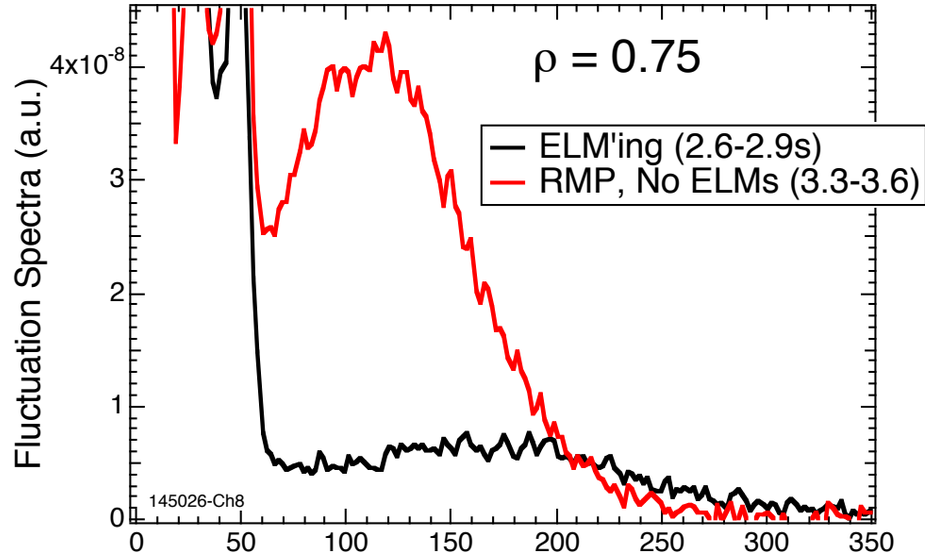
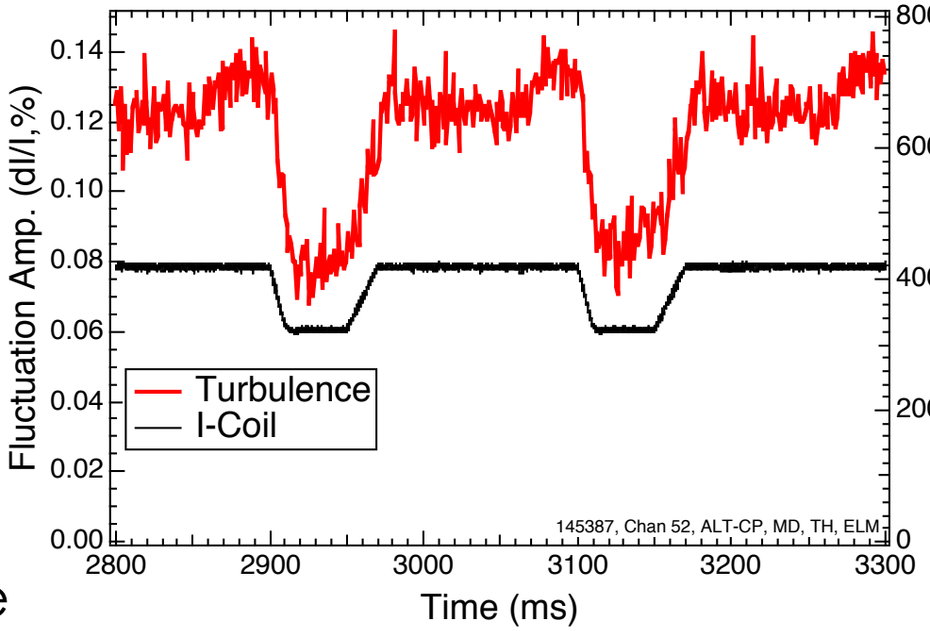
Impact of 3D Radial Field Perturbations on Turbulence, Transport and ELMs in the ST

G. McKee, D. Smith, R. Fonck, *U. Wisconsin*

- **Motivation: Application of Resonant Magnetic Perturbation (RMP) can suppress ELMs**
  - ELM-free operation for many τ_E
  - Pedestal relaxes from Peeling-Ballooning boundary
  - 3D coils being installed in ITER for ELM suppression
  - ELMs destabilized in previous NSTX exp. (Canik)
  - Physical mechanisms not fully understood
    - *Interplay of equilibrium, stability, rotation, turbulence, transport*



- **Background**
  - RMP fields observed to significantly increase low-k density turbulence in DIII-D over $0.5 < \rho < 1$
    - *Local response near pedestal is "rapid" (~ ms)*
  - Transport: Density "pump-out", rotation/Er changes
  - May play a critical role in ELM-suppression by: increasing transport, reducing gradients, stabilize P-B
  - Theoretical mechanisms proposed: T. Bird, M. Leconte



Impact of 3D Radial Field Perturbations on Turbulence, Transport and ELMs in the ST

- **Experiment plan**
  - Develop "standard" ELM'ing H-mode
  - Apply mid plane n=3 magnetic field
    - *Coil current scan*
    - *Different configuration from DIII-D, non-resonant*
  - Vary q_{95} via I_P scan at constant B_T (0.75 T)
  - Boronized conditions?
  - Obtain fluctuations measurements with BES, high-k scattering, GPI, Corr. Refl.
  - Future: if NCC deployed, compare resonant/non-resonant field effects

Similar conditions to those proposed by J. Lore for pedestal experiment