NSTX

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UT-K Collaborative Program on NSTX for 2012-2015

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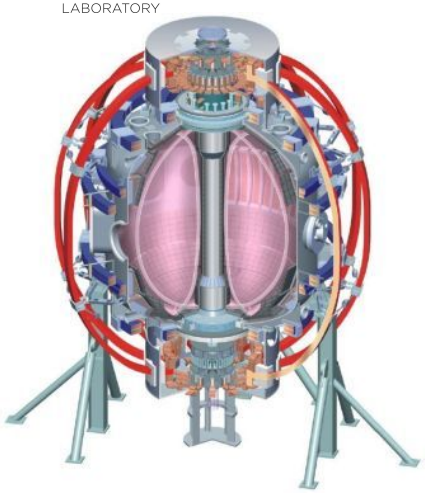
*Joint Appointments with UT-K and ORNL

NSTX-U University Diagnostic Meeting

PPPL - Princeton, NJ

July 26, 2012

PPPL PRINCETON PLASMA PHYSICS LABORATORY



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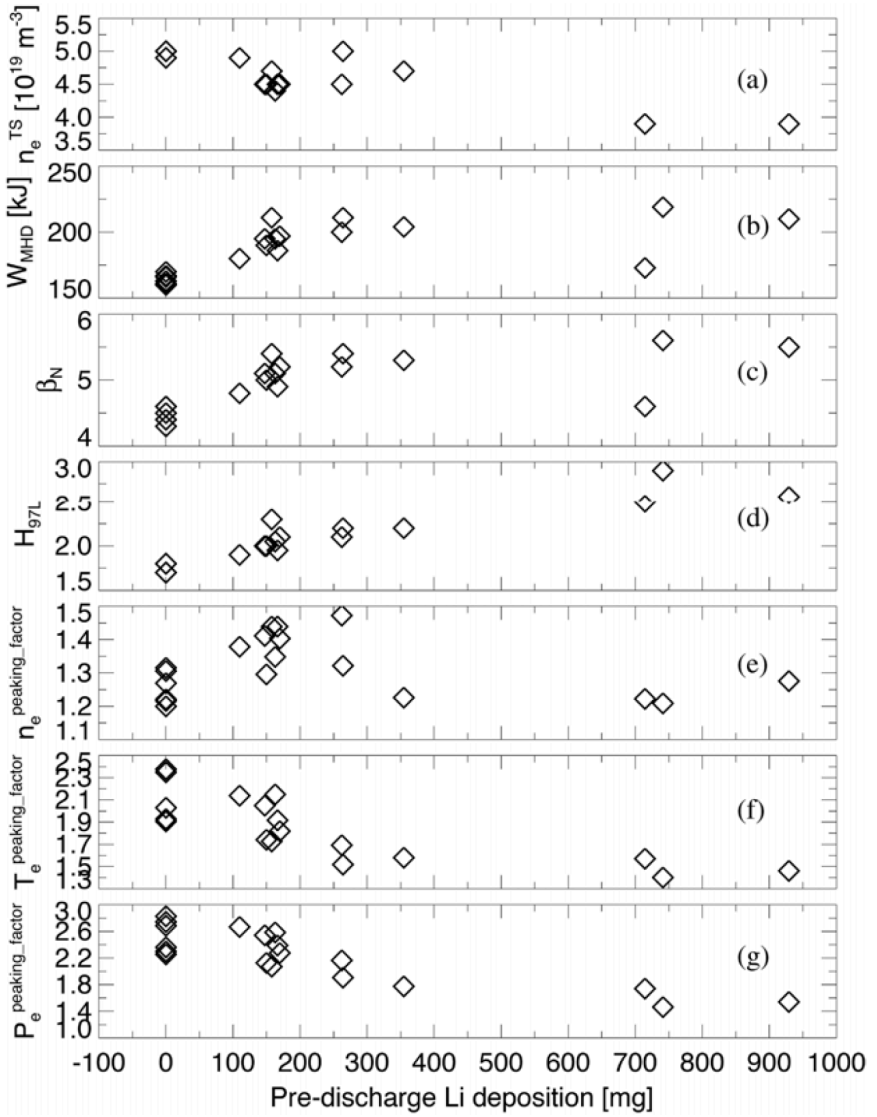
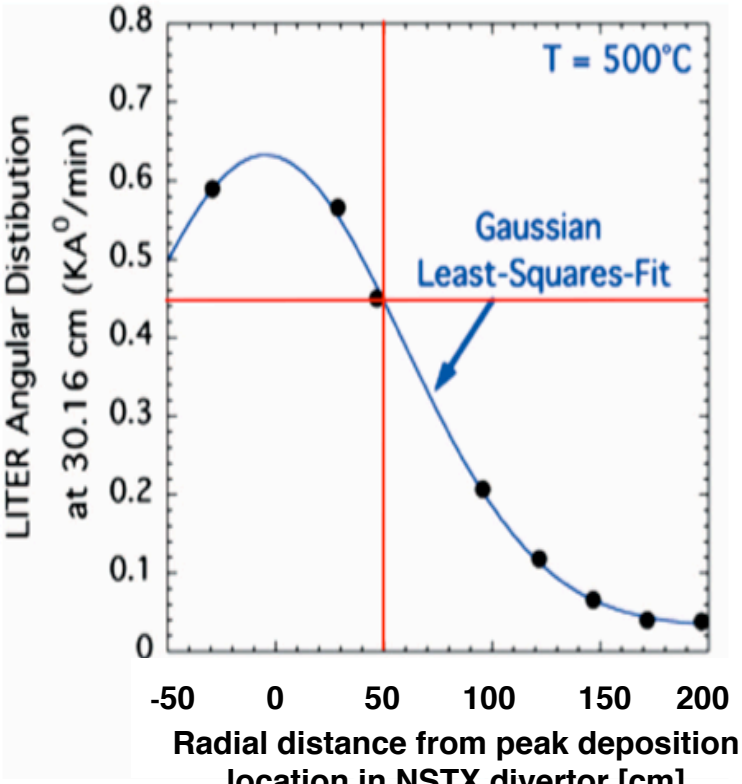
Main objective of UT-K program is to evaluate the dependence of the effectiveness of lithium coatings on poloidal deposition asymmetries

