Role of neoclassical impurity transport in the NSTX gradient region

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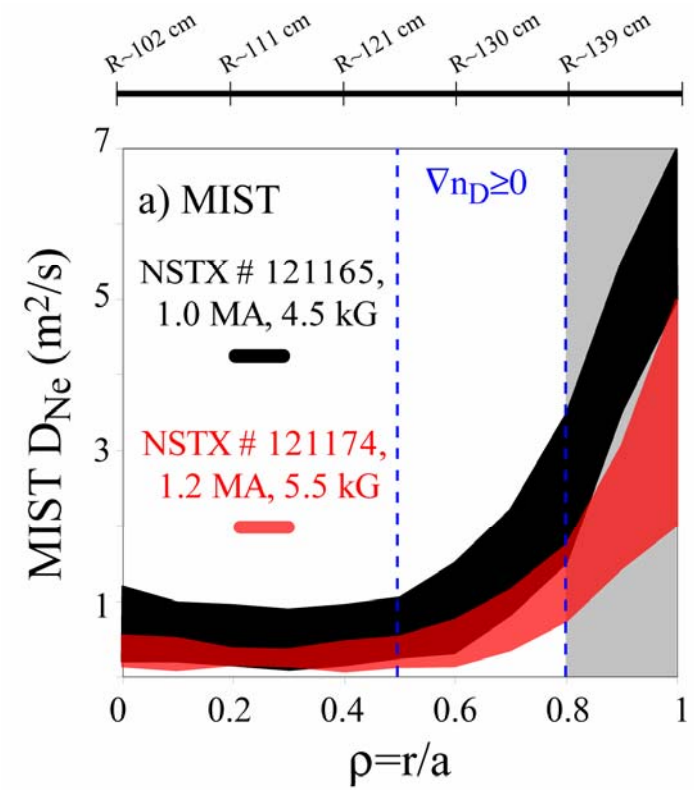
Diffusivity results from XP 613

Experimental



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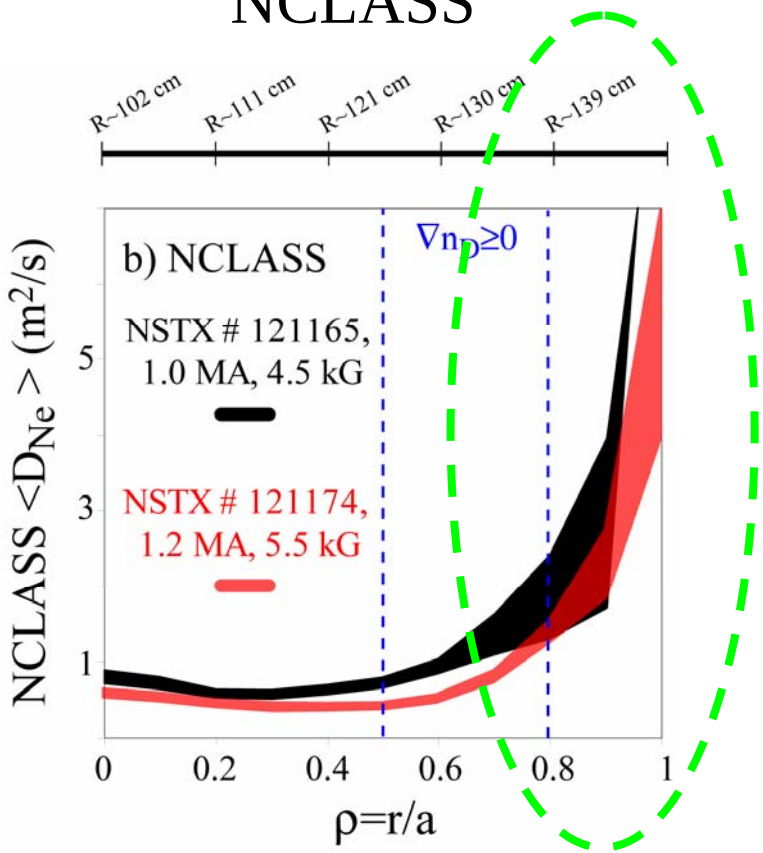

- The large peripheral particle diffusivity in the NSTX H-mode seem to be due to neoclassical transport associated with the high q~6-10 value, high n_D and low T_D.
- Is this big edge transport neoclassical?
- Implication of the formation of density ears.
- Are the impurities penetrating the H-mode barrier neoclassicaly?

Neoclassical scaling for D_Z

Neoclassical impurity diffusivity dependence on B, Z_i, n_i and T_i

$$D_Z \propto \rho_z^2 \nu_{Z,i} q^2 \propto \frac{1}{B^2} \cdot \frac{Z_i^2 n_i}{T_i^{1/2}} \cdot q^2$$

- Change q-profile by performing an I_p scan at fixed B_t.
- Change the working ion (He working ion).

Beam heated He H-mode also proposed for magnetic transport assessment (D. Stutman)

Elements of XP (2nd tier priority at 2008 Forum)

A) q95 (I_p) scan at fixed B_t:

- Establish 5.5 kG – 1.0 MA, quiescent deuterium H-mode (4 MW, 2 NBI sources).

- I_p scan at 5.5 kG + Neon injection: $D_Z \propto \rho_z^2 \nu_{Z,i} q^2 \sim \frac{1}{1+I_p^2/B_t^2} \cdot \frac{1}{I_p^2}$

- Use also TESPEL injection (Al or Mg) (N. Tamura, NIFS/NSTX/JHU collaboration)

B) Collisionality change at fixed I_p, B_t, through change to He dominant working ion:
- Establish 5.5 kG, 1 MA quiescent, 4 MW Helium H-mode
(shot development common with magnetic transport XP)

- Neon and TESPEL injection

1 RUN day (combined with boundary)