NSTX

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ITER XP and LLD Physics XP Discussion

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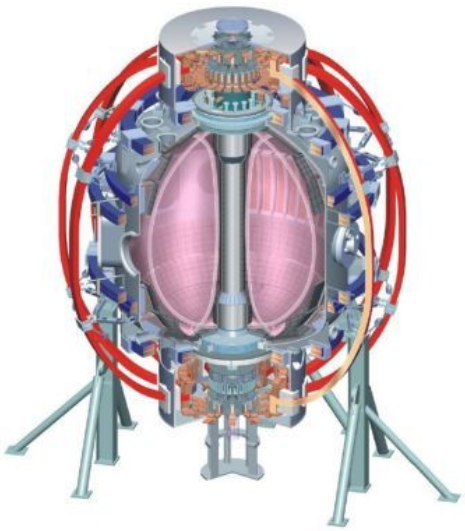
"Helping Eric transition into the joys of run coordination…"

B318, PPPL
December 11, 2009



Proposed ITER XP list

(In the coming months, we need to develop focused 1-2 run days on new/developmental edge resonance physics XPs, but is this good enough for now?)

Proposal #	Primary Proposer	Title	Proposing TSG	Run Time Request	Min. Useful Run Time	Priority 1 run-time	Priority 1+2 run-time	JEM comments
1	Canik / Gerhardt	Synergistic effects between 3D fields and vertical jogs in ELM pacing	ASC	1	1	1		static n=3 + vertical jogs would be most compatible with ITER internal coils…
2	J. Canik	RMPs below the ELM triggering threshold for impurity screening	ASC	0.5	0.5	0.5		Important research for controlling impurities in ELM-free scenarios. Also consider L-mode studies of particle transport with RMP coils on vs. off.
3	J. Canik	ELM pace-making with n=3 fields during ELMy H-modes	ASC	0.5	0.5			Try a few shots of this in #1 and #2 above?
4	A. Loarte	Effects of ELM control with RMP on edge power fluxes between and at ELMs	BP	2	1	1		Important, and we have the cameras, but do we also need first wall diagnostics for this to be useful? Could be bumped up to 1.5 or 2 days if other proposals have issues. Observations of 3D structure in divertor vs. collisionality/LLD could inform Sabbagh XP
5	A. Loarte	Physics processes leading to ELM triggering by vertical jogs and extrapolation to ITER	BP	1.5	1	Piggyback with proposal #1		
6	S. Sabbagh	Global MHD and ELM stability vs edge current, n*qped, edge nu	MS	1.5	1	0.5		Needs dedicated pre-XP analysis - fine-scale scan of edge q at low nu* could lead to new result - should focus on ELM stability
7	A. Sontag	Peeling-ballooning stability and access to QH-mode in NSTX	MS	1.5	1		0.5	Before receiving run time, substantial analysis and/or expt evidence of EHO is needed
8	S. Kaye	Density dependence of L-H threshold	T&T	0.5	0.5	0.5		Complete the FY09 data set - requires density variation (if not actual density control)
9	R. Maingi	Dependence of PLH on Radius and triangularity of the X-point	T&T	1	0.5	0.5		LH threshold still ITER high priority from FY09. For NSTX, may also be useful tool for controlling H-mode transition time and/or threshold power
10	D. Battaglia	ELM suppression using 3D fields from a single row off-midplane coils on NSTX	T&T	1	0.5	0.5		Worth a try - could be issues with MHD stability if q95 is too low, and midplane profile data is compromised. Needs ISOLVER simulation, target development, and a pumping LLD
11	G. Fu	Validation of M3D-K code for Beam Driven TAE modes	WPI	1	0.5			Not an urgent ITER design need (compared to RMP coils and ICRF coupling) - this is long-term goal of EP TSG
12	J. Hosea	HHFW power coupling versus ELM Activity	WPI	0.5	0.5	0.5		Quoting ITER Physics Work Programme 2009-2011: "It is essential that coupling studies be carried out as soon as possible, including local density scans in front of the antenna, so as to be able to make changes to the ICRF system design before the procurement is finalized" Question - is density scan (ranging from LLD to antenna gas puffing) more important than ELM effects?
13	N. Gorelenkov, N. Crocker	Conversion of Alfvenic Eigenmodes to Kinetic Alfven Waves	WPI	1	0.5			Difficult to understand how this impacts near-term ITER design, unless there is some diagnostic and/or port access requirement issue - all of which I'm unfamiliar with.
			TOTALS	13.5	9	5		

What are goals of LLD physics survey experiments?
(and is this the best experimental approach?)

