

Radial Structure Measurement of BAAE and RSAE/TAE Modes with High-k Scattering System

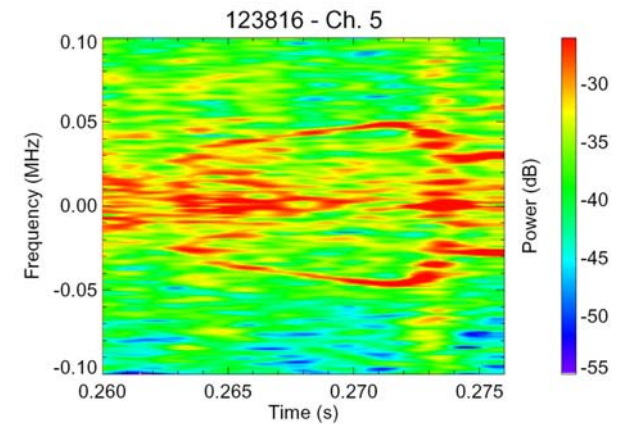
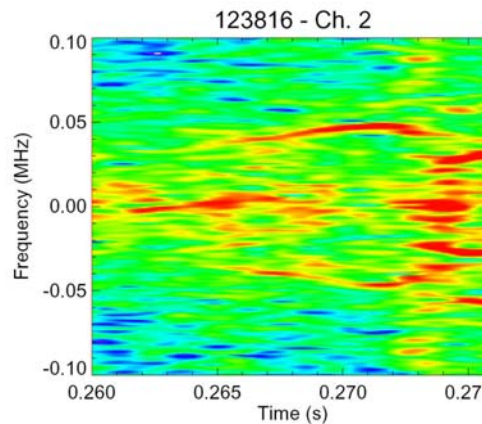
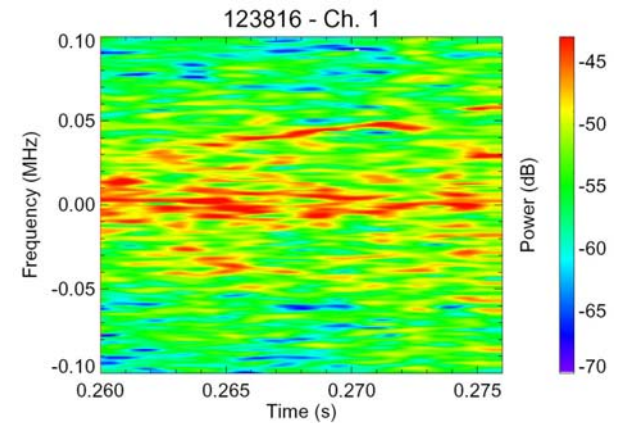
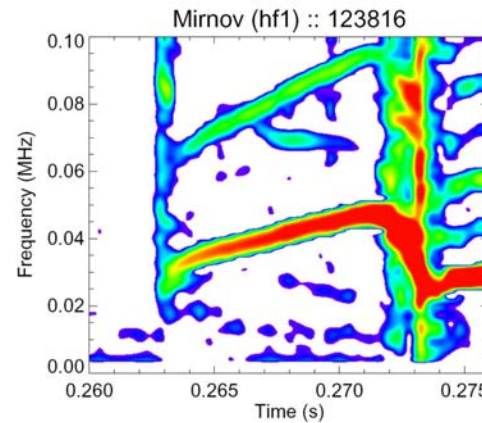
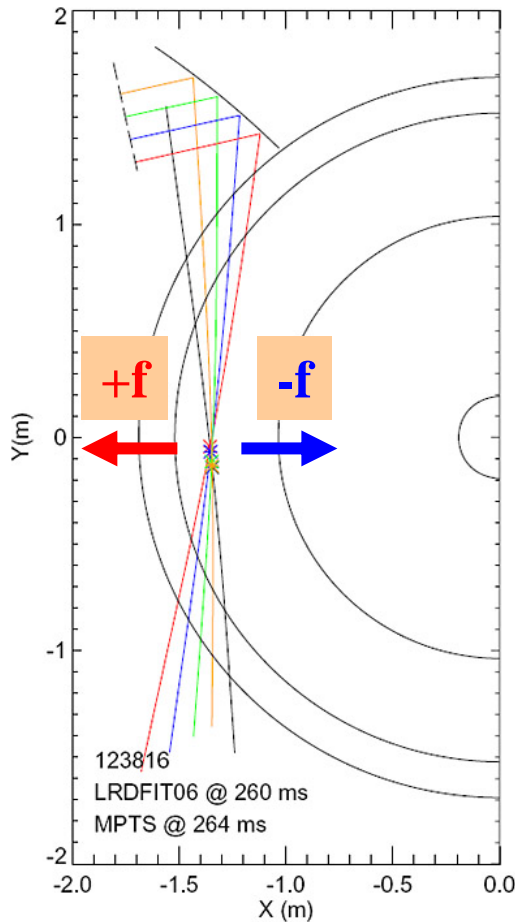
W. Lee and N. Gorelenkov

