# Electrodes for SOL Control (XP #806)

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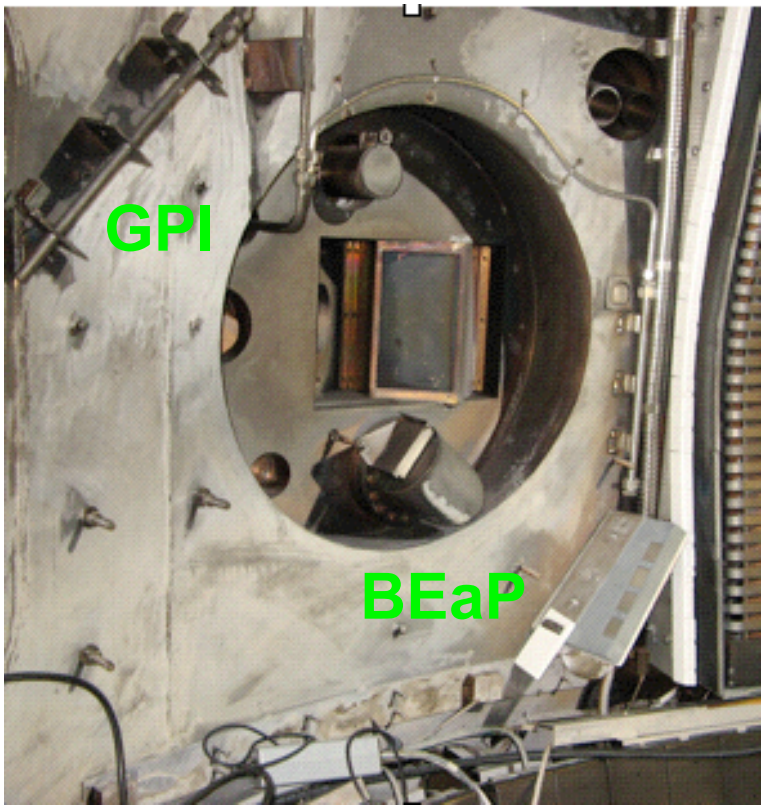
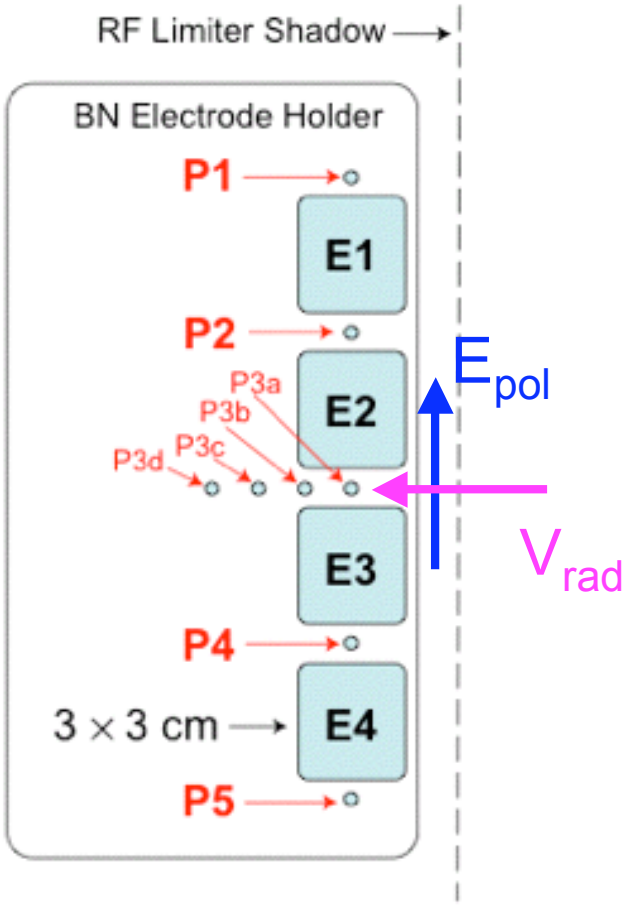
Goals:

