Thomson Scattering on NSTX

B. P. LeBlanc

NSTX Five-Year Plan Ideas Forum

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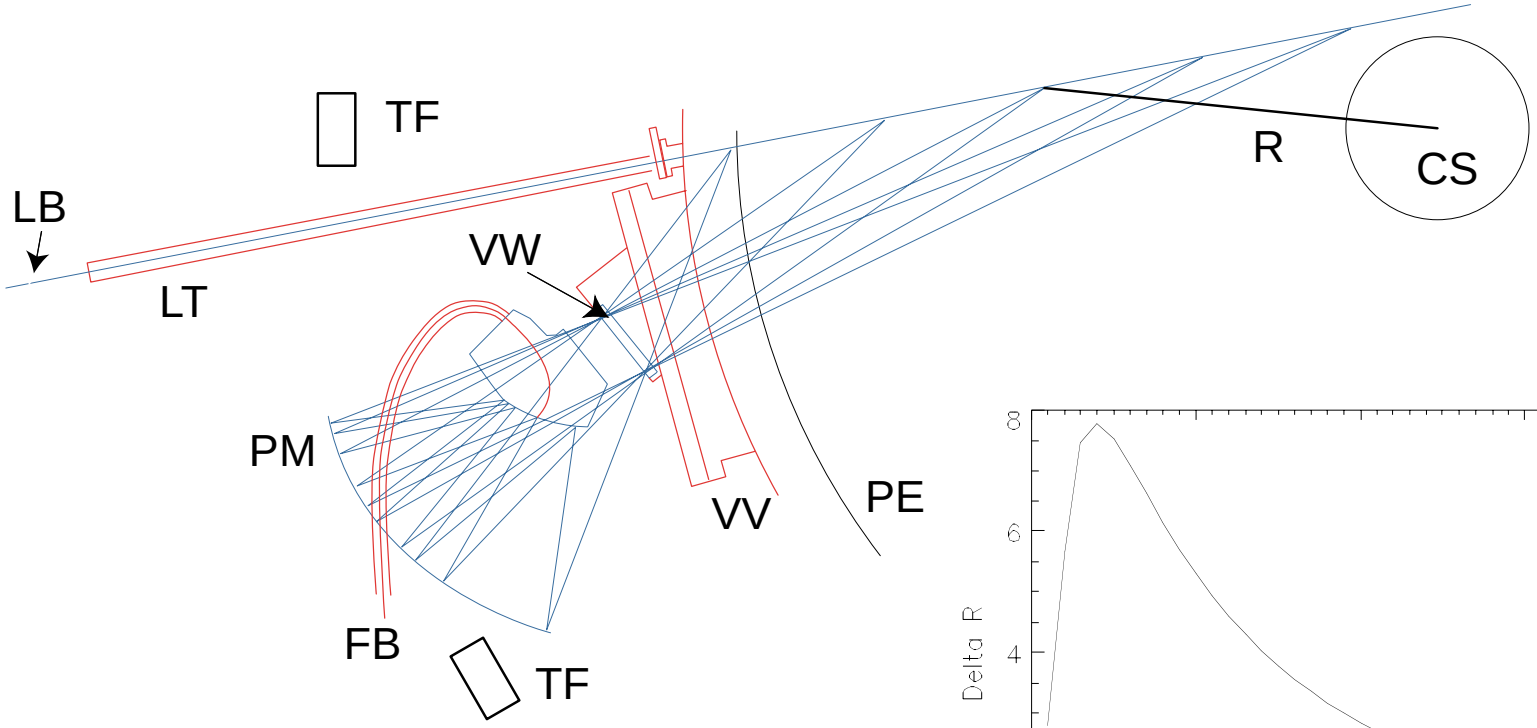
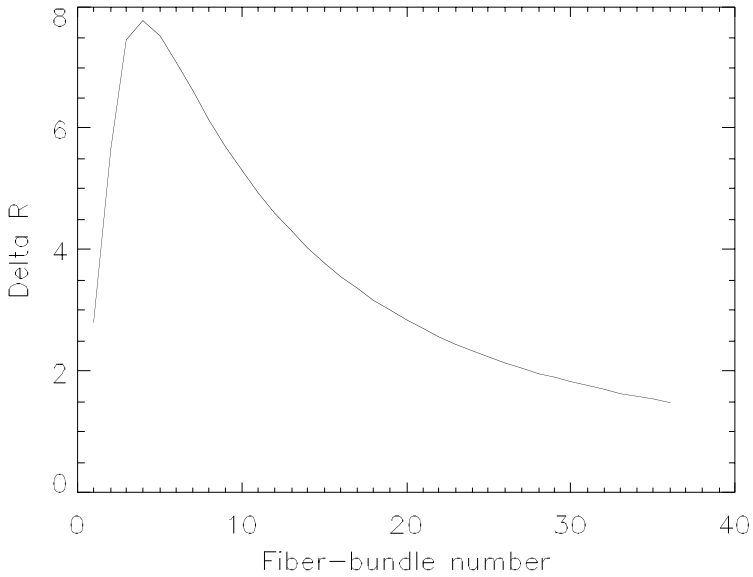
Present Configuration
Design Specification

