Flows, Turbulence, and the Edge Plasma in NSTX

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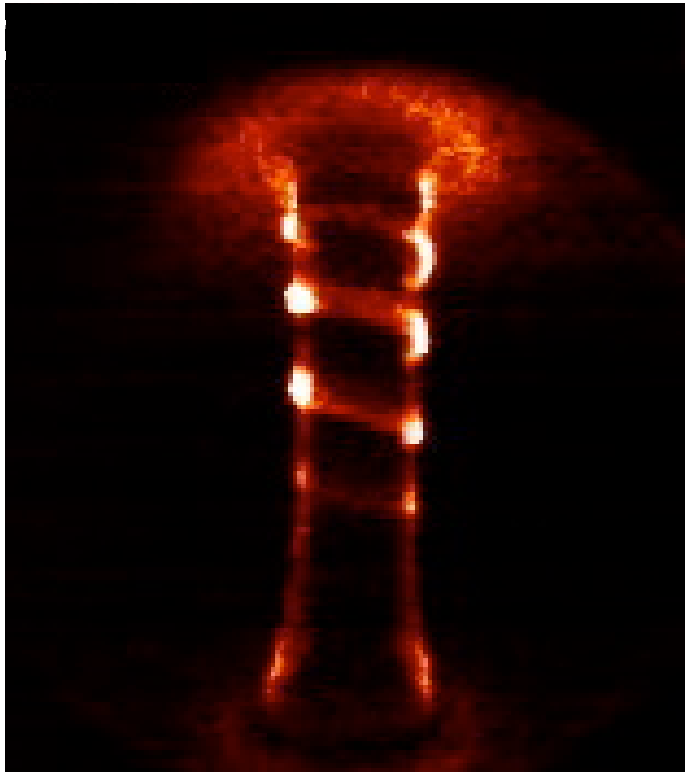
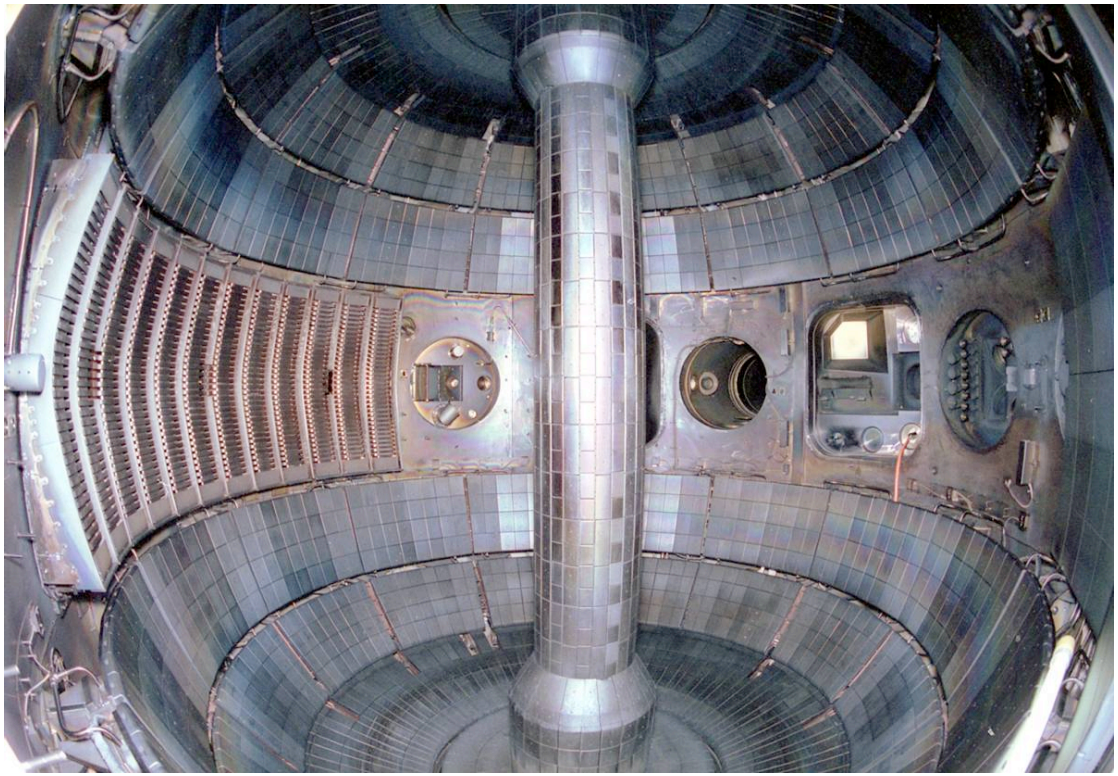


