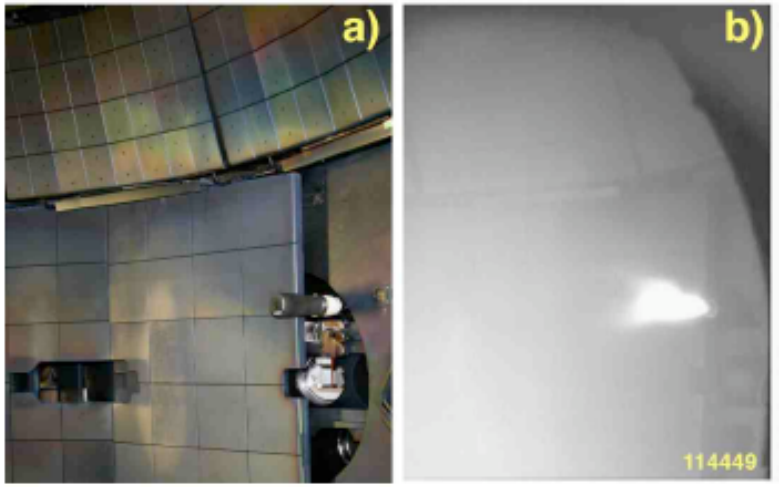
XP to optimize diagnostic method employing supersonic gas injector for transport studies

- Gas injection for radial transport studies
  - Density pulse - deuteron transport (D_D, v_D)
  - Impurity density pulse propagation- impurity transport (D_{imp}, v_{imp})
  - Cold pulse propagation – heat transport (χ_e)
- Pulsed or modulated to resolve diffusive and convective parts
- Supersonic gas injector on NSTX
  - Any gas (D_2, He, CD_4, Ne, Ar)
  - Midplane location (Z=16 cm)
  - $\tau_{pulse} \geq 10$ ms, up to 100 pulses / shot
  - Flow rate $5 \times 10^{20} – 1.4 \times 10^{22}$ s^{-1}
    - Total plasma inventory $N_e \leq 10^{21}$ / shot
  - Delta-function-like perturbation affects T_e, n_e, n_Z in pedestal and core
  - Edge / divertor D_α spectroscopy in combination with DEGAS 2 can be used for source rate estimates



- Diagnostic issues
  - Need to optimize SGI flow rate and pulse times for edge reflectometry n_e cutt-off and FireTip / MPTS n_e sensitivity
  - SGI pulses generally cause CHERS background signal contamination
  - Need to optimize impurity inj. rate for soft X-ray diagnostic sensitivity for cold pulse and impurity transport