Proposal



- **Goal:** Measure the precise radial structures of BAAE and RSAE/TAE modes with high-k scattering system and find the relation between Alfvén modes and the fast ion loss.
- **Background:** Previous campaign BAAE mode measured with USXR, reflectometer, and high-k. Next campaign more precise structures of BAAE and RSAE/TAE modes with high-k will be measured.
- **Experimental plan:** Obtain high-k data at $R=110 - 145$ cm with 5 cm step (beam diameter ~ 6 cm) for shot 123816 or 124930 or both.
- **Machine time:** 0.5 day (need remote control)
- **Diagnostics:** high-k, USXR, reflectometer, FIDA, NPA, MSE, MPTS, FIRETip, etc

BAAE (n=2) Mode (123816)



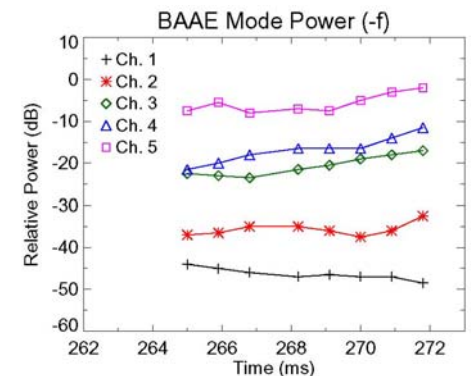
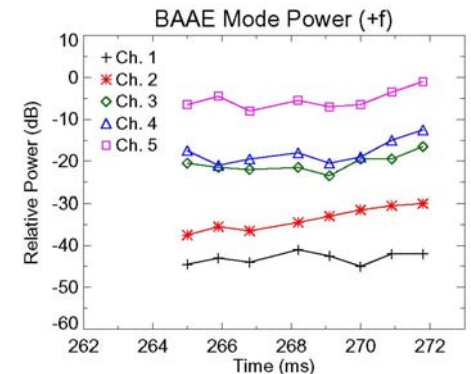
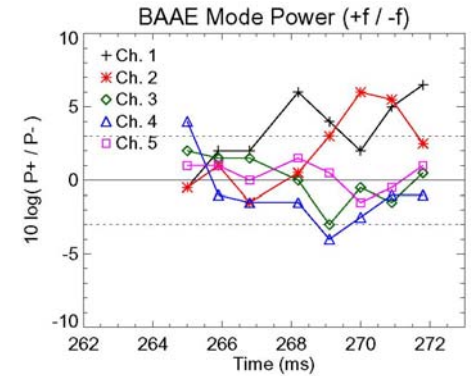
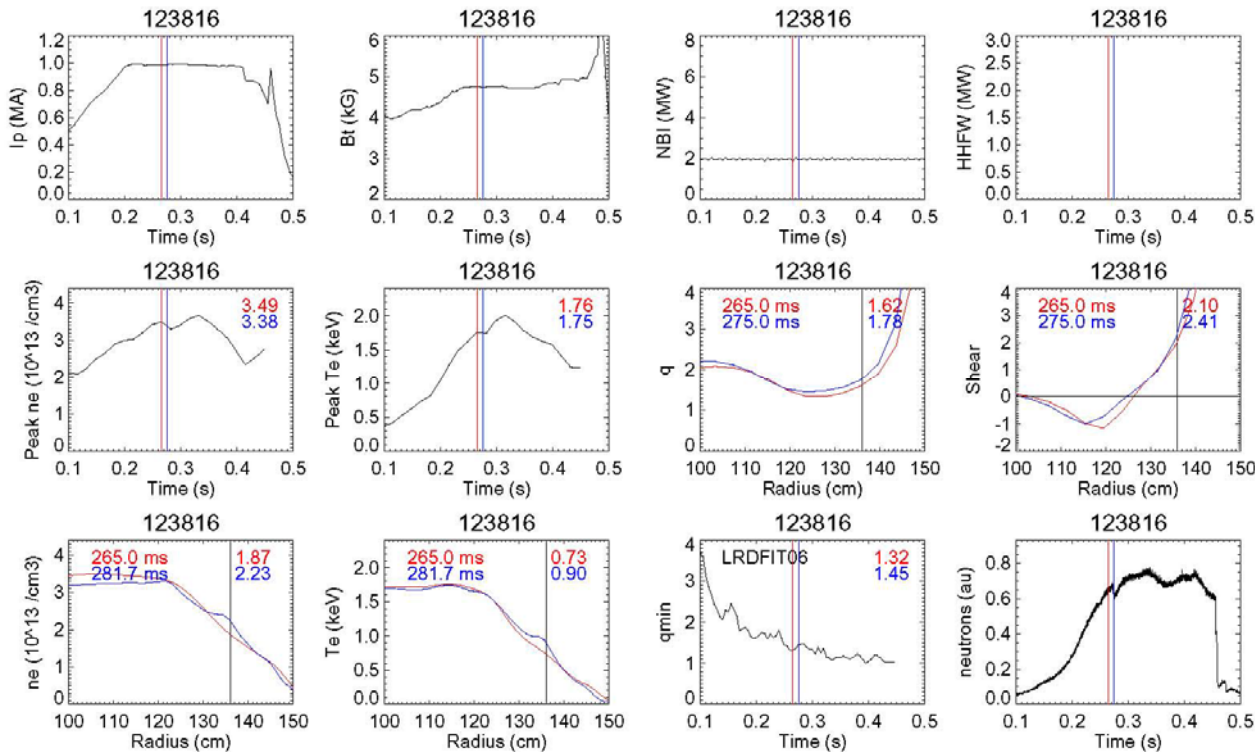
D plasma, $R = 136$ cm