- Presently have 20 spatial channels at 60 Hz.
  - Two 30-Hz YAG lasers.
  - ΔT = 0.4-16.7 ms.
  - $\Delta R \geq 1.7$ cm.
- Nominal design: 36 spatial channels at 90 Hz.
- System designed for highest spatial resolution at outer edge.
  - Extra spatial channels can be added for better resolution.

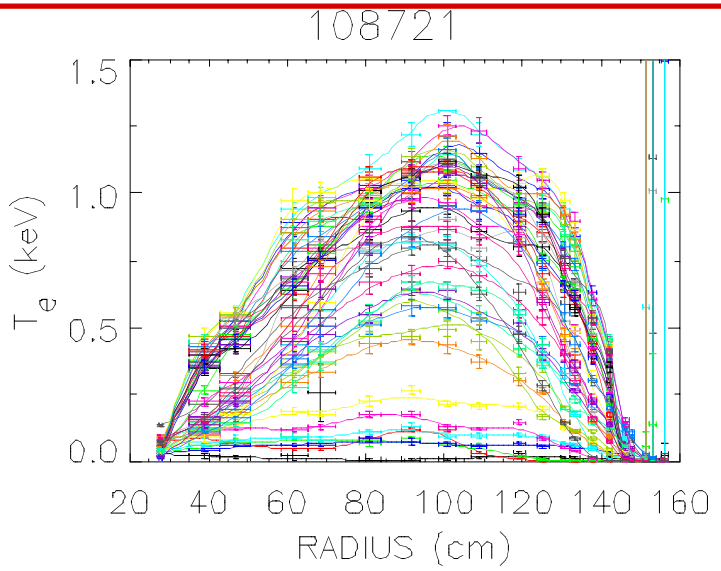
MPTS Collecting Optics

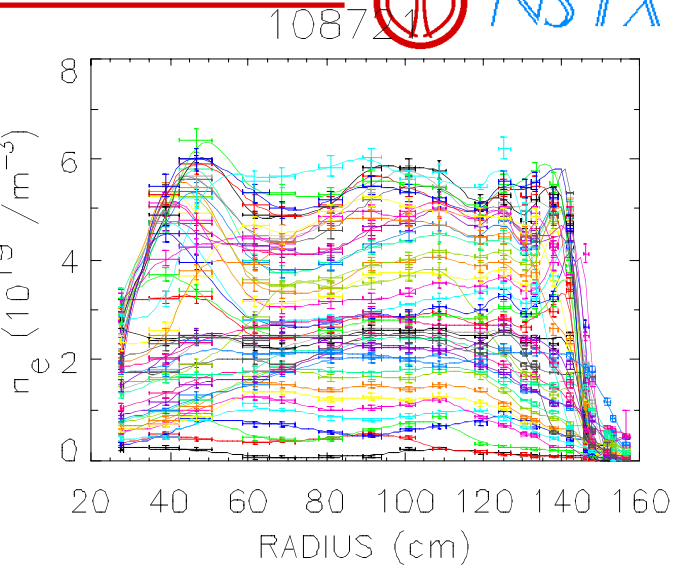


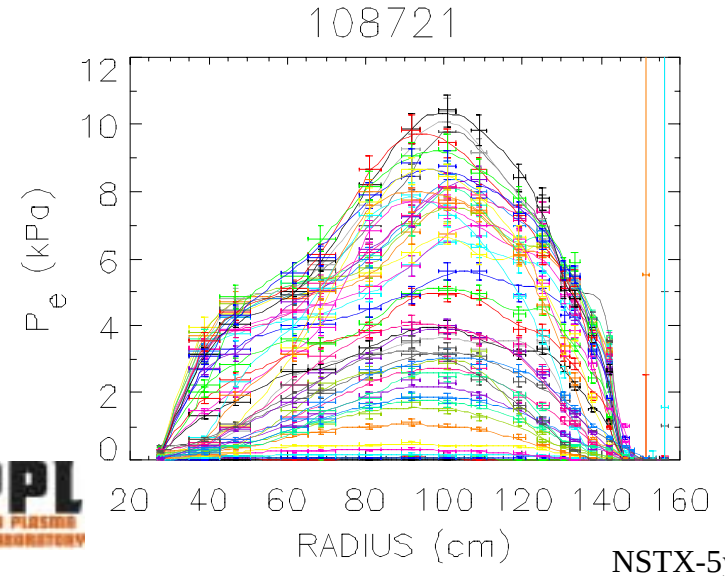


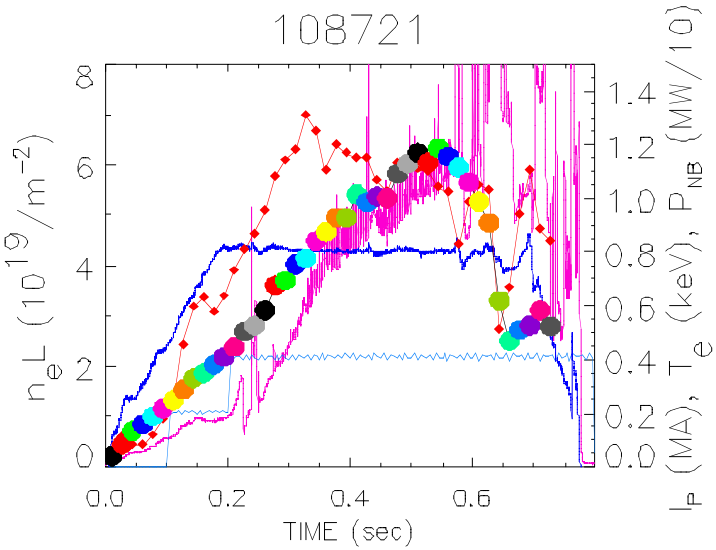
- 36 fiber bundles.
- 20 fiber bundles instrumented.
- Some bundles “see” the SOL.

