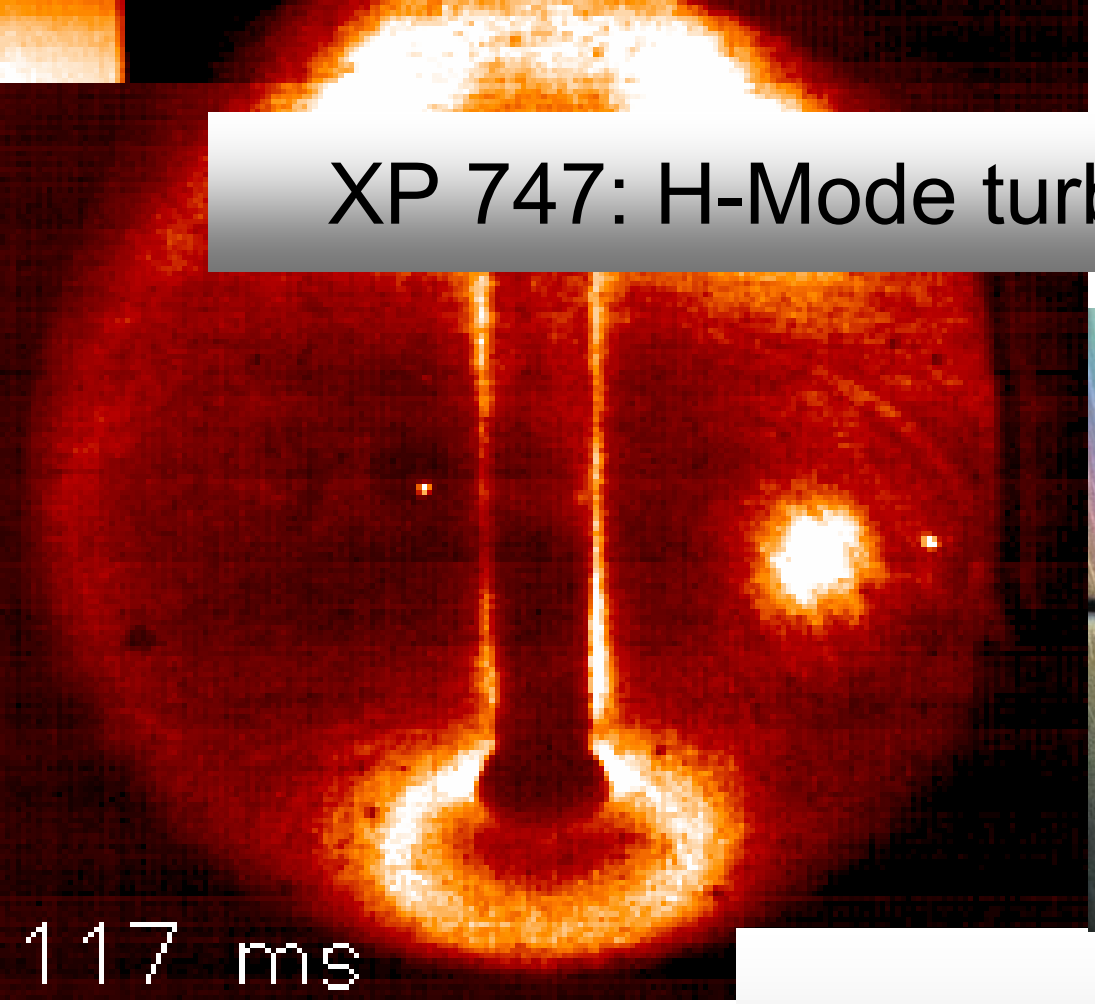
XP 747: H-Mode turbulence in NSTX



J. Boedo

For

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