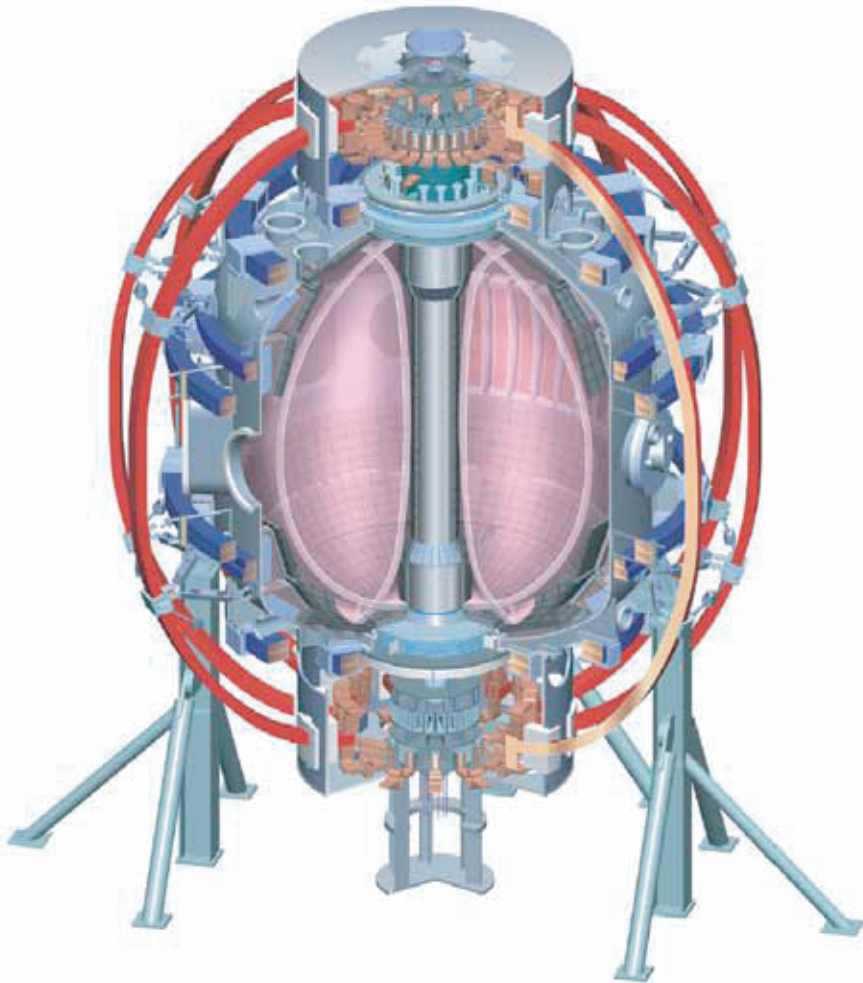


Initial Operation of the High-k Scattering System



D. R. Smith, E. Mazzucato,
and H. K. Park

Princeton Plasma Physics Laboratory

L. Lin, C. W. Domier,
and N. C. Luhmann, Jr.

*Department of Applied Science,
University of California at Davis*

NSTX Results Review