$B_t = 4.5$ kG, $P_{NB} = 2$ MW

k_r (ch.1 - ch.4) = 17.1, 12.9, 8.9, 5.1 cm^{-1}

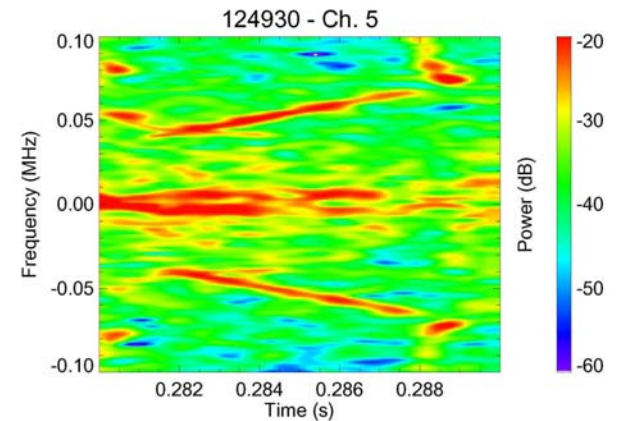
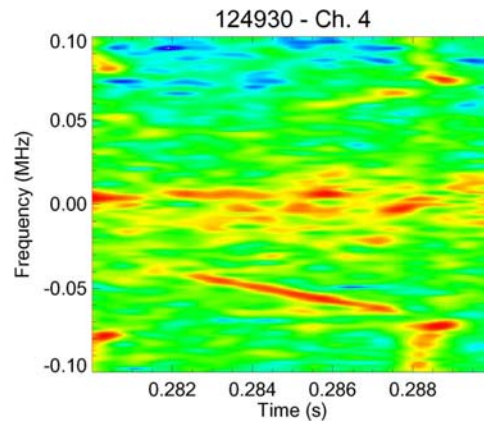
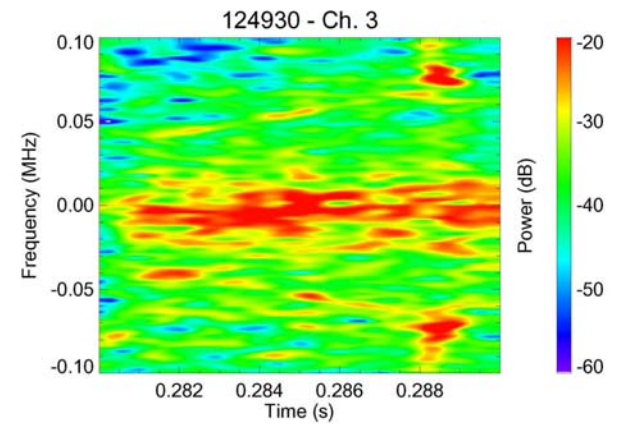
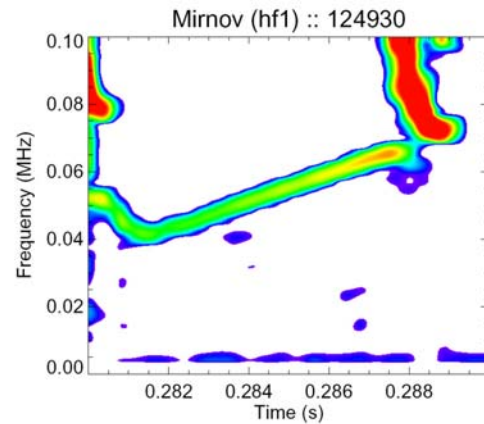
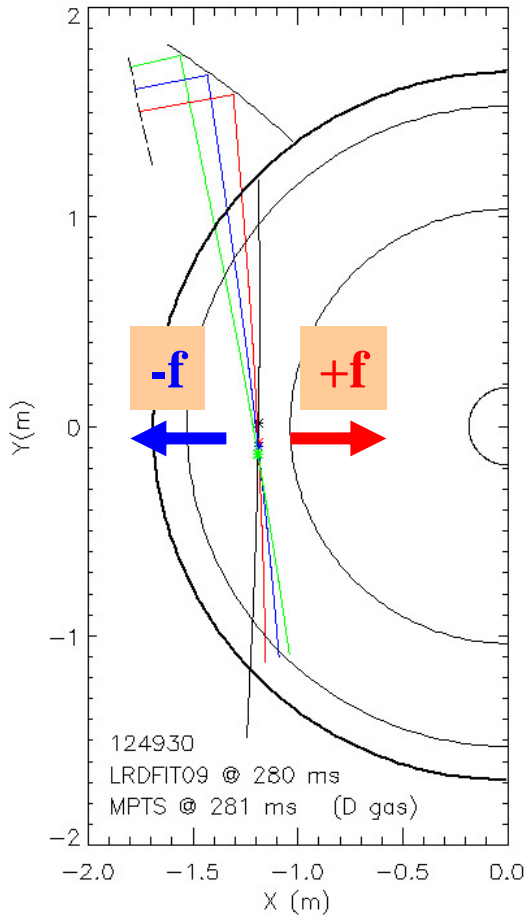
$k_{\perp} \rho_e$ (ch.1 - ch.4) = 0.43, 0.33, 0.23, 0.13

Analysis of BAAE (n=2)



- High-k channels (ch.1 and ch.2) show the radial outward transport.
- There are sawtooth-like drops in electron density, electron temperature, and neutron rate at the end of the mode.

