Experiments to Study Effects of 3D Fields on Turbulence in NSTX

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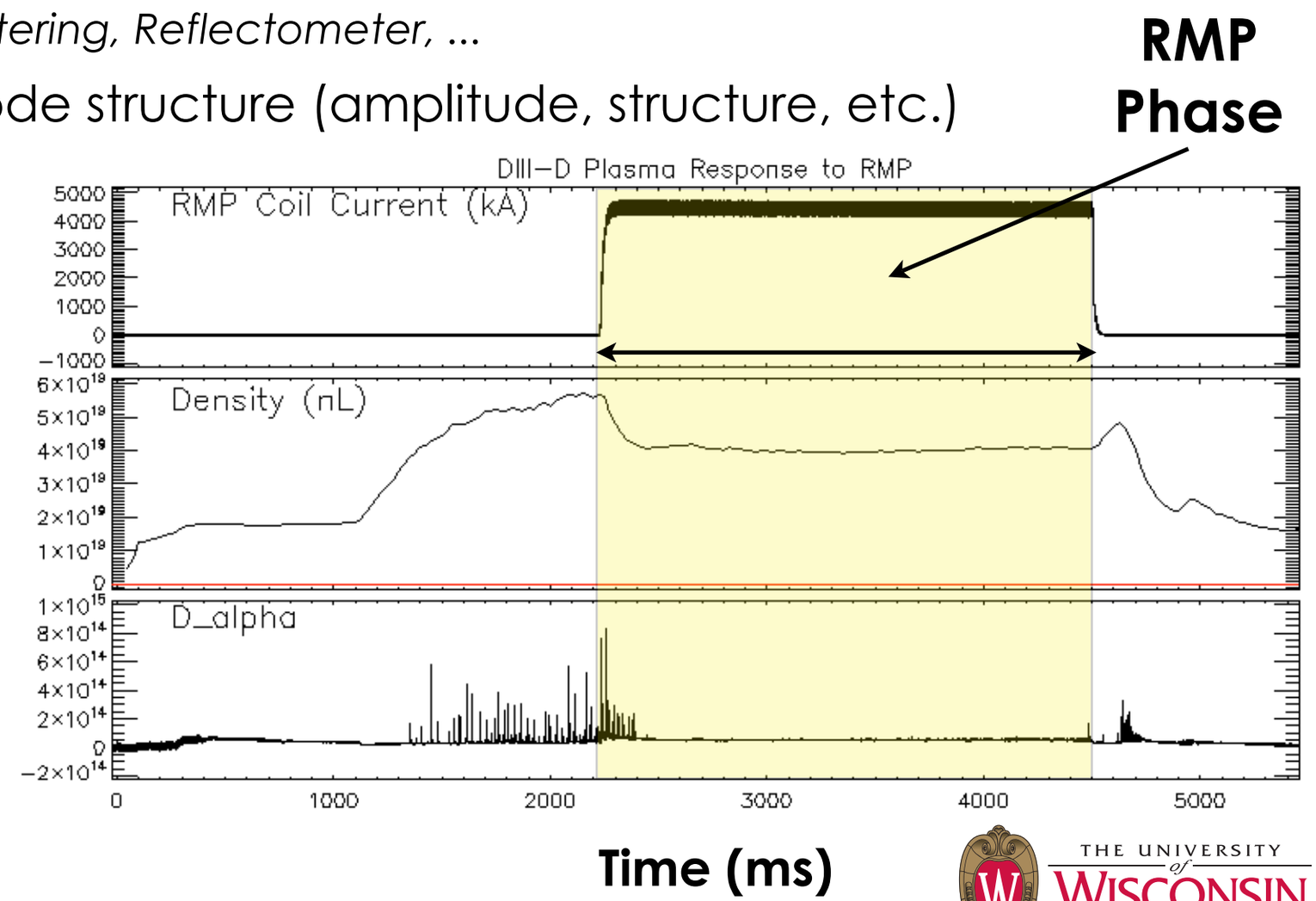
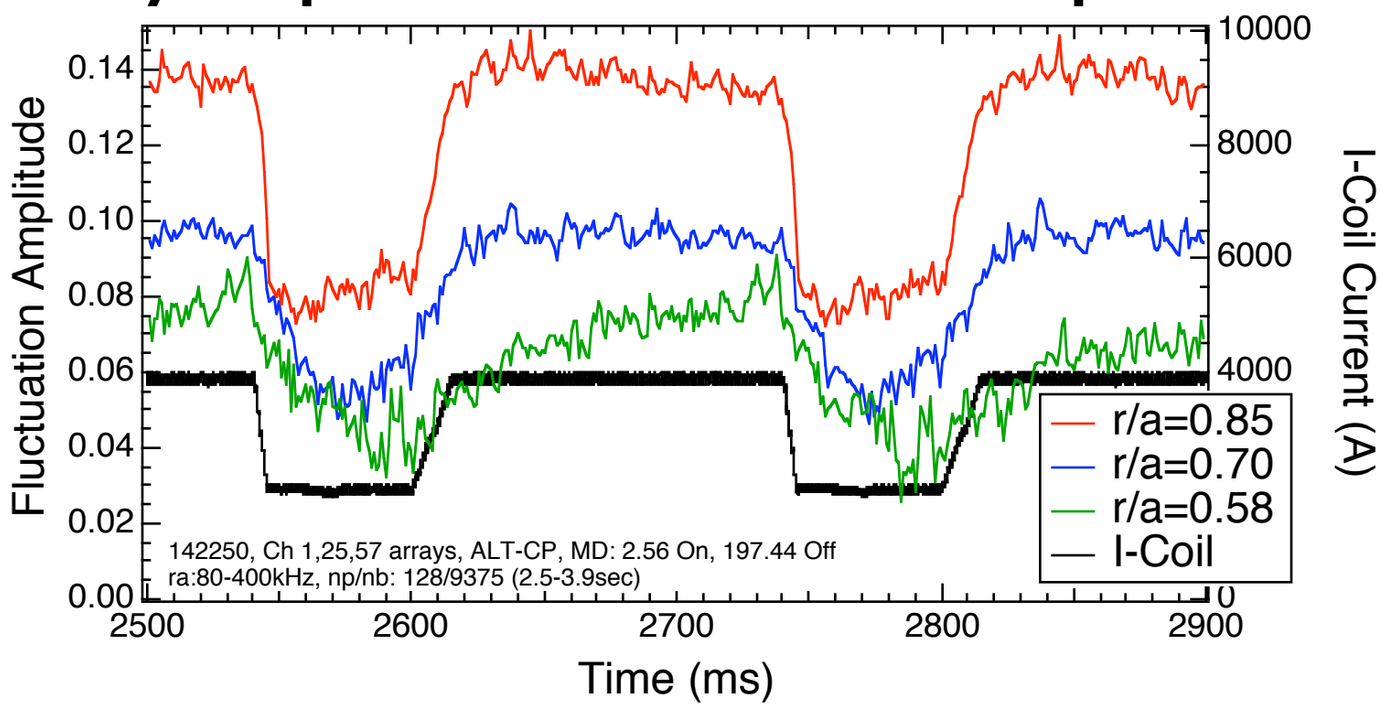
- **Experiments on DIII-D show significant turbulence enhancement via application of 3D RMP fields to suppress ELMs**
  - Density pump-out typically observed during RMP application
- **Propose extending these studies to spherical torus**
  - New and available fluctuation diagnostics on NSTX can measure wide spatial and wavenumber response:
    - *BES, GPI, High-k Collective Scattering, Reflectometer, ...*
  - Vary I_p (q_{95}) & applied 3D mode structure (amplitude, structure, etc.)
  - Density profile response
  - Turbulence characteristics
  - Temporal dynamics
  - ELM response
  - Interaction with Li-coverage
  - Compare D3D v NSTX B_r
    - *EFC/RWM midplane (NSTX)*
    - *Up/down I-coils (DIII-D)*