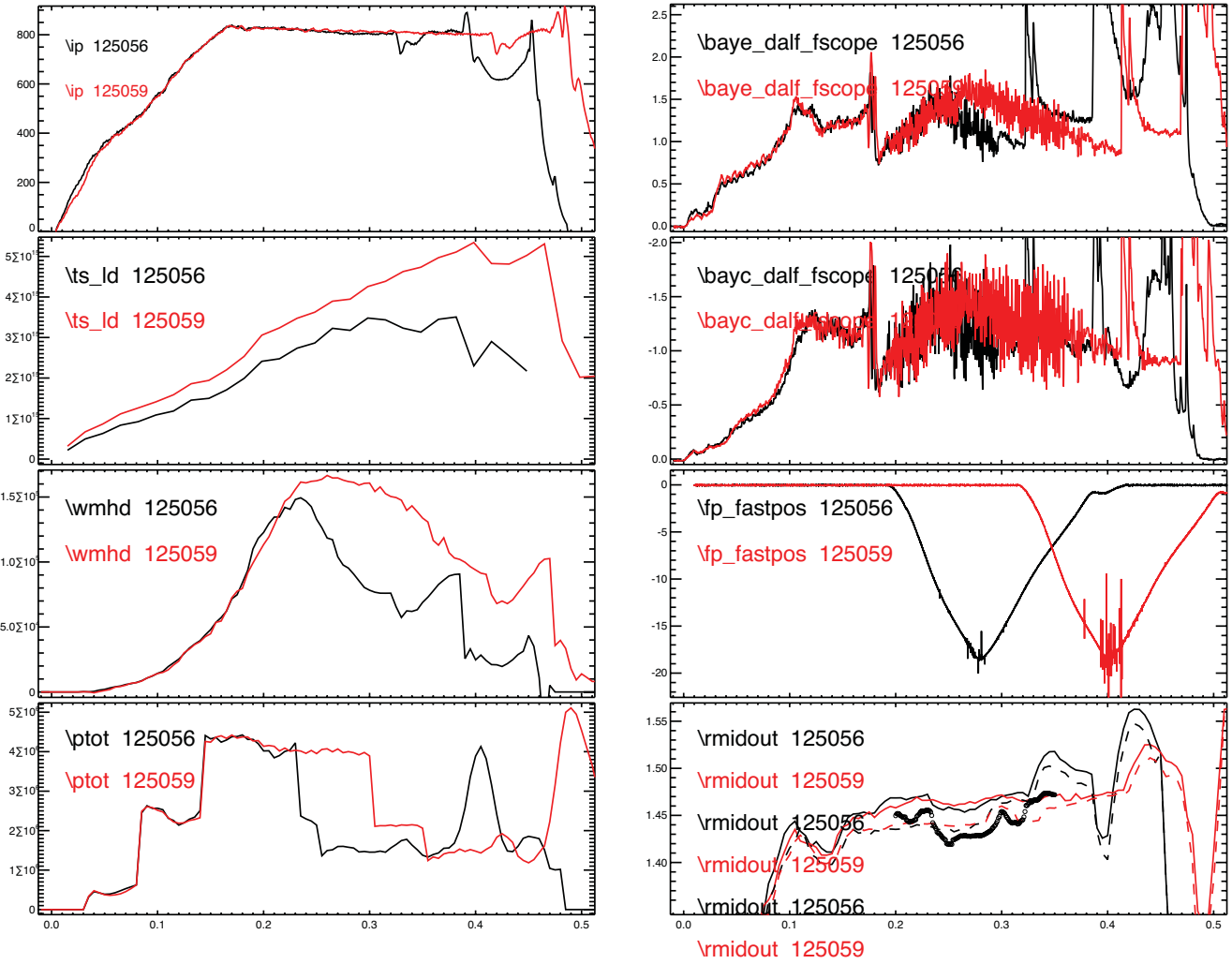
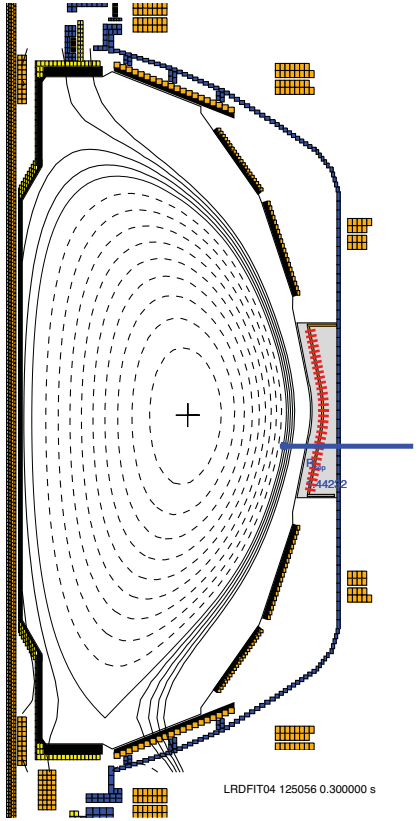
Goal: Study turbulence & Intermittency vs Ne