MPTS: 20-channel Output

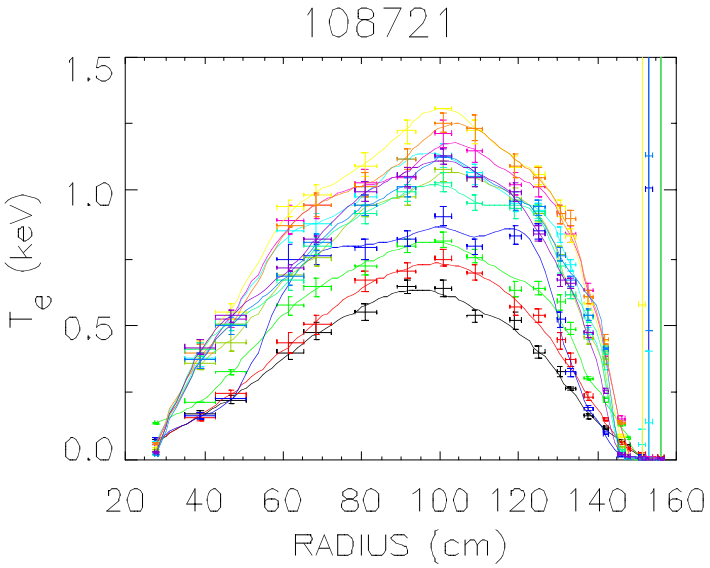


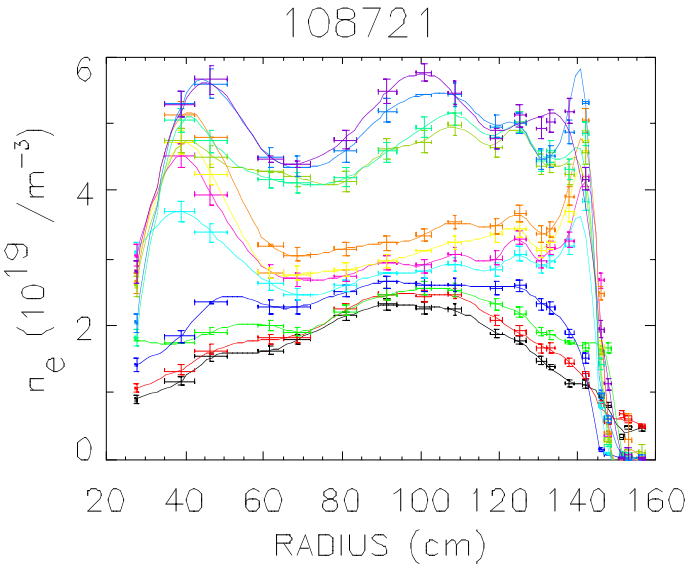


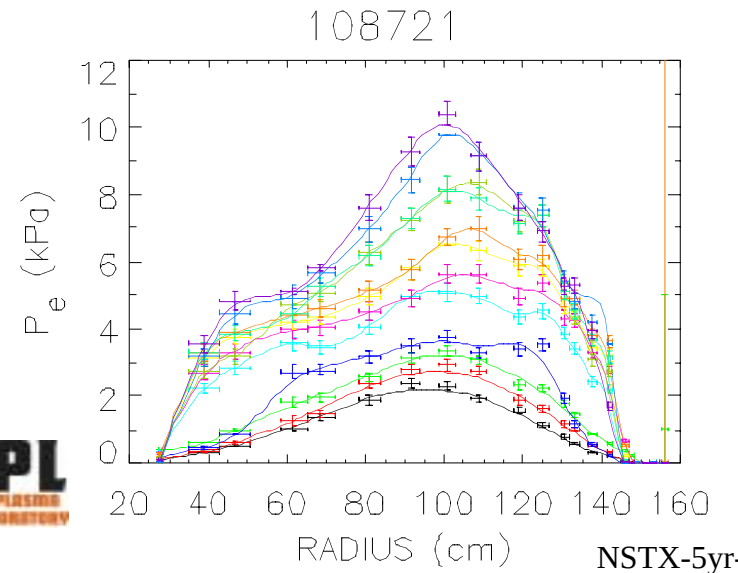


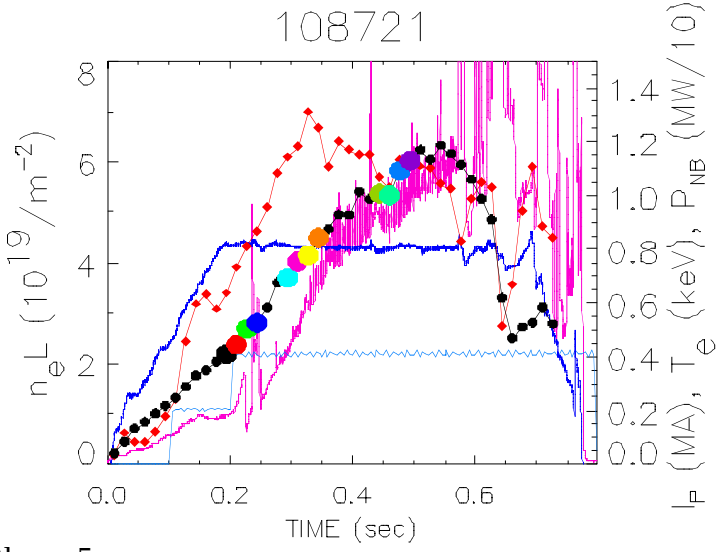


