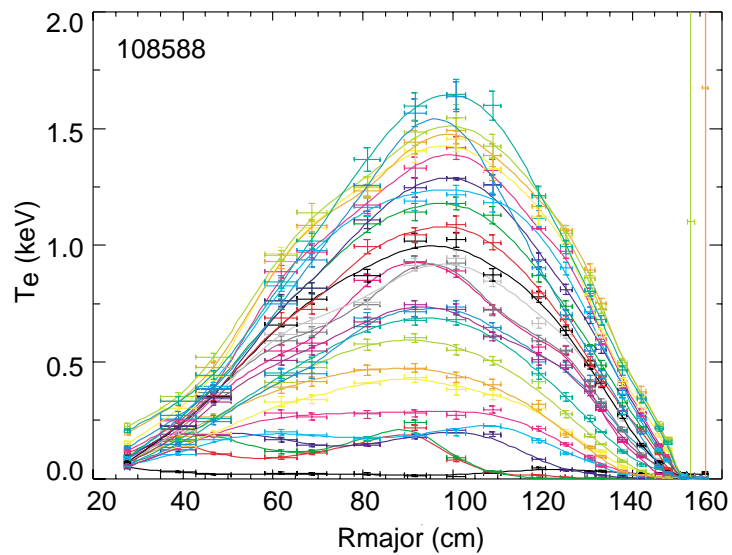


MPTS Data Analysis Update



*B.P LeBlanc,
with R.E. Bell, D.W. Johnson,
and D.E. Hoffman*

NSTX Results Review

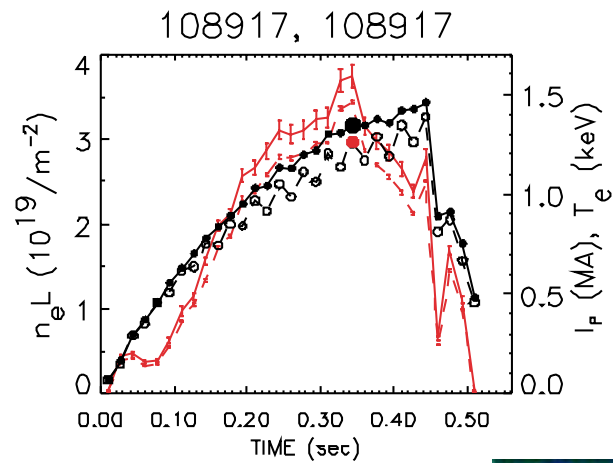
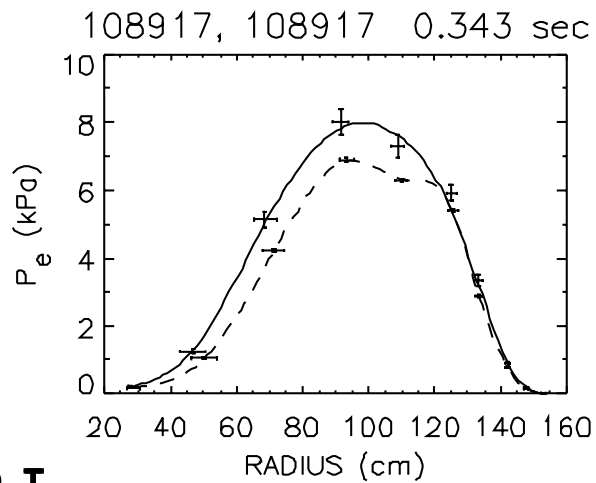
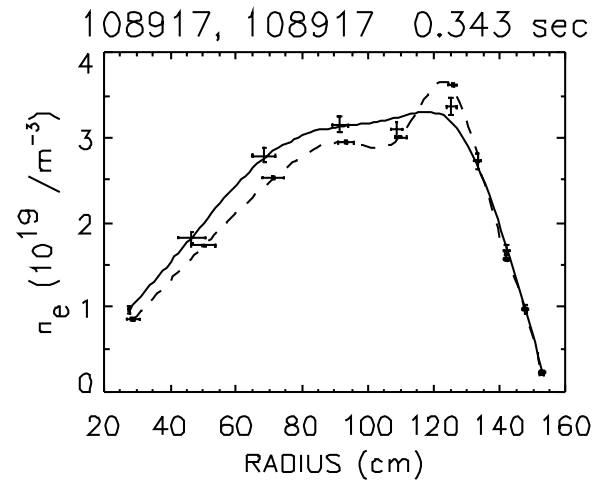
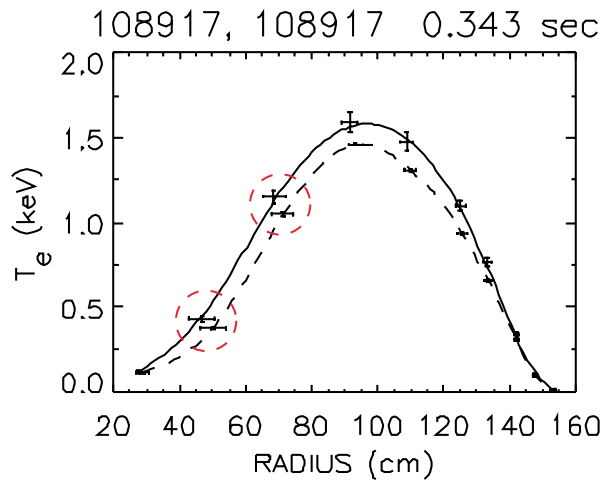
September 9, 2002

End-of-run Outstanding Issues

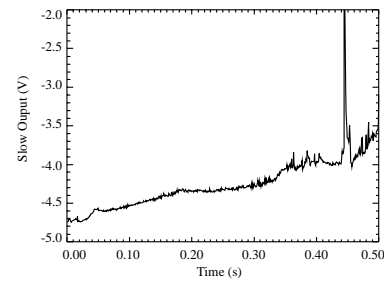
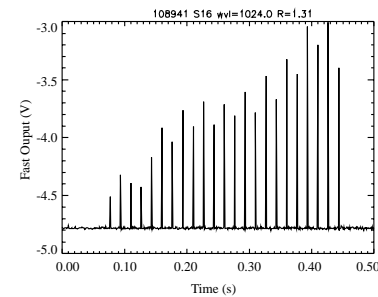


- New spectral calibration gives higher T_e ($\approx 10\%$).
- 20-channel data availability.
- Radial array from in vessel measurements (11/01).
- Rerun analyses with updated software.
 - Improved error calculation.
- Repair data taken with shutter obstruction.