- Tried to finish long-standing XP on turbulence. This is the H-mode part
- 12 shots tried, 6 no/bad plasma, 6 ok shots
- Obtain Ne dependence by using natural Ne ramp. Plunge probe at various times (Ne)
- Generic predictions (BOUT) are a dependence of turbulence on Grad Pe I.e. Ne
- Important since radial transport will have scaling with Ne

LSN Low Power H-Mode Discharges

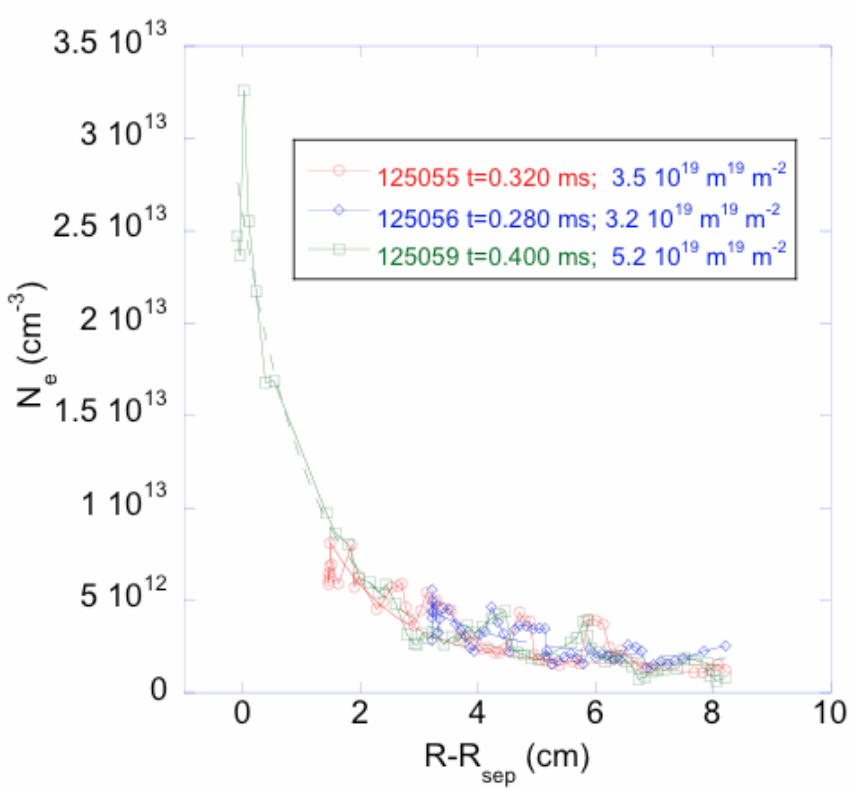
- H-mode extended to higher Ne by keeping NBI on longer