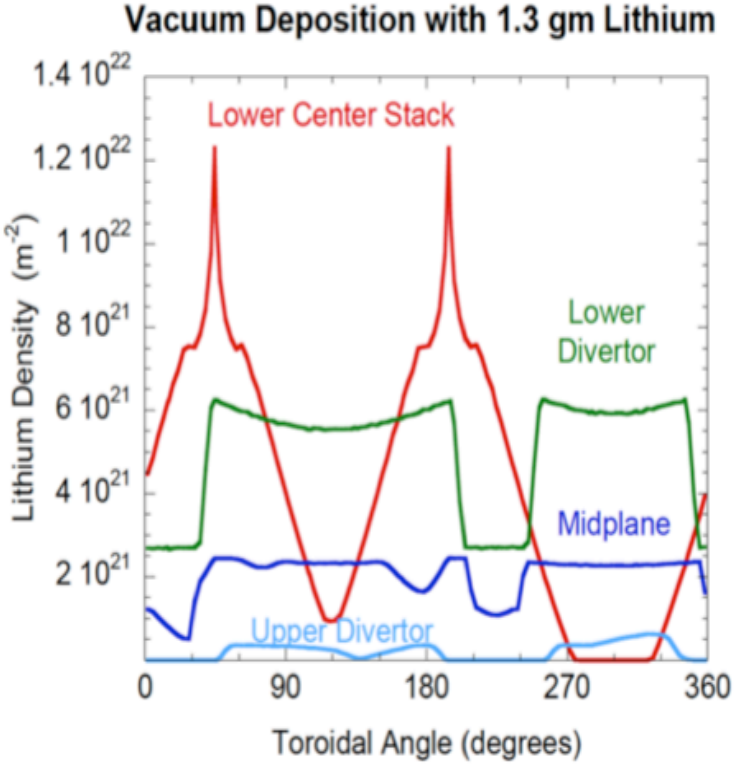
- Q: Plasma performance improves nearly continuously with lithium coatings – why? (nominal divertor coating 'thickness' scan went well beyond ion implantation depth)
- Hypothesis: areas of lower deposition (e.g. center stack, upper divertor) take longer to 'saturate'
- Hardware Elements: 20 new spectroscopic sightlines of upper divertor and center stack; dual band IR of center stack and upper div.
- Modeling: detailed dynamical PFC response to measured plasma fluxes



