ROLE OF EDGE TURBULENCE FLOWS AND MAGNETIC GEOMETRY IN THE L-H TRANSITION OF AN ST

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Goal: Examine and characterize the evolution of turbulence and turbulence flows before, across and after the L-H transition and hows these vary with magnetic geometry

Background and Motivation:

-L-H transition found to occur as local shearing rates increase above turbulence decorrelation rates

- Bifurcation trigger remains elusive

-Most toroidal experiments observe a strong dependence of the L-H power threshold on magnetic geometry (ion grad-B Drift direction relative to X-point), including NSTX

- Turbulence suppression and L-H bifurcation dynamics crucial to developing understanding and predicting threshold in ITER

- ST provides a configuration to compare and contrast transition mechanism: different trapped particle population, geometry, field pitch,...

- Rotation shown to strongly affect P_{LH} in DIII-D

NSTX

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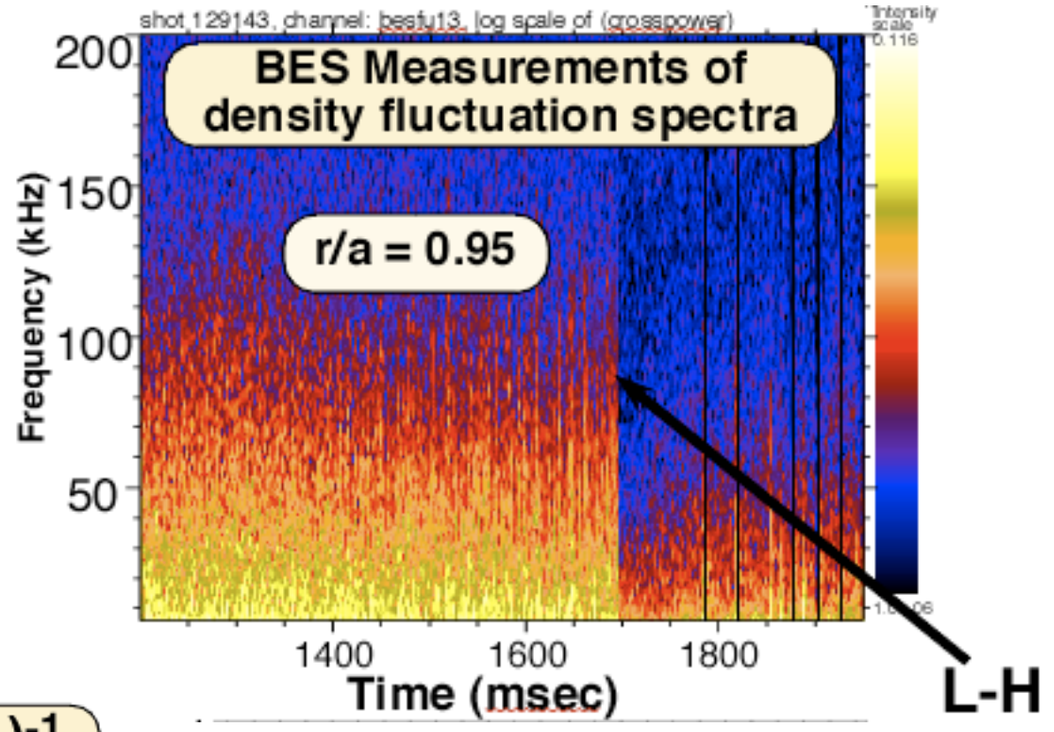
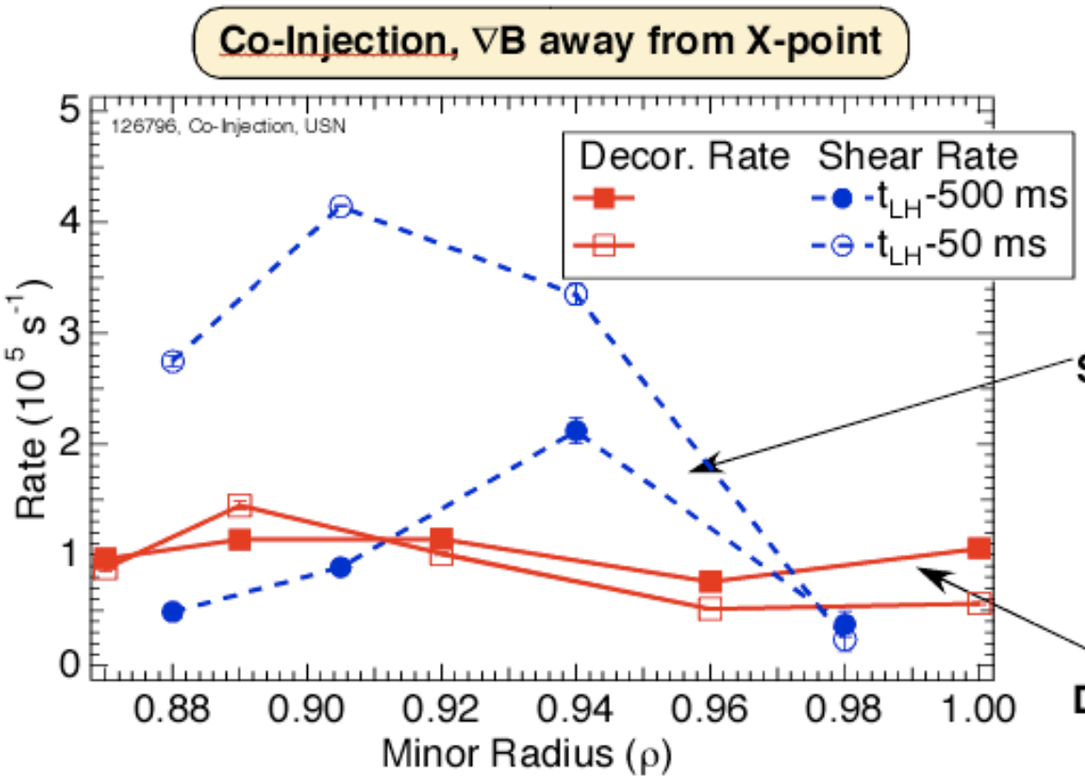
TURBULENCE DYNAMICS AND FLOWS LEADING TO L-H PHYSICS REVEAL UNDERLYING MECHANISMS

- **2D fluctuation data from BES determines:**
  - Turbulence amplitude
  - Poloidal velocity and shear
  - Decorrelation rates
  - Correlation Lengths
  - GPI has provided similar data





$\omega_s > (\tau_c)^{-1}$

(from BES@DIII-D)

- **Mode structure and flows vary significantly with magnetic configuration:**
  - upper single null (ion grad-B away from X-point)
  - lower single null (ion grad-B towards X-point)
- **Likely relates to differences in power threshold**

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EXPERIMENTAL PLAN

- **Develop discharge with "standard" L-H transition:**
  - Vary X-point location (lower-single-null, upper-single-null)
  - Perform double-null-discharge
  - Vary R-midout to scan extended poloidal BES arrays across pedestal region, including SOL (see D. Smith discussion)
  - Obtain fluctuation and flow measurements across transition, including zonal flow characteristics (if feasible)
- **Vary rotation using n=3 braking (less developed concept)**
  - Determine variation in turbulence, flows, Er, and P_LH with rotation

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