Princeton Plasma Physics Laboratory

NSTX Experimental Proposal

Title: Dependence of B_T on high-k fluctuations

OP-XP-714	**Revision:** ***2006***	Effective Date: *(Ref. OP-AD-97)* Expiration Date: *(2 yrs. unless otherwise stipulated)*

PROPOSAL APPROVALS

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ATI – ET Group Leader: K. Tritz (T&T ET Group)	Date
RLM - Run Coordinator: D. Gates	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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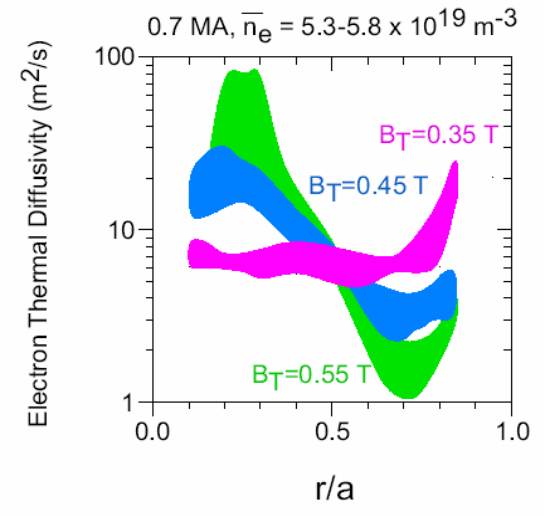
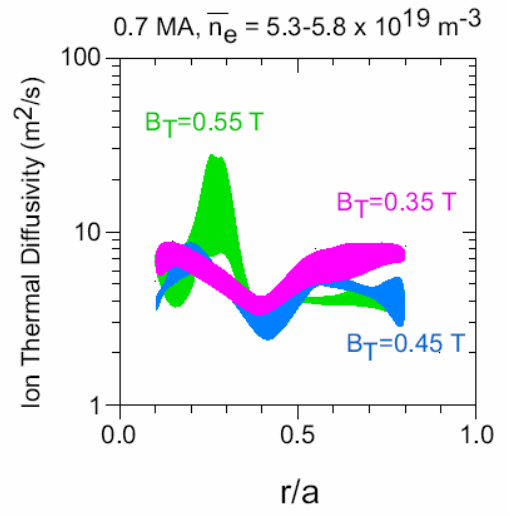
1. Overview of planned experiment

Measure high-k fluctuations inside, outside, and at the χ_e inversion point revealed in the B_T scan (0.7 MA) of XP532.

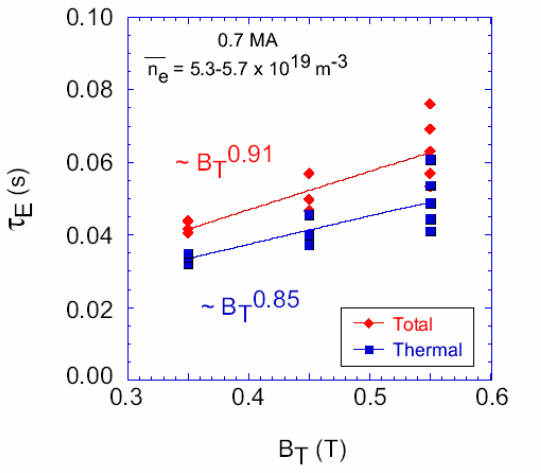
2. Theoretical/ empirical justification

As demonstrated in XP532 [S. Kaye], the H-mode energy confinement time (τ_e) in NSTX exhibits a B_T dependence stronger than that of conventional aspect ratio machines. In addition, TRANSP calculations indicate the electron thermal conductivity (χ_e) increases inside r/a ~ 0.5 as B_T increases while χ_e falls outside r/a ~ 0.5. Meanwhile, the ion thermal conductivity (χ_e) does not exhibit the variation χ_e exhibits.





S. Kaye, NSTX 2006 Results Review



3. Experimental run plan

Reproduce the B_T scan of XP532 (LSN, 4 MW NBI, Ip = 0.7 MA) with the high-k system configured for measurement at r/a ~ 0.25, 0.5, and 0.7.

SHOT MATRIX	r/a ~ 0.25	r/a ~ 0.5	r/a ~ 0.7
0.35 kG (121014)			
0.45 kG (121013)			
0.55 kG (121012)			

2 controlled accesses will be required to reconfigure high-k system

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

Machine requirements: TF at 5.5 kG, NBI

Diagnostic requirements: MPTS, CHERS, PCHERS, MSE, magnetics, x-ray arrays, high-k scattering, interferometer, reflectometer

5. Planned analysis

EFIT, TRANSP, GS2

6. Planned publication of results

Journal article

PHYSICS OPERATIONS REQUEST

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Machine conditions (specify ranges as appropriate)

I_{TF} (kA): **66 kA** Flattop start/stop (s): _____**/**_____

I_P (MA): **0.7 MA** Flattop start/stop (s): _____**/**_____

Configuration: **LSN**

Outer gap (m): _____, Inner gap (m): _____

Elongation : **~ 2**, Triangularity : **~ 0.7 lower**

Z position (m): **0.00**

Gas Species: **D**, Injector: **Midplane**

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

ICRF – Power (MW): ____, Phasing: _____, Duration (s): _____

CHI: **Off**

Either: List previous shot numbers for setup:

_____

Or: Sketch the desired time profiles, including inner and outer gaps, , , heating, fuelling, etc. as appropriate. Accurately label the sketch with times and values.

DIAGNOSTIC CHECKLIST

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Diagnostic	Need	Desire	Instructions
Bolometer - tangential array			
Bolometer array - divertor			
CHERS	x		
Divertor fast camera			
Dust detector			
EBW radiometers			
Edge deposition monitor			
Edge pressure gauges			
Edge rotation spectroscopy			
Fast lost ion probes – IFLIP			
Fast lost ion probes – SFLIP			
Filtered 1D cameras			
Filterscopes			
FIReTIP			
Gas puff imaging			
High-k scattering	x		
Infrared cameras			
Interferometer – 1 mm			
Langmuir probes - PFC tiles			
Langmuir probes - RF antenna			
Magnetics – Diamagnetism			
Magnetics – Flux loops	✓		
Magnetics – Locked modes			
Magnetics – Pickup coils	✓		
Magnetics - Rogowski coils	✓		
Magnetics - RWM sensors			
Mirnov coils – high frequency	x		
Mirnov coils – poloidal array	x		
Mirnov coils – toroidal array	x		
MSE	x		
Neutral particle analyzer			
Neutron Rate (2 fission, 4 scint)			
Neutron collimator			
Plasma TV			
Reciprocating probe			
Reflectometer - FM/CW			
Reflectometer - fixed frequency homodyne			
Reflectometer - homodyne correlation			
Reflectometer - HHFW/SOL			
RF antenna camera			
RF antenna probe			
Solid State NPA			
SPRED			
Thomson scattering - 20 channel	✓		
Thomson scattering - 30 channel		X	
Ultrasoft X-ray arrays		X	
Ultrasoft X-ray arrays - 2 color		X	
Visible bremsstrahlung det.			
Visible spectrometers (VIPS)			
X-ray crystal spectrometer - H			
X-ray crystal spectrometer - V			
X-ray PIXCS (GEM) camera			
X-ray pinhole camera			
X-ray TG spectrometer			