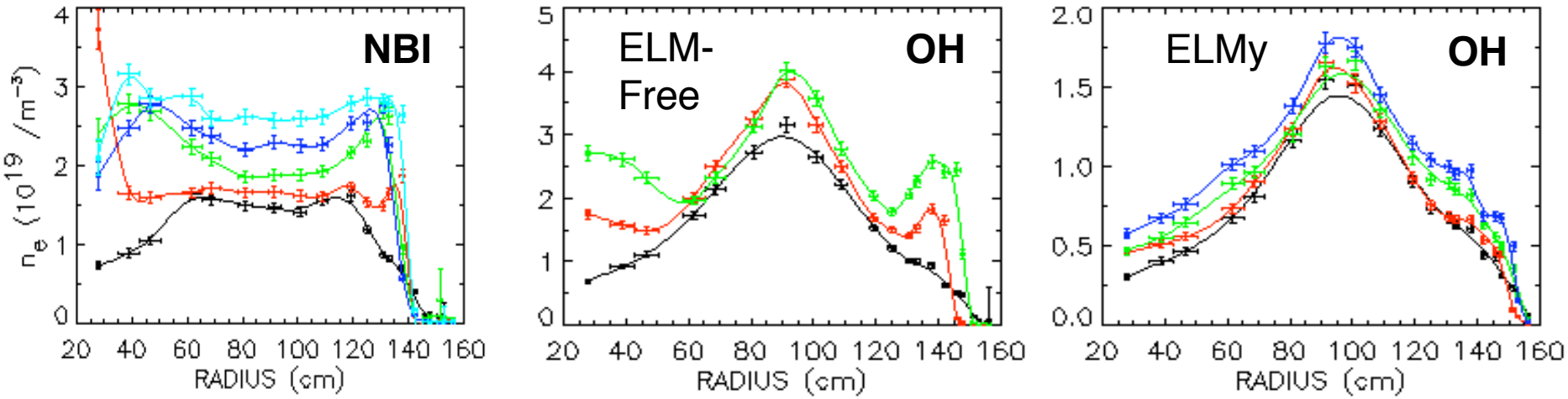


- XP442 - Scoping Study of Ohmic H-modes
- Fast Cameras - Flows, turbulence, and phenomena
- Tile Langmuir Probes

NSTX 2004 Results Review, Sept. 20-21

Motivation

- Ohmic H-modes have low centrally peaked densities
  - Explore edge and core turbulence simultaneously
  - Target plasma for early NBI and combined ITB and ETB



