

2014-18 Boundary Physics Research Timeline

FY13 14 15 16 17 18



Physics

Thrust 1

Assess, optimize, and control the pedestal structure, edge transport and stability

L-H transition physics: threshold studies, pedestal formation

Characterize the pedestal structure vs B_t , I_p , shaping

Pedestal control and development of EPH-mode and I-mode

ELM studies and mitigations: response to 3D magnetic field perturbations and Lithium coatings

Optimize and control the pedestal structure

Develop projections to FNSF based on experiment and models

Utilize 3D fields (NCC) to optimize pedestal transport and stability

Develop an understanding of the physical properties of the pedestal structure on low aspect ratio tokamaks

Thrust 2

Assess and control divertor heat and particle fluxes

Heat flux width and turbulence studies; connections to SOL models

Snowflake divertor studies and control development

Radiative divertor with D_2 , Ne, Ar seeding

Experiments validation of cryo-pump designs

Impurity erosion and SOL transport studies

Support projections of heat flux width and divertor scenarios to ST-FNSF

Utilize magnetic control for long-pulse snowflakes with reduced heat flux

Implement radiative divertor control

Demonstrate through experiments density control

Assess Mo divertor PFCs and their impact on H-mode confinement

Develop and validate divertor heat and particle control to support projections of divertor scenarios to ST-FNSF

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Tools

Diagnostics

Upgraded MPTS	Additional laser for MPTS with fast rep rate
2D BES for pedestal studies, and L-H physics; 3D GPI for SOL studies	Molybdenum core, edge, divertor spectroscopy (VUV, visible)
IR & visible cameras, bolometry, spectrometers, Langmuir probes, and fast thermocouples to support divertor measurements	SOL flows, divertor ion energy or temperature, and SOL current sensors
Reflectometry/DBS measurements TBD?	Full plasma radiation tomography
	Edge neutral density measurements (LIF or LII)
	Edge profile reflectometry
	Divertor Thomson Scattering system
Real-time density measurements: Interferometry and MPTS	

Facility

Lithium granule injection; improved Liters	EHO antenna
Edge gas injection and SGI with PCS feedback control; HFS gas injection shut-off valve	Pellet, molecular cluster, compact toroid injectors
Divertor gas seeding	Non-axisymmetric control coils
Improved divertor tile alignment	Cryo-pumping

Plasma Control

Control of divertor coils for X- and strike-point positions	
Implement and advance snowflake divertor configuration control	
Gas injection feedback control; PCS control of divertor gas injection	Radiative divertor control