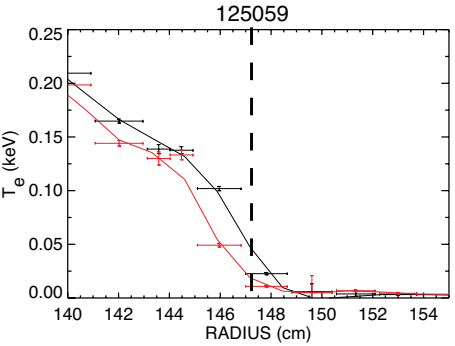


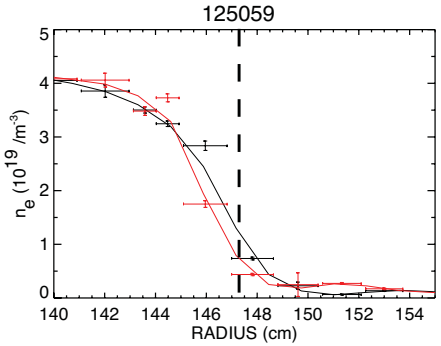


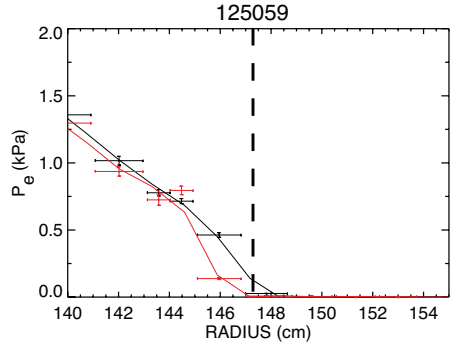
Ne profiles using LRDFIT04

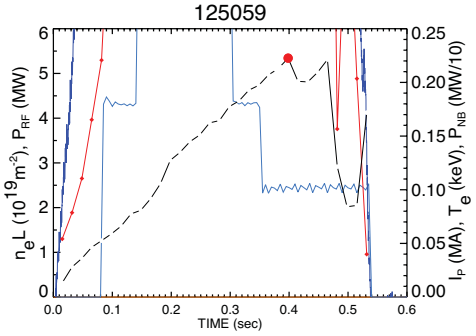
- Data comparable to TS
- Decay length~ 1.2-1.5 cm (comparable)
- Far SOL Ne comparable