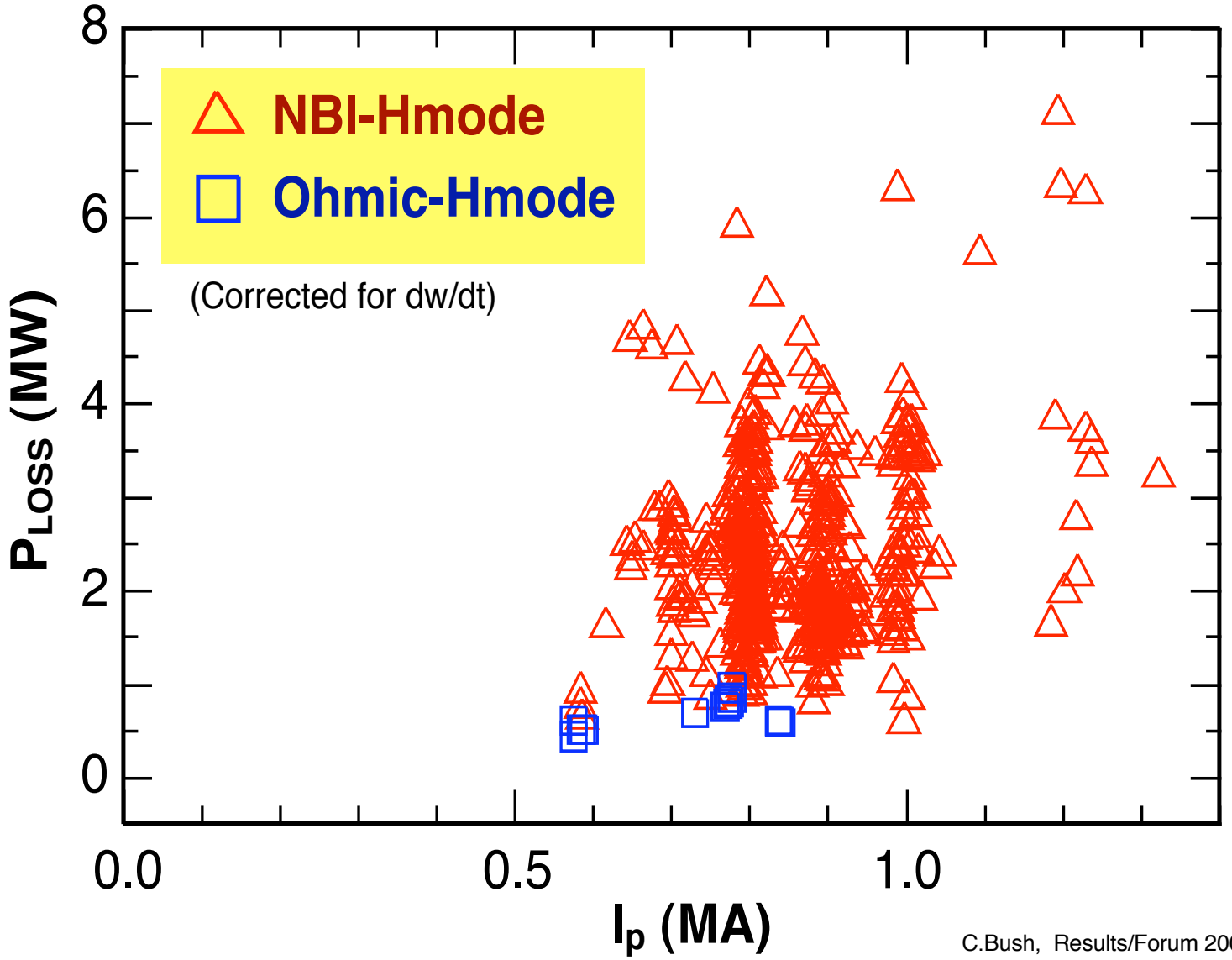
Goals

- Scoping study in parameter/configuration space
- Measure turbulence in core and edge of H-mode simultaneously
- Assess use as Target Plasma

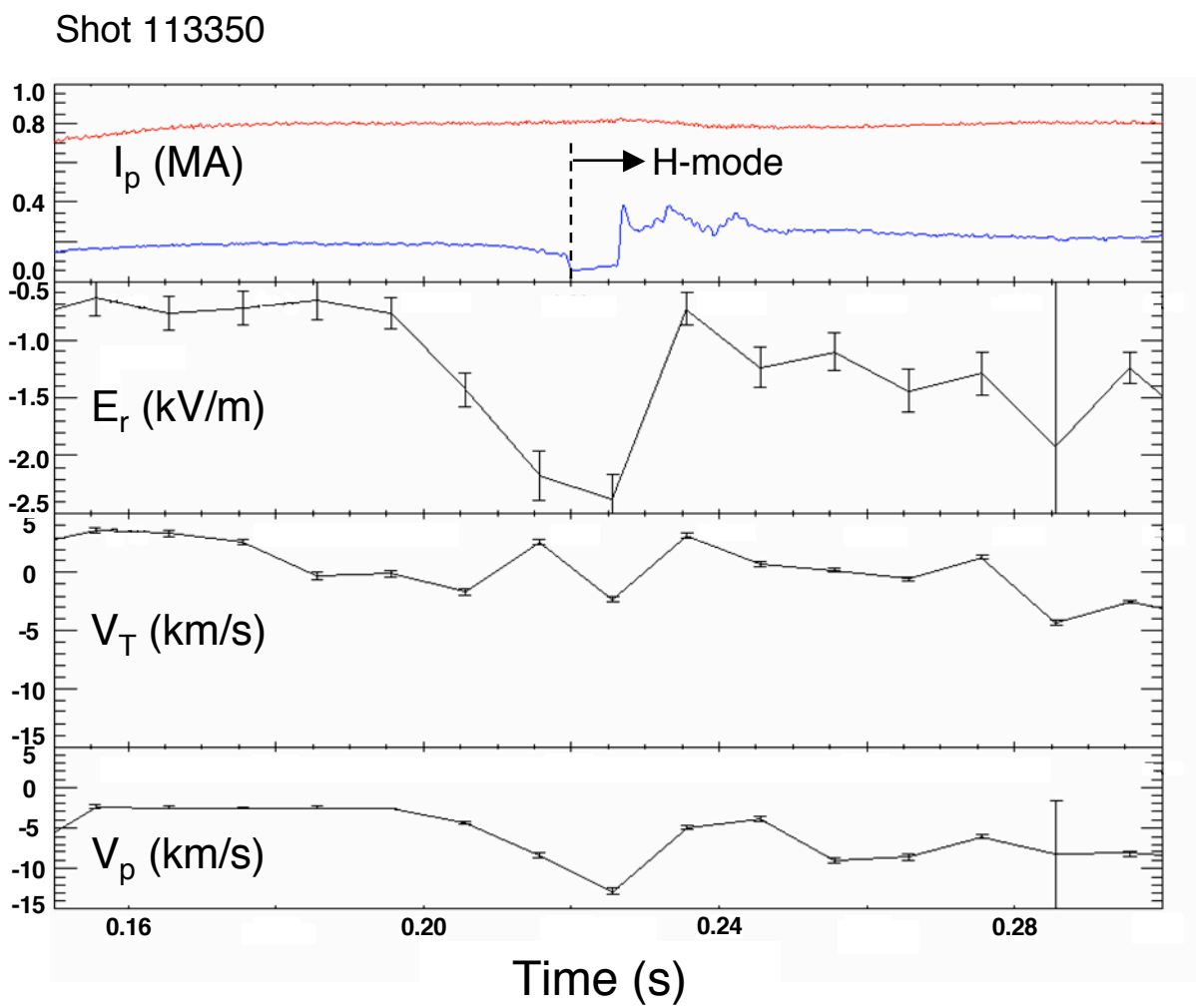
Results for Ohmic H-mode Scoping Study

- One-half run day – mini-scans in B_t and I_p
  - Some OH-H-modes randomly on other days
- H-modes at 600 to 900 kA, 3.0 to 4.5 kG TF
  - Short H-mode at I_p = 600 kA, B_t = 3 kG
- OH H-modes obtained for 1st time ever on NSTX during this run
  - Most readily obtained after hot boronization
  - Alternating helium conditioning shots seem to help
  - Obtained both double null (DN) and lower single null (LSN) divertor
  - Most short duration, some with ELMs and some ELM-free
- Peaked Central n_e
  - ELMy: Small high frequency ELMs (?) keep ears from developing
  - ELM-free: have ears, but edge peak lower than central n_e
- No turbulence measurements made in core of OH H-mode
- Some edge reflectometer fluctuation data; Some GPI data, not L-H

