

Optimize He-dispersed lithium evaporation to understand role of PFCs without direct lithium evaporation

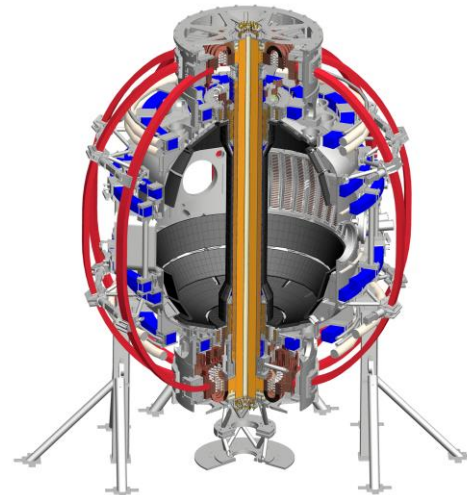
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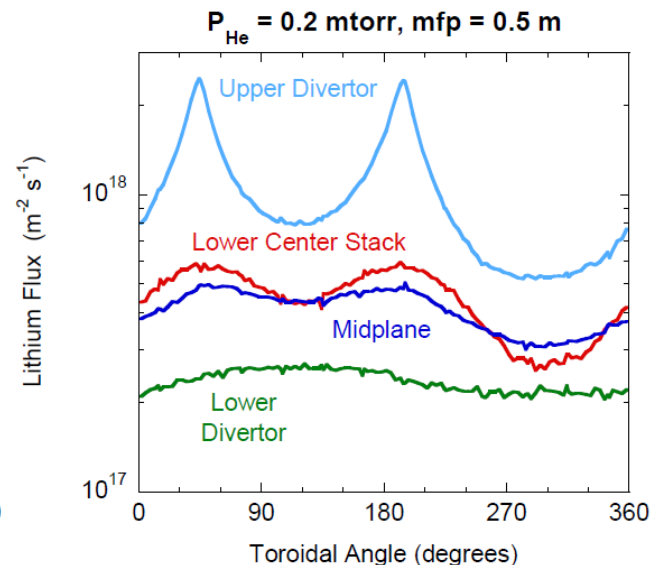
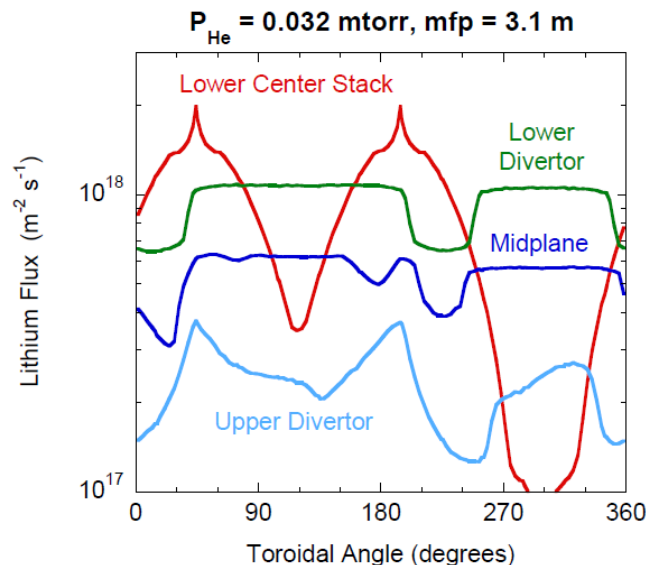
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Role of upper divertor PFCs for impurities and plasma performance not understood in NSTX

- Motivation: Continuous improvement in global plasma performance observed with increase in pre-applied lithium evaporation
 - Speculation that this could be related to the increasing role of PFCs without direct evaporation, including upper PFCs [Maingi, 2011]
 - Unknown role of upper PFCs impurity sources
- Goal: Optimize upper PFCs conditioning via He-dispersed evaporation aided by Monte Carlo simulations
 - Builds upon XP951 and 2011 NSTX-ROF by Skinner & Stotler
- Support first year goal of Five year plan Thrust MP-1:
 - *“Experiments will be conducted to improve understanding of the role of more complete coverage of the PFCs by evaporated lithium using upward-facing evaporators and/or diffusive evaporation...”*

Mixed results obtained in XP951, without consistent reduction in core impurities

- XP951 used He-dispersed evaporation to address upper PFCs sources
 - Reduction in core impurities not consistently observed
 - Results possibly hampered by off-normal plasma wall interaction (SFLIP, HHFW limiter)
 - Outgassing during evaporation prevented careful control of gas pressure
 - Significant H₂O partial pressures (1.e-6 Torr)
- Second half of XP951 already used MC guided evaporation (D. Stotler)
 - Stepped helium pressure to achieve uniform coating distribution



LITERs
10 mg/min

Establish effect of coatings of upper PFCs for particle control, plasma performance

- Establish Li conditioned ELM-free lower-div-biased H-mode
 - Already characterized by first lithium introduction XP
- Maintain steady He press. via flow from leak valve (2011 proposal)
- Optimize He-dispersed Li evaporation to gradually increase upper PFC Li dose, maintaining constant areal densities on the lower PFCs
 - Study evolution of impurity sources, recycling in upper divertor
 - Study evolution of plasma performance and particle balances
- Repeat in double null configuration
- New upper camera view will help qualitatively characterize coatings distribution and validate Monte Carlo calculations
- This should run shortly after main lithium introduction to avoid large lithium buildups and migration to upper divertor