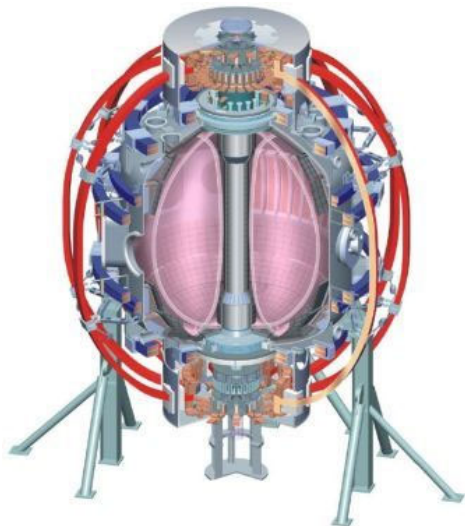


Lithium research program, guidance for upcoming PAC

J. Menard

**NSTX Monday Physics Meeting
PPPL B318
January 10, 2011**

*College W&M
Colorado Sch Mines
Columbia U
CompX
General Atomics
INL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Nova Photonics
New York U
Old Dominion U
ORNL
PPPL
PSI
Princeton U
Purdue U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Illinois
U Maryland
U Rochester
U Washington
U Wisconsin*



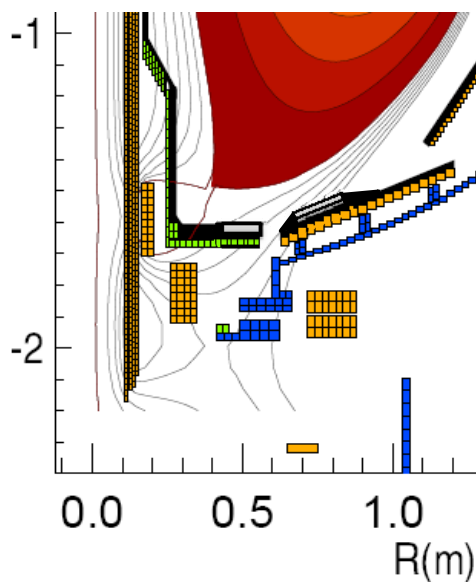
*Culham Sci Ctr
U St. Andrews
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAEA
Hebrew U
Ioffe Inst
RRC Kurchatov Inst
TRINITY
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POSTECH
ASIPP
ENEA, Frascati
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IPP, Jülich
IPP, Garching
ASCR, Czech Rep
U Quebec*

FY11-12 research plans in support of Li program

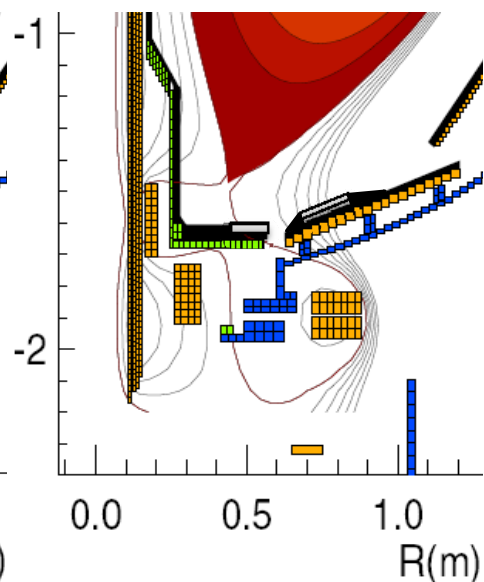
- Assess and reduce impurities in LiTER ELM-free H-mode
(High priority for ITER needs/cross-cutting TSG in FY11-12)
 - Snowflake divertor, divertor gas puffing, USN/I-mode, EHOs, ...
- Develop stable operating scenarios compatible with strong pumping and reduced n_e using Li pumping already available (FY12 milestone)
 - Can use existing LiTER systems at elevated evaporation rates/durations
 - Assess, optimize fueling methods (shoulder injector, SGI, HFS, LFS)
- Relate core plasma performance to Li-coated PFC conditions using materials analysis and particle probe (MAPP) (FY12 milestone)
- If FDR successful, and schedule permits: Mo tiles on outer row of IBD
 - Assess core C, Mo impurities vs. outboard strike-pt position: Mo vs. C
 - LiTER onto IBD to test Li on Mo – impurity influx, D pumping by Li
 - Example: 80mg/min for 20mins on Mo tiles + plasma melting could test inboard LLD
 - If LLD present, operate with both LSN strike points on Mo, Mo + Li