- Provide bridge between LLD commissioning XP (Kugel in LRTSG) and individual TSG XPs using LLD.
  - Optimize preparation for follow-on XPs
- Get cross-TSG data early in run, i.e. before anything breaks
  - Avoid running OSP on LLD until late in run
- Develop shots of interest to all TSGs
- Assess/survey changes in “global” plasma properties in response to reduced density and collisionality from LLD

Example questions and scans
(are these the right questions/scans? Is this enough run time?)

- **Assume we are comparing warm LLD vs. cold LLD**
- Assume 2-3 run days, shared by 5 TSGs (LR done, CHI later)
  - ASC: How does lower ν^*/density modify V_{SURF}, non-inductive fraction?
    - Scan q* at fixed shaping? – compare high β_P & high β_T scenario performance
  - BP: How does pedestal structure and ELM stability change?
    - How is pedestal width, height, and ELM-type modified?
    - Is plasma response to RMP fields/ELM pacing different?
  - MS: How do global q, p, ν^* profiles change? What is on impact stability?
    - Probe ideal limit changes with NBI pulses
    - Probe NTV damping, RWM stability (n=3 braking, n=1 critical rotation)
  - T&T: How does global confinement scale with ν^*?
    - Measure energy confinement vs. field and current, maybe power
    - Good targets for commissioning/using turbulence diagnostics
  - WPI:
    - How does HHFW coupling, loading, electron heating change?
    - How is observed AE spectrum modified by density profile, reduced density?

Proposed Cross-Cutting/Enabling XP/XMP list

- ***What is best/required mix of LLD commissioning vs. LLD physics survey run time?***
- ***Should other CCE run-time be reduced to accommodate requested LLD commissioning and survey?***

Primary Proposer	Title	Proposing TSG	XP or XMP	Run Time Request	Min. Useful Run Time	Priority 1 runtime	Priority 2 runtime	JEM comments
Gerhardt	Confinement, Stability, and Boundary Control During Current Rampdown in NSTX	ASC	XMP, XP	1	0.5	0.5		Develop PCS capability + clean ramp-down for NSTX before attempting for ITER scoping - could be cross-cutting/enabling since useful for LLD ops
Skinner	Impurity Reduction by Diffusive Li injection	LR	XP	2	1		0.5	If LR TSG results look promising, extend the technique as cross-cutting and enabling with another 1/2 day, since this could be a useful tool for all users
Kolemen	Development of Fiducial Shots with LLD: Strike Point Control Improvement and Incorporation in Regular Operation	ASC	XMP/XP	1	0.5	0.5		Broadly useful, need for LLD
Gerhardt	Optimization of beta-control XMP	ASC	XMP	1.5	0.5	0.5		Needed for MS milestone
Menard	Influence of LLD-induced collisionality and profiles on ST stability	MS	XP	1.5	1			Do in survey XP, if survey XP is done
Hosea	HHFW plasma conditioning to high RF power	WPI	XMP	5	4	4		Needed for HHFW milestone, other XPs
Hosea	Power limiting mechanisms on HHFW	WPI	XMP/XP	1?	0.5?		0.5	Cover this this in WPI TSG
Gates	Plasma jogs to measure *AE mode structure w/ interferometer	WPI	XMP/XP	1	0.5		0.5	Only needed by EP group in WPI TSG? Can this be done with 0.1-0.25 days of actual run-time?
D. Smith	BES commissioning	T&T	XMP	2	1	1		Needed for FY11 T&T milestone, several FY10 XPs
Kugel	LLD-1 Commissioning	LR	XP	6	5	3		Eliminate/delay large R=0.75 OSP case to save run time?
Kugel	LLD-1 Decommissioning	LR	XMP/XP	1	0.5	0.5		Remember to close your shutters
Group	LLD Physics Survey	All	XP	4	3	2		Are we doing this?
	Program Reserve			1.5	1.5	1		Edge resonance physics, other
	MSE and magnetics calibrations			2	2	2		Necessary
						15		