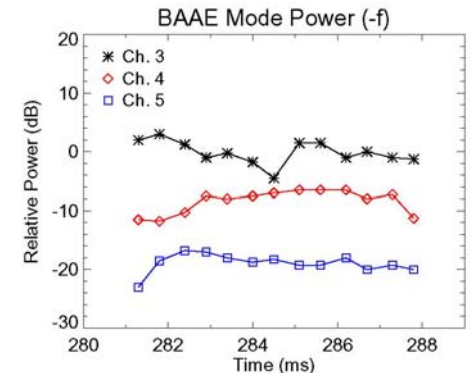
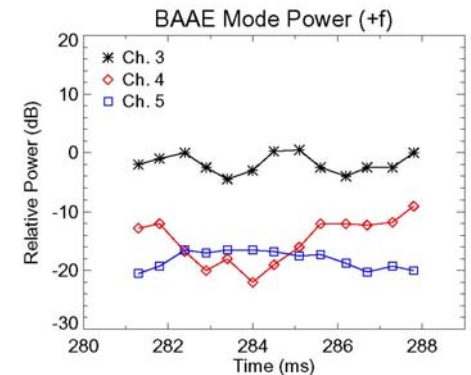
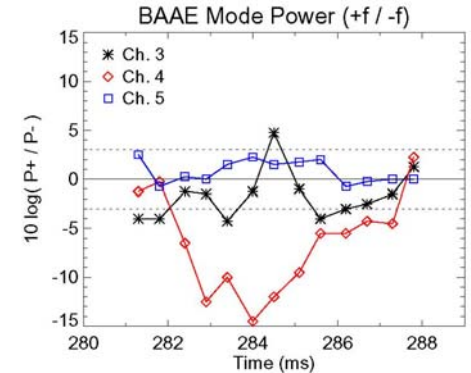
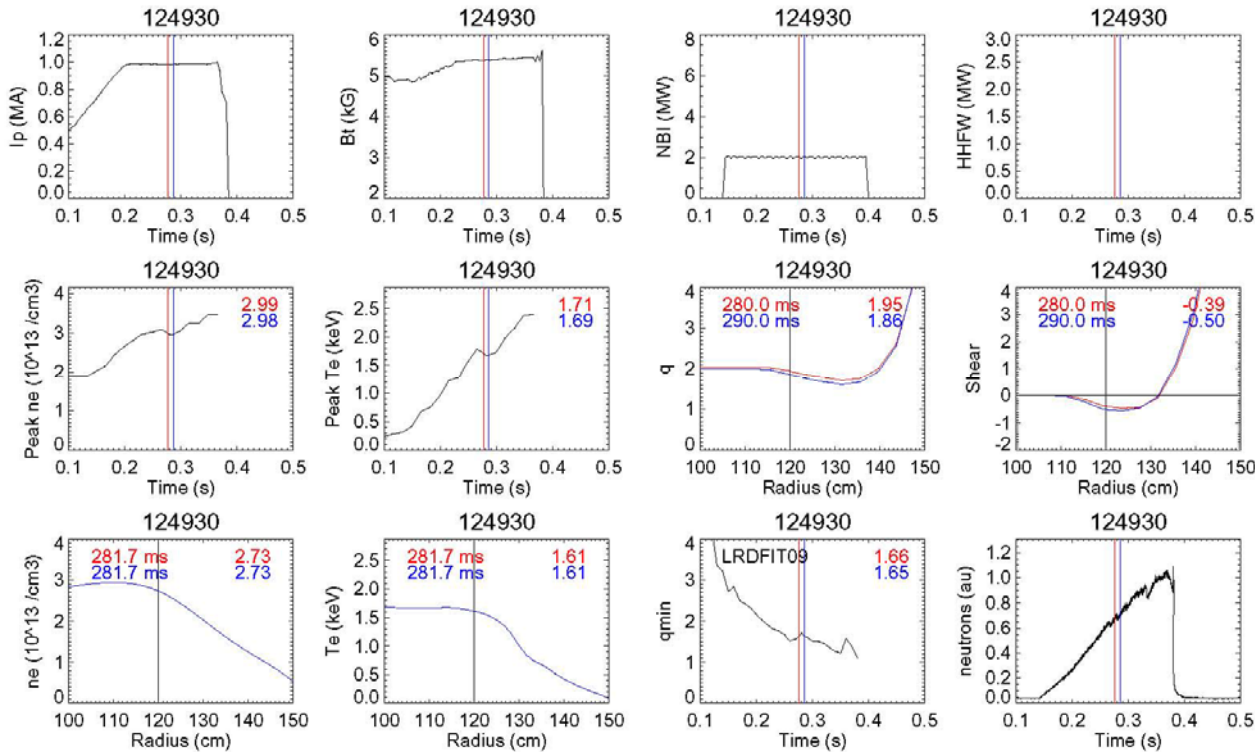
BAAE (n=4) Mode (124930)