- Broaden SOL with local $V_{rad}=E_{pol}$ x B made using biased electrodes (based on idea from LLNL)
- Understand penetration of electric fields II and $\perp$ B

Result: SOL broadened in L-mode, H-mode, Ohmic & RF

# Electrode Hardware and Location

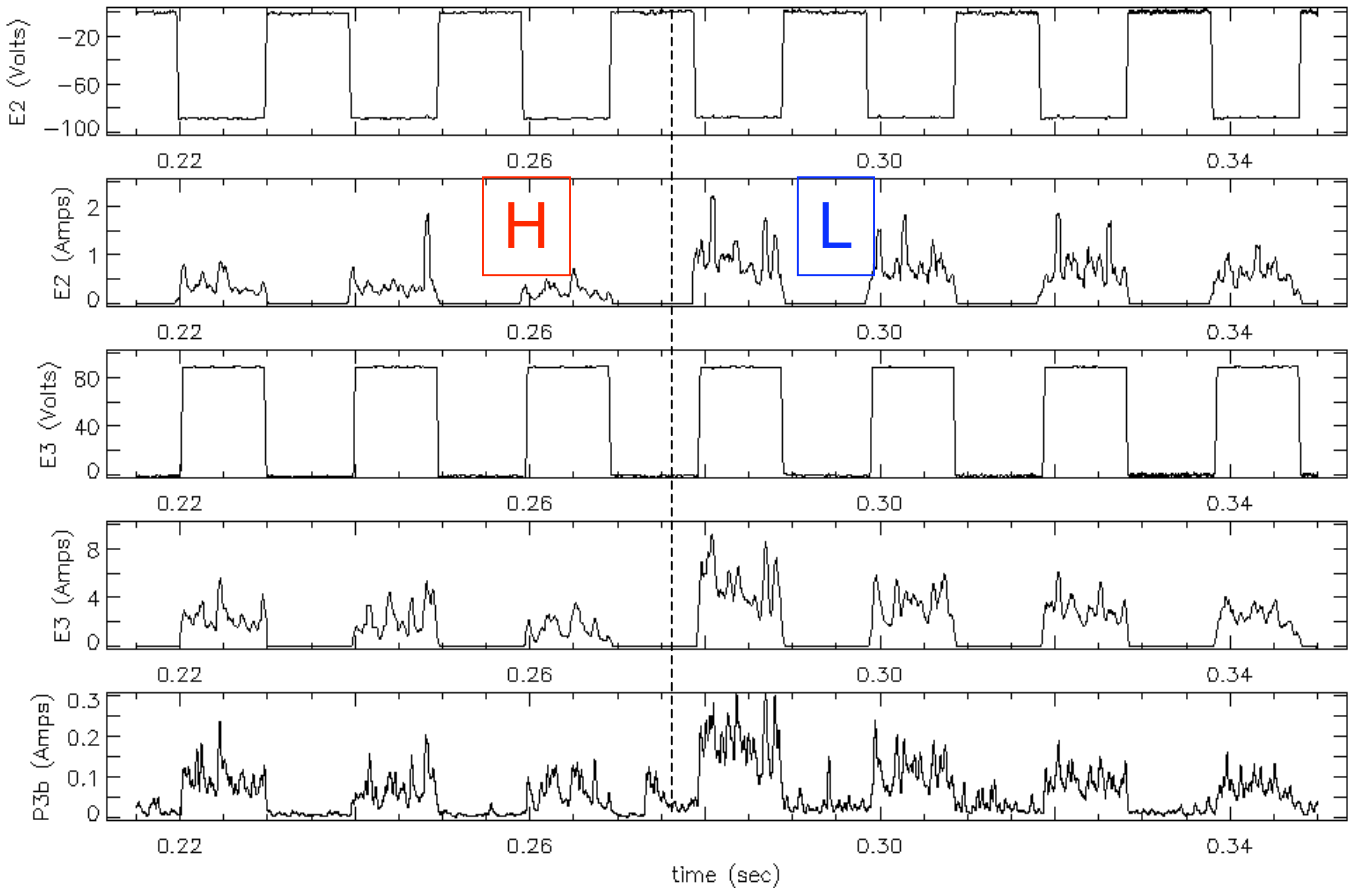



- E2 and E3 were ±90 volts for this experiment

# Signals from Electrodes and Probes

I = 0.8 MA, B=4.5 kG, P = 2 MW NBI (#127054)




