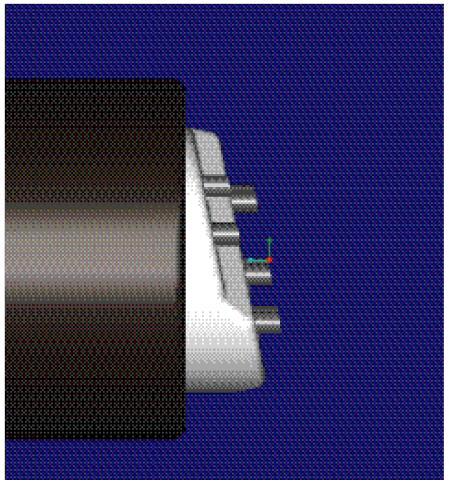
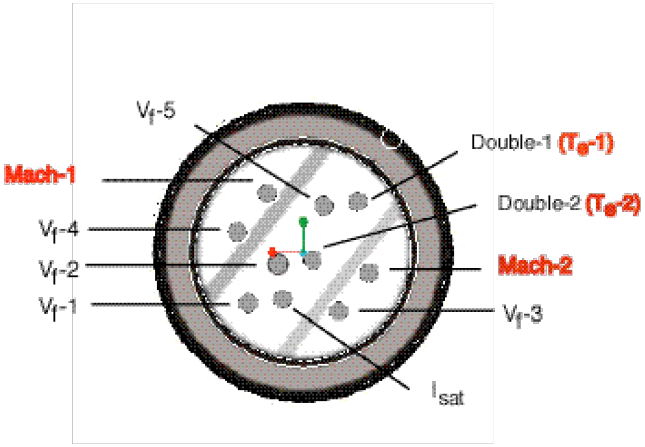
UCSD Activities at NSTX

J. Boedo

For the UCSD Team





Fluctuation Quantities to Characterize in NSTX

density fluctuations: $$\frac{\tilde{n}}{n} = \frac{\tilde{I}_{sat}}{I_{sat}} + \frac{\tilde{T}_e}{2T_e}$$

plasma potential fluctuations $$\tilde{\phi}_{pl} = \tilde{\phi}_{fl} + \alpha \tilde{T}_e$$

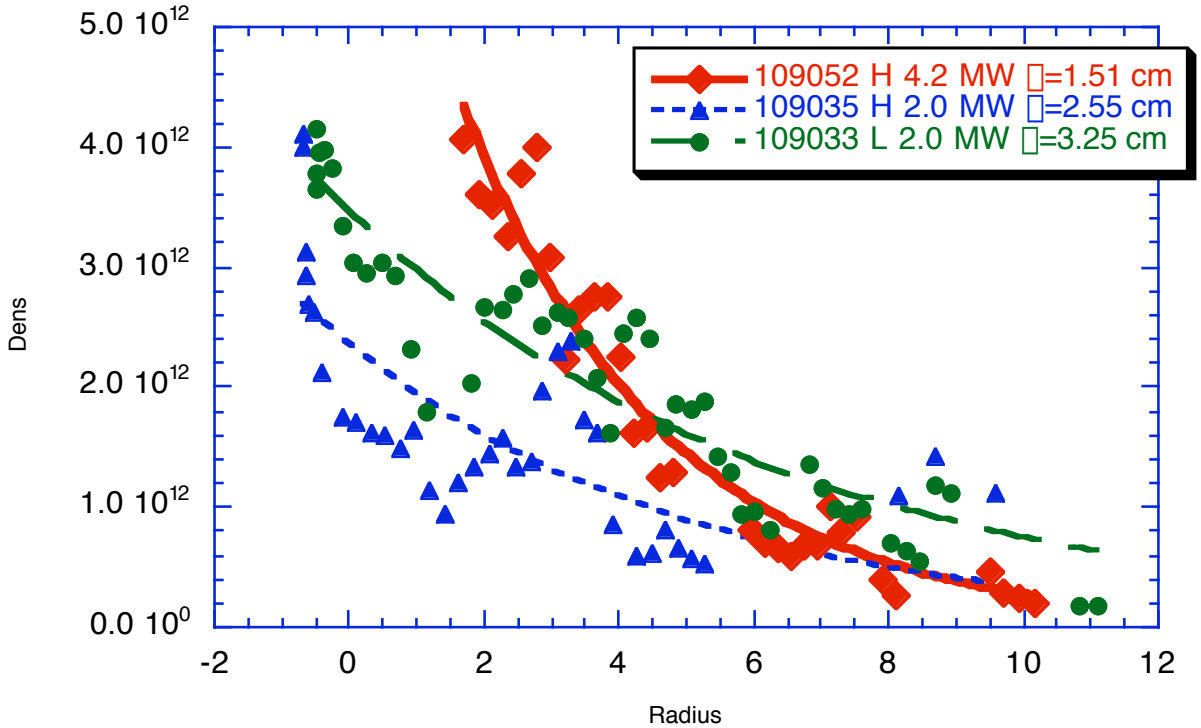
cross-field particle flux: $$\Gamma_{turb} = \tilde{n}\, \tilde{E}_{\theta} / B_{\theta}$$