December 12-13, 2005

High-k System '05 Activities



Tangential, microwave scattering system

Measures radial density fluctuations on electron gyroscale

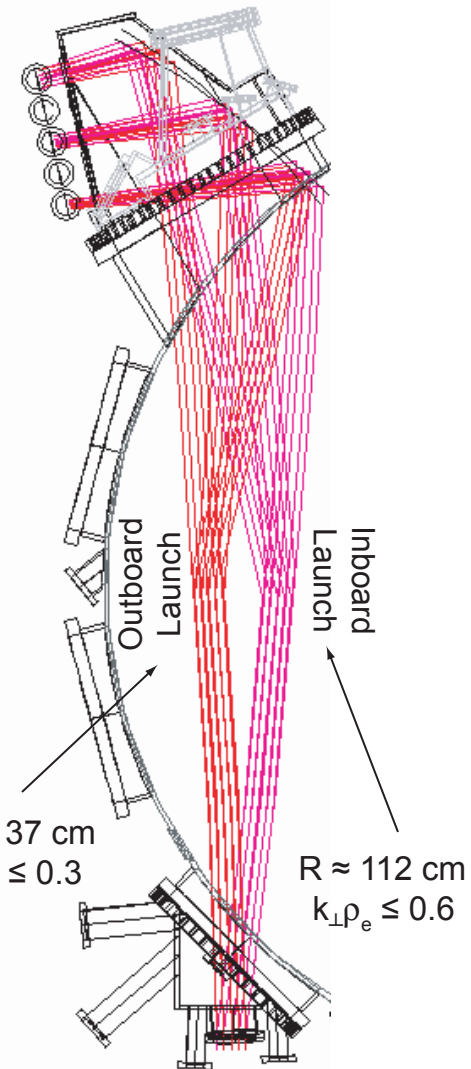
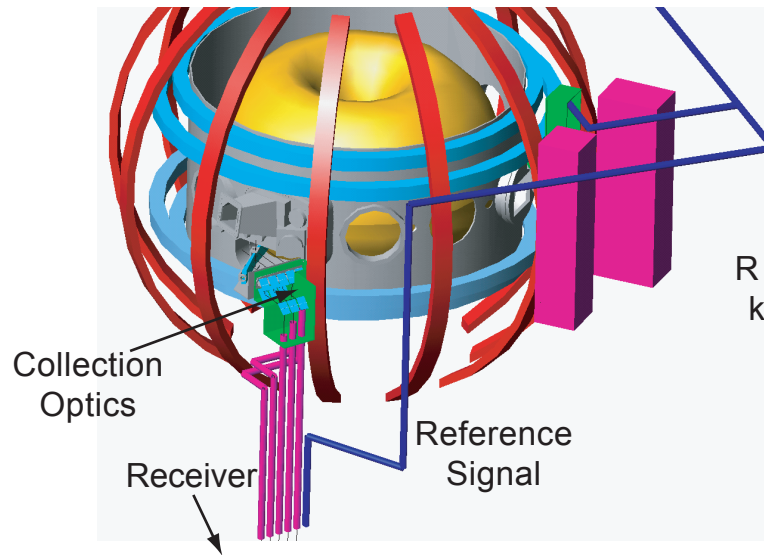
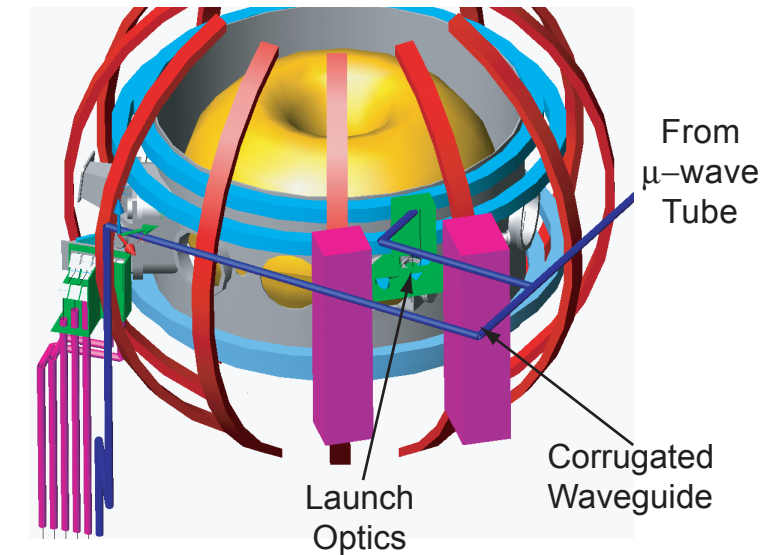
Installation from Fall 2004 thru Summer 2005