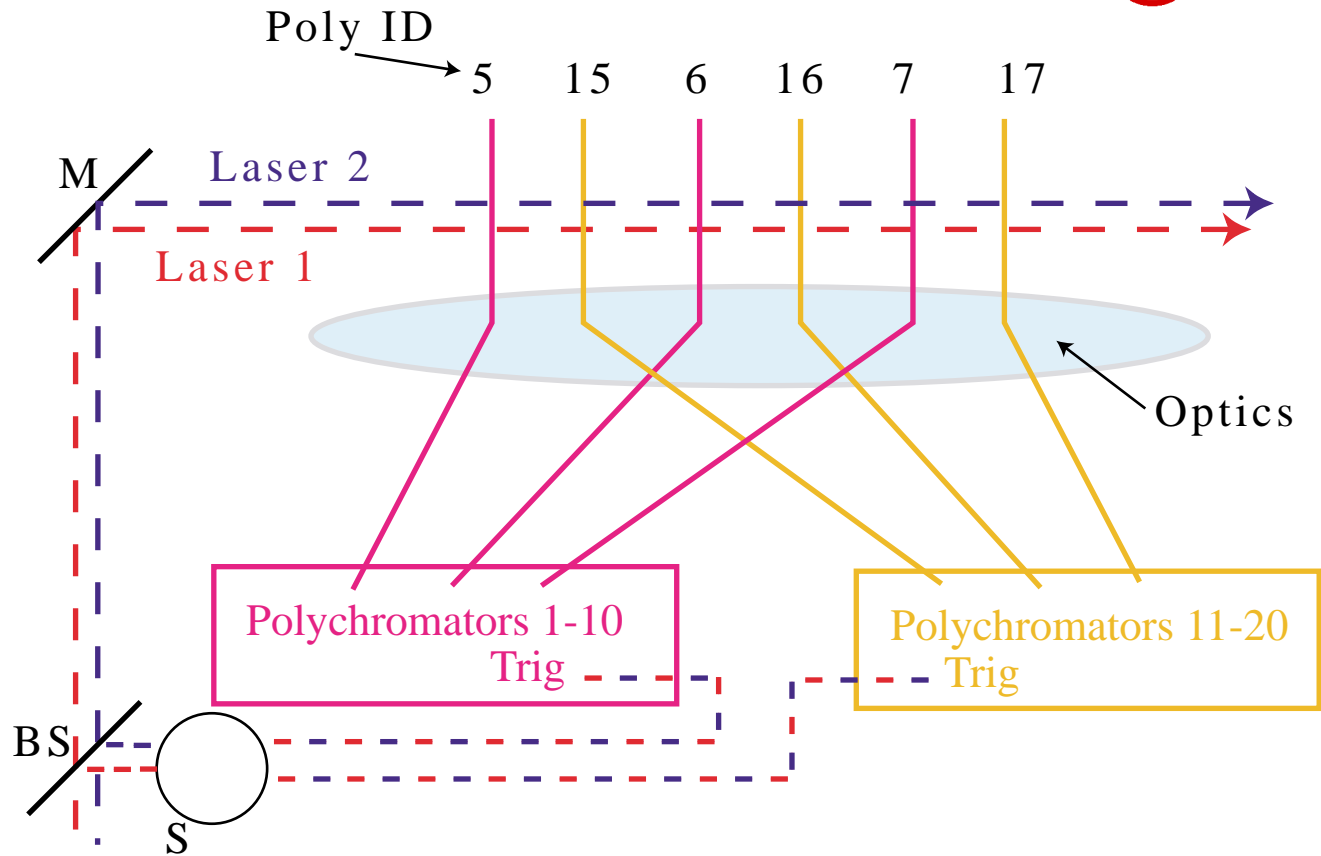
New vs. Old Analysis for 10-channel Case



20 Channels: Two 10-Polychromator Stacks



Twenty-channel Implementation



Twenty-channel Analyses on MDS Tree



```
: TOP ...
└─ CHERS
└─ CLOCK ...
└─ ICHERS ...
└─ MPTS ...
  # : ENERGY_BYTES
  └─ CONFIG ...
  └─ OUTPUT_DATA ...
    └─ BEST ...
    └─ TS1 ...
    └─ TS2 ...
      : COMMENT
      : DATEANALYZED
      ✓ : FIT_NE ...
      ✓ : FIT_NE_ERR
      ✓ : FIT_PE ...
      ✓ : FIT_PE_ERR
      # : FIT_RADII
      # : FIT_R_WIDTH
      ✓ : FIT_TE ...
      ✓ : FIT_TE_ERR
      # : LASER_ID ...
      : QUALITY ...
      # : RR ...
      ✓ : SPLINE_NE ...
      ✓ : SPLINE_PE ...
      # : SPLINE_RADII
      ✓ : SPLINE_TE ...
      ✓ : TS_LD ...
      # : TS_TIMES
```