PLOSS for NBI and OH Hmodes



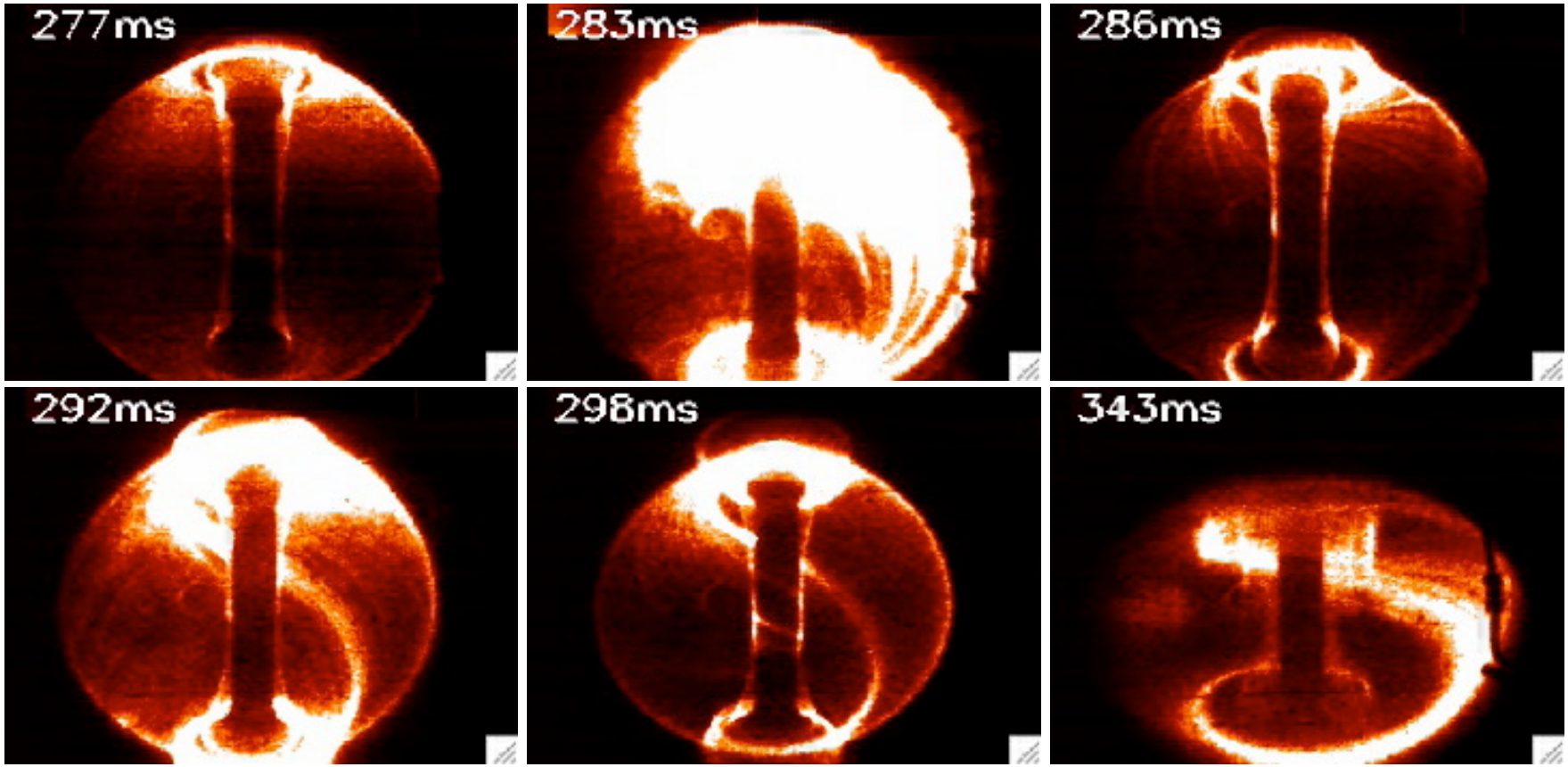
Edge measurements (ERD) in Ohmic H-modes show E_r and V_p change prior to L-H transition



E_r and V_p begin to change 10 to 20 ms before L-H transition (here at t ~ 0.220 sec)