Successfully commissioned in late August 2005

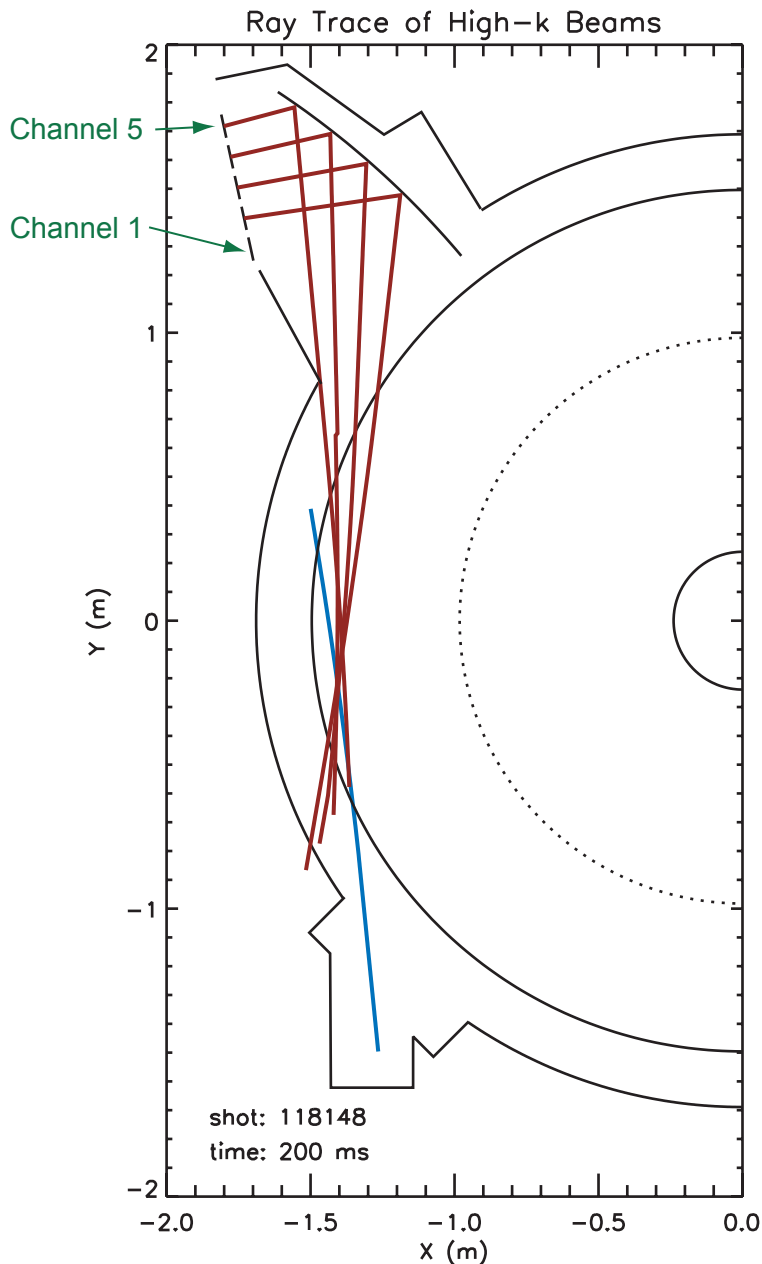
Collected data during final three non-CHI run days of 2005

All data for outboard launch configuration

Only 4 of 5 detection channels were operational



Probe and Receiving Beam Alignment Issues



According to ray tracing simulations, the probe and receiving beams were not well aligned.

Vertical misalignment

The receiving beam for channel 5 did not come within 7 cm of the probe beam. Channel 2 exhibited the closest approach with 2.4 cm.