He plasma, $R = 120$ cm
 $B_t = 5.5$ kG, $P_{NB} = 2$ MW

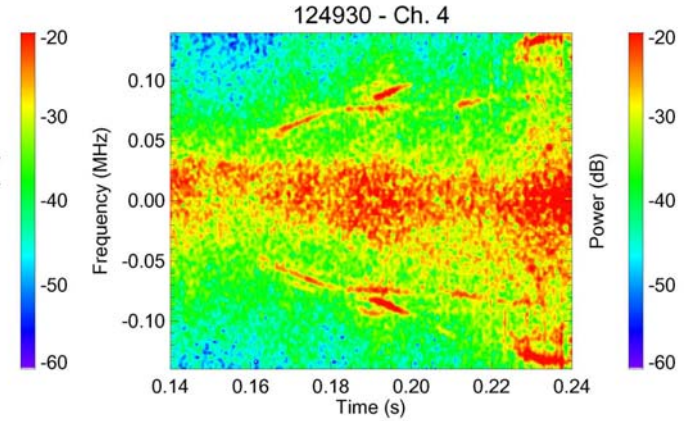
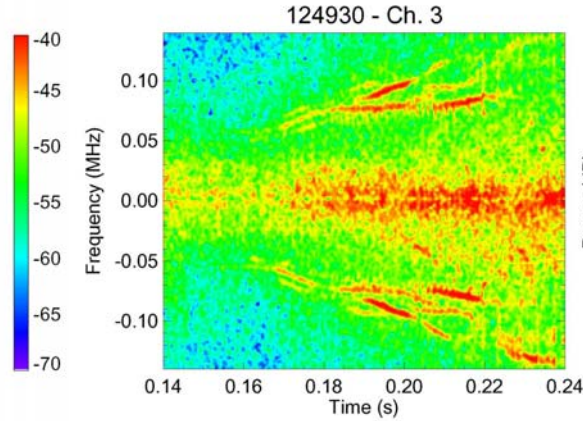
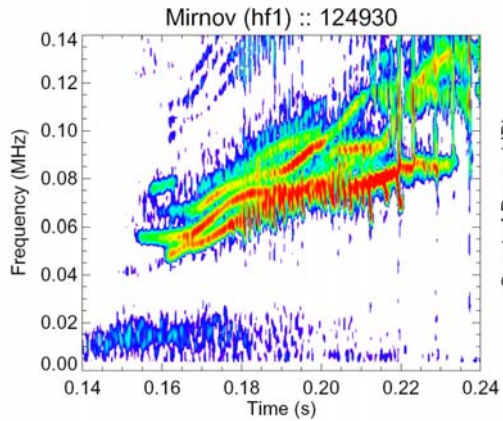
k_r (ch.3 - ch.5) = 3.5, 7.3, 10.4 cm^{-1}
 $k_{\perp} \rho_e$ (ch.3 - ch.5) = 0.11, 0.24, 0.33

Analysis of BAAE (n=4)



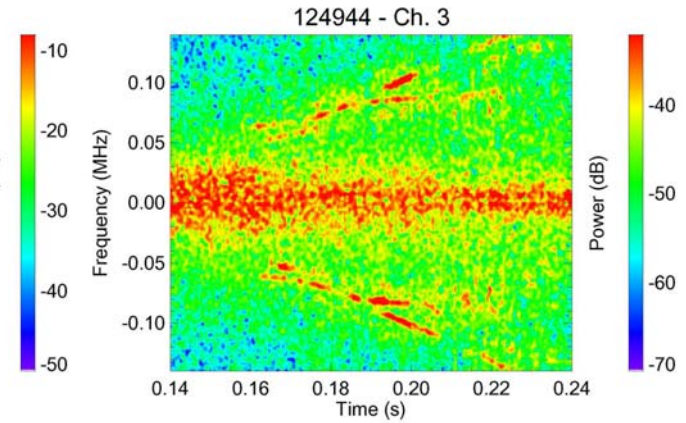
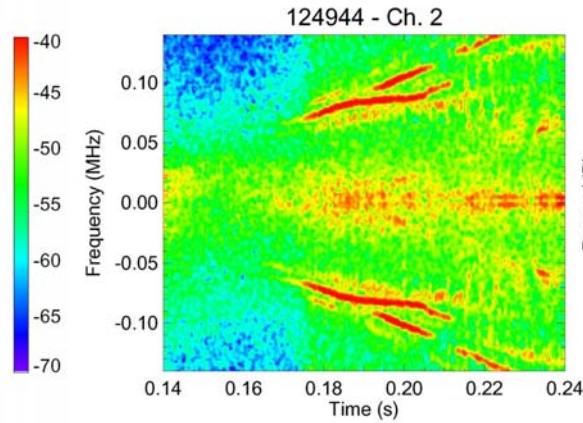
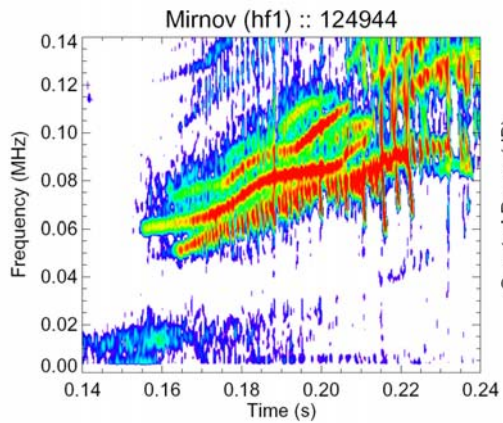
- Mid-k channel (ch.4) shows the radial outward transport.
- There are sawtooth-like drops in the electron density and electron temperature, but not in neutron rate.