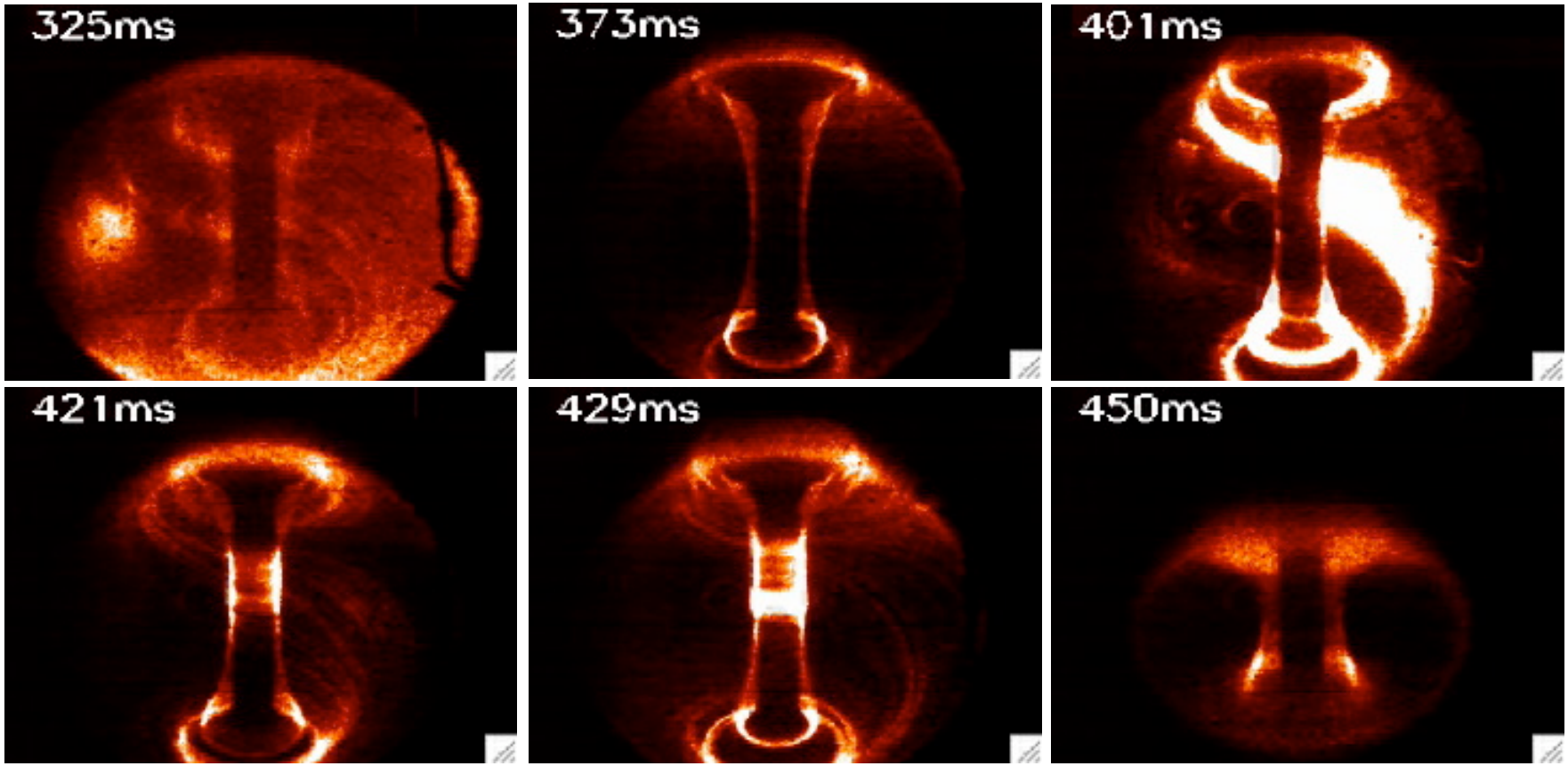
Highest Normalized β ($\beta_N \sim 35\%$) Shot: Perturbed by an External Kink Mode: (CIII filter)