TS2 ←

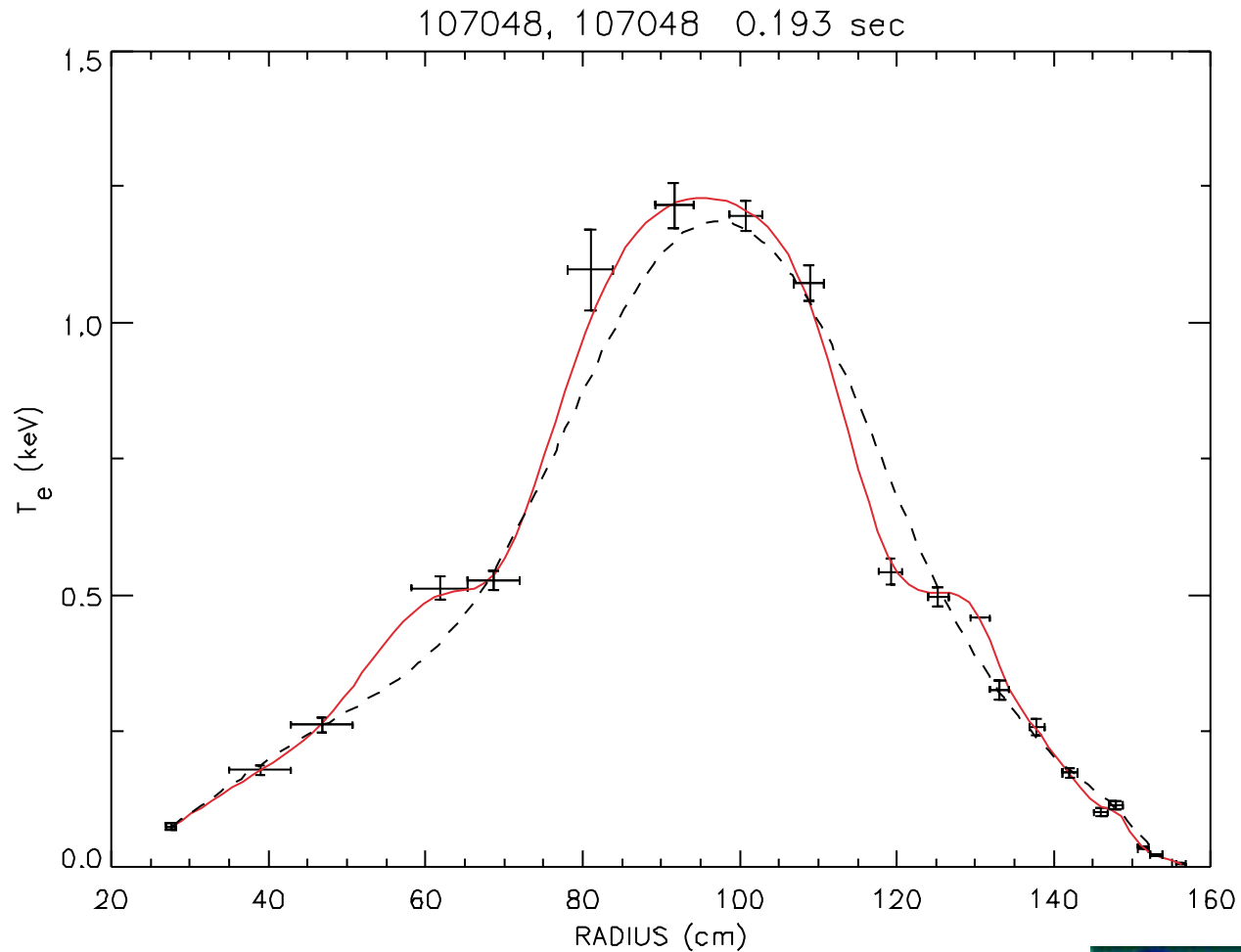
- Available 20-channel analyses loaded with same arrangement and variable names as for 10-channel case. MDS branch TS2.
 - Post-bakeout shots: 107280-109079.
- Retrieval from TS2 into IDL structure: $s = \text{TS2}(123456)$.
- MPTS 4-panel plotting routine: `IDL>plotts,ts2(123456),/nb,/rf,...`
 - VMS for the moment...Unix later .

MDS Labels for TS2



```
treename='\ACTIVESPEC::TOP.MPTS.OUTPUT_DATA.TS2:'  
qual = MDSvalue(treename+'QUALITY',/quiet,stat=readstatus)  
radius = MDSvalue(treename+'FIT_RADII',/quiet,stat=readstatus )  
dr = MDSvalue(treename+'FIT_R_WIDTH',/quiet)  
time = MDSvalue(treename+'TS_TIMES',/quiet)  
Tef = MDSvalue(treename+'FIT_TE',/quiet)  
dTef = MDSvalue(treename+'FIT_TE_ERR',/quiet)  
nef = MDSvalue(treename+'FIT_NE',/quiet)  
dnef = MDSvalue(treename+'FIT_NE_ERR',/quiet)  
Pef = MDSvalue(treename+'FIT_PE',/quiet)  
dPef = MDSvalue(treename+'FIT_PE_ERR',/quiet)  
rs = MDSvalue(treename+'SPLINE_RADII',/quiet)  
nes = MDSvalue(treename+'SPLINE_NE',/quiet)  
Pes = MDSvalue(treename+'SPLINE_PE',/quiet)  
Tes = MDSvalue(treename+'SPLINE_TE',/quiet)  
ld = MDSvalue(treename+'TS_LD',/quiet)
```

