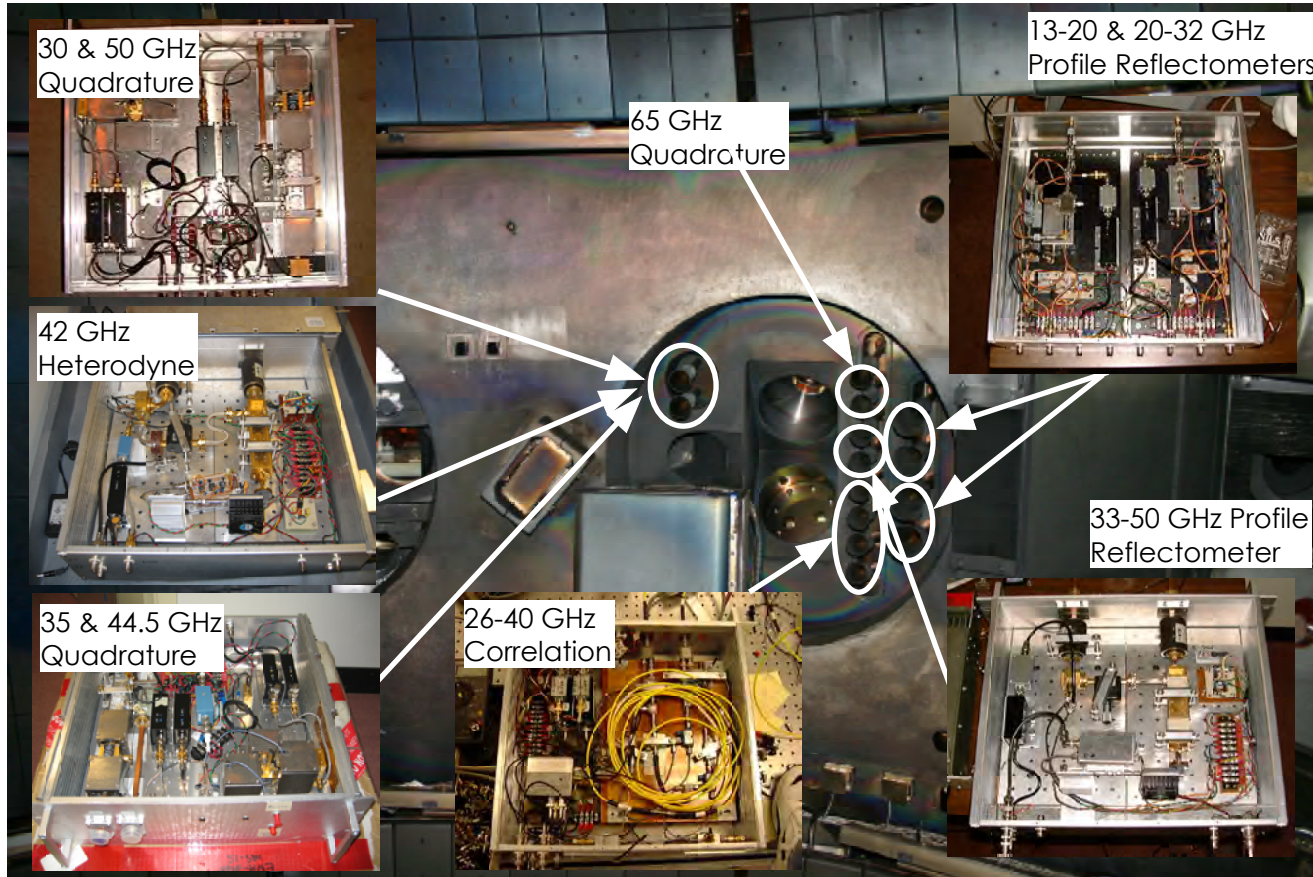


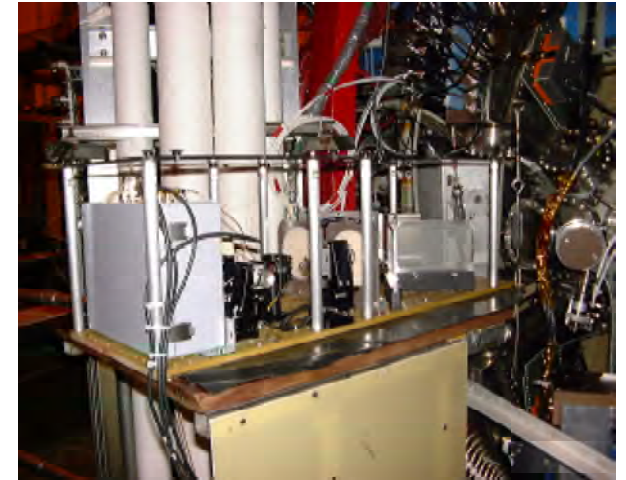
Millimeter-Wave Measurements on NSTX

S. Kubota, et al.

Bay J Reflectometers



Bay G Interferometer/ Fraunhofer Diagnostic



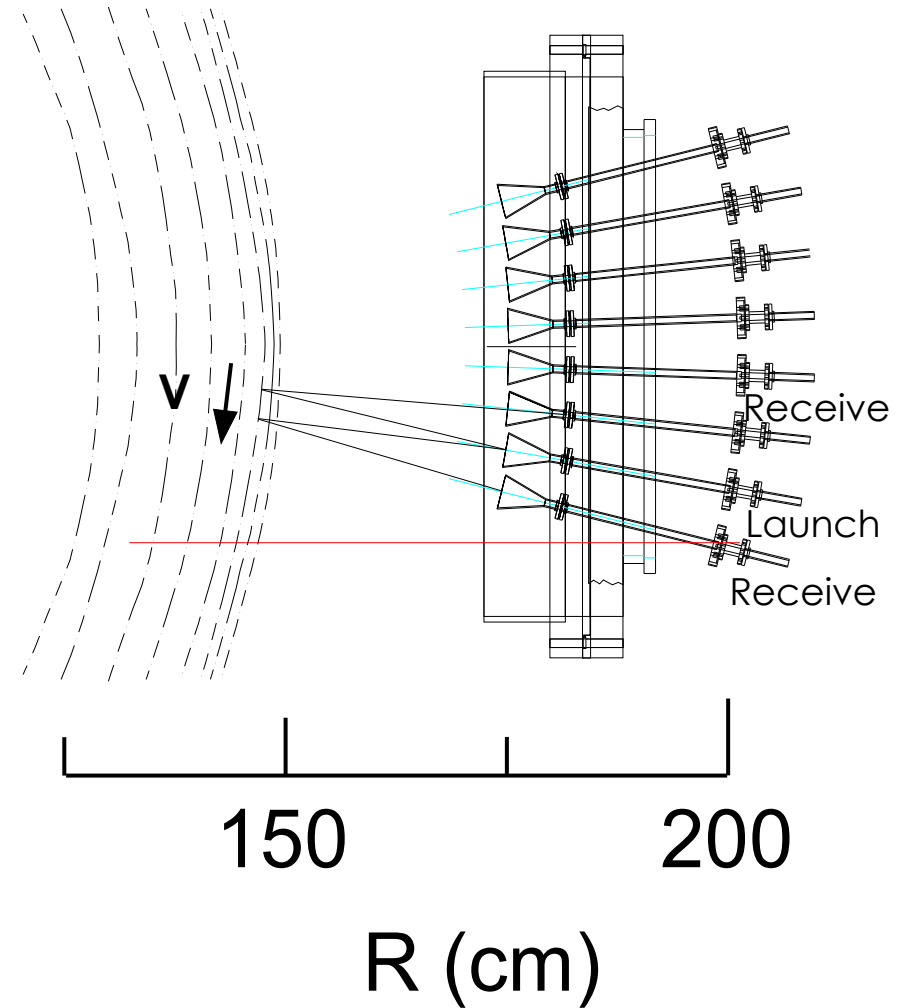