Shot 114463



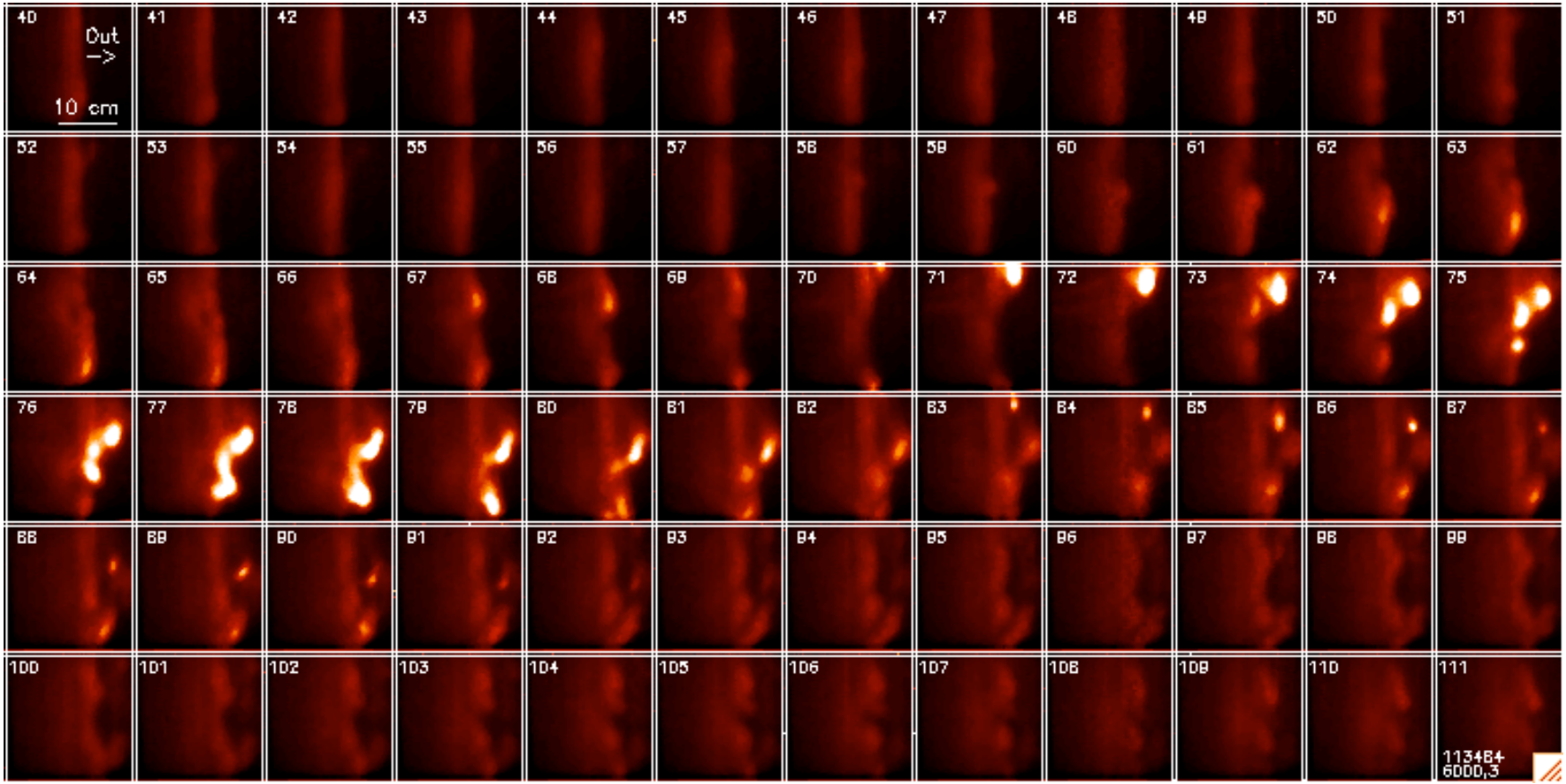
H-mode Showing Quiescent → External Kink → Small Torus at EOS: (CIII filter)