convective heat flux: $$Q_{conv} = \frac{5}{2} T_e \Gamma_{turb}$$

conductive heat flux: $$Q_{cond} = \frac{3}{2} \tilde{T}_e \tilde{E}_{\theta} / B_{\theta} \; T_e \Gamma_{turb}$$

- Will add Te fluctuations capability in 2004
- Enable measurements of particle and Heat radial transport
- in L and H-modes
- Compare to other devices (DIII-D)

Continue Characterization of Edge Profiles in NSTX



Edge/SOL profiles available with high spatial (2-2.5 mm) resolution

Limited to 1086xx, 1089xx, 109032-109062

Within the limited shot space, density and power were varied. So scaling is inconclusive

So far:

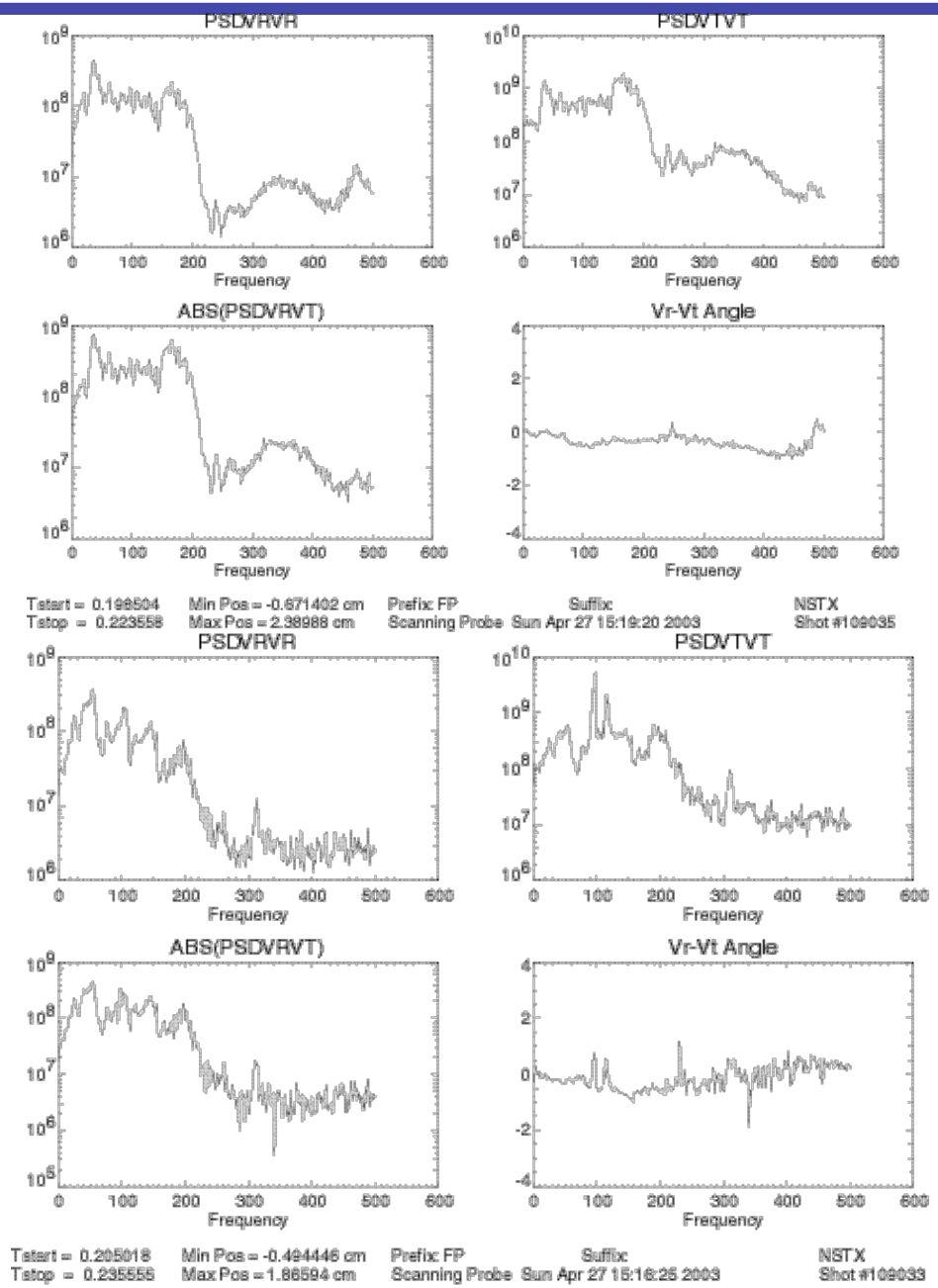
Δ_n decreases in H mode with power 2.5>1.5 cm

