Achievement of divertor detachment in NSTX

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Power dissipation is critical for long pulse discharges

- Recent IRTV measurements: most power flows into divertor
- May be problematic for t > 1 s pulses
- Dissipate power: 1/ sweep strike points or 2/ detach divertor
- Detachement criterion from the two point model (Pitcher & Stangeby 1997):

$$\frac{14}{3} c_Z L_Z n_u^2 L > q_u$$

(L-connection length, Lz - rad.power coefficient, n - upstream density, c - impurity concentration, q - upstream heat flux)

(Remove upstream power by volumetric processes)

- Analyze and identify NSTX divertor regimes
- Detachement may be a challenge for NSTX: L - short, q - high, n - not high enough, Lz - not high enough

Develop path to detachement

- MAST divertor frequently operates in linear (sheath-limited) regime, detaches in L- and H-mode with $n_{e,u} > n_G$ in other tokamaks $n_{e,u} < 0.3 - 0.5 n_G$
- Available diagnostics - neutral pressure gauges, D-alpha cameras, IRTV, divertor bolometry, divertor tile probes, UCSD reciprocating probe - sufficient to be able to see detachement
- Experiment: - establish NBI-heated LSN H-mode plasma
  - puff D2 from LDGIS in increasing quantities
  - use one NBI source
  - may need to try to puff nitrogen or neon
  - optimize performance (confinement degradation? Discharge length? Strike point location?)