Radial misalignment

Observed fluctuation wavevectors were contaminated with finite k-parallel

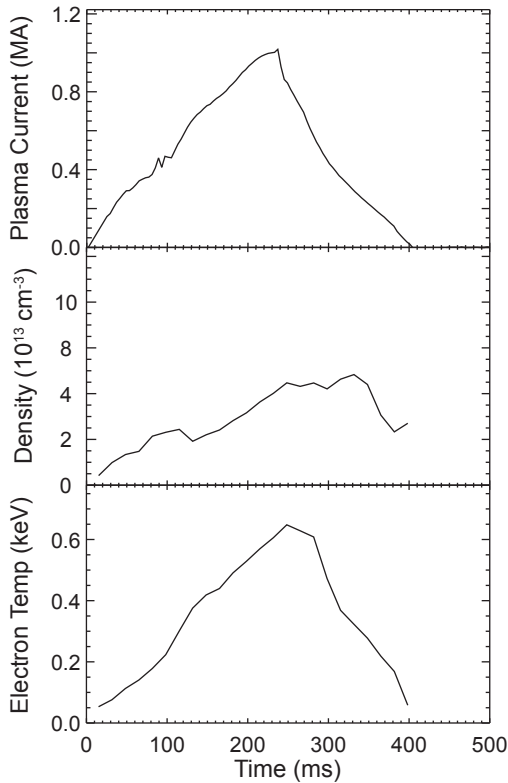
Visible/microwave beam misalignment

Probe beam clipped by NB armor

Preliminary Scattering Data

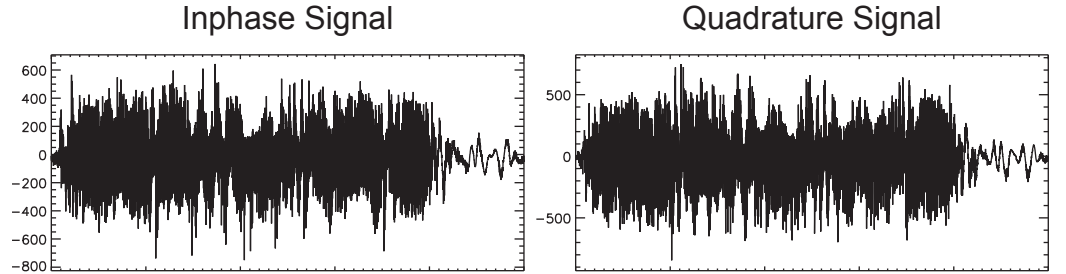


Shot 118148
Ohmic Discharge
Outboard Launch
Scat. Vol. at $\rho \approx 0.76$

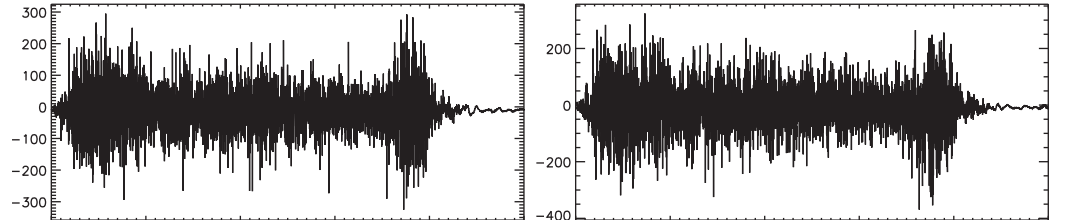


Low-k
↑
↓
High-k

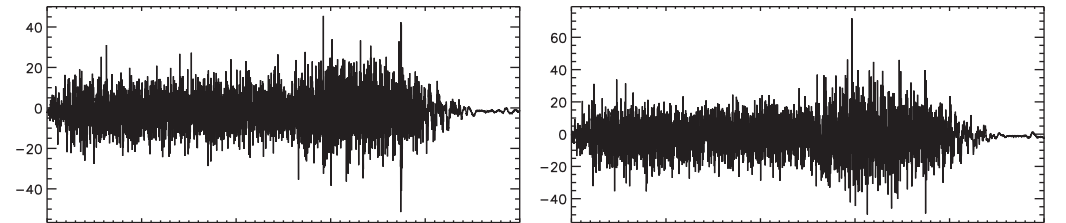
Channel 5
 $k_{\perp} = 4.5 \text{ cm}^{-1}$
 $k_{\parallel} = 1.3 \text{ cm}^{-1}$
 $k_{\perp}\rho_e = 0.034$



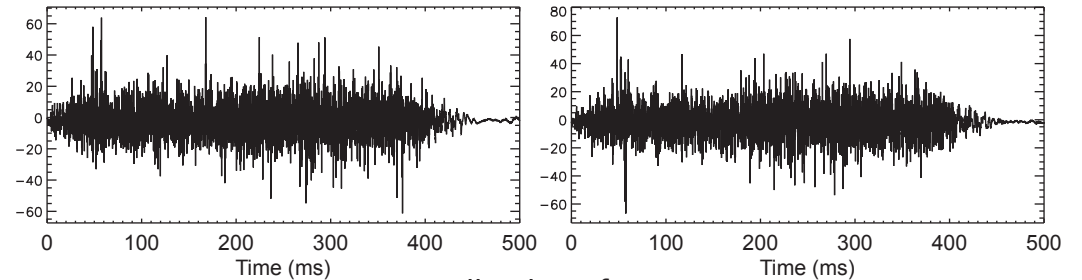
Channel 4
 $k_{\perp} = 8.9 \text{ cm}^{-1}$
 $k_{\parallel} = 1.6 \text{ cm}^{-1}$
 $k_{\perp}\rho_e = 0.067$