Will obtain wider operating space in the future and produce scalings

Reynolds Stress and Bicoherency Measurements

$$\frac{\partial u_{\square}}{\partial t} + \frac{\partial u_r u_{\square}}{\partial r} = \square\square u_{\square}$$

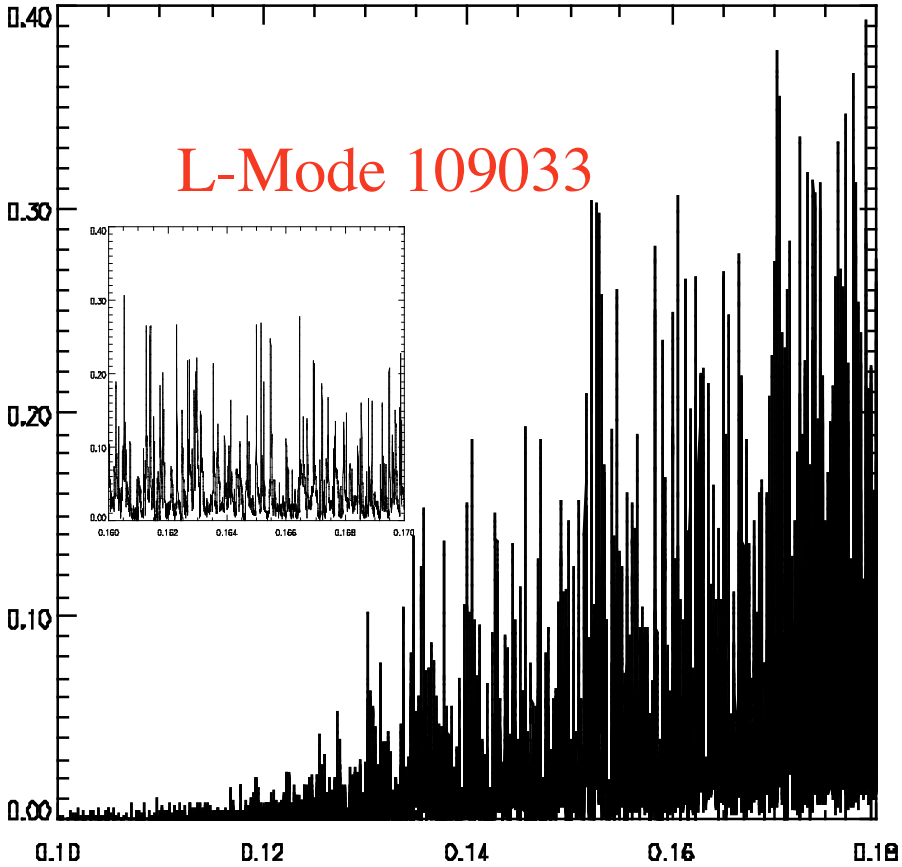
•Investigate energy cascading and self-organized flows

