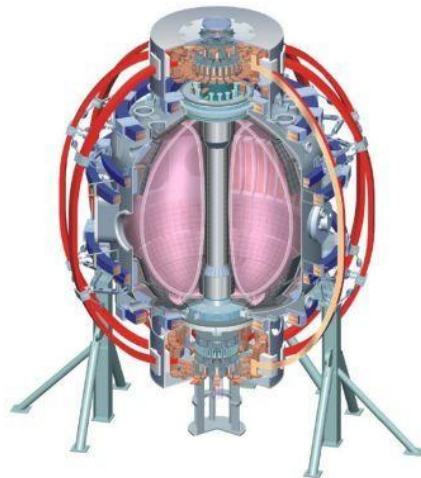


Intro to FY12 particle pumping milestone

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B318
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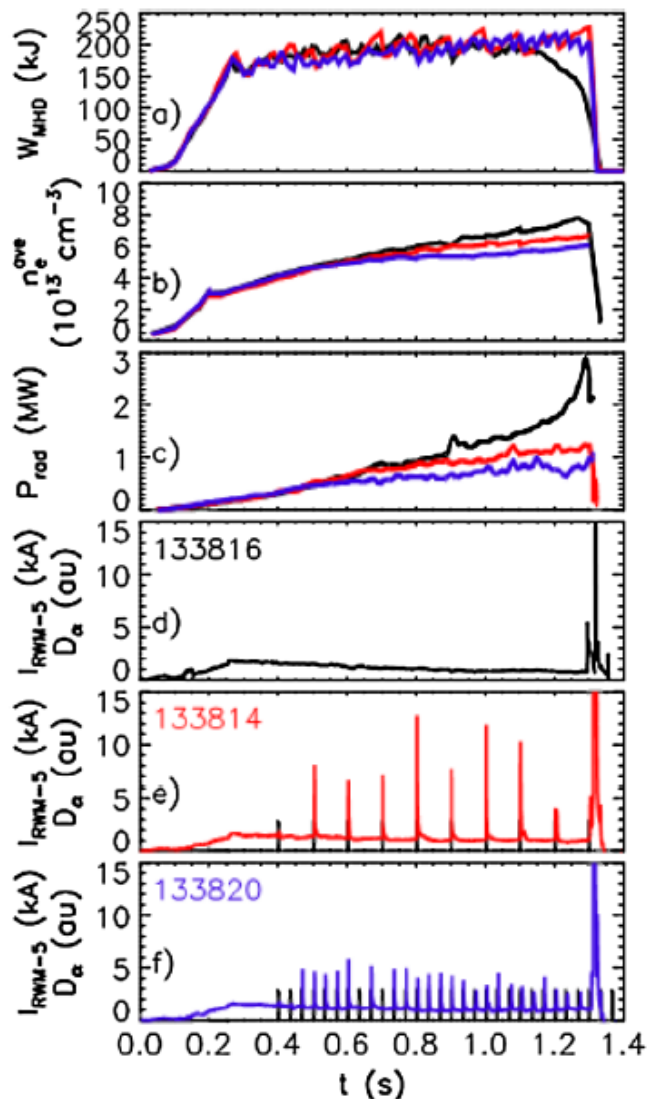
*Columbia U
CompX
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Some motivation for the proposed FY12 milestone on particle control analysis and simulation

- PAC report executive summary highlighted divertor/PMI issues/planning and preparation for NSTX-U:
 - “Since a primary focus of the NSTX Upgrade five-year plan must be the demonstration of stationary, high-performance, non-inductive spherical torus (ST) discharges that will inform next-step fusion development choices, the **PAC suggests the NSTX Team launch a serious cyropump and divertor geometry design study and develop an alternative to insure against uncertainties associated with the use of any next generation LLD in the NSTX Upgrade.**”
- NSTX 2009-13 5 year plan mid-term review comments:
 - “The use of lithium wall coating for longer pulse length of NSTX-U is questionable as lithium coating does not produce steady-state densities in shorter NSTX pulses.”
 - “For the Liquid Lithium Divertor (LLD), no clear plan was presented for either additional research or analysis of possible upgrades. There is a need to come to some conclusions as to the use of the LLD, the upgrades that are required and what the research strategy should be employed after the upgrade. **For example, is the pumping from the use of Li/LLD sufficient for NSTX-U?**”

Scenarios exist which trend toward stationary D and C inventory – but how do they extrapolate?



J. Canik - PRL 104, 045001 (2010)

- Li coatings + triggered ELMs come closest to achieving stationary D inventory and Z_{eff}
- How do these results project to NSTX-U parameters?
 - Up to 5x longer pulse
 - Up to 2x higher NBI fueling
- How persistent is D pumping by Li?
 - Can we use run days where large lithium evaporation was only performed in morning, or at beginning of week, to inform the pumping persistence question?
 - Lab-based surface studies should also play an important role

Proposed milestone R(12-2): “Project deuterium pumping capabilities for NSTX-U using lithium coatings and cryo-pumping”

- Responsible TSGs:
 - Boundary Physics, Lithium Research, Advanced Scenarios & Control
- Milestone elements:
 - Perform cryo-pumping physics design for NSTX-U compatible with vessel geometry and snowflake shapes
 - Use SOLPS to interpret/reproduce heat and particle flux profiles from high I_p and P_{NBI} discharges from NSTX, project to NSTX-Upgrade
 - Also use UEDGE to assess cryo-pumping of snowflake configurations
 - Model D pumping from Li coatings in NSTX, project to NSTX-U conditions, compare to cryo-pumping projections
- TSGs need to agree on elements, write text ASAP