Channel 3
 $k_{\perp} = 12 \text{ cm}^{-1}$
 $k_{\parallel} = 2.6 \text{ cm}^{-1}$
 $k_{\perp}\rho_e = 0.095$

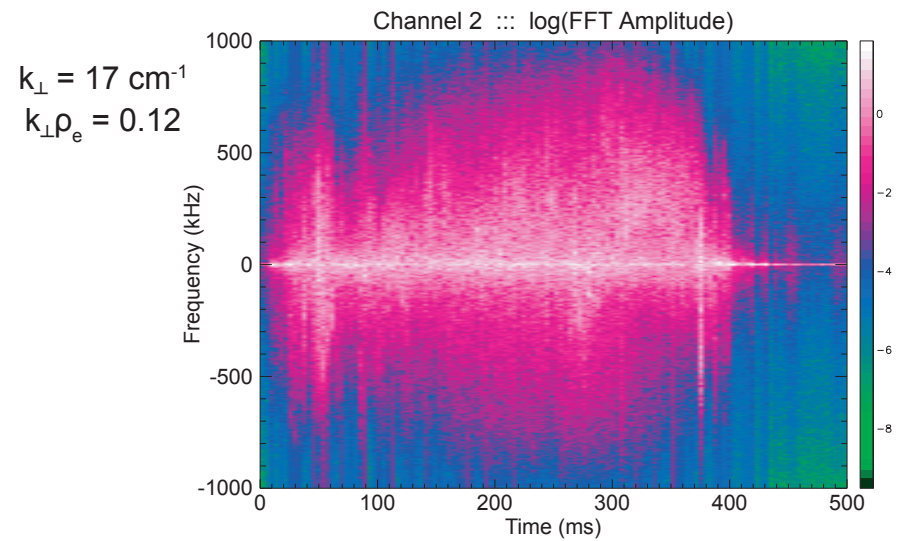
