NSTX-U

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PCTF prioritization discussion

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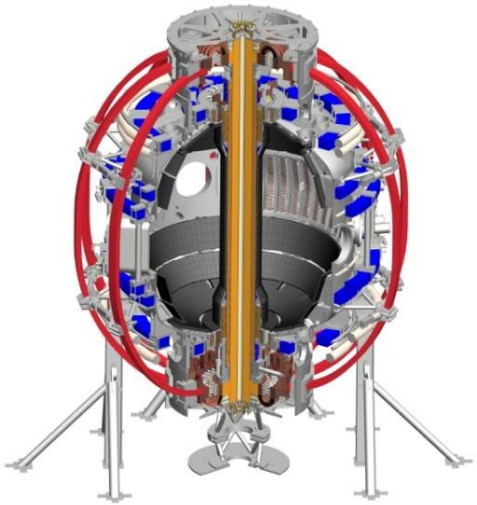
Particle Control Task Force Meeting
PPPL LSB B318
February 26, 2015



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Priorities as discussed in pre-forum meetings

- Task Force Goals (Duration: 2015-2018):
  - Confirm physics design calculations of the cryopump plenum geometry
  - Deploy a number of long pulse particle control techniques
  - Coordinate effort for density feedback implementation with cryo

Particle Control Task Force – Cryo physics design

- Task Force Goals:
  - Confirm physics design calculations of the cryopump plenum geometry
    - Semi-analytic model and 2-D calculations used for physics design
    - Need divertor thermography, Langmuir probe data, D_α profiles, which should be available relatively early in run
    - Desire to do this with boronized conditions (early) and lithiated conditions, with follow up experiments in 2016 after installation of high-Z row (joint with M&P)

Particle Control Task Force – Techniques (1)

- Task Force Goals:
  - Deploy long pulse particle control techniques
    - Naturally occurring ELM regimes: easy to obtain in NSTX with boronization (early), but can also achieve with lithiumization with 'low' amounts of inter-shot deposition (50-100 mg)
    - Lithium Granule Injector (LGI) for ELM triggering in discharges with low natural ELM frequency (some LSN with boronization early, 'high' lithium doses for ELM-free)
      - Consider using LGI as tool to controlled B -> Li transition
    - LiTERs to reduce impurity sources
      - Downward facing evaporator available 'early', upward facing one in 2016

Particle Control Task Force – Techniques (2)

- Task Force Goals:
  - Deploy long pulse particle control techniques
    - Snowflake divertor and/or gas puffing to reduce divertor T_e and sources (joint with Boundary Science group)
      - Timing of the snowflake likely paced by PCS optimization
      - Can probably do the source study (piggyback early, including e.g. 3-D asymmetries and tile edges) and dedicated gas puffing first with boronized walls (early)
      - Recycling and particle balance can support these
      - Comprehensive suite of diagnostics to support these
    - 3-D fields for ELM destabilization (mostly with Li)
    - Li dropper for destabilization of micro-edge instabilities (2016+)
    - Cryopump + density feedback (2017+)

Title of proposal	Name	P1 days	P2 days	B/Li?	Comments	
Characterize plasma near planned plenum entrance	Canik	0.5		B		
Multi-species particle injection for ELM pacing and in	Lunsford	0.5	0.5	B	combine	
ELM pacing with 3D fields in boronization operationa	Lore				combine	
Lithium granule injection into ELM free H-modes wit	Lunsford	1		Li	combine	
Re-establish ELM pacing via 3-D fields in NSTXU	Canik				combine	
Divertor gas puff effect on impurity reduction	Soukhanovskii	0.5		Li		
EHO Scoping Study	Goldston	0.5	0.5	Li	combine	w/ PED? C
EHO 3D coil interaction (possible control)	Koleman				combine	
Combining ELM pacing with divertor gas injection for	Lore	1		Li	combine	Placehold
Combination of 3D fields with snowflake for impurity cont	Ahn				combine	
Optimize gas fueling for low density startup and H-m	Battaglia	0.5	0.5		combine	w/ ASC?
Establish minimum SOF density vs Ip ramp rate	Battaglia				combine	
Controlled introduction of Lithium into NSTX-U	Maingi	0.5		both	combine	
Recycling and pumping with lithium coatings	Soukhanovskii				combine	
Study of the chemical evolution during transition from B	Allain				combine	
Characterization of carbon and lithium sources follov	Scotti				combine	
Coupling to Plasma Fluctuations Using Amplitude Mc	Golfinopoulos				combine	
Optimization of helium-dispersed lithium evaporatic	Scotti		0.5	Li		
Development of Small ELM regimes	Gray		0.5	both		w/ ASC?
Assess high-Z granule injection	Soukhanovskii		pb?			which grou
Boundary diagnostic-optimized configuration (BDOC	Soukhanovskii					
High-Z impurity injection	Reinke		0.5			w/ M&P, T
I-mode	Hubbard					
	TOTAL	5	3			