Same Data with Selected Time Points

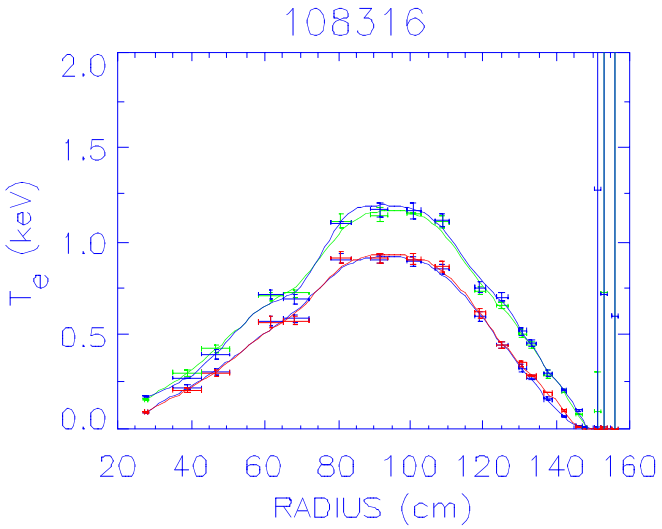


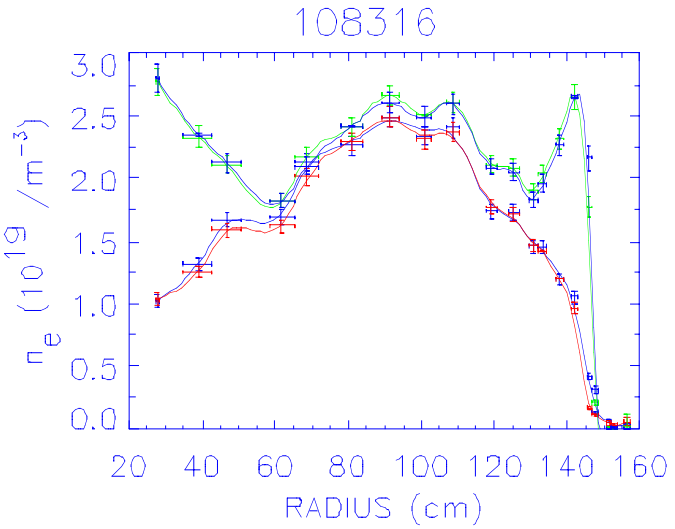


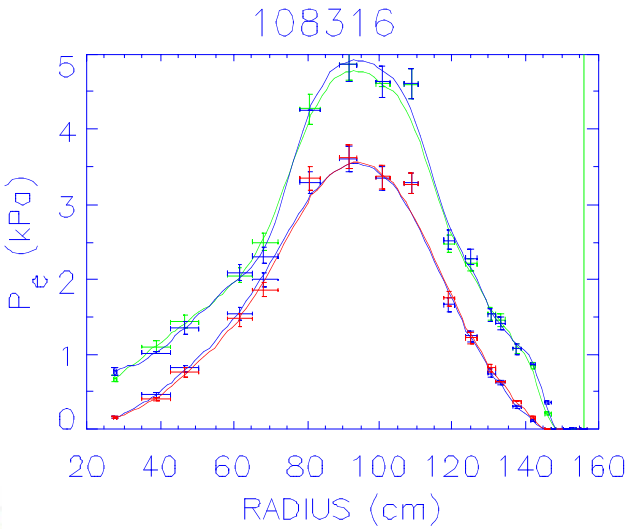