RSAE/TAE Mode Structure (124930, 124944)



R = 120 cm

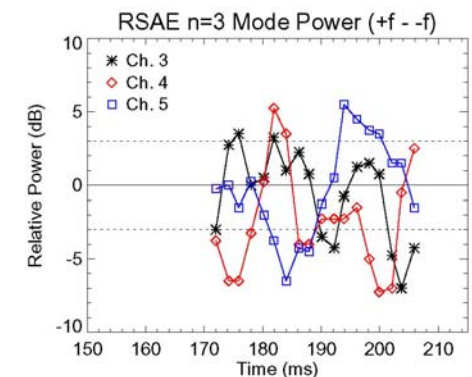
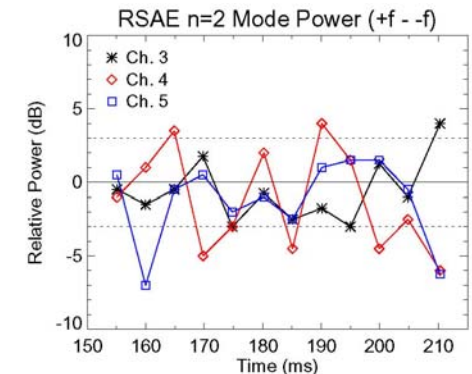
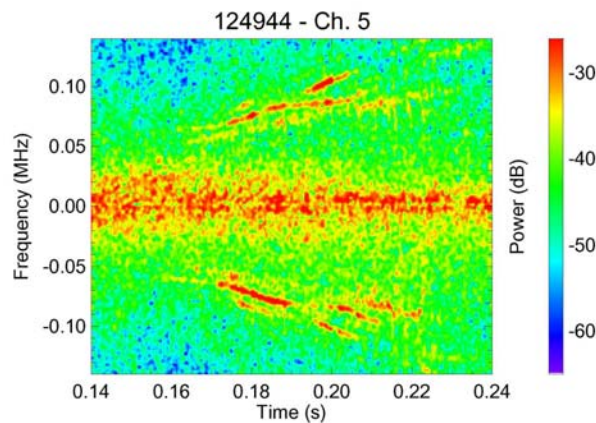
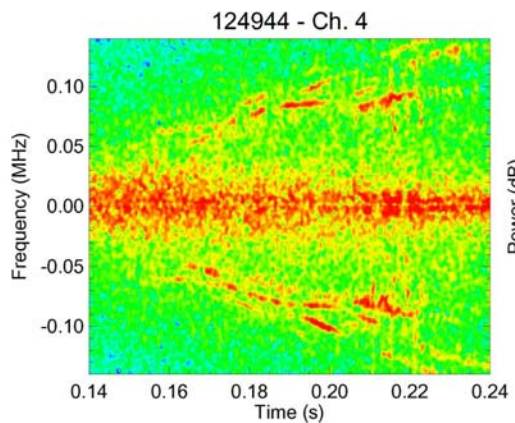
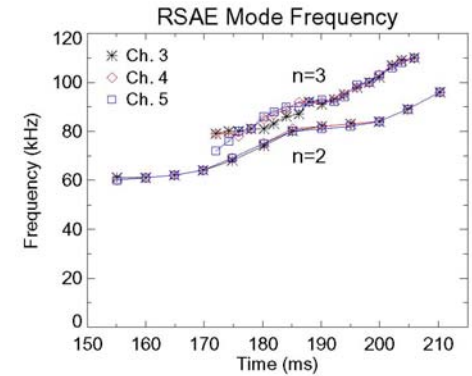
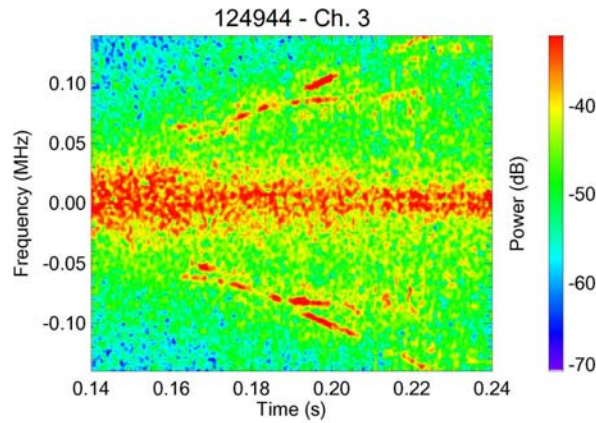
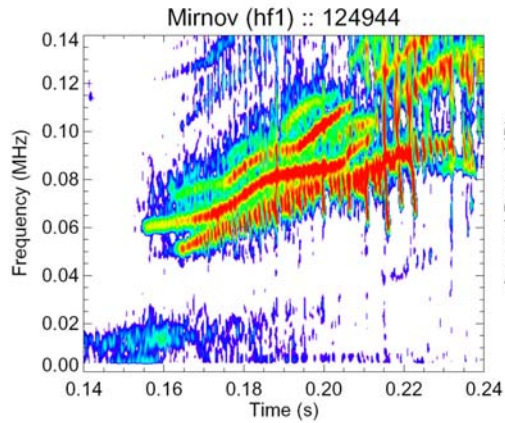
$$k_r (\text{ch.3} - \text{ch.5}) = 4.4, 8.0, 11.2 \text{ cm}^{-1}$$