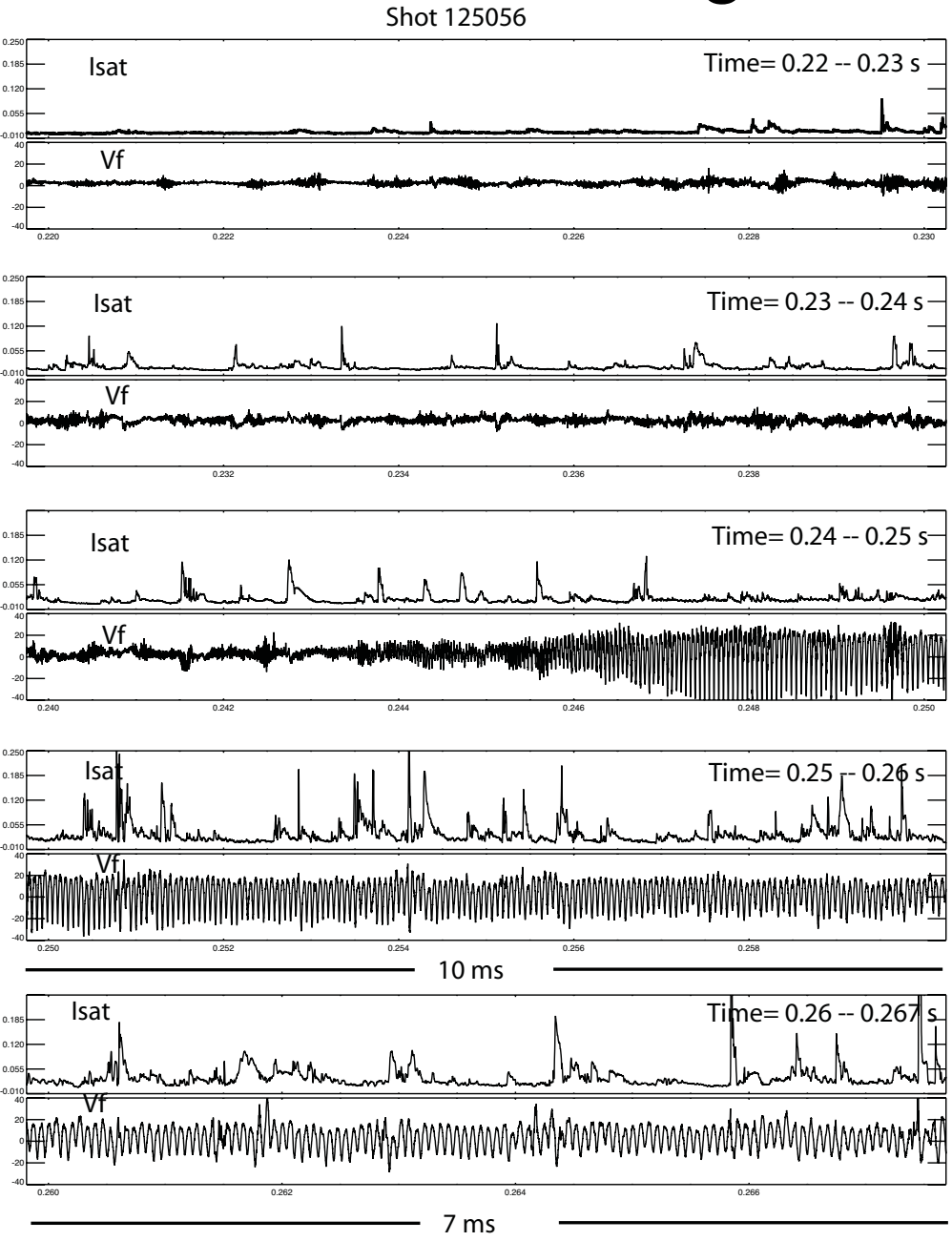








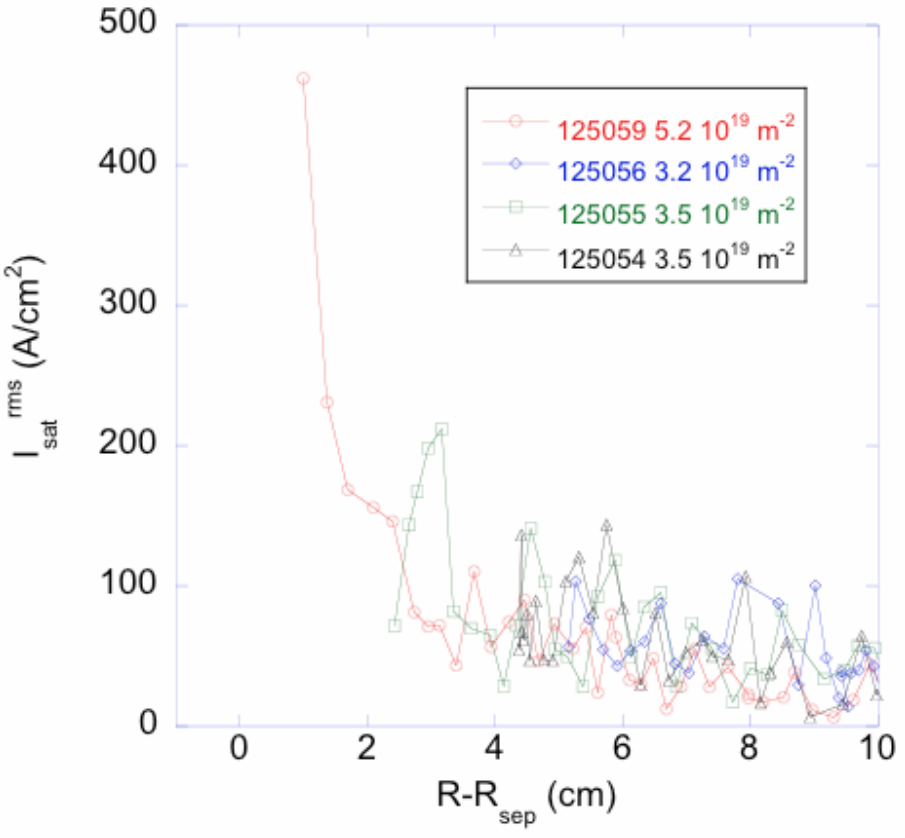
Basics: Strong Intermittency in Signals

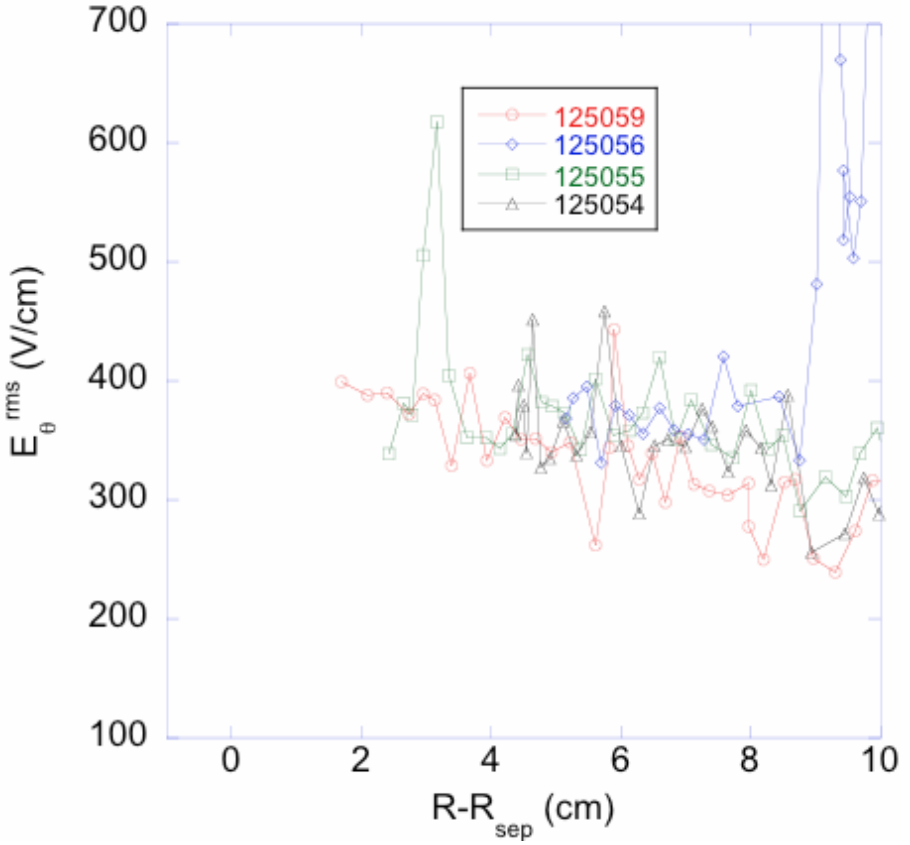


- Far SOL and near SOL quite different
  - Larger amplitude in near SOL
  - More frequent
  - Amplitude decreases into the SOL
  - More spaced in far SOL (IPO loss)
  - Oscillation in Vf closer to LCFS (coherent mode?) BUT results in no transport

