Core fueling and scrape-off layer properties of NSTX

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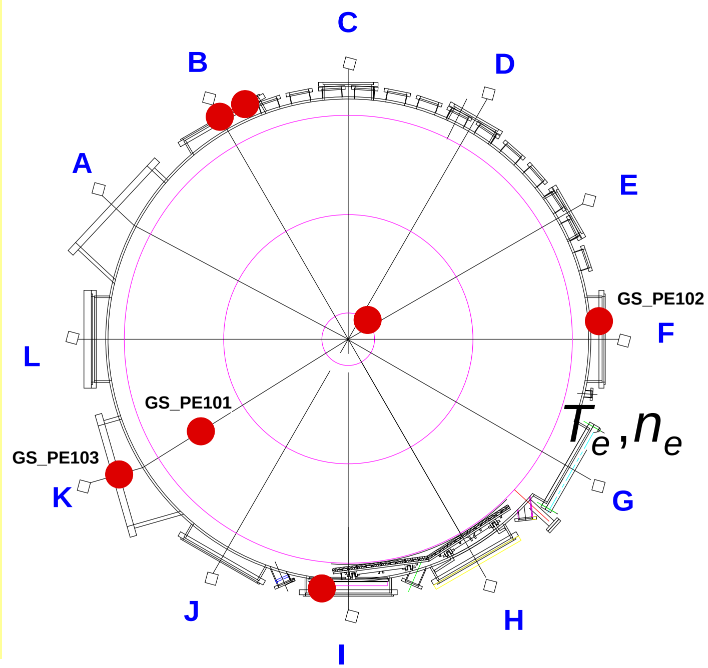
Present status and diagnostics

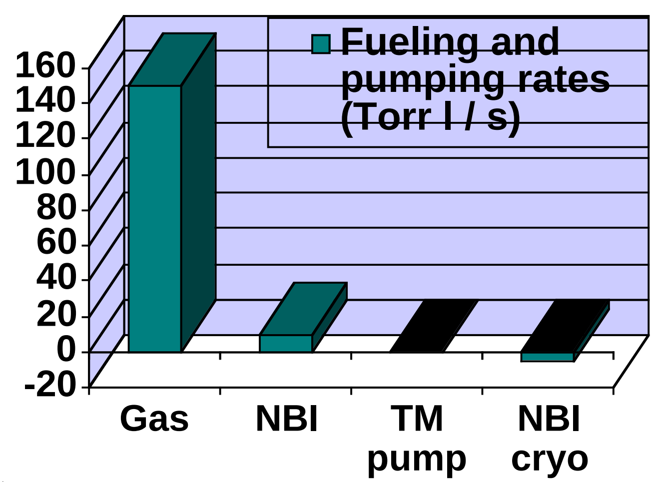
Edge, SOL, divertor diagnostics (2002):

- Multi-point Thomson scattering system
- CHERS
- Mm wave reflectometer, far IR polarimeter
- Fast pressure gauges
- Fast reciprocating probe
- IR cameras
- Midplane and divertor bolometers
- VB, Dα , Dβ, Dγ monitors
- Dα**,** C III filtered 1-D CCD cameras (2 cameras, three locations)



Fueling in NSTX

- Gas puff fueling efficiency η < 10 %
- NBI fueling efficiency η < 60 %
- Gas puff neutrals dominate other boundary sources during gas puff
- HHFW antenna frequently causes neutral influx
- Impurity fueling efficiency is small



Core fueling and density control (dedicated XP)

XP under development

- Fueling efficiencies of gas puff and NBI fueled plasmas
- D2, He gas puff fueled ohmic discharges fueled from inboard, outboard, top gas injectors
- Impurity gases (Ne, Ar) (inboard, outboard, top gas injectors)
- NBI heated (and fueled) plasmas

Goals

- Determine fueling efficiencies, role of recycling in divertor and main chamber
- Gain understanding of density and pressure profile control factors
- Determine global particle confinement scaling, ionization source profile and impact on ion transport
- H-mode plasma edge properties and L-H transition
- Study RF fueling effects, RE “wall conditioning”
- Compare results to MAST

Scrape-off layer properties (piggy-back expt's)

- New midplane diagnostics (probe, 1-D CCD, IR cameras) should allow detailed Te and ne, heat flux, and particle flux and profile measurements

- Modeling with UEDGE 2-D multifluid code with various transport models (M. Rensink, LLNL, non-diffusive transport - A. Pigarov, S. Krasheninnikov, UCSD)
  - SOL particle and heat transport

- Assess divertor particle exhaust performance
- Correlate results with available fluctuation measurements and modeling
- SOL properties during L-H transitions

- Compare to MAST (different SOL!)

Development of fueling methods

- Gas puff (present)
- Neutral beam injection (present)
- Pellet injection (future)
    - Edge (near future)
    - Core (future)
- Compact toroid injection (future)

- Supersonic thermal beam injector (reality?)
- Range of applications:
    - fueling and density control
    - particle transport studies
    - SOL / edge temperature and density diagnostic