R = 110 cm

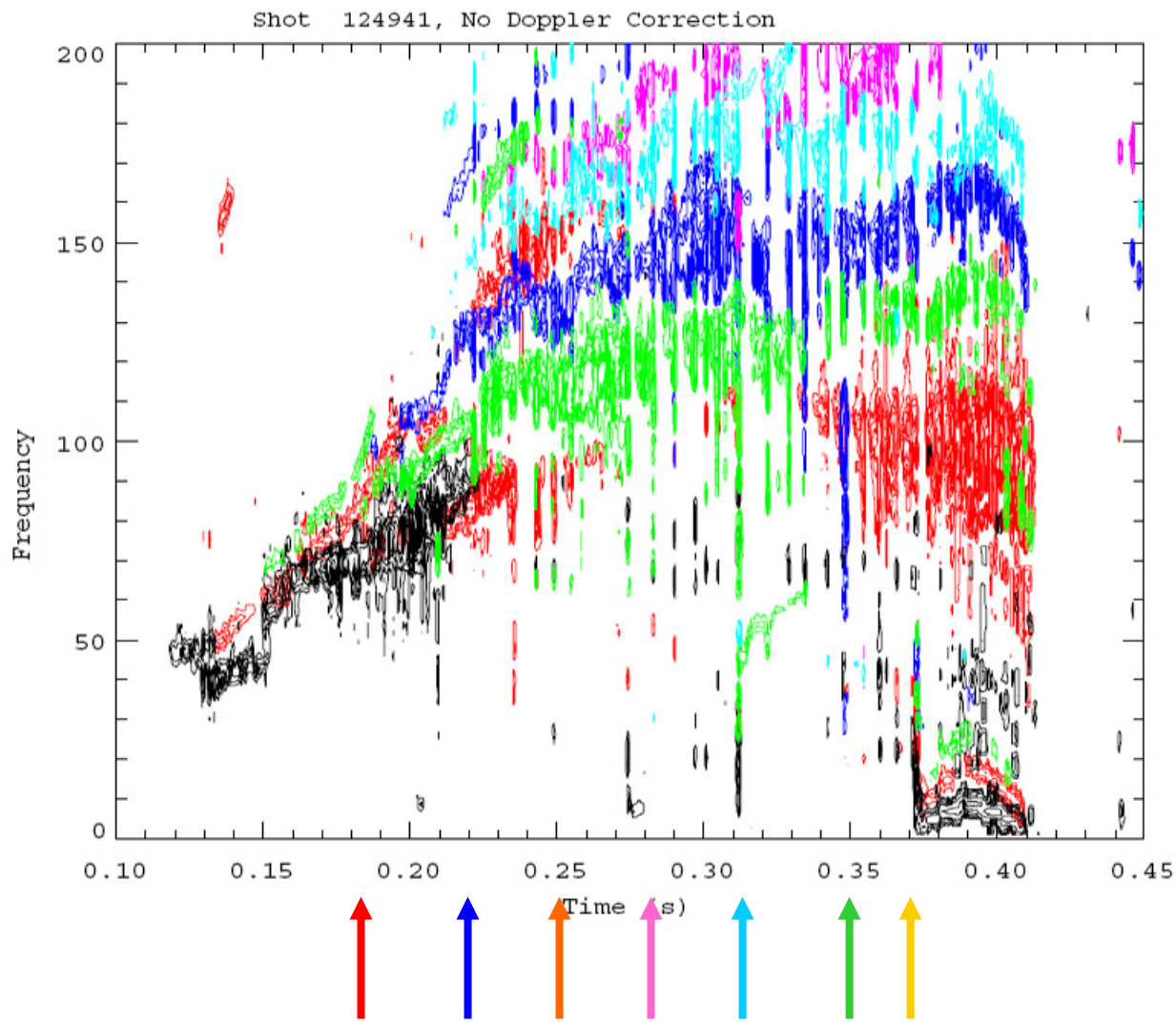
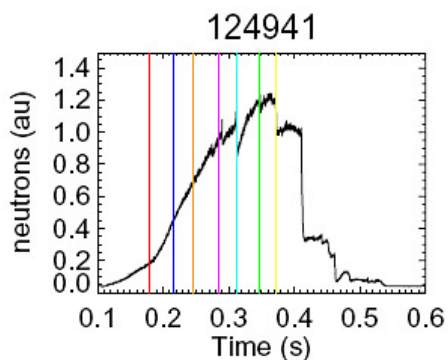
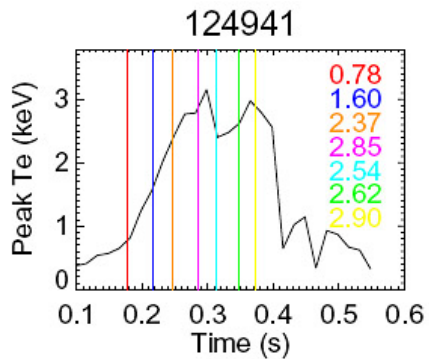
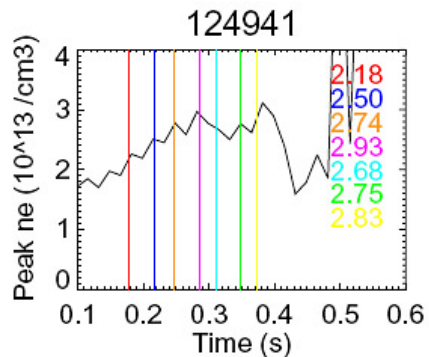
$$k_r (\text{ch.2} - \text{ch.5}) = 6.1, 9.8, 13.2, 16.2 \text{ cm}^{-1}$$

