

Intrinsic impurity transport in NBI-heated H-mode discharges

NSTX-U research forum – T&T
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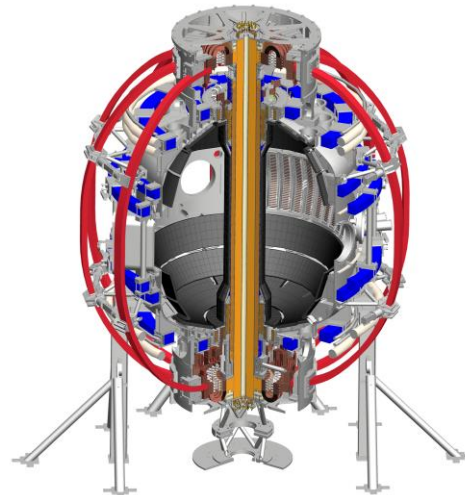
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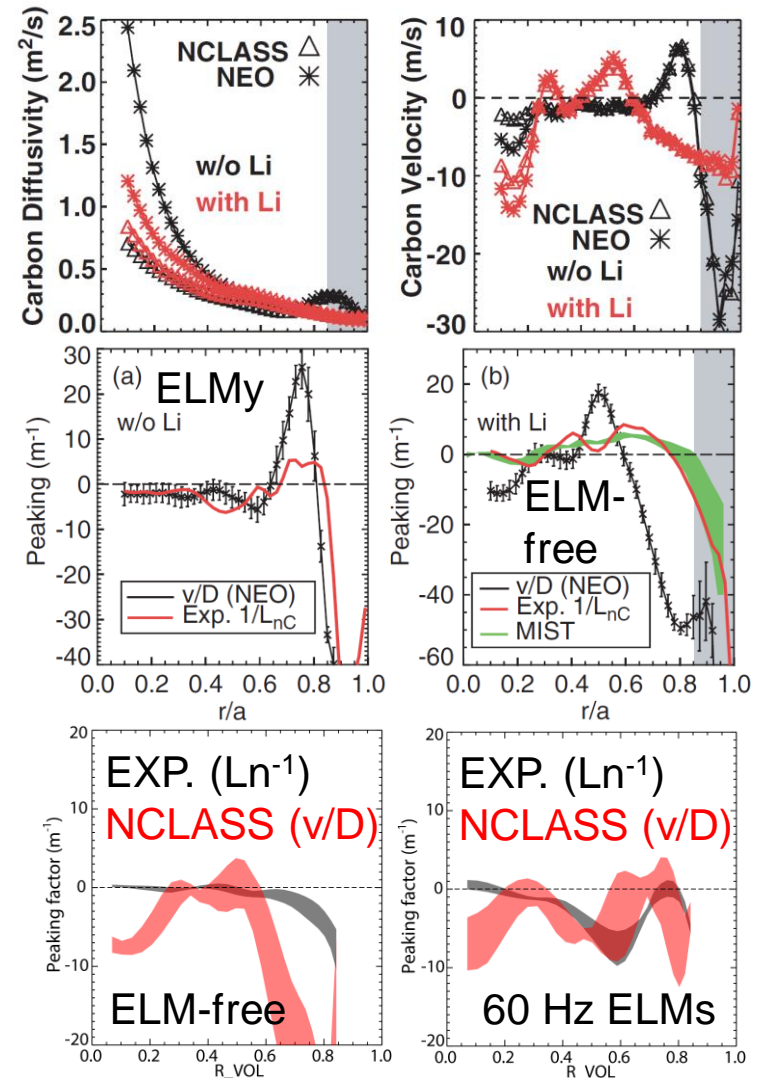
 NSTX Upgrade