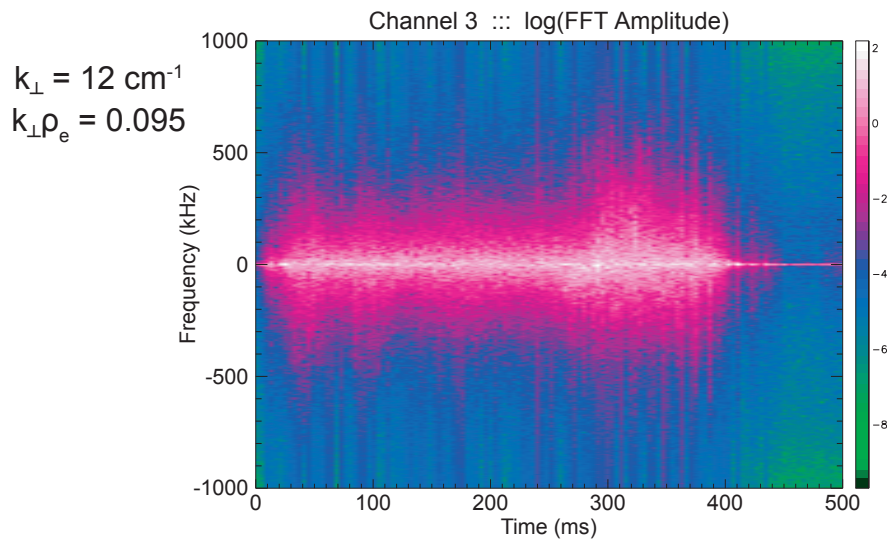
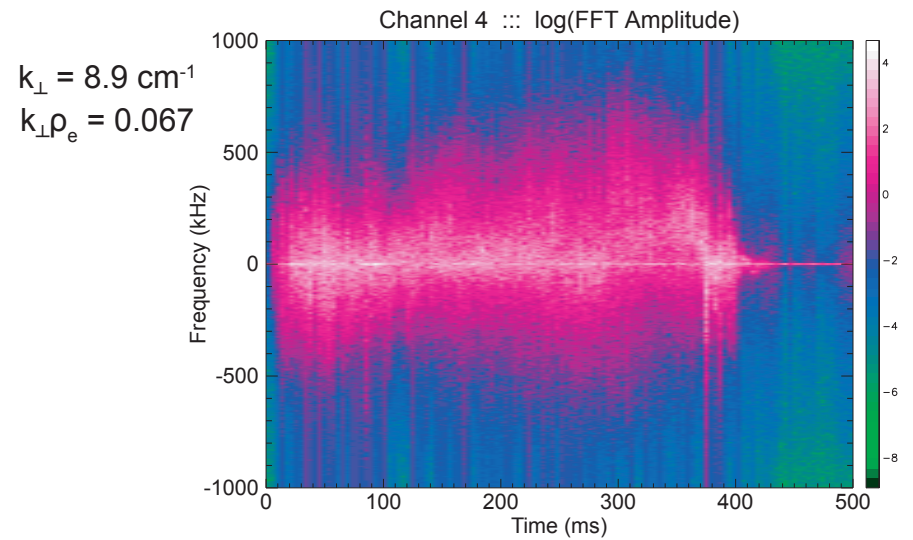
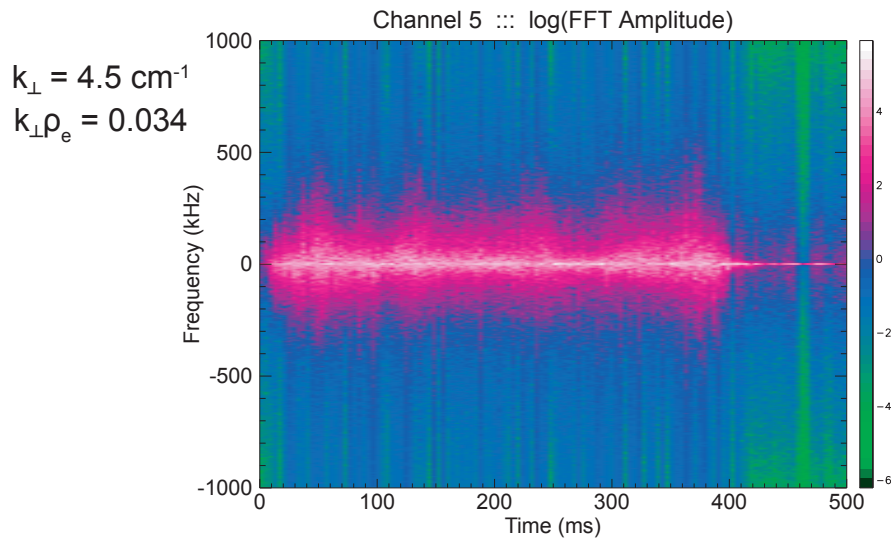