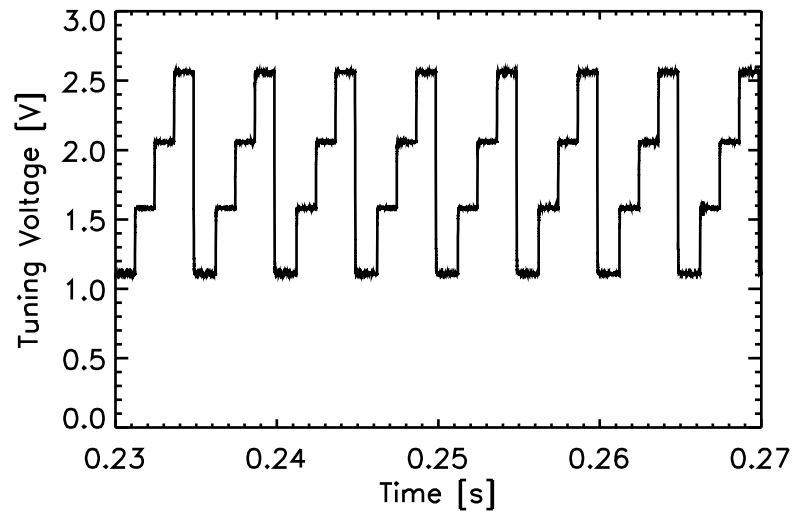
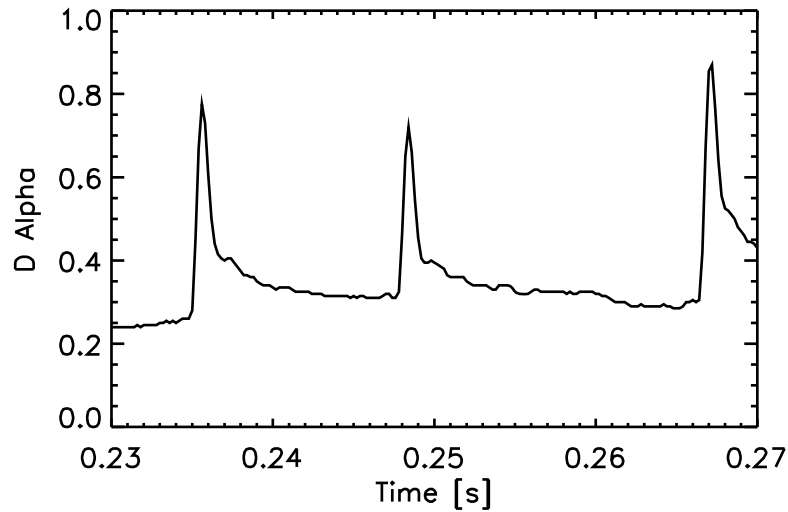
- Edge poloidal velocity measurements and fluctuations.
- Global and local measurements of HHFW (density fluctuations).
- Core turbulence poloidal velocity and radial correlation measurements.
- Backscattering.