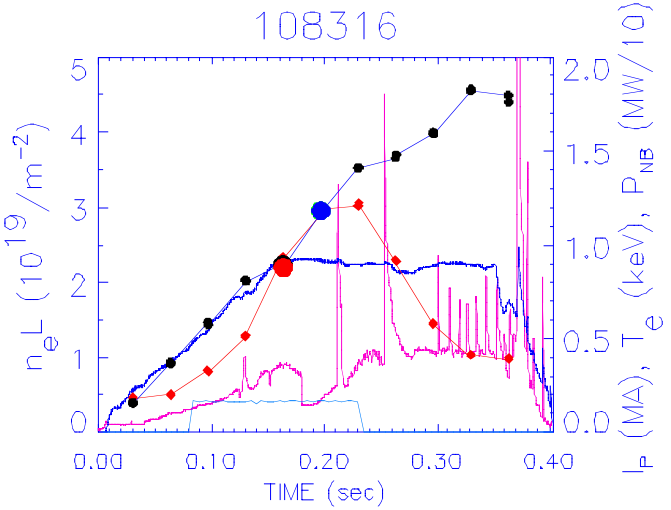


ΔT=0.4 ms

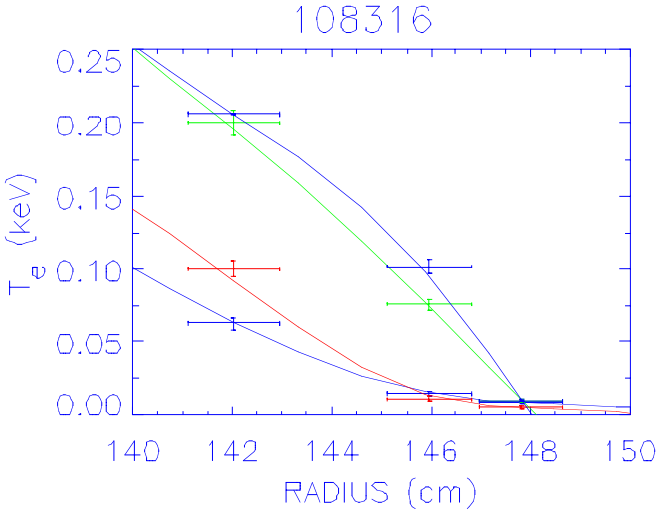

108316
T_e (keV)
RADIUS (cm)

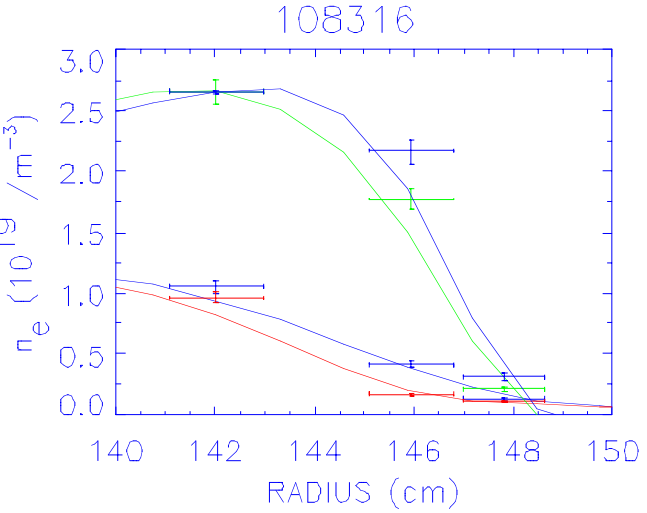

108316
n_e (10^{19} /m^{-3})
RADIUS (cm)