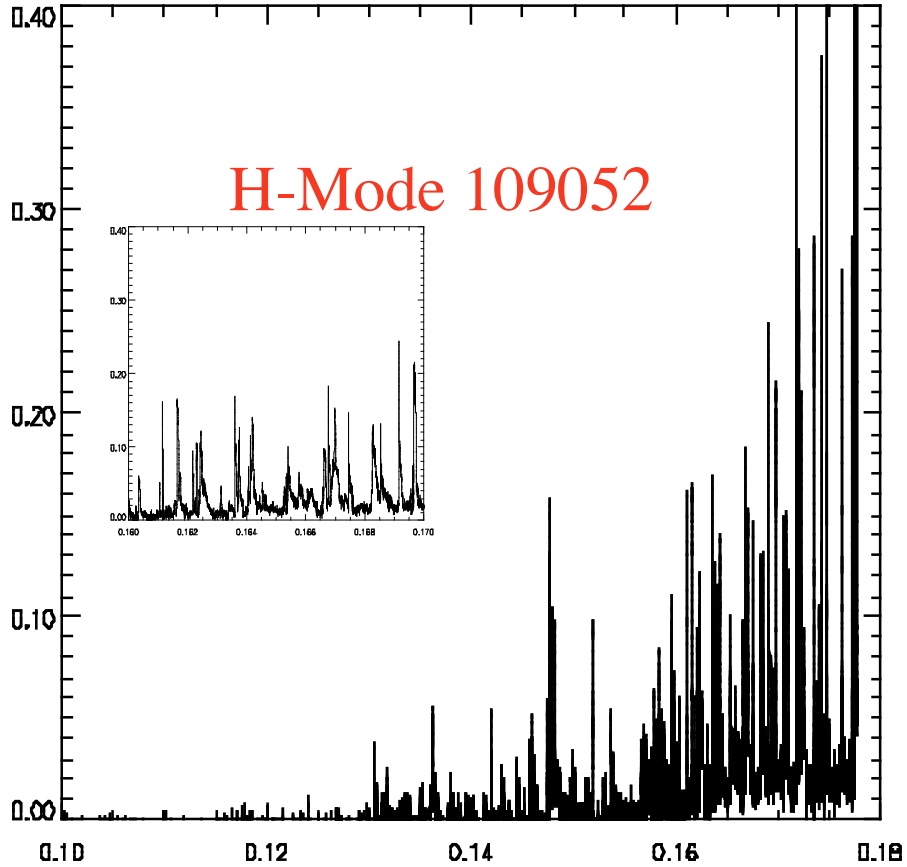


H-Mode

L-Mode

Detailed Analysis of Intermittency





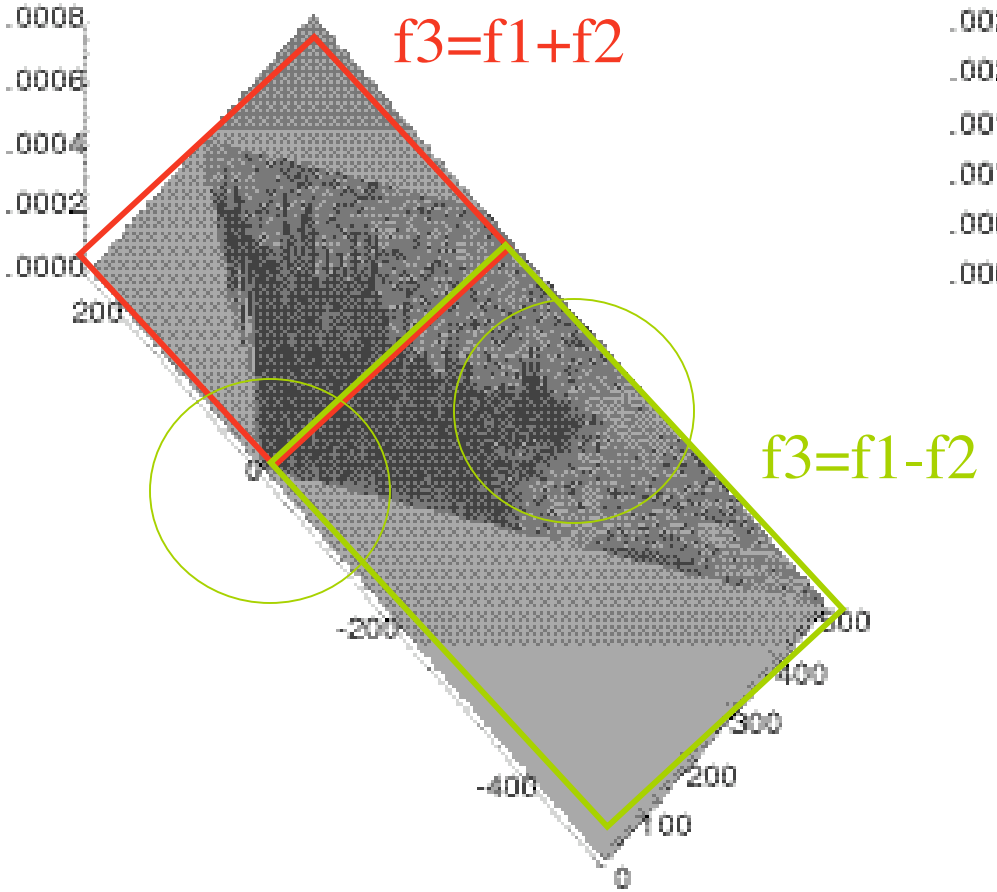
- Conditional averaging routines working
- Perform systematic analysis (need new data)
- Compare to GPI and D'Ippolitto/Myra work
- Finish wavelet analysis routines