Addition of IBD Mo tiles would enable important divertor studies

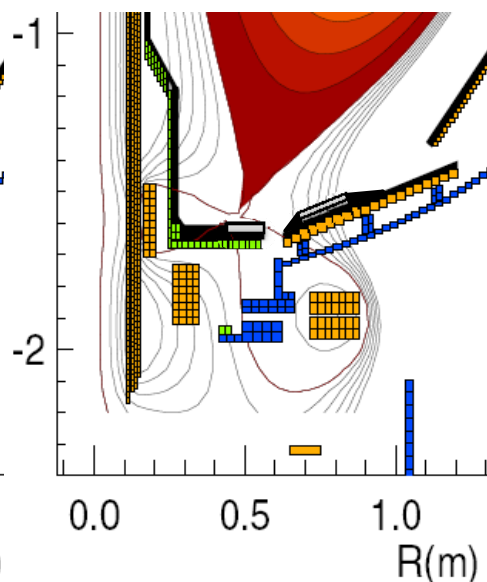
- Help quantify fraction of core C coming from lower divertor for high- δ shapes
- Potentially reduce C content of Li ELM-free scenarios
- Characterize Mo performance to inform choice of div/CS PFC in Upgrade
- Apply Li (LiTER) to IBD/OBD Mo for partial/full LLD
- If LLD present, LSN with both strike-points on Mo (how different than C?)



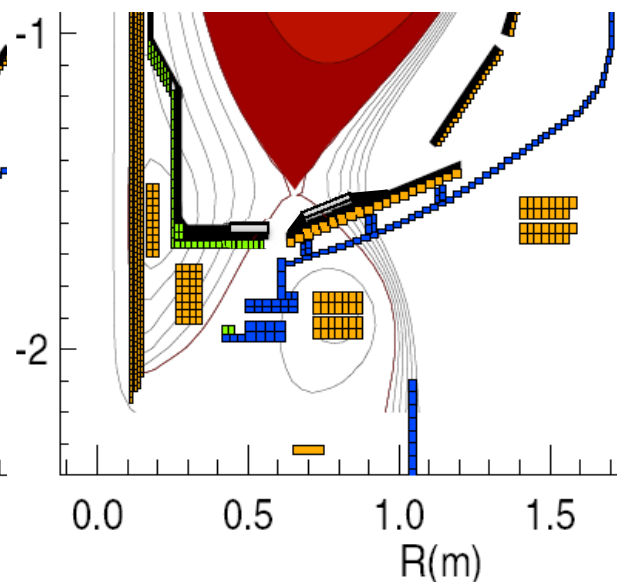
Standard divertor on C



Standard divertor on Mo



**Snowflake on Mo
(also possible on C,
not shown)**



**LSN strike-pts on Mo,
Mo + Li, or
C (IBD) + Mo (OBD)
(not shown)**

Pumping issues for NSTX Upgrade

- Upgrade Project plan includes removal of existing LLD due to concerns over disruption survivability
 - Those concerns are now known to be well-founded
 - Plan for first run year(s) of Upgrade has C PFCs on outboard divertor
 - New pumping capability on OBD is not part of Upgrade Project
 - But it may be possible to modify/prepare for Mo PFCs on centerstack
- Can LiTER coatings pump 3-5s Upgrade plasma?
 - D inventory saturates at $n/n_{\text{gw}} < 1$ for NSTX pulses ~ 1 s
 - How much would stability optimization, fueling reduction help?
- Need to begin consideration/design of next-steps
 - More advanced LLD concepts for sustained pumping, power handling
 - Consider cryo-pumping in Upgrade
 - Perhaps cryo for upper divertor, compare to new lower LLD?
 - Plan to present preliminary cryo calculations at upcoming PAC

Guidance to PAC speakers

Guidance for PAC presentations - 1

- The point of these talks is to convey the PLAN
 - Results shown in the talks should help MOTIVATE the plans
 - 1/2-2/3 of talk content = motivation/results, 1/2-1/3 = planned research
- Refer to the NSTX research milestones, OFES joint research milestones, ITPA, ITER needs, etc in the plans and motivation
 - Start by looking at the plans for FY11 and 12 from the last PAC!
 - Revise these accordingly – several milestones/plans have changed
 - State what your TSG will focus on during FY13-14 Upgrade outage
 - Examples: T&T will design new high-k system, ASC will do scenario modeling, etc...
- Help the PAC by attempting to answer the charge questions for them - point out how the results and plans support:
 - Advancement of the ST for fusion
 - Important fusion physics for FNSF, ITER, Pilot Plant, Demo, next-steps
 - Necessary research in-preparation for NSTX Upgrade
 - The OFES vision 4 themes (see charge questions):

Guidance for PAC presentations - 2

- Please stick to the suggested content slide count
 - PAC questions usually take $1/3$ (up to $1/2$) of the total time-slot
 - If you run way long, it can blow the schedule and short-change other presentations and annoy the PAC - be concise - less is more
 - If you have extra content you just can't do without or expect the PAC might want even more detail on, **put it in backup**
- Your presentation should respond to each of the previous PAC recommendations/comments you are responsible for
 - This is as simple as labeling a relevant graph or bullet-point with a box like: PAC17-## where ## is the recommendation/comment number from the previous PAC, and indexed in the XL file distributed to you
 - If this is a “major” recommendation requiring a graph or full slide, mention verbally during the presentation how what you are showing addresses the PAC recommendation/comment