20-channel Data Reveal Additional Features



Some Analyses Show n_e Spatial Modulation

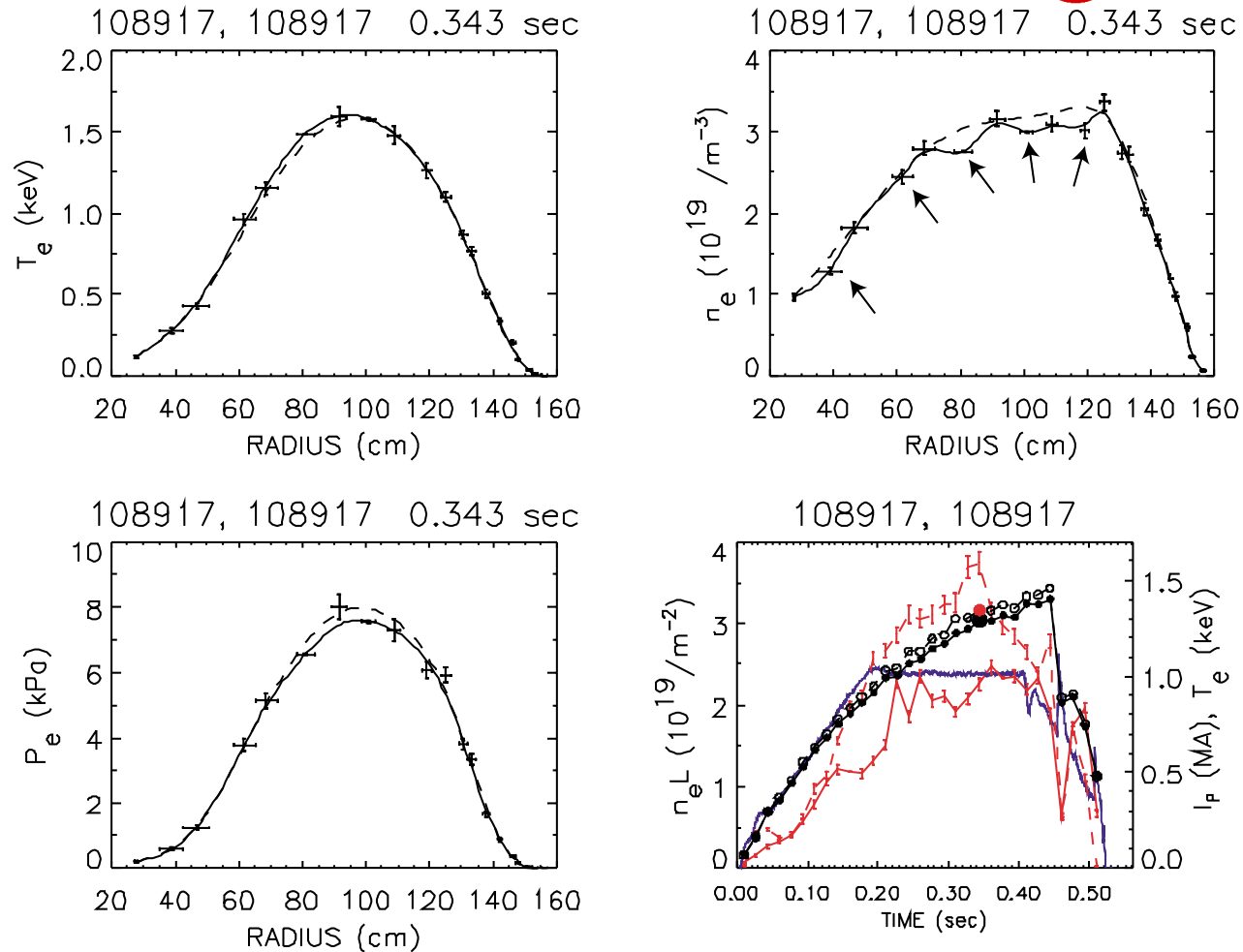
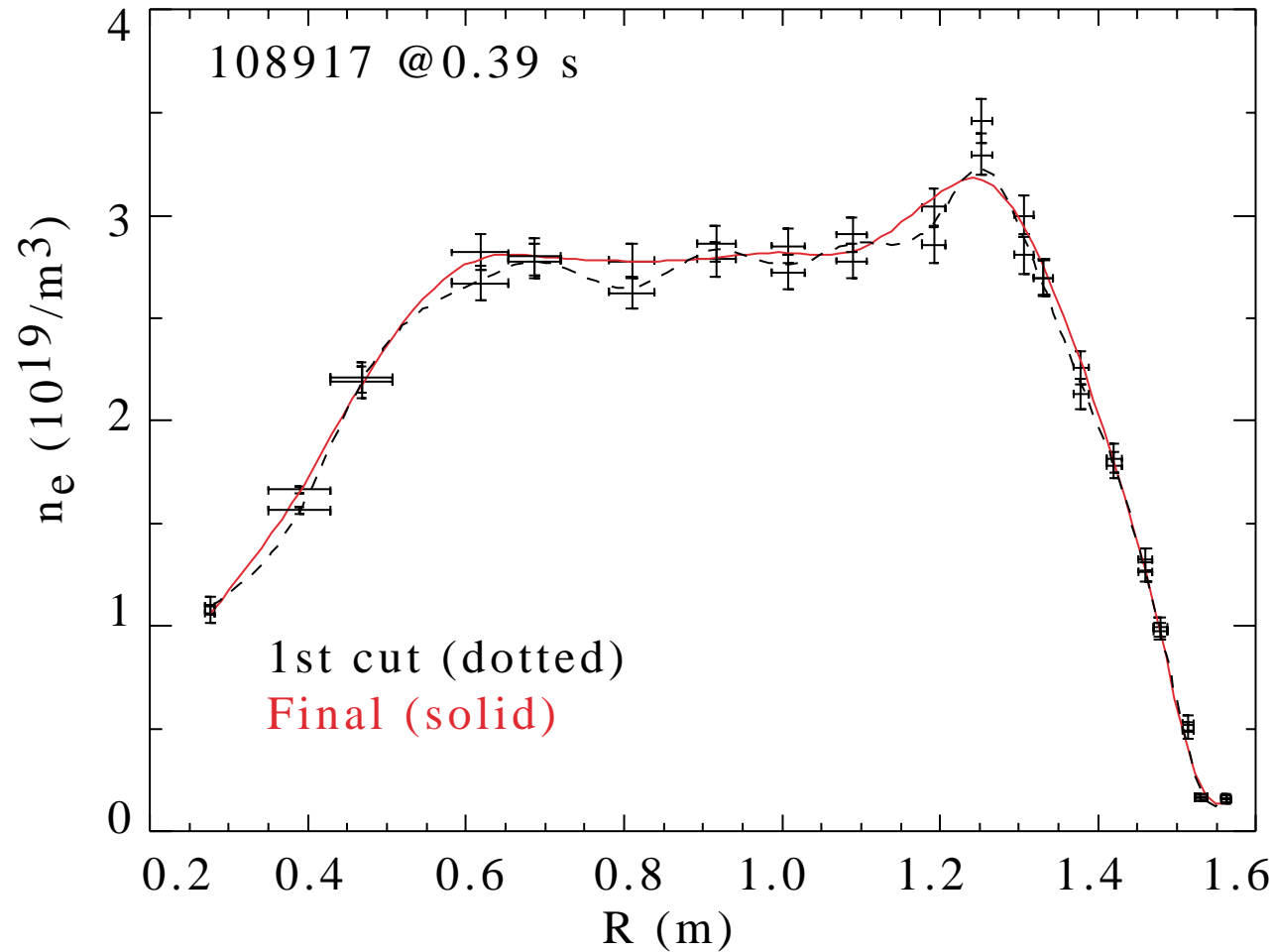