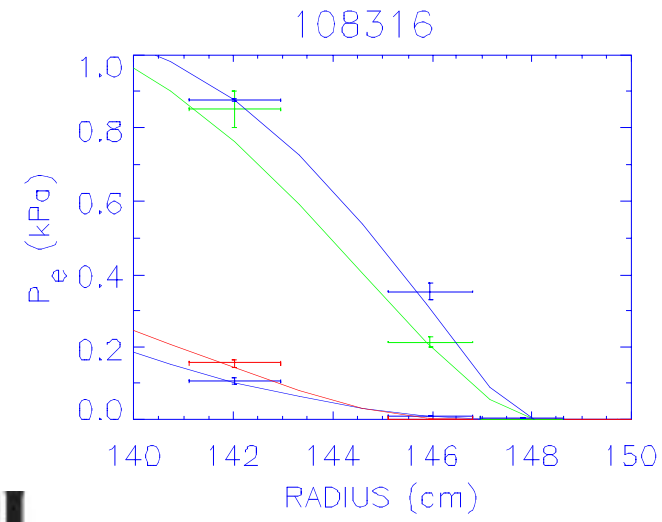

108316
P_e (kPa)
RADIUS (cm)

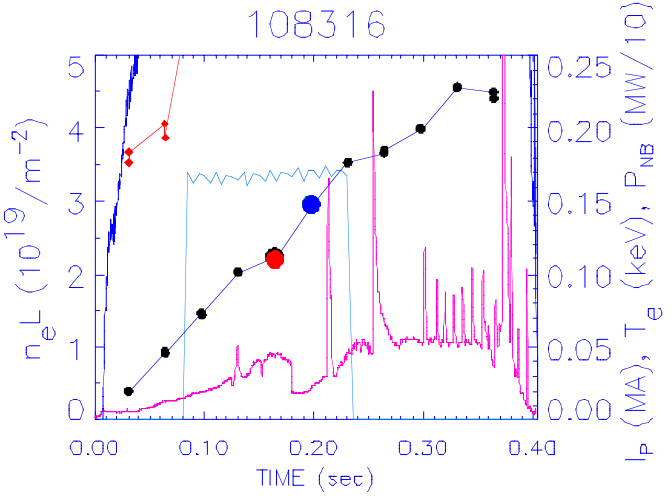

108316
$n_e L$ (10^{19}/m^{-2})
I_P (MA), T_e (keV), P_{NB} (MW/10)
TIME (sec)

Spatial Resolution at Outer Edge Can be Improved



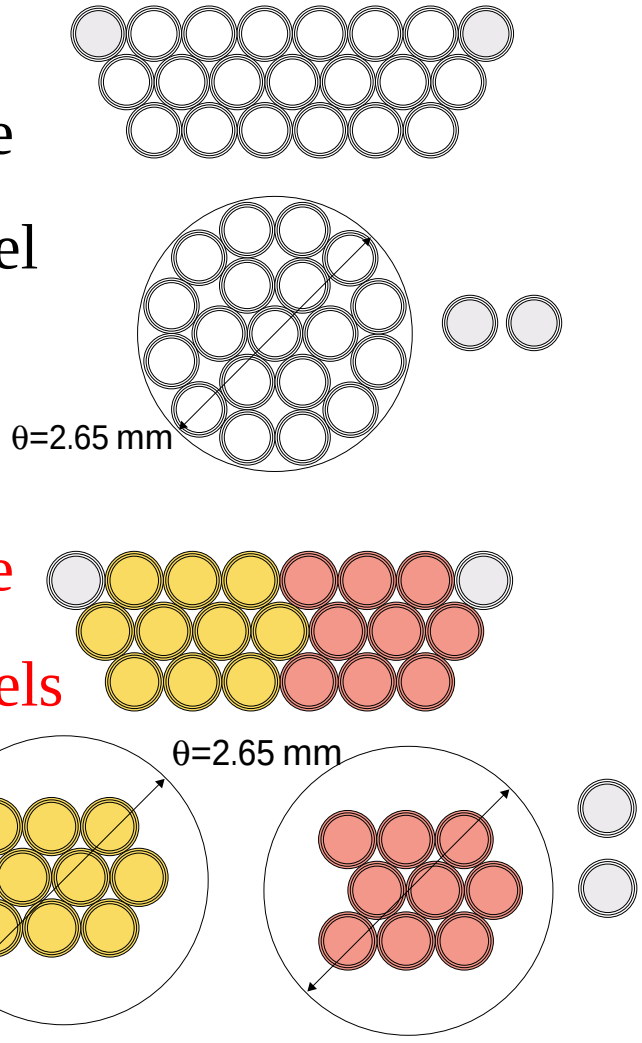






More Spatial Channels

- 16 fiber bundles still not instrumented.
- Individual fiber bundles can be divided at output end for added spatial resolution.
- Potential 40-45 spatial channels.



Fast Data $T_e(R,t)$ and $n_e(R,T)$ Delivery

- Presently multiplexed signals sent to CAMAC digitizers.
  - Delivery times 2-6 minutes.
- In future, send multiplexed signals to PCI-based digitizers.
  - Data sent directly to live memory for computation.
  - Delivery time aimed of a few ms.

New Center Stack Issues

- Wider center stack likely to block existing laser beam path.
- Re-aiming of lasers.
- Modification of the collecting optics.
- Could be a substantial project.