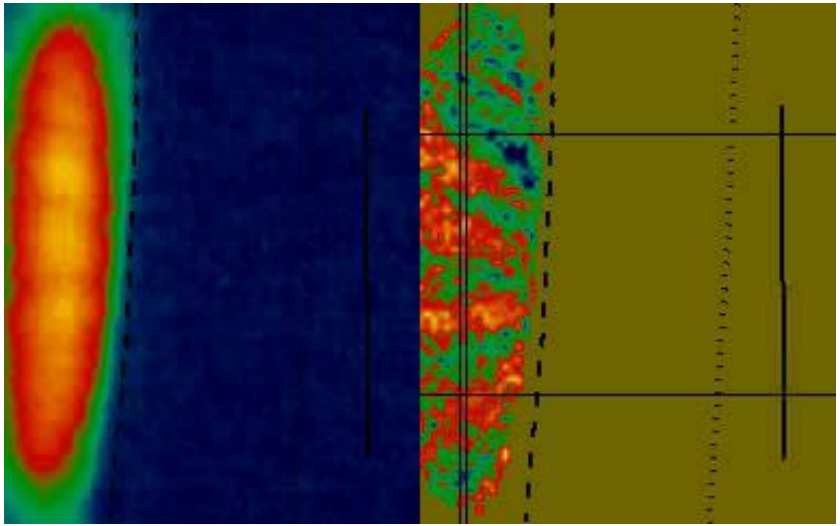
Investigating small-scale edge turbulence with GPI

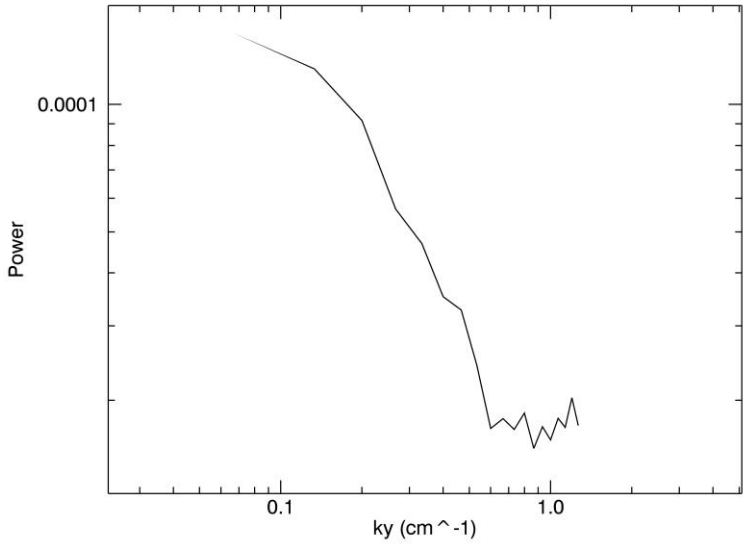
Noah Mandell, Stewart Zweben, Walter Guttenfelder, Yang Ren, Steve Sabbagh

NSTX T&T Forum 2015
2/25/2015

Motivation & GPI Optics Upgrades

- 2010 GPI data included shots that showed small-scale (sub-cm) structure → consistent with ETG turbulence
- Zoom optics upgrade will allow 2-3x zoom to enhance spatial resolution of optics so that ~2-3mm structure can be resolved
- Other upgrades to fiber bundle, etc will allow better signal-to-noise ratio, possibly faster frame rate for movies





Experiment Goals

- Measure fluctuation (w,k) spectra of edge turbulence from GPI movies made using new magnifying zoom lens
- Examine how edge turbulence changes with ∇T_e, ∇n_e near separatrix
- Compare with theory (Guttenfelder) and other diagnostics (e.g. high-k scattering, Ren) to assess whether observed fluctuations are characteristic of ETG turbulence or other theorized modes
- Determine role of turbulence in stiff T_e profiles near separatrix (as suggested by Canik et al, 2011)

Plasma Conditions

- Require scans of B_T or I_P to align local B field with GPI optical view to optimize small-scale resolution, guided by EFIT (Sabbagh)
- This will require 5-10 dedicated shots (~2 hours), with GPI gas puffing. Could be an XMP.
- H-mode, boron PFC required to get large ∇T_e near separatrix to maximize expected ETG level
- Can piggy-back on other XPs for additional data as allowed