Fig. 2

Nstx-Res-Rev-LeBlanc *et al.*-9

Spatial Modulation Removed in Final Analysis

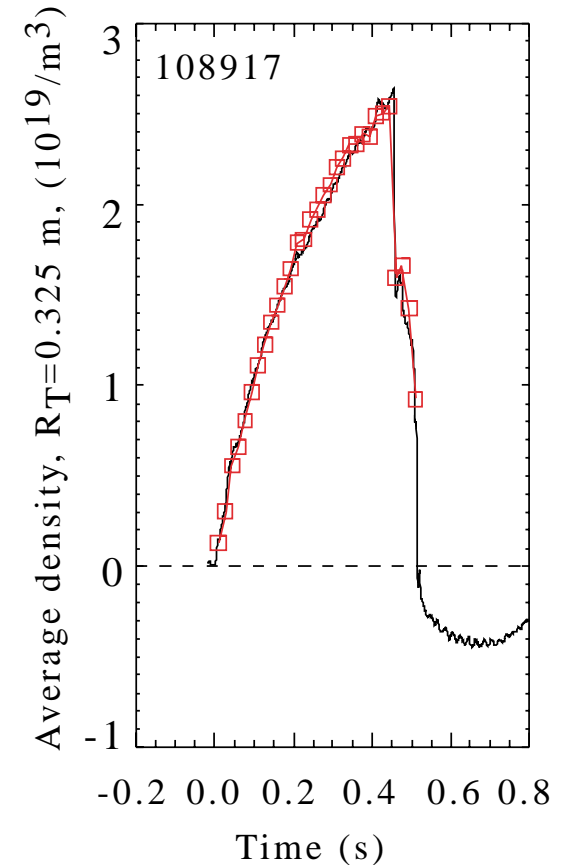
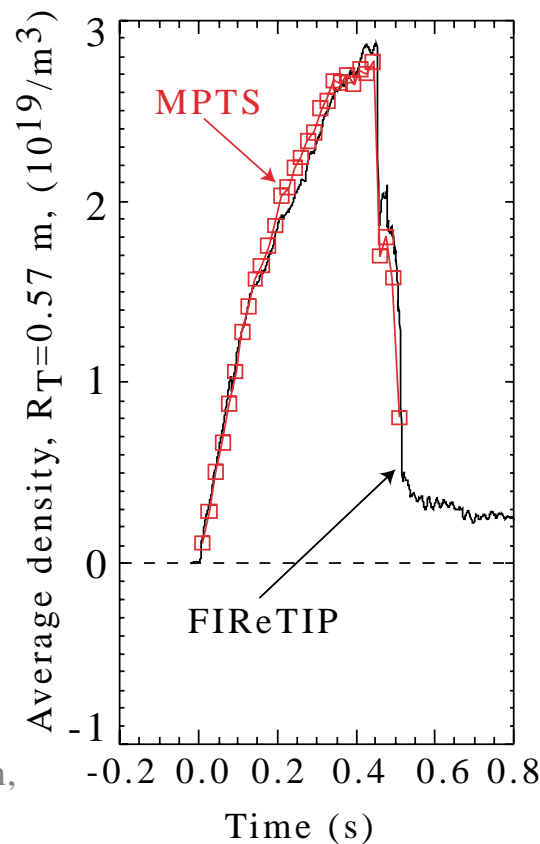


Good Agreement between FReTIP and MPTS



Comparison between line average density from FReTIP and MPTS.

$R_T=0.57$ m and 0.325 m.



FIR Interferometer: K.C. Lee, N.C. Luhmann, C.W. Domier, *U.C. Davis*, H. Park, *PPPL*