E2 voltage

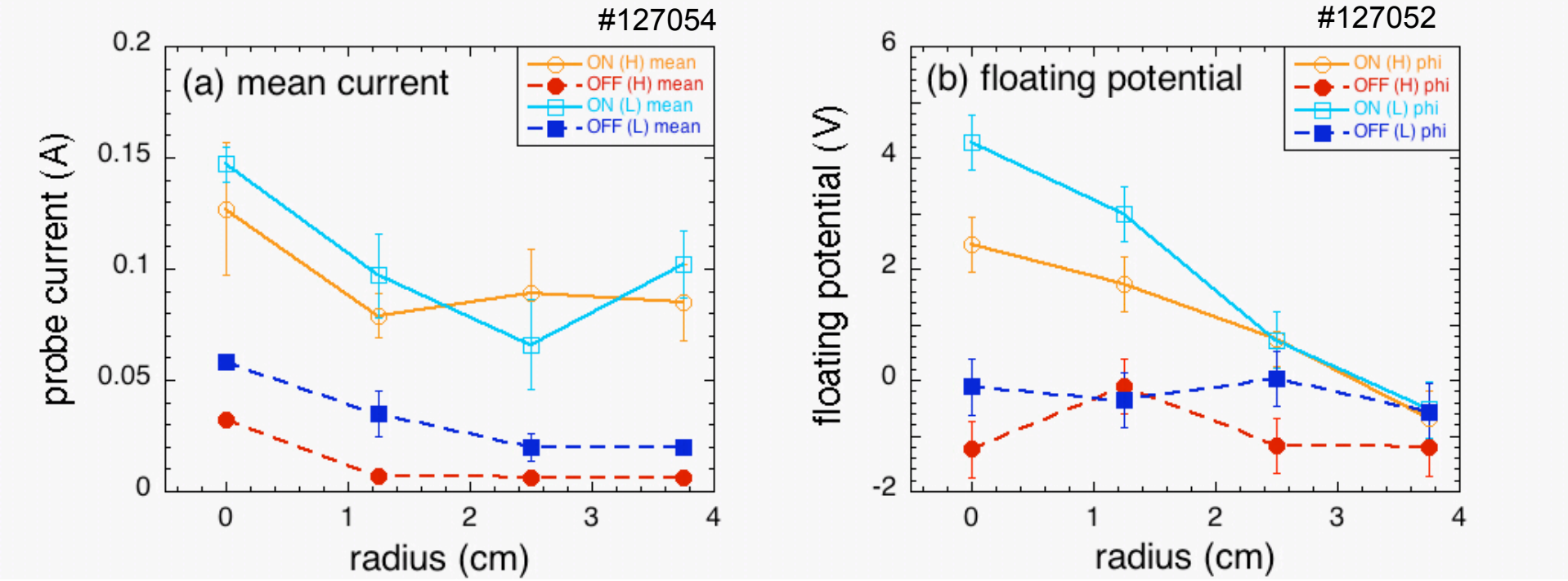
E2 current

E3 voltage

E3 current

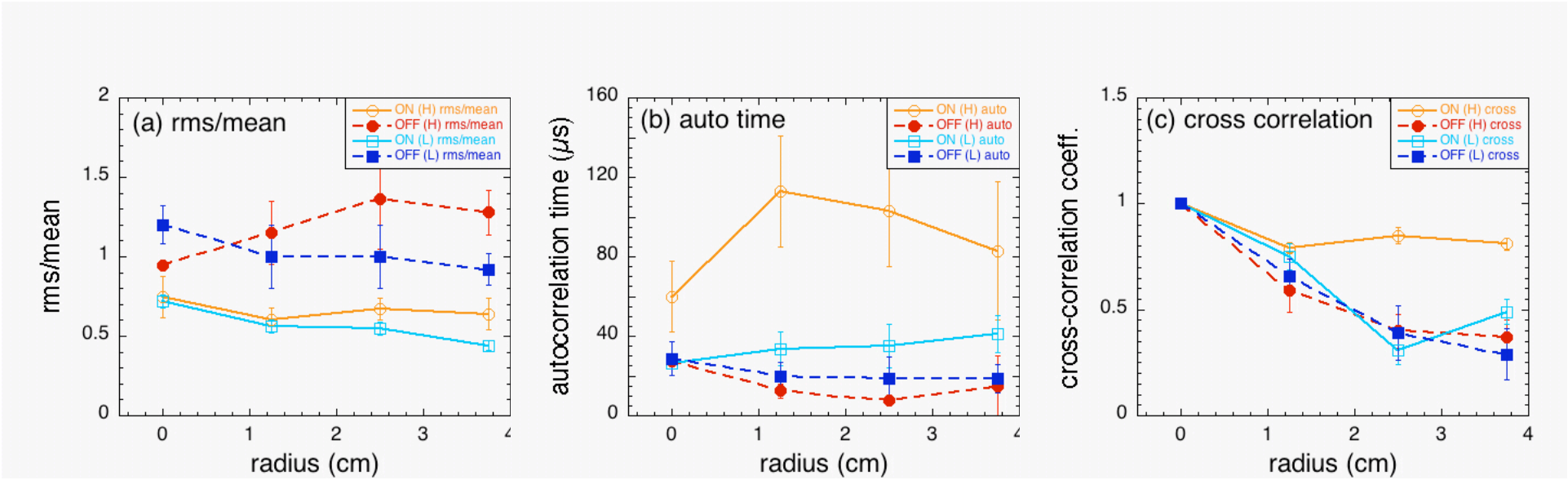
P3b current
+45 volts

# Example of Radial Profiles Effects