Very Preliminary Results

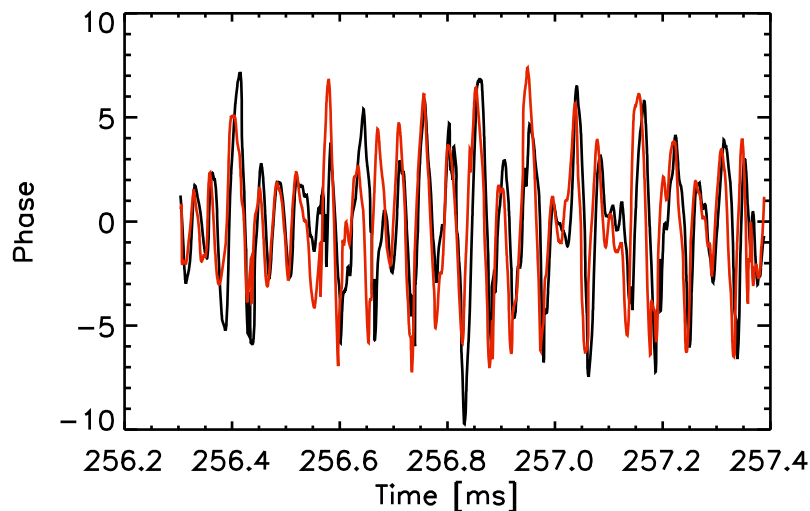
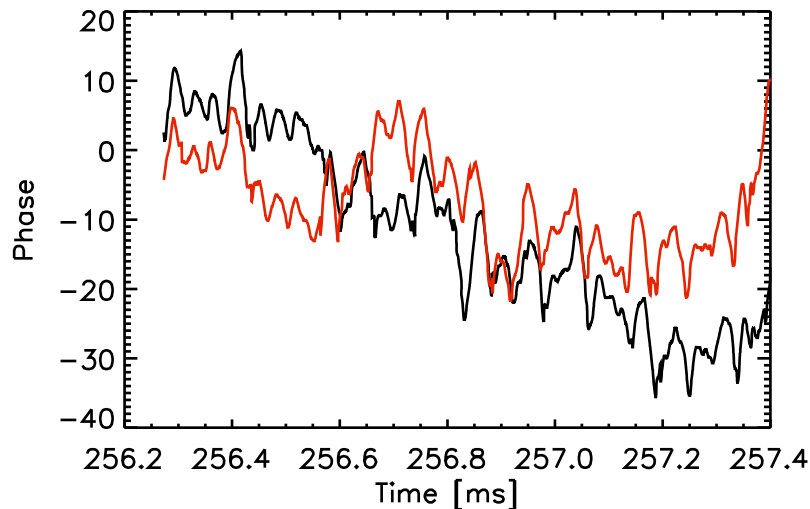