Shot 114151



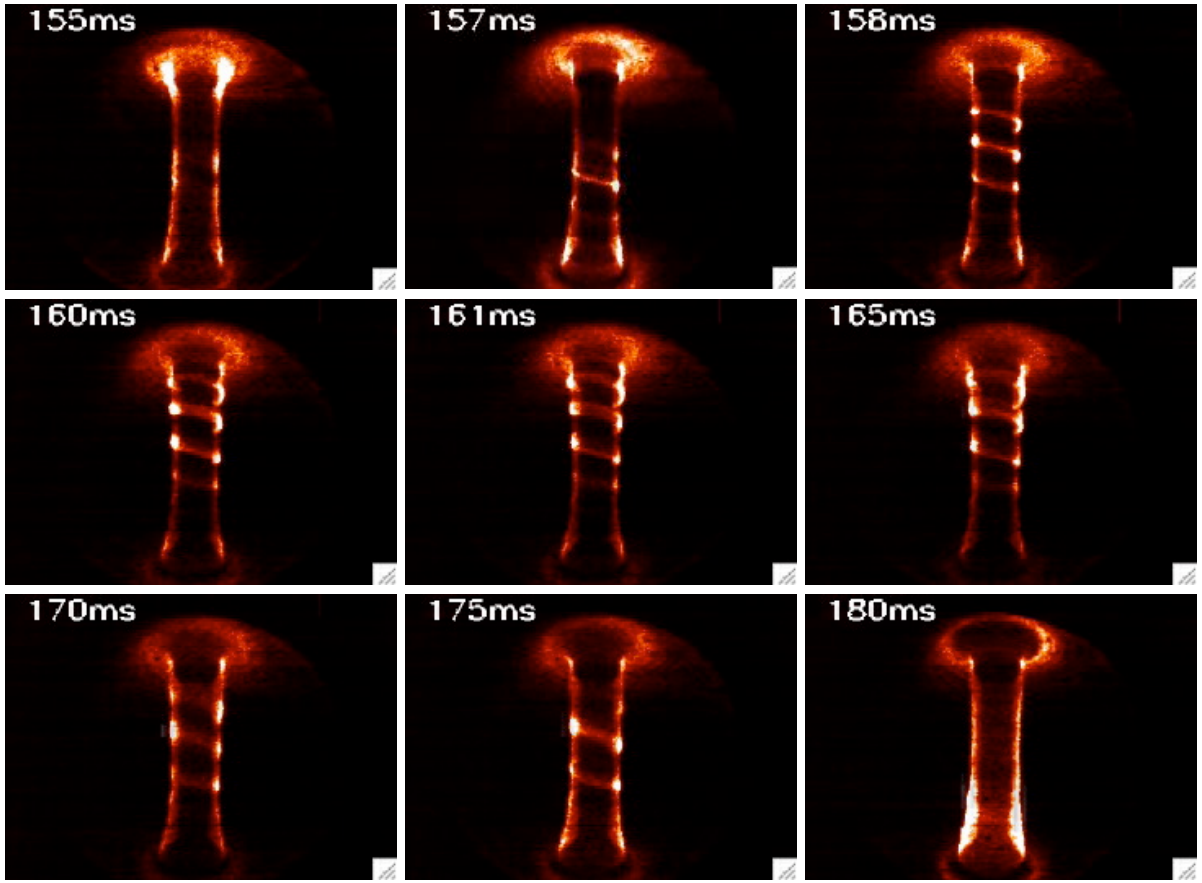
Medium ELM Images #2

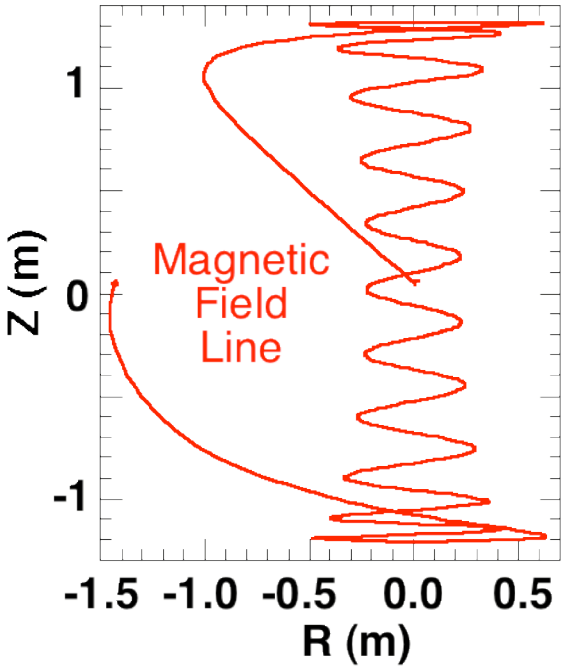
#113484 @ 4 μsec/frame (D_α light)



Activity Near Inner Wall During and Following an ELM (157-175 ms)