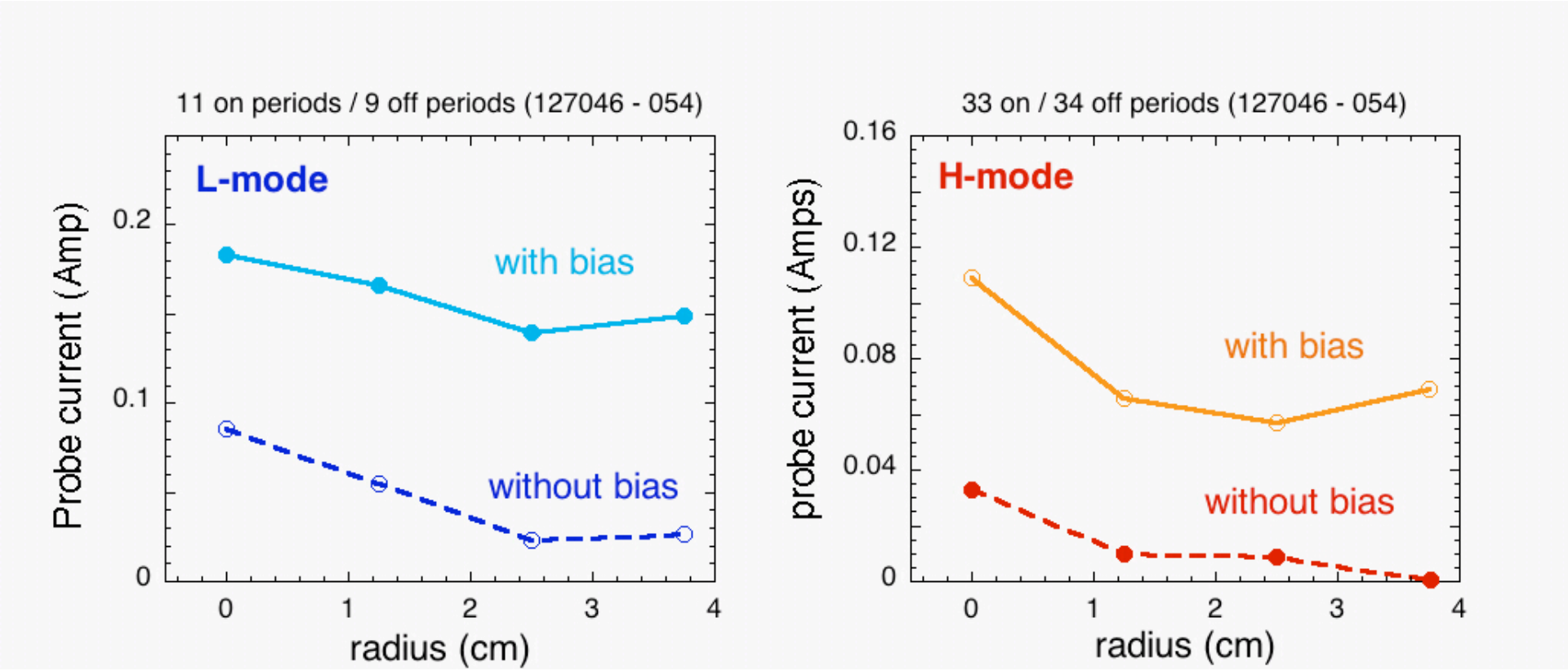

- Probe e-sat currents increase x 3-10 with electrode bias
- Probe potentials increase by + 4-5 volts near electrode

# Turbulence Effects of Biasing



