APS invited: Assessing low wavenumber pedestal turbulence in NSTX with measurements and simulations — D. R. Smith, R. J. Fonck, G. R. McKee, et al.

- Validation of pedestal models is critical for ITER, and ST pedestal turbulence simulations are among the most difficult.
- Objectives
  - Characterize **low-k pedestal turbulence** (ELM-free, MHD quiescent) with BES measurements
  - Identify **parametric dependencies** among turbulence quantities and plasma parameters
  - Perform **gyrokinetic and fluid simulations** of NSTX pedestal turbulence and **compare** to measurements and parametric dependencies
- Low-k pedestal turbulence in ELM-free, MHD quiescent H-modes
  - $L_c/\rho_i \sim 10$ $k_\theta\rho_i \sim 0.2$ $\tau_d/(a/c_s) \sim 5$
- Parametric dependencies from regression analysis and model aggregation
  - ITG: ∇n_e, ∇T_i, and v scalings are *inconsistent*; T_e/T_i scalings show mixed agreement
  - TEM: ∇n_e and $1/L_{Te}$ scalings are *consistent*; T_e/T_i and v scalings show mixed agreement
  - KBM: β_e scalings are *consistent*; ∇n_e, ∇T_i, and $1/L_{Te}$ scalings show mixed agreement
  - μ-tearing: β_e and v_e scalings are *consistent*; $1/L_{Te}$ scaling is *inconsistent*
- Gyrokinetic (GEM and XGC1) and Braginskii fluid (BOUT++) simulations
  - GEM: linear growth rates increase with ∇n_e and decrease with ∇T_i in **agreement** with measured L_c parametric dependencies and absence of ITG turbulence
  - BOUT++: $L_c/\rho_i \sim 8$ and $k_\theta\rho_i \sim 0.7$–1.4 **compares favorably** with measurements (single, non-representative simulation; analysis ongoing)