Maingi, PRL 2011; Maingi, NF 2012

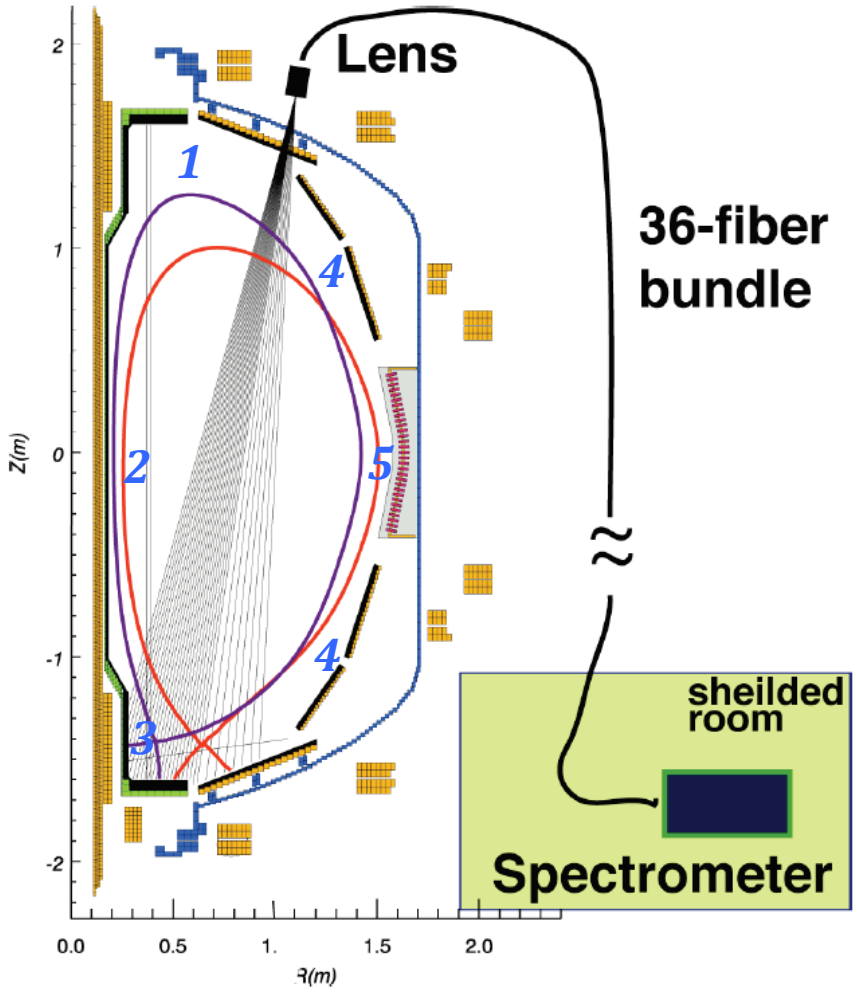
Previous NSTX LiTERs had toroidal and poloidal asymmetries in deposition thickness





Program relies on strong collaboration between UT-K, ORNL, and LLNL

- Lower divertor (region #3) well covered with existing DIMS (LLNL - Soukhanovskii) and 30-channel filterscope array (ORNL)
- We plan to add 20 diagnostic sightlines in regions #1 and #2 to measure lithium and impurity emission from surfaces, using either filterscopes, special ORNL compact spectrometer arrays, or time-sharing on a spectrometer
- We also plan to measure the PFC temperature and heat flux in regions 1 and 2 with dual-band IR cameras



Time-table and Annual Milestones

Milestone	Due Date
Identify postdoctoral candidate	06/12 ✓ A. Bortolon
Purchase components of dual band adapter for IR camera	09/12
Bench test dual-band adapter with borrowed IR camera	12/12
Assemble dual-band IR camera system for implementation in NSTX-Upgrade	**03/13**
Complete engineering design of spectroscopic sightlines	06/13
Purchase components for spectroscopic studies (fibers + lenses)	09/13
Complete analysis of existing lithium data from NSTX	12/13
Implement additional diagnostic sightlines in NSTX-Upgrade	**03/14**
Identify new postdoctoral candidate or extend existing postdoc, if possible; may opt instead for a graduate student and Ph. D. project	06/14
Purchase dedicated IR camera for upper divertor; start materials response modeling	09/14
Document first data with upper divertor IR camera and new diagnostic sightlines, if NSTX-Upgrade remains on schedule for first plasma	12/14
Fully implement first dual-band IR camera in NSTX-Upgrade	**03/15**
Apply SOLPS to newly acquired data; Purchase components of second IR camera for center stack region	06/15
Fully implement second IR camera	09/15
Continue materials response modeling, using SOLPS plasma solution	12/15
Assess effect of poloidal variations in lithium deposition on plasma performance	**03/16**