- **Poloidal velocity measurements (poloidal correlation reflectometer):**
 - Clearest measurements thus far in H-mode edge.
 - **Poloidal propagation of low-k turbulence structures clearly visible.**
 - Core measurements?
- **Measurement of density fluctuations associated with 30 MHz HHFW:**
 - Directionality of launch, magnitude of wave electric field ($\delta\varphi \propto E$).
 - 1 mm interferometer/FD for global estimates of k and $\delta n/n$.
 - Local estimates of $\delta n/n$ using heterodyne reflectometry. In FY06, measured down-shifted IF signal corresponding to (30 MHz modulation).
 - **In FY07, PoP measurements of both the unmodulated and modulated portions of the signal. Allows local estimates of $\delta n/n$.**
- **Radial correlation reflectometry:**
 - Some data in next to last week of run.
 - CR and FD diagnostics both need calibration shots before they are considered commissioned.
- **Backscattering:**
 - Data under review.

Poloidal Velocity Measurements



Poloidal Flow Observations

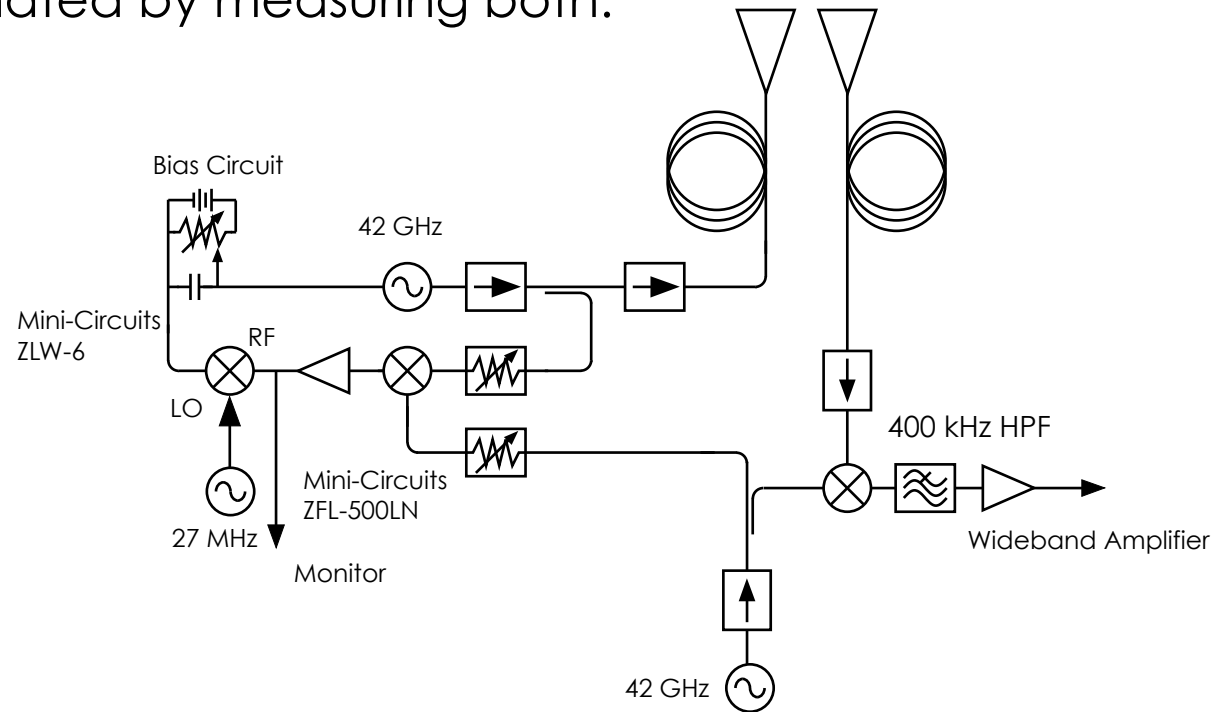


- **Summary:**
 - Low-k edge turbulence during H-mode.
 - Both channels track each other.
 - Fluctuations offset in time (typically several μs to a few tens of μs).
- **Future analysis:**
 - Actual flow velocity will require distance between reflection points. 2-D full-wave code to do this.
 - Local turbulence levels, spectra and flow available simultaneously.
 - Possibility of edge flow profile. Fast changes in E_r during L-H transitions, etc.
 - Core measurements?
 - Fluctuations in the flow.
 - Observation of zonal flow, GAMs?

Density Fluctuations Associated with HHFW

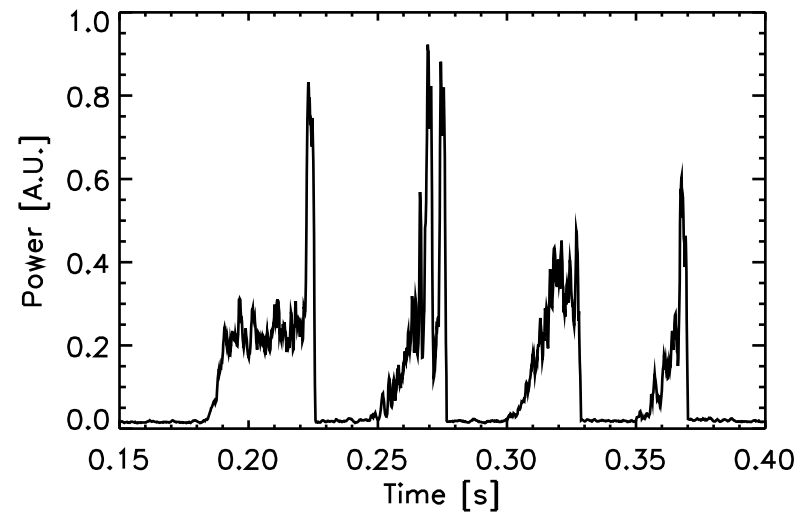
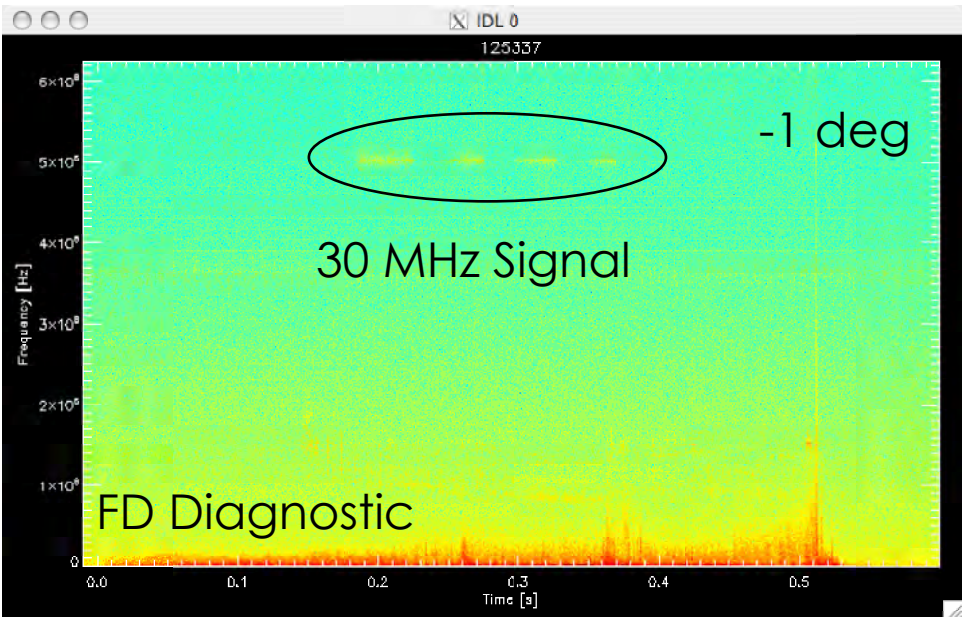
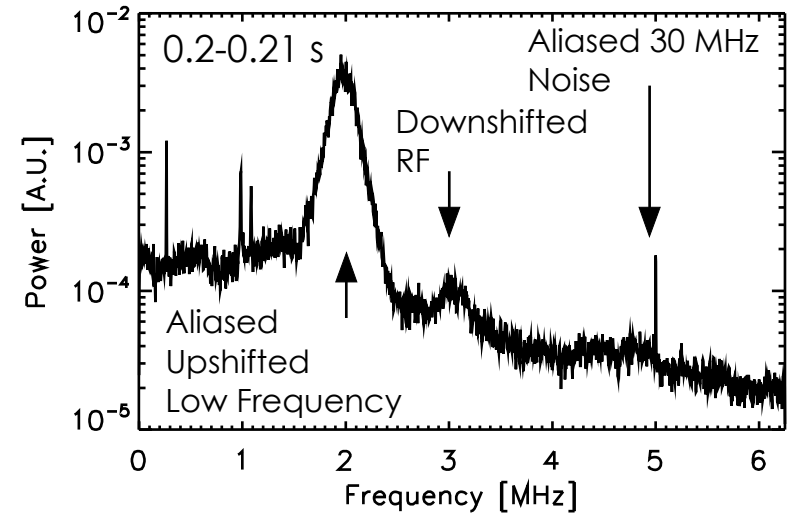