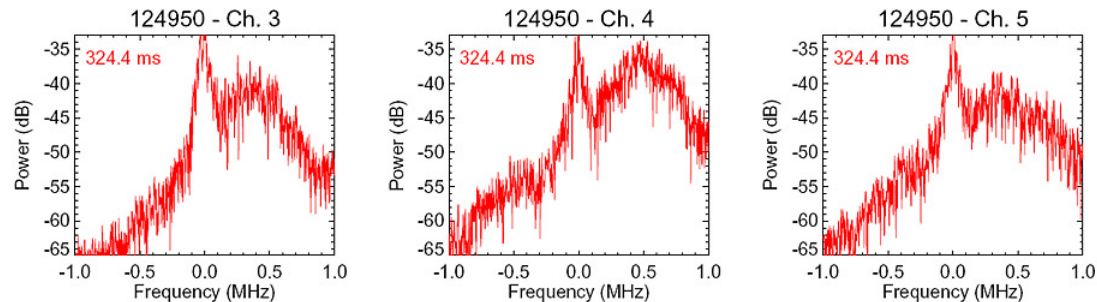
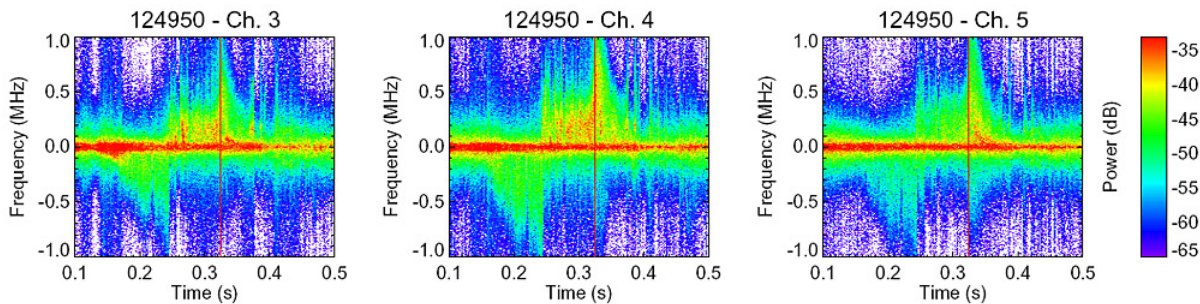
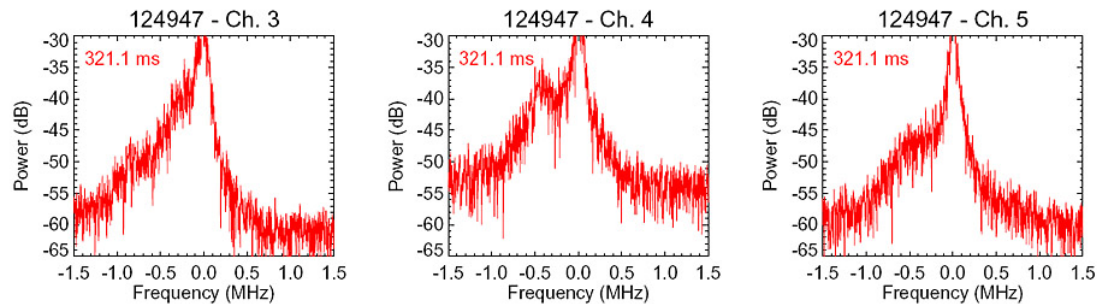
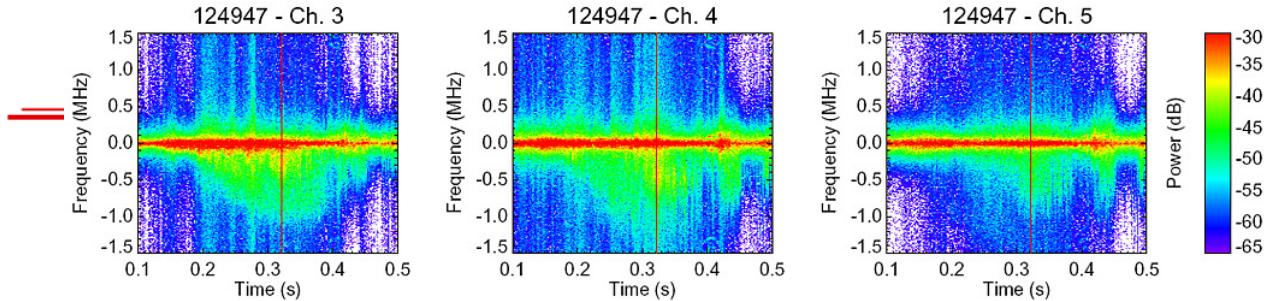
RSAE/TAE (n=2, 3) Mode (124944)



- Weak but radial outward transport

RSAE/TAE or Alfvén Avalanches on Plasma





XP717 - Hosea

He plasma,

$R = 120$ cm

$B_t = 5.5$ kG,

$P_{NB} = 2$ MW

RF phase:

947 \rightarrow - 90 deg

950 \rightarrow + 90 deg