NSTX-U

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Impurity transport in electron-dominated RF–heated scenarios

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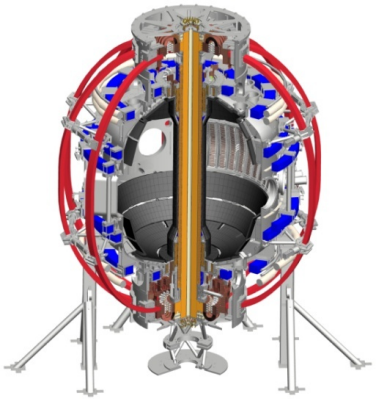

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This proposal aims to characterize impurity transport in electron-dominated RF–heated scenarios

FACTS

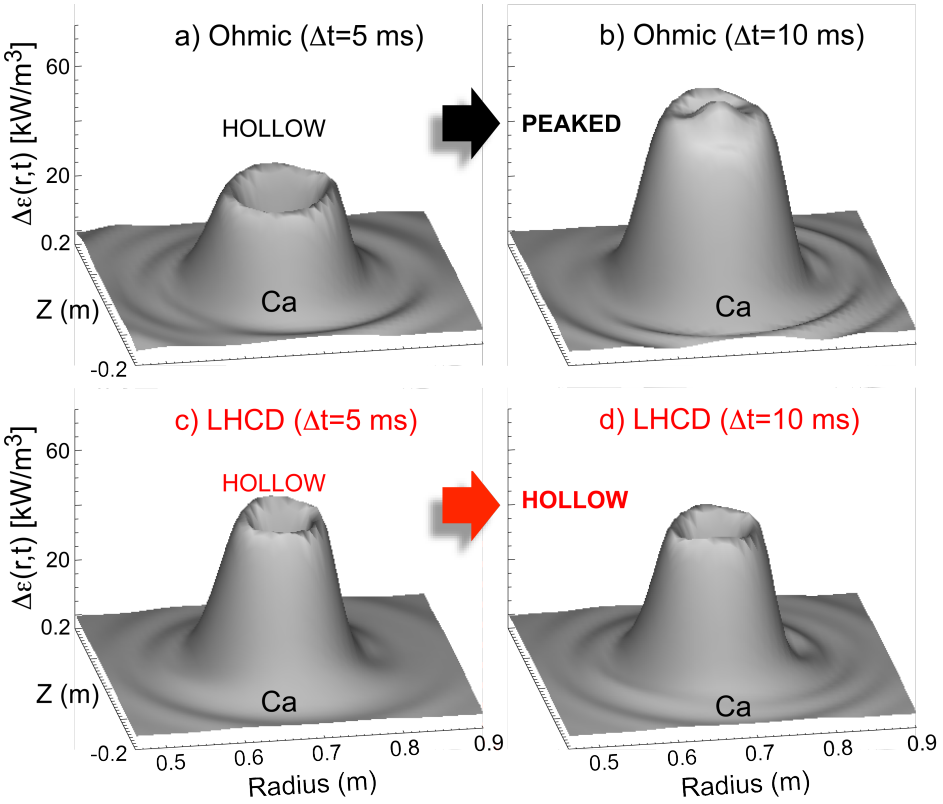
a) In ASDEX H-modes with dominant auxiliary ion heating by NBI the impurity particle pinch is regularly measured directed inwards.

b) In TCV L-modes with dominant auxiliary e^- heating by ECRH, the impurity pinch is measured directed outwards.

c) In JET H-modes using NBI + ICRH, the pinch velocity has been systematically found to change its direction from strongly inwards to slightly outwards when using ICRH in MH (ions) vs MC (electrons).

d) New experiments @ C-MOD!

$\varepsilon_{SXR,Ca}$ (Ohmic vs LHCD – AFTER Ca inj.)



L. Delgado-Aparicio and J. Rice, MP# 710
Alcator C-Mod @ MIT-PSFC
(work in progress to support JRT15)

Is turbulent impurity transport in play? TEM modes are leading candidate for "explain" core shielding

a) TEP pinch: ***TEM (-)*** ***ITG (-)***

- a.k.a: B curvature pinch

$$\frac{V_Z^{TEP}}{D} \approx -\frac{4s/3 + 0.5}{R}$$

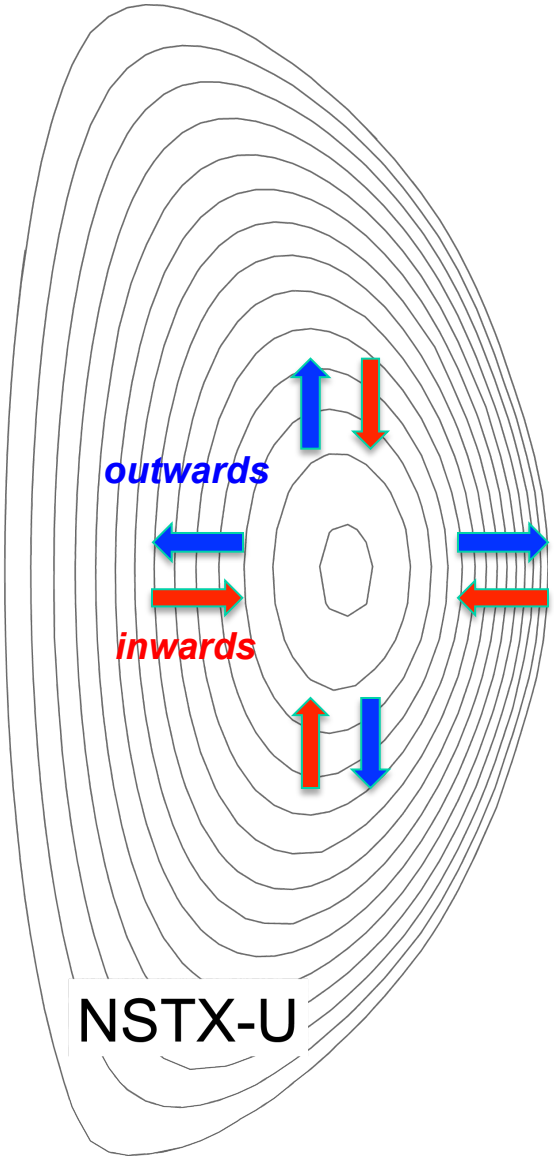
b) Thermodiffusion pinch: ***TEM (-)*** ***ITG (+)***

- Depend on the v_{phase}.

$$\frac{V_Z^{TD}}{D} \approx \frac{1}{Z} \cdot \frac{\nabla T_Z}{T_Z}$$

c) Parallel compresibility: ***TEM (+)*** ***ITG (-)***

- ∇T driven
- the T_e/T_i dependence is negligible
- $\propto Z/m_Z$
- mass/charge independent for fully stripped impurities: e.g. C⇒ Z_C/m_C=1.0/m_D, Ne⇒ Z_{Ne}/m_{Ne}=1.0/m_D
- Predict the effect for Moly: Mo⇒ Z_{Mo}/m_{Mo}=0.67/m_D



1-day experiment can help elucidate role of turbulent particle transport in NSTX-U

- Impact operation with high-Z PFCs.
- Probes particle transport in the absence of particle and momentum sources!
- Has NEVER been tested in NSTX.
- This is a particular attractive scenario for ITER since α-heating predominantly heats the electron channel.
- Will provide valuable data for NSTX-U T&T thrusts #s 2 & 3, and ITPA TC #s 11 & 15 .
- Request one day of experiments w/ and w/o Ne-puffs while scanning the HHFW power from 0.5 to 3 MW (no-Lithium). Key diagnostics are CHERS, MPTS, MSE and the new ME-SXR [5] and AXUV-based "bolometer" [6] systems.
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