Rms level show no/weak Ne dependence in SOL

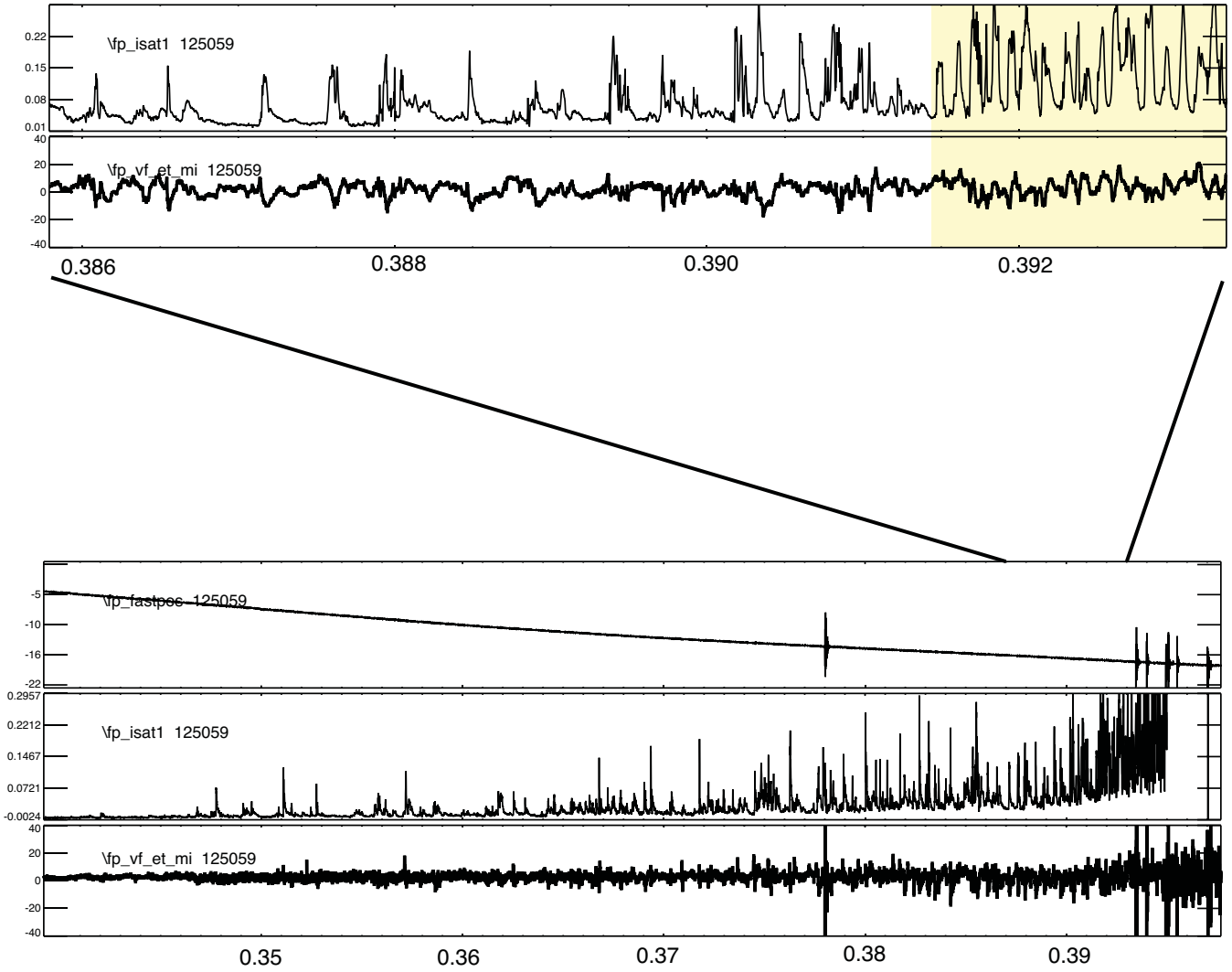
- However, Isat rms level shoots up near/at LCFS at highest density /deepest penetration shot
- Why?