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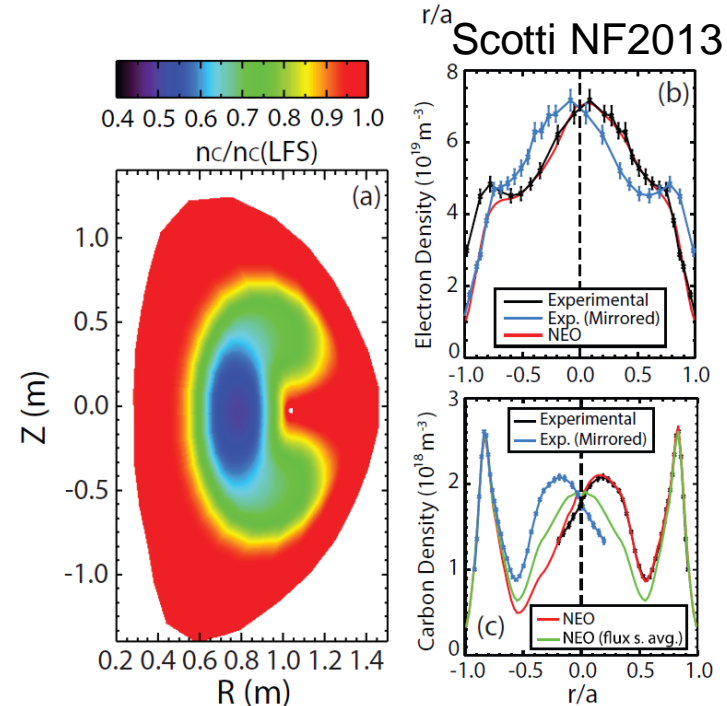
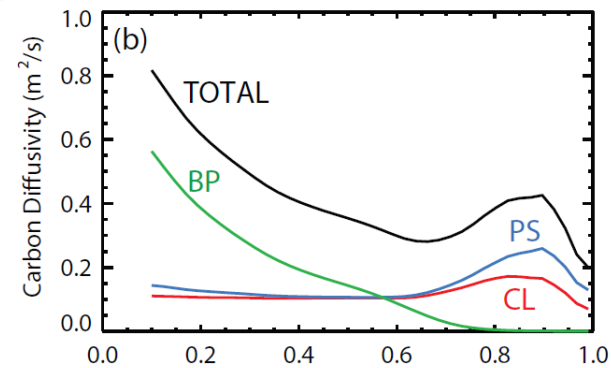
Intrinsic carbon transport close to neoclassical estimates in NSTX H-modes

- In NSTX thermal ion transport close to neoclassical levels [Kaye, NF 2008]
- Carbon transport consistent with neoclassical estimates in ELMy, boronized discharges [Scotti NF 2013]
- With Li changes in carbon neoclassical convection (NCLASS, NEO) and some disagreement between exp. profiles and neoclassical at top of pedestal
- Indications of agreement with neoclassical transport predictions with lithium + triggered ELMs
 - Similar to naturally ELMy discharges
 - Both cases have similar changes in T_i , v_{tor} profiles wrt to ELM-free



Understand C transport crucial for part. control, medium/high-Z perturb. transport won't inform about C

- Carbon in BP in the core, PS at edge
 - High-Z deep PS regime
- Importance of toroidal rotation effects
 - Poloidal asymmetries observed for C and in agreement with NEO, higher for high mass
 - Neoclassical diffusivity enhancement
 - Already up to 3x for C ($r/a < 0.4$), higher for higher mass
- Importance of multi-impurity effects for extrinsic impurities
 - 3% of carbon doubles neoclassical diffusivity of additional impurity



Characterize carbon transport, consistency with neoclass. at higher B_T - I_p , carbon balance

- Goal: characterize intrinsic C transport (Piggy-back):
 - Comparison with neoclassical estimates (NEO, GTC-NEO) for impurity peaking
 - Both boronized and lithiated discharges
 - Piggy-back on B_T , I_p scan by T&T, lithium introduction XP by PC-TF
- Transition to higher B and lower collisionality will probe if carbon transport still \sim neoclassical
- Testing RMP ELM perturbation to infer absolute D, v [Scotti, APS2014], momentum diffusivities + off diagonal terms [Walter]
- Additional requirements:
 - Nothing perturbing CHERS: NO NBI beam 2, NO GPI
 - Possibly consider triggered ELMs at end of shots?
- Global inventory / impurity confinement scaling with eng. parameters
- Attempt at intrinsic impurity balance with improved spectroscopic coverage for impurity sources (benefit from ELM-free discharges)