Flexible Fueling System for NSTX High Density Studies

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Fueling Comparison Between NSTX and DIII-D

- Both DIII-D and NSTX are preparing inner wall fueling capabilities
  - DIII-D will use existing pellet guide tubes on the inner wall for gas injection ports.
  - NSTX has added a tube to the column wall as has been successfully used on MAST.
- A comparison of the fueling efficiency of inside and outside wall gas fueling between these machines is proposed (DN, SN, IW limited)
  - A large difference in fueling efficiency has been seen on DIII-D with pellet fueling
  - The same ExB polarization drift mechanism may apply to gas fueling
  - Scaling with aspect ratio and field topology can be examined
- A future extension of this comparison to pellet fueling may be possible
  - A proposed pellet injector for NSTX may be installed at a later date for such a study.

Summary of Pellet Injection Proposal

- **Flexible low-cost pipe-gun injector system proposed for installation on NSTX**
  - 1 - 4, ~1.8mm pellets, 200-1500 m/s, injection line for central or steerable off-axis density perturbation
  - More flexible than MAST system, which will use low speed outside midplane injection

- **Pellet injection tool applications:**
  - Extending operating regime to high density ($n >> n_{GW}$)
  - Triggers for L to H-mode transitions for reduced power threshold
  - Peaked density profiles for PEP-mode ITB formation with $T_i \sim T_e$, (unlike other ITB regimes)
  - Off-axis density/rotation perturbation for ITB formation
  - Particle confinement and transport studies