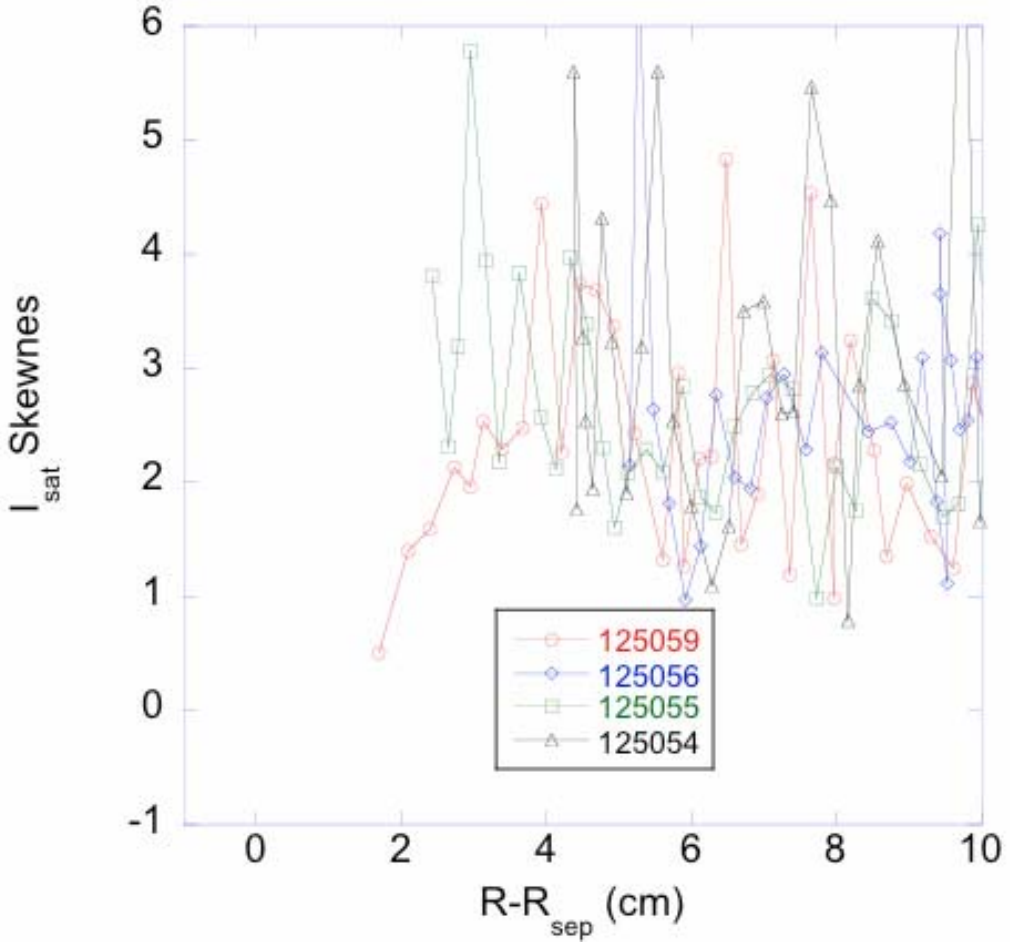
Transition in Intermittency Occurs Near LCFS

- Signal becomes almost periodic (yellow area)



Skewness similar to D3 and others

- Isat skewness measures fluctuations deviation from Gaussian/symetry
  - Negative inside LCFS
  - Zero ~ LCFS
  - Strongly positive in SOL



Conclusions and Follow-up Work

- H-mode Transport is also strongly intermittent
- Coherent oscillations show in near SOL (Ne, but also Vf)
- Intermittency decays in the SOL
- Intermittent objects spread out and thin out into the SOL
- No obvious Ne dependence
- Compare to L-mode cases
  - No density dependence
  - Decay lengths
- Investigate coherent oscillation > no Vf osc effect on transport