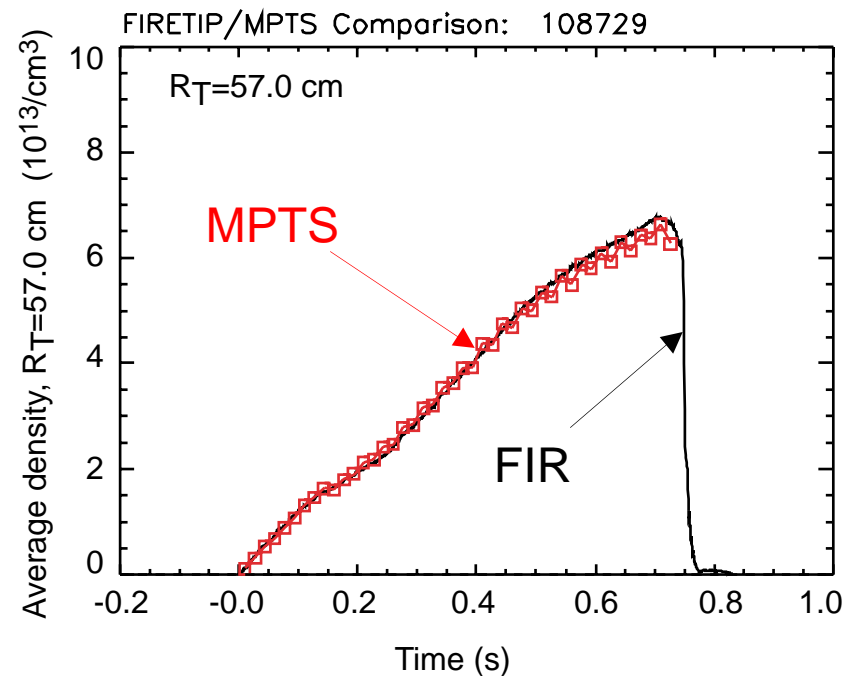
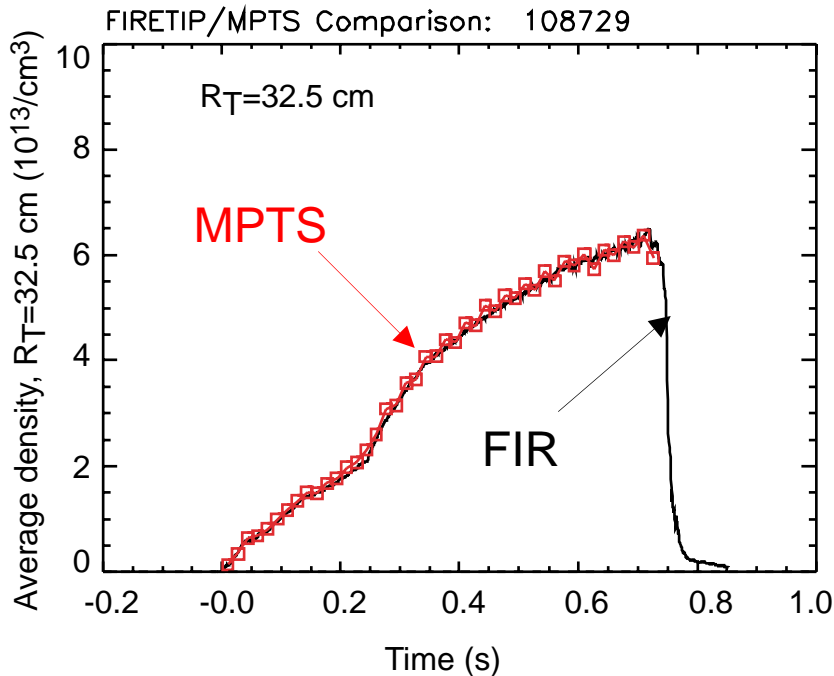
Nstx-Res-Rev-LeBlanc *et al.*-11



Shutter Obstruction Calibrated out with Rayleigh Scattering

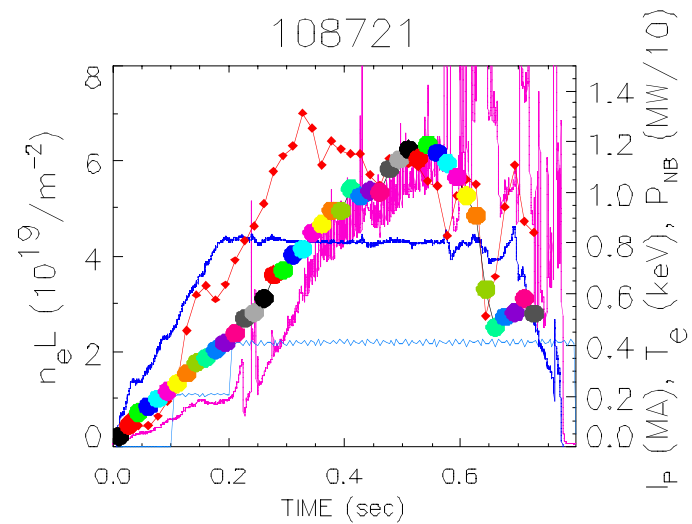
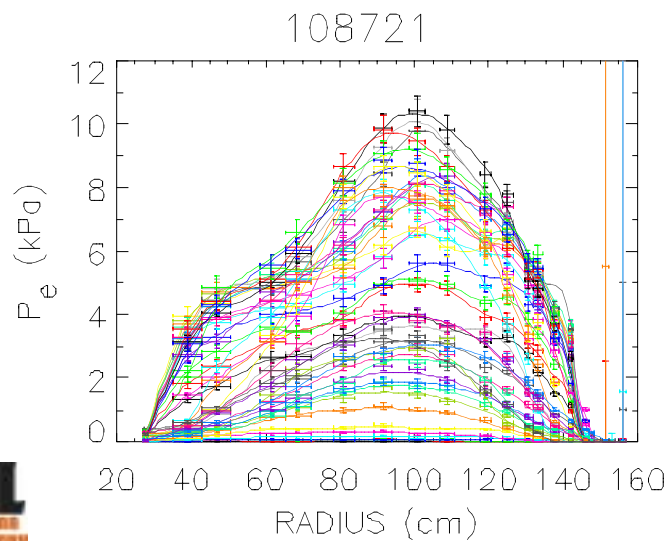
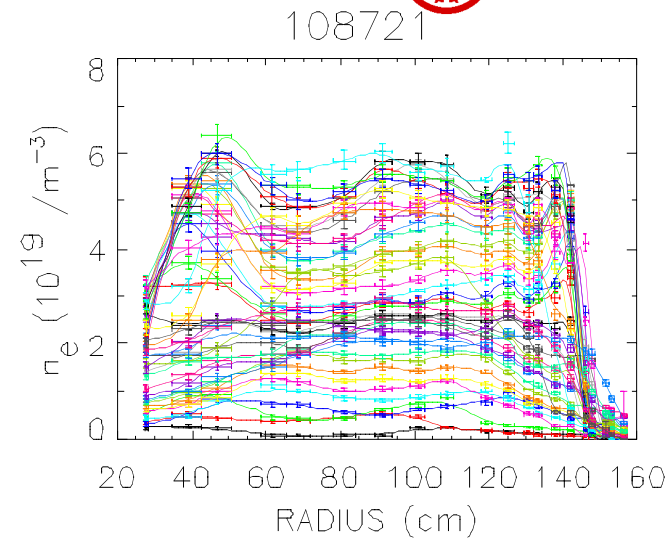
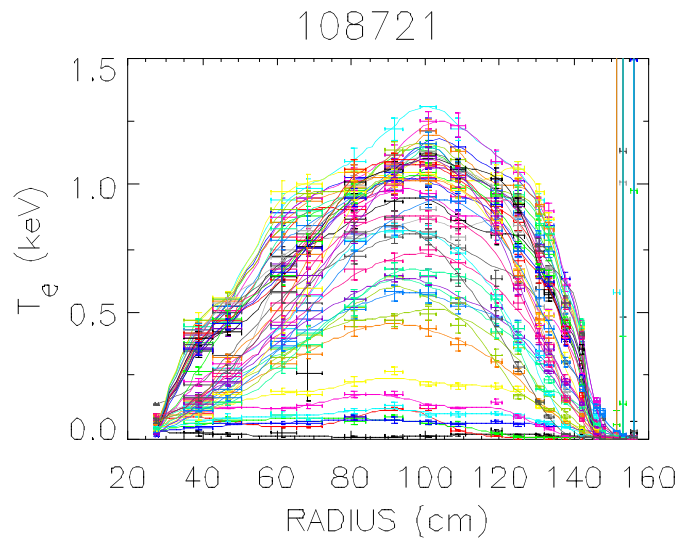