Channel 2
 $k_{\perp} = 17 \text{ cm}^{-1}$
 $k_{\parallel} = 3.7 \text{ cm}^{-1}$
 $k_{\perp}\rho_e = 0.13$



all values for
 $t = 250 \text{ ms}$

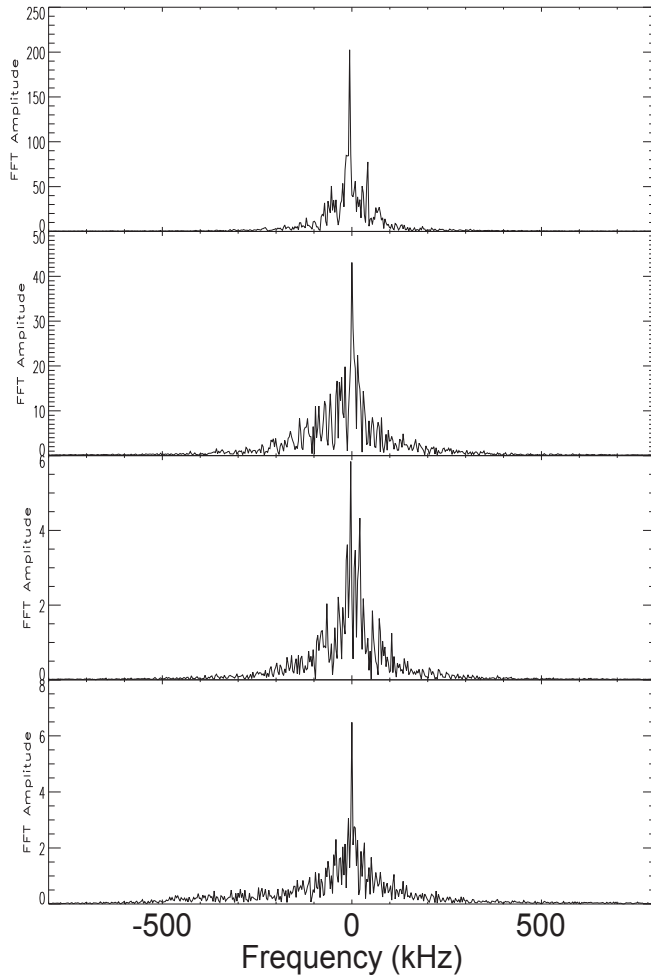
Preliminary Scattering Data



Preliminary Scattering Data



$t = 100$ ms



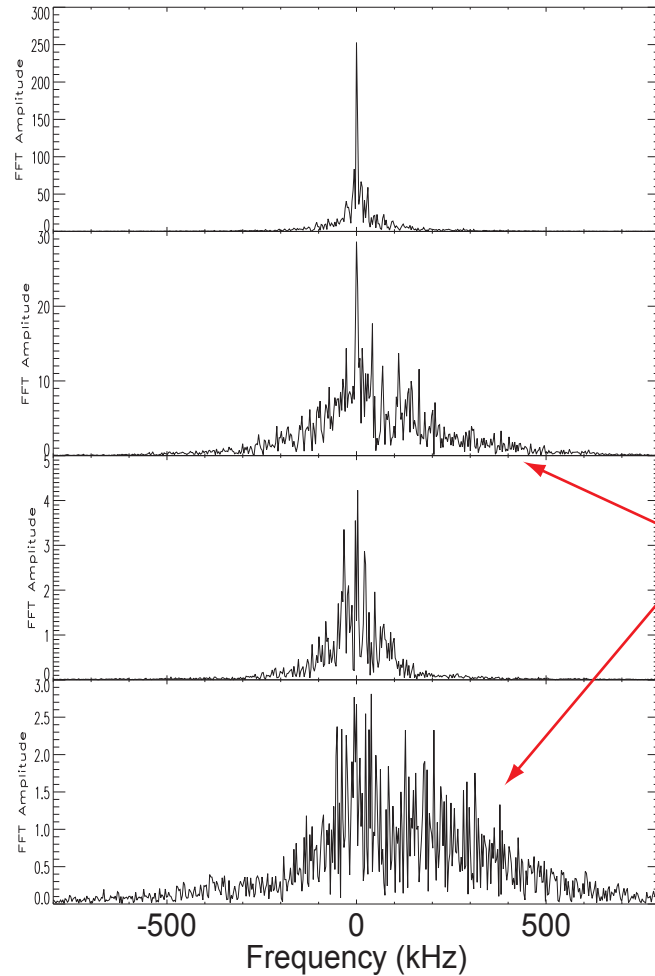
Ch. 5
 $k_{\perp} = 4.5 \text{ cm}^{-1}$
 $k_{\perp}\rho_e = 0.034$

Ch. 4
 $k_{\perp} = 8.9 \text{ cm}^{-1}$
 $k_{\perp}\rho_e = 0.067$

Ch. 3
 $k_{\perp} = 12 \text{ cm}^{-1}$
 $k_{\perp}\rho_e = 0.095$

Ch. 2
 $k_{\perp} = 17 \text{ cm}^{-1}$
 $k_{\perp}\rho_e = 0.12$

$t = 250$ ms



Uneven spectra indicate possible doppler-shifted k_{pol} contribution to k_{\perp}

Future Work



Redo alignment of probe beam and perform alignment of receiving beams (finished)

Investigate if the microwave beam is coincident with the alignment laser (finished)

Scan 2D microwave beam profile in vessel to test quasi-optical design (finished but not analyzed)

Bring 5th detection channel online

Plan for RS high T_e and perturbative transport experiments in 2006