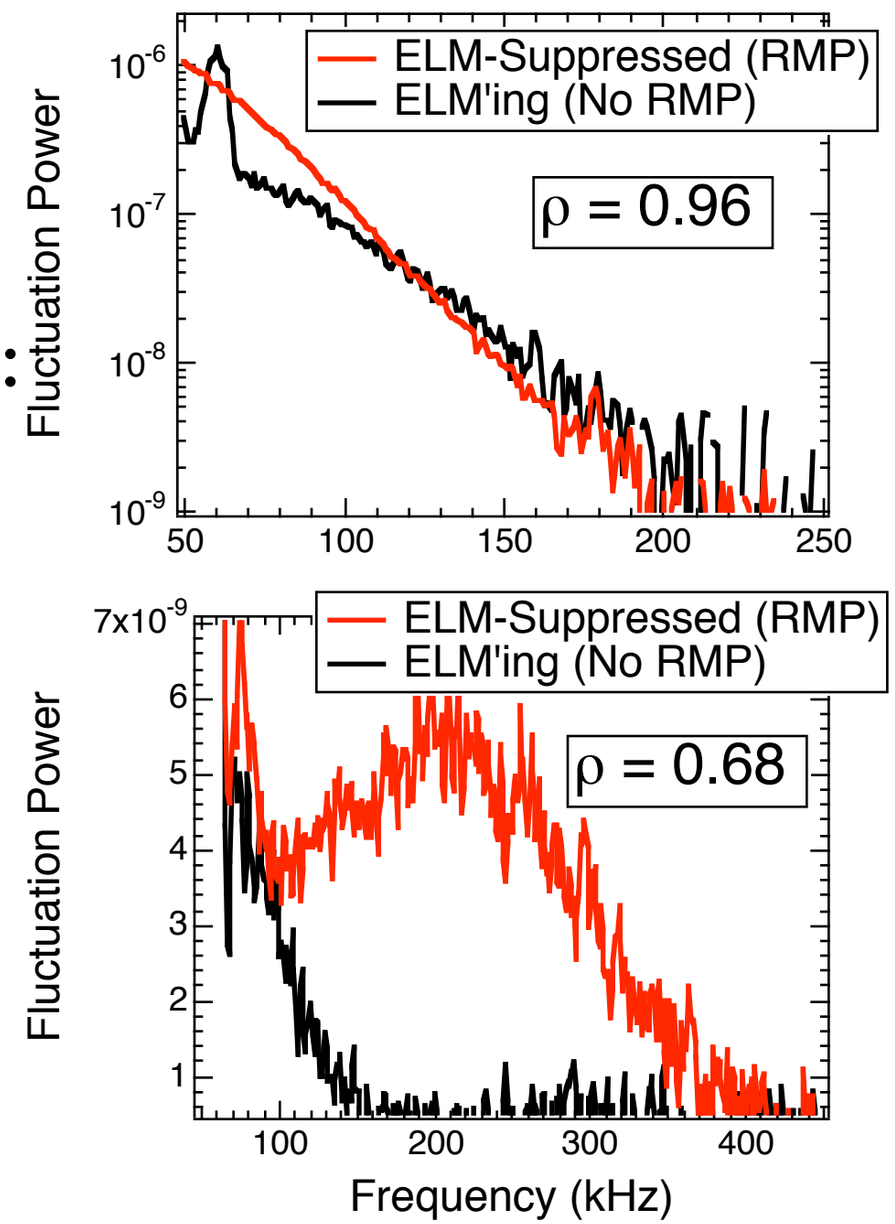
Core and Edge Turbulence Increase Significantly with Application of RMP to Suppress ELMs on DIII-D

- **BES measurements show turbulence enhancement over wide radial range:**
  - 0.4 < r/a < 1.0 show increases during RMP
  - Density fluctuation spectral shape [$S(k_\theta)$] changes
  - Pedestal turbulence undergoes modest increase
- **Modulating I-coil current causes *fast* (few ms), radially-dependent turbulence response to RMP:**



Enhanced Turbulence → Transport → Reduced Density and ∇n_{PED}?

BES Density Fluctuation Spectra



Experiments by Evans, Moyer et al