- Good agreement between *nel* from FIR-laser and MPTS.
- MPTS is absolutely calibrated.

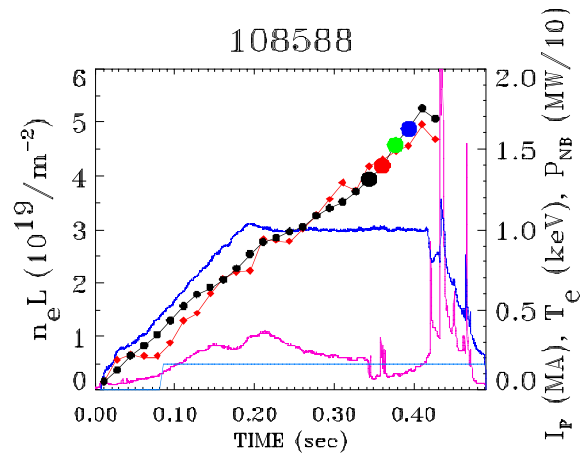
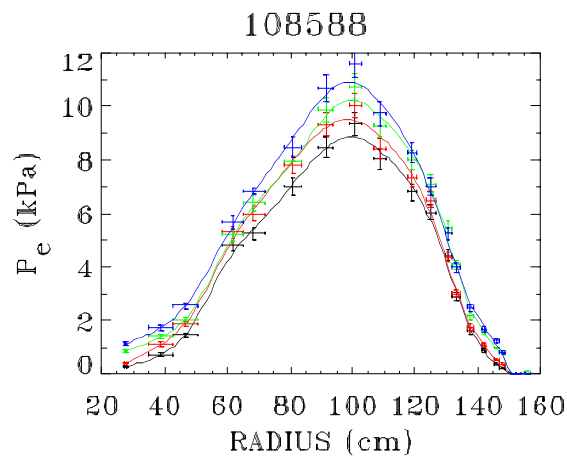
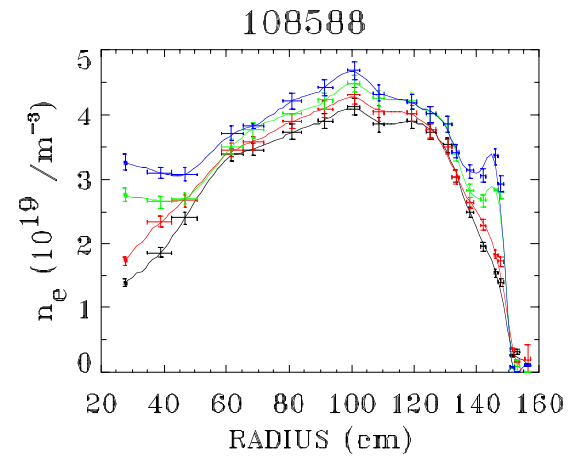
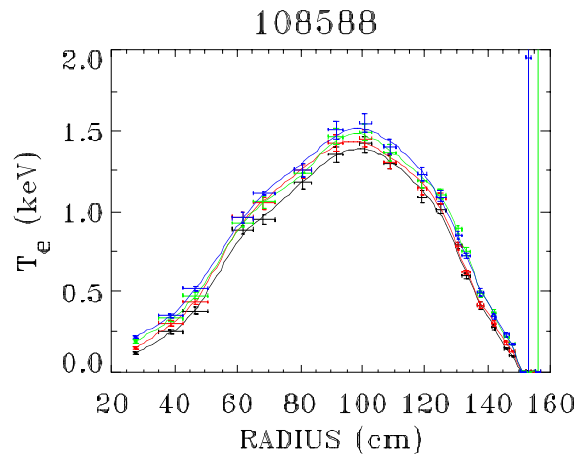