Non-linear Analysis Ready to go

Bispectrum

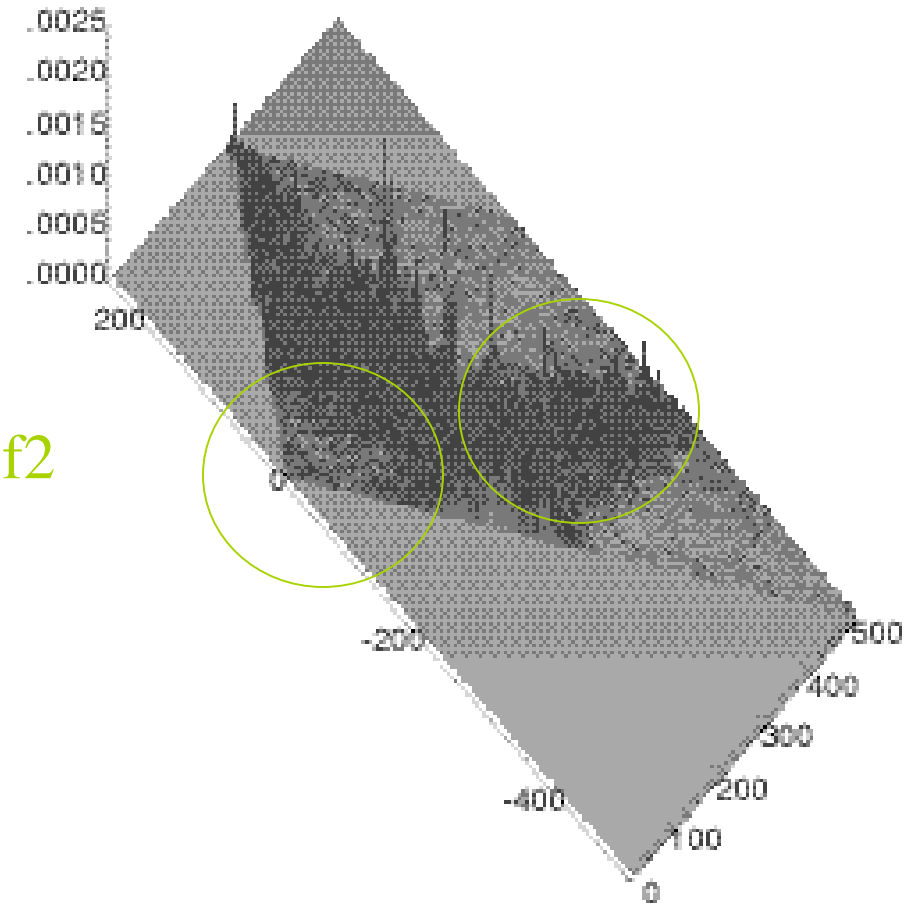
Bispectrum

H-mode



Tstart = 0.198504
Tstop = 0.223558
Min Pos = -0.671402 cm
Max Pos = 2.38988 cm
Prefix: FP
Scanning Pro

L-Mode



Tstart = 0.205018
Tstop = 0.235555
Min Pos = -0.494446 cm
Max Pos = 1.86594 cm
Prefix: FP
Scanning Pr

Tasks to be Performed

- SOL length scales with power in L and H-mode. Ongoing, need more shots.
  - Aid pedestal studies

- Able to measure Er and dEr/dr (enhanced tips and penetration)> effects on turbulence

- Will add Te fluctuation diagnostic in 2004.

- Need to quantify electrostatic turbulence in L and H-modes.
  - Compare to DIII-D

- Intermittency analysis using Conditional Averaging and Wavelet Analysis
  - Compare results to GPI (S. Zweben) and theory (D. D'Ippolitto).

- Bicoherency and Reynolds Stress codes just finished.
  - Investigate energy cascading and self-organized flows in L and H-mode

- Need to quantify electromagnetic components of transport
  - Upgraded head partially designed (need funding).
  - Collaborate with H. Ji and M. Schaffer