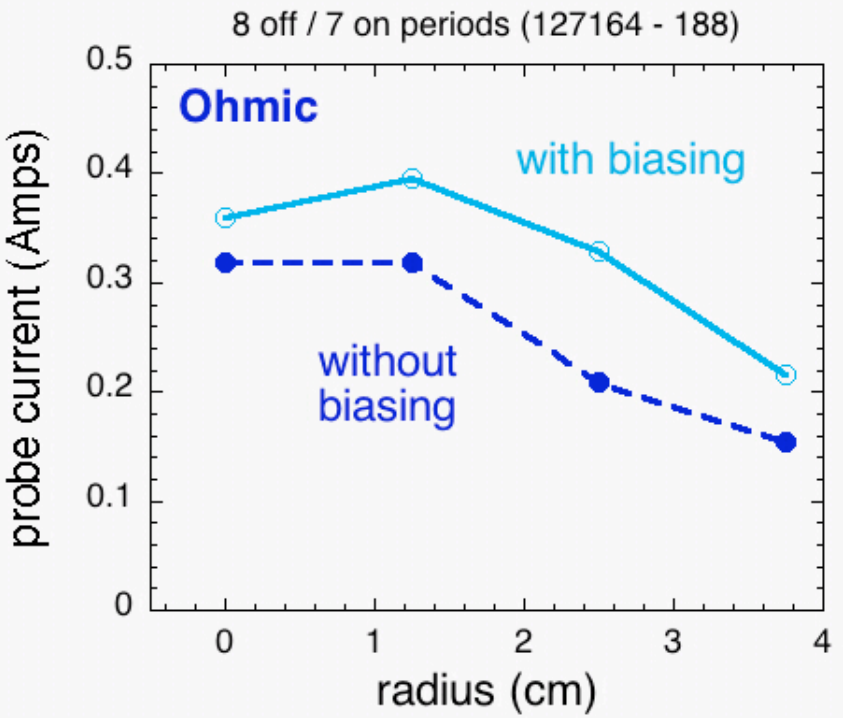

- Fluctuation level reduced somewhat with biasing (to ~ 0.5)
- Correlation times and lengths ~ unchanged by biasing, except due to small ELMs in H-mode biased case