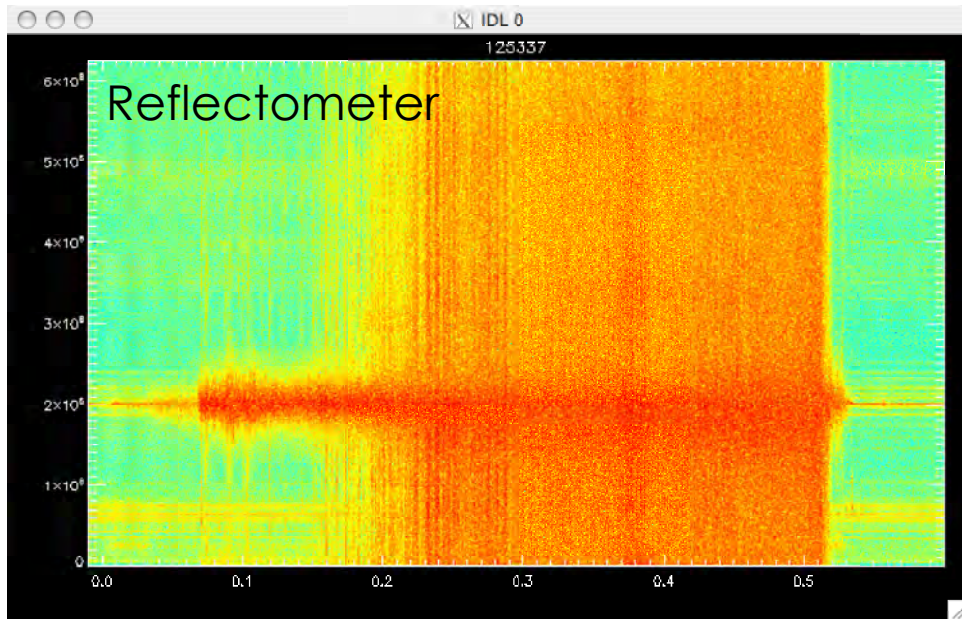


- **Heterodyne reflectometer with $\Delta f=27$ MHz.**
 - Digitizer sampling rate of 10.5-12.5 MSa/s.
 - Wideband amplifiers up to 50 MHz.
 - HHFW appears at 3 MHz. Low frequency portion of signal (0 MHz) appears at 27 MHz (undersampled).
 - $\delta n/n$ estimated by measuring both.



- **Fraunhofer diffraction diagnostic.**
 - 1 mm interferometer with tilted beam.
 - Homodyne this year. Wide bandwidth.

Measurements of 30 MHz Fluctuations



Summary



- **For HHFW measurements:**
 - FD diagnostic very sensitive to 30 MHz fluctuations. Noise not fully evaluated. Heterodyne next year should help.
 - Reflectometry: both 30 MHz and low-frequency measured simultaneously.
 - Issues with data acquisition bandwidth need to be addressed.
- **Radial correlation measurements:**
 - Data under review.
- **Backscattering:**
 - Data under review.