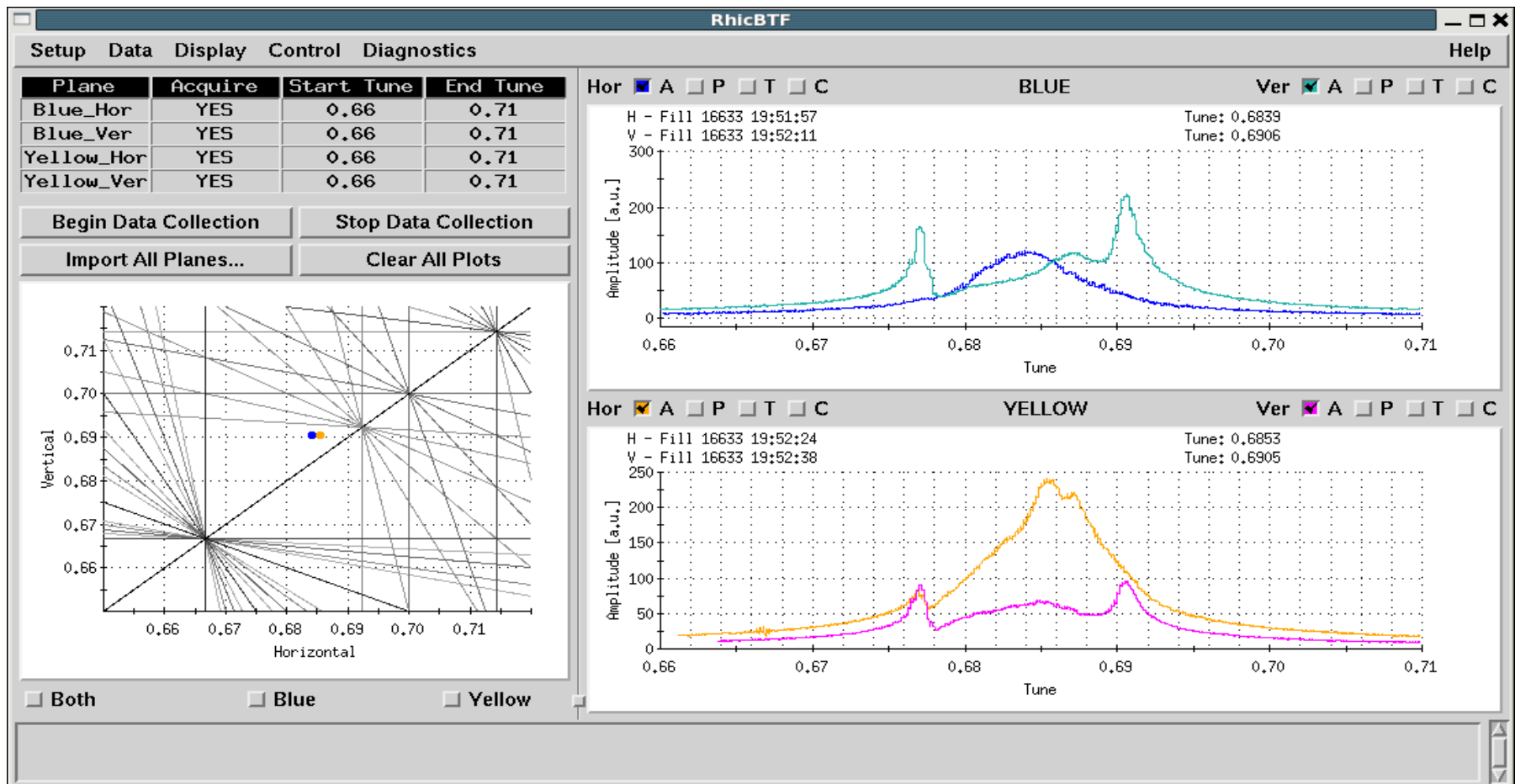
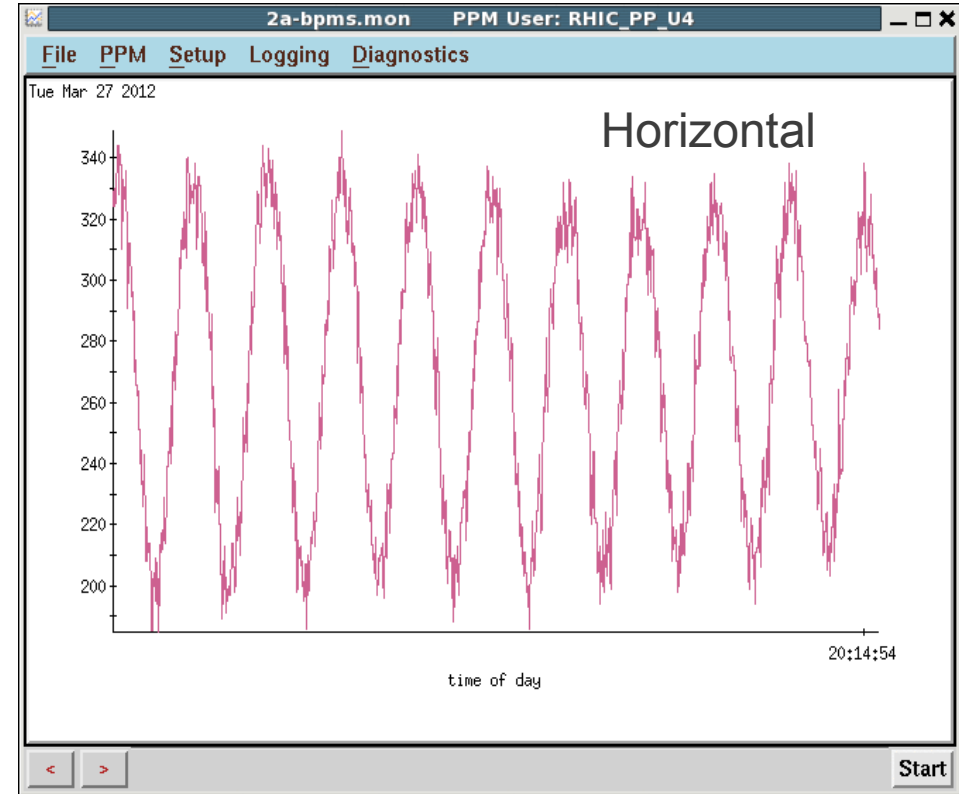