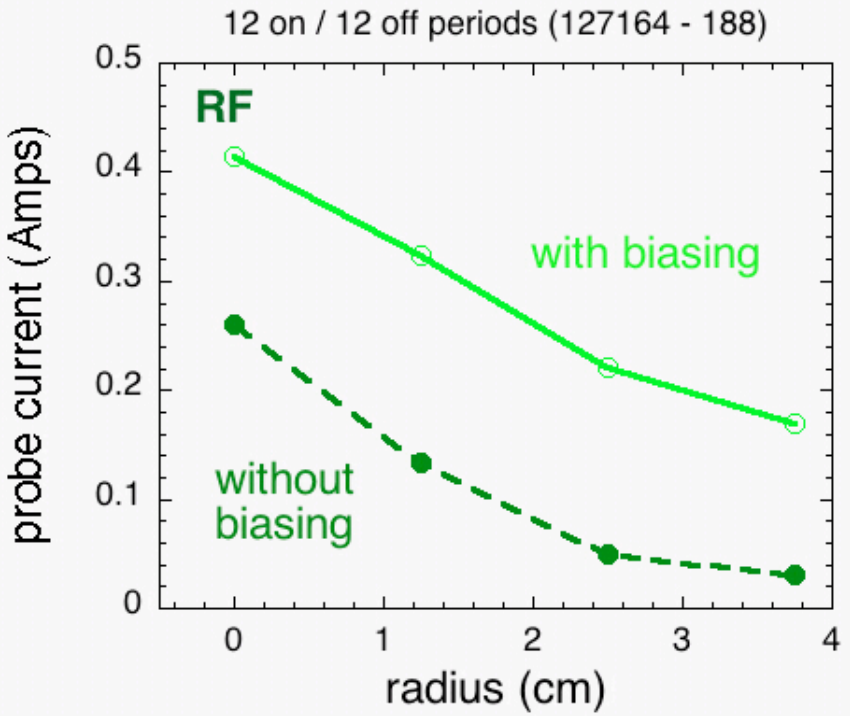
# Average Over 4 Shots from XP #806




- Consistent increase in SOL density with biasing

# Average Over 4 Ohmic and RF Shots

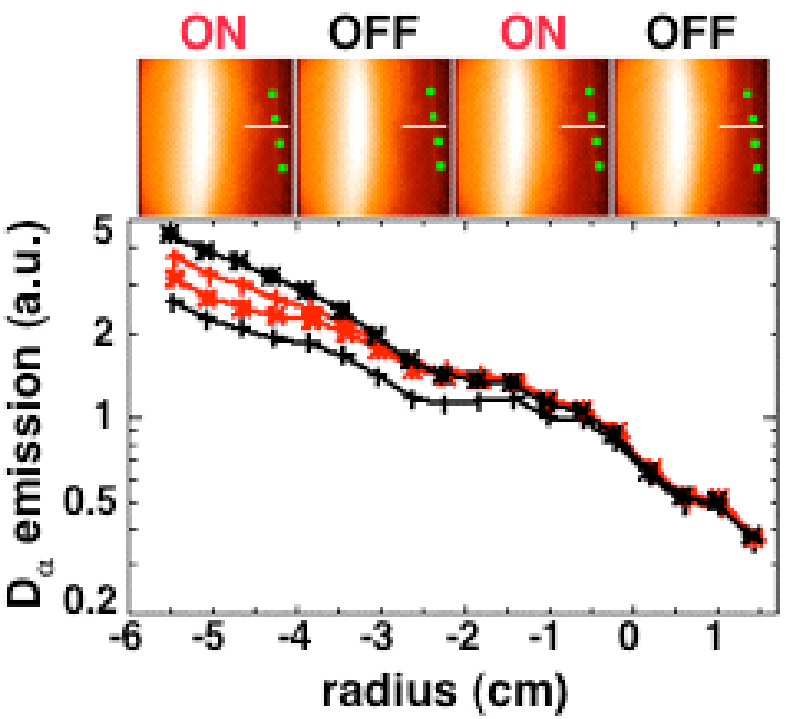


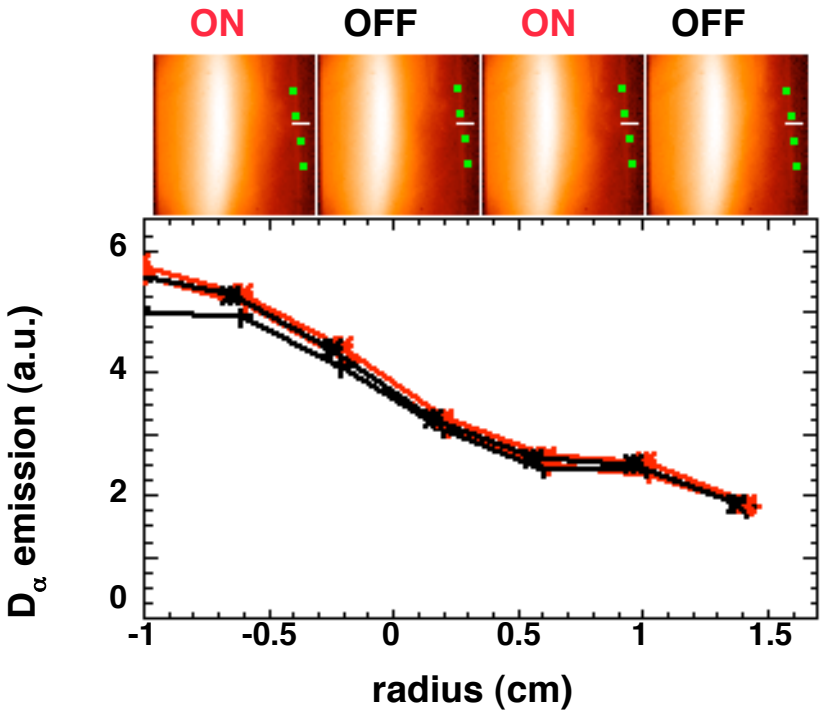




- Less increase with biasing in Ohmic (but only ±50 volts)
- Interpretation of probe data with RF maybe an issue

# Radial Profiles of $D_\alpha$ from GPI

- no significant change in $D_\alpha$ profiles ~ 1 meter along B
- apparently profile changes do not get this far along B