FIR Interferometer: K.C. Lee, N.C. Luhmann,
C.W. Domier, *U.C. Davis*, H. Park, *PPPL*

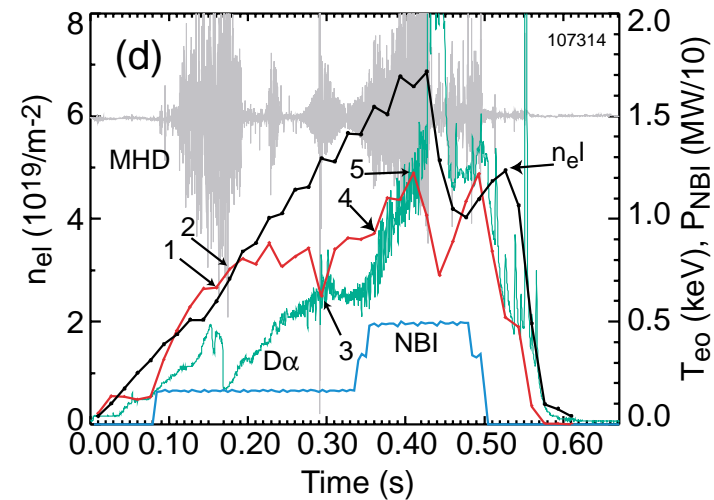
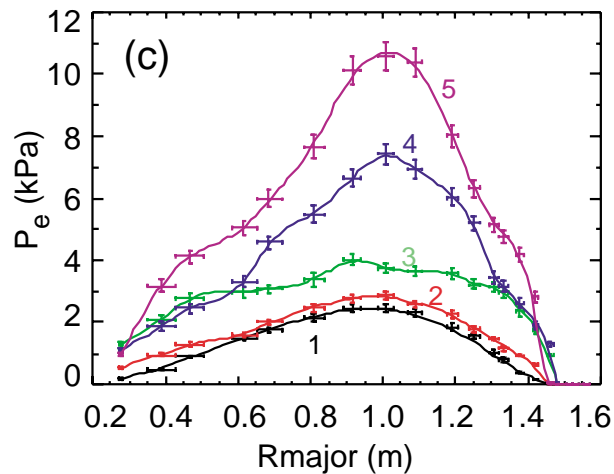
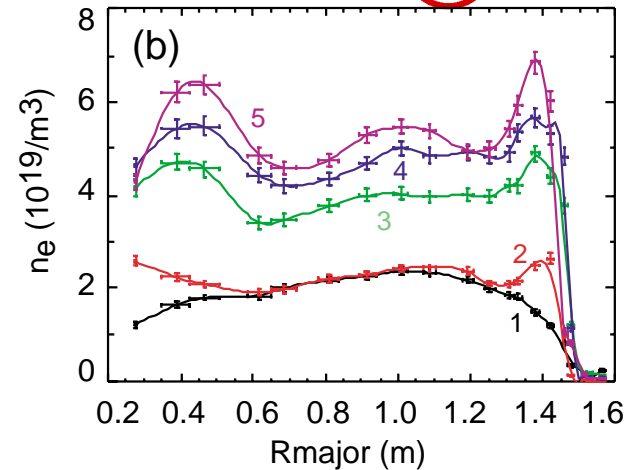
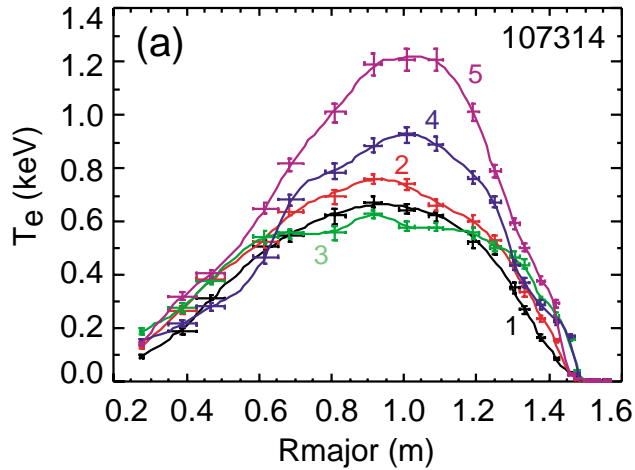
MPTS: 20-channel Output



NBI H-mode: Temporal Zoom Display



NBI H-mode: Distributed Time Points Display



Concluding Remarks



- Available 10- and 20-channel analyses have been loaded into MDS: TS1 and TS2.
- Shutter obstruction issues have been fixed.
 - Shutter-actuator improvement work in progress.
- Spatial $n_e(R)$ modulation is an instrumental artifact.
 - Can be eliminated with proper calibration.
 - TS2 will be updated as data become available.
 - T_e is not expected to change.

Even more Concluding Remarks



- Hardware maintenance needed before new run.
 - Lasers need maintenance.
 - Laser delivery optics to be modified.
 - Laser alignment monitoring system to be installed.
- Important in-vessel work needed before run.
 - White calibration for Z-effective measurement.
 - Verify radial array.
 - Viewing window to be replaced.
 - Take laser burns inside the vessel
 - Etc, etc, etc....

Multi-point Thomson Scattering: MPTS and Mission and Progress, Long Term Goal



- Main source of kinetic documentation
 - Best technique for measuring $T_e(R,t)$ in low field ST.
 - Measurement of $n_e(R,t)$, $T_e(R,t)$.
- 2000 → 1 laser (30 Hz), 10 spatial channels
- 2001 → 2 lasers (60 Hz), 10 spatial channels
- 2002 → 2 lasers (60 Hz), 20 spatial channels
- Ultimately:
 - ≥ 3 lasers (≥ 90 Hz), 36-45 spatial channels.
 - High edge and scrape-off layer spatial resolution (0.5cm).