). This then introduces the possibility of inducing turbulence close to the divertor target plates and widen the heat deposition profiles without degrading the scrape-off layer transport near the midplane.

Preliminary results in 2007 have shown that midplane intermittency (blobs) are well correlated to "footprints" on the divertor target plates. One of the objectives of this experimental proposal is to explore the conditions at which this good correlation is lost by imaging simultaneously the midplane intermittency (gas puff imaging) and the divertor footprints on the lower divertor from above. At the same time, the newly installed Bay E divertor gas puffer can be used to image the turbulence and blobs tangentially from Bay F.

In addition, the imaging systems available will be used to search for intrinsic filamentation in the divertor region (particularly in the private flux region and vicinity to the X-point) that is not related to midplane blobs.

3. Experimental run plan

Reproduce the following shots (repeat 2-3 times), the main objective being changes in the X-point topology and its position within the divertor region.

128640 (1 MA, 5.5 kG, 6 MW NBI, high X-point)

128630 (1 MA, 5.5 kG, 6 MW NBI, medium height X-point)

128642 (1 MA, 5.5 kG, 6 MW NBI, low X-point, high δ)

128646 (1 MA, 5.5 kG, 6 MW NBI, low X-point, lower δ)

128349 (800 kA, 4.5 kG, 4 MW NBI, low κ)

128948 (900 kA, 5.5 kG, 4 MW NBI, low-to-high κ, X-point limiter)

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

3 Phantom 7 cameras (GPI, top view of lower divertor and tangential view of lower divertor)

new Bay E lower divertor gas puff

3 NBI sources (it may be possible to run with just 2)

5. Planned analysis

EFIT/LRDFIT needed.

GPI and divertor imaging data will be analyzed to infer characteristics of turbulence/blobs/intermittency.

6. Planned publication of results

If successful, results will be submitted to appropriate journal.

PHYSICS OPERATIONS REQUEST

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Machine conditions (specify ranges as appropriate)

I_{TF} (kA): **many** Flattop start/stop (s):

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

Configuration: **LSN**

Outer gap (m): Inner gap (m):

Elongation κ: Upper/lower triangularity δ:

Z position (m): **~ 0.0**

Gas Species: **D** Injector(s): **HFS midplane**

NBI Species: **D** Sources: **A/B/C** Voltage (kV): **90** Duration (s):

ICRF Power (MW): **no** Phasing: Duration (s):

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

LITER: Off

Previous shot numbers for setup:

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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		