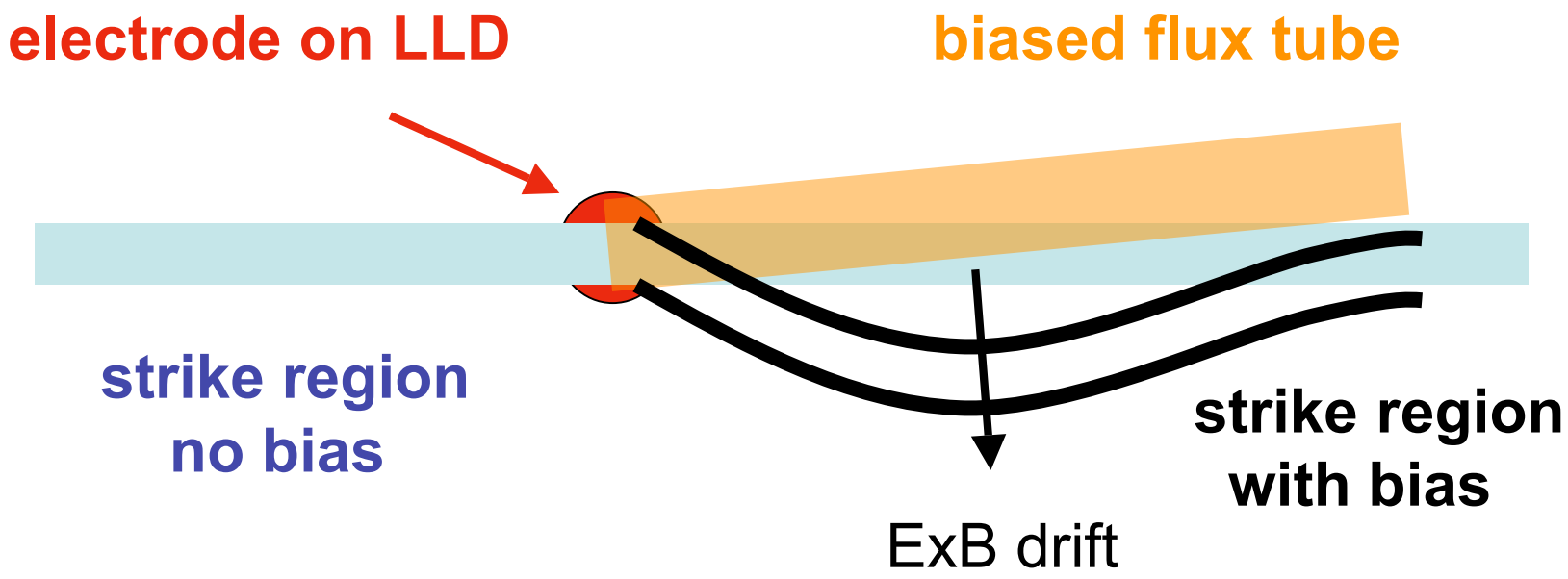
# Summary and Plans

- SOL broadened with biasing in L- and H-mode, OH and RF
- Electric field penetrates ≤ 1 m along B and a few cm ⊥ B
- Caveats:
  - so far only done in far-SOL (shadow of RF antenna)
  - so far requires currents near electron saturation
- Plans:
  - try ‘floating double probe’ bias to reduce current
  - maybe try electrodes in diagnostic segment of LLD

# Biased Electrode(s) for LLD

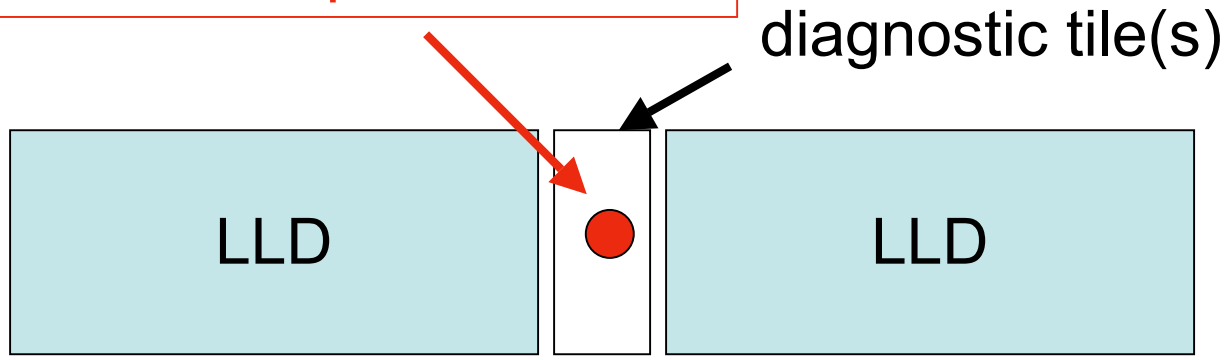
Goals:

- Measure motion of divertor strike region with electrode bias
- Understand physics of electric field propagation ll and ⊥ B



# LLD Electrode Design Options

Single Electrode ~ 3 cm diameter
±100 volts, ~ 30 Amp max current




Two electrode option