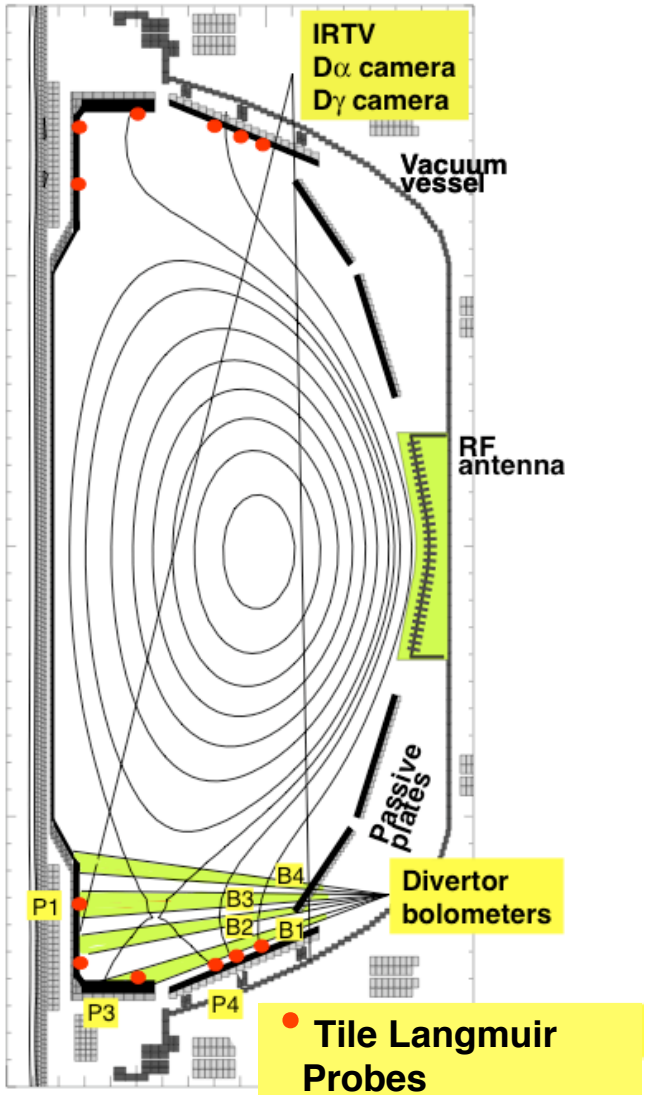
Shot 113862





Magnetic field line plot from EFIT

Langmuir Probes



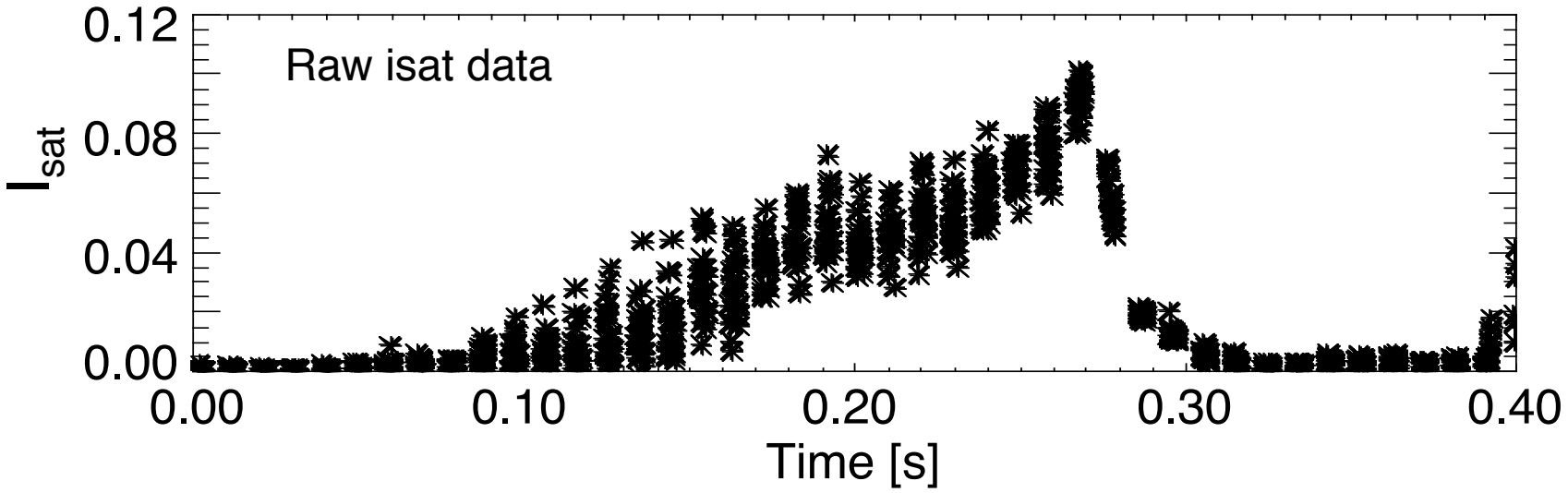
- Flush mounted single probes
- Total of 22 probes, 6 top and 6 bottom divertors
  - Remainder along centerstack
- Have data for vast majority of shots
- Virtually no signal from centerstack probes when plasma is diverted
- Some I_{sat}, T_e, n_e data in Tree soon

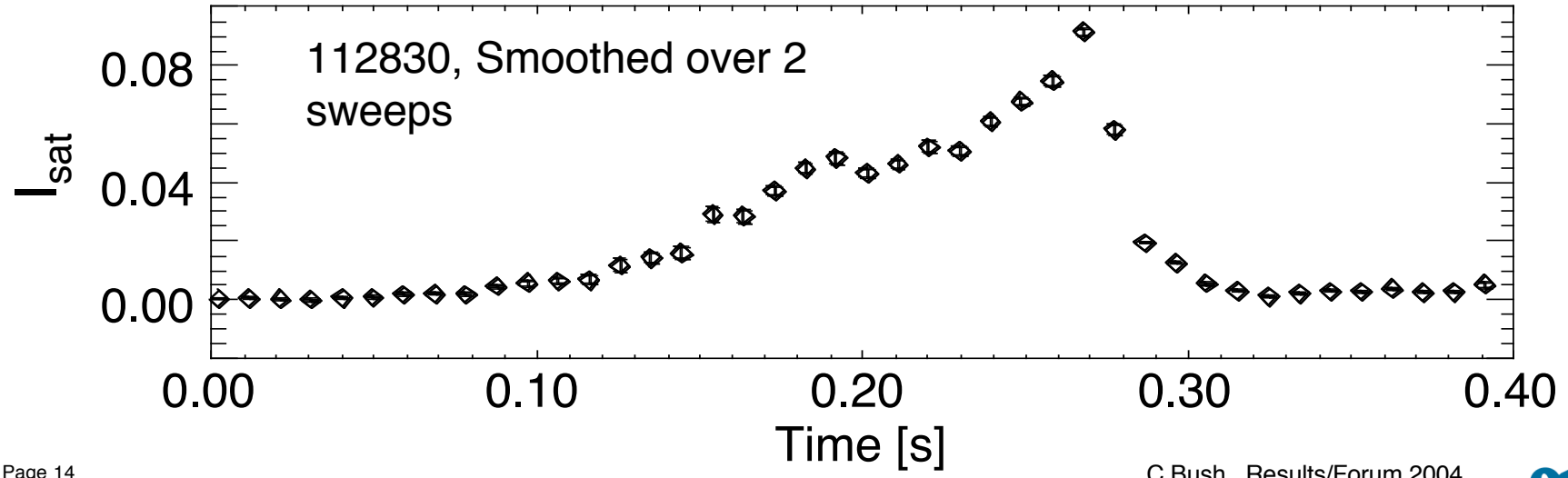
Future Plans

- Continue XP442
  - Get core turbulence data
  - Finish scoping studies
- Fast camera studies
  - Add filters – CI, LiII, Neon
  - Correct fisheye distortion
- Langmuir Probes
  - Get data in tree
  - Additional probes (?)

Extras

Ion Saturation Current vs. Time





Activity Near Inner Wall During an ELM (160 ms)

Shot 113862