

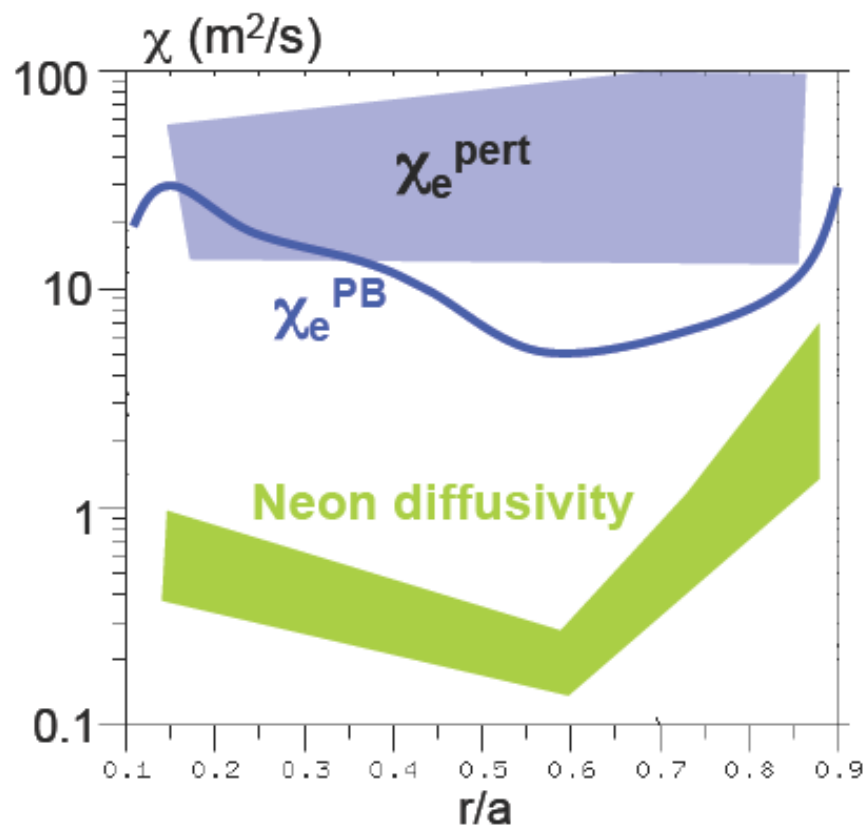
Assessing magnetic electron transport in NSTX using He H-modes

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Unusual gap between χ_e and D_{imp} in NSTX



$$D_{\text{magn}} \approx V_{\parallel} (\Delta B_r / B)^2 L_s$$

↓

$$D_i \approx \chi_i \approx \chi_e \sqrt{m_e / m_i}$$

↓

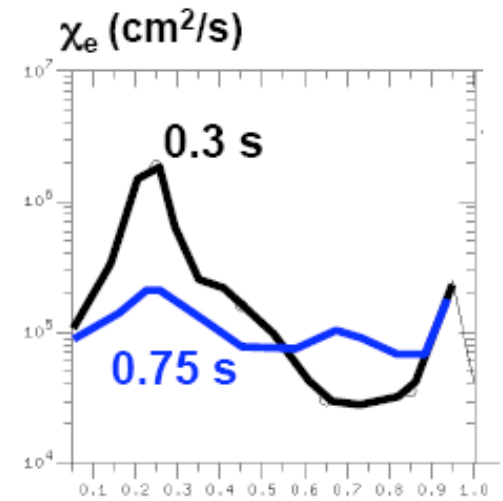
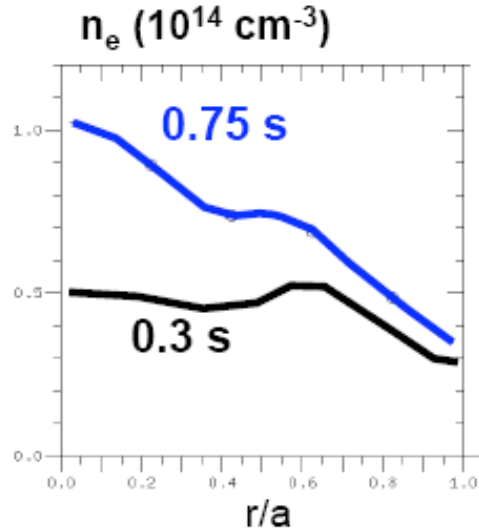
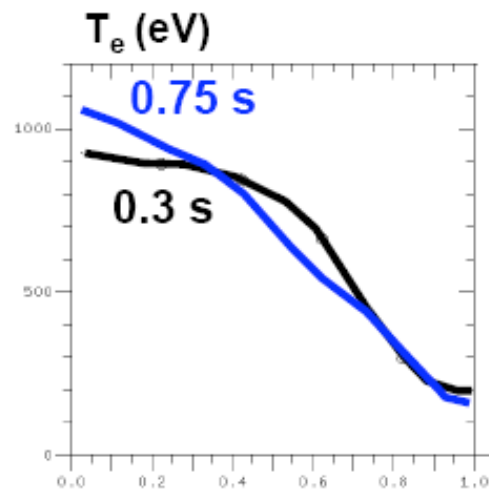
$$\chi_e / D_{\text{Ne}} \approx O(10^2)$$

(Rechester & Rosenbluth 1978)

- Impurity diffusivity \sim neoclassical in high power H-modes
- $\chi_e^{\text{pert}}, \chi_e^{\text{PB}}$ up to ~ 100 times larger
- Magnetic (stochastic) transport would explain gap
- Microtearing χ_e in the range of experiment (K. Wong *et al* 2006)

Magnetic electron transport and neoclassical particle transport scale oppositely with v_{ei} (and q)

$$\chi_e^{\text{mag}} \sim (\rho_e/L_T)^2 v_e^2 q^{-1} \underline{v_{ei}^{-1}} \leftarrow \text{Wong et al 2006}$$
$$D_{\text{imp}}^{\text{neo}} \sim (\rho_i)^2 q^2 \underline{v_{ei}}$$



Preliminary indications that v effect present

Proposed XP: Compare χ_e , D_{imp} in high power He and D₂ H-modes

- Factor of 4 (Z_i^2) change in v_{ei} at similar n_e , q
- If T_e higher in He -> adjust P_{nb} for similar T_e
- Inject Neon to measure D
- Change in χ_e / D_{imp} with Z_i gives measure of magnetic transport
- Possible explanation of isotopic effect on confinement ?
- Estimated run time: 1/2 day

High power beam heated Helium H-mode proposed also for study of impurity transport in gradient region (L. Delgado-Aparicio)