Achieving I-mode on NSTX

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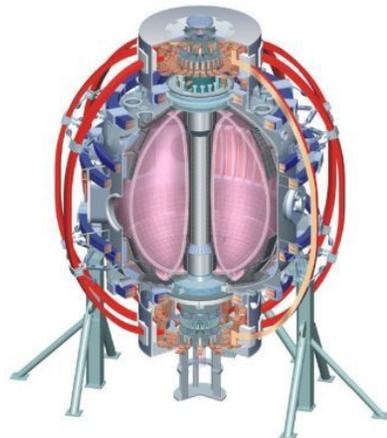
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I-mode is an attractive operating regime with H-mode energy confinement and L-mode particle confinement

- Operating regime found on C-MOD
  - H-mode like T_e pedestal
  - L-mode like density profile
- Typically achieved via:
  - Operating in the "unfavorable" grad-B drift direction (USN)
  - Low q95
    - high I_p moreso than low B_t
  - High δ
  - Strong edge pumping
- Contribute pedestal profiles and analysis to JRT 2011
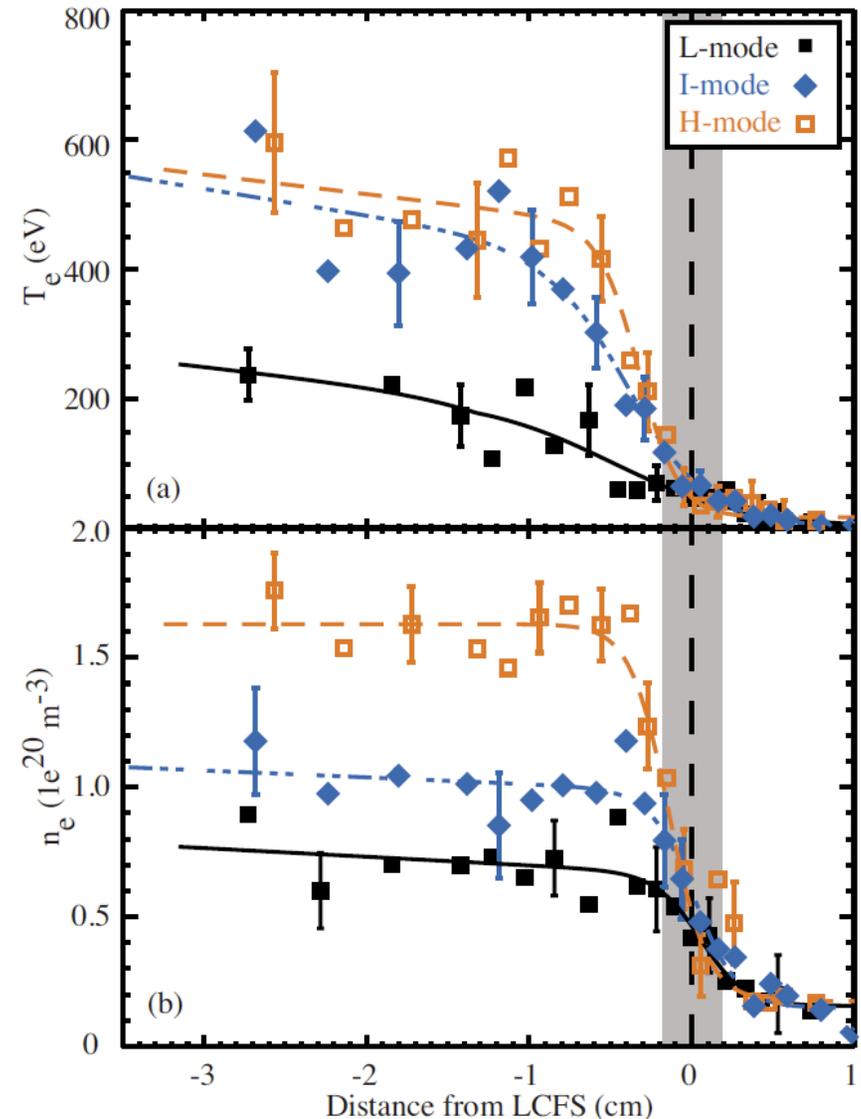
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Propose a 1 day XP to look for I-mode in NSTX

- Examine L-mode operating window
  - Begin with fiducial discharge, $\delta r_{sep} <\sim 0$, $I_p = 0.9$ MA
  - With lithium evaporation (~150 mg between shots)
  - Reduce HFS gas and use β_n controller to remain in L-mode longer
  - May need to sweep δr_{sep} positive early in the discharge to delay H-mode transition

- Increase I_p up to 1.1 and 1.2 MA to look for I-mode at low q_{95} and $\delta r_{sep} <\sim 0$

- Scan $\delta r_{sep} > 0$, (+5, +10 mm) @ stable I_p
  - Optimize P_{nbi} to avoid H-mode transition
  - If recycling is too high in the upper divertor, use Li power injection for coverage
    - Can also consider Li evaporation into diffuse He to condition upper divertor
  - Reference case with $\delta r_{sep} <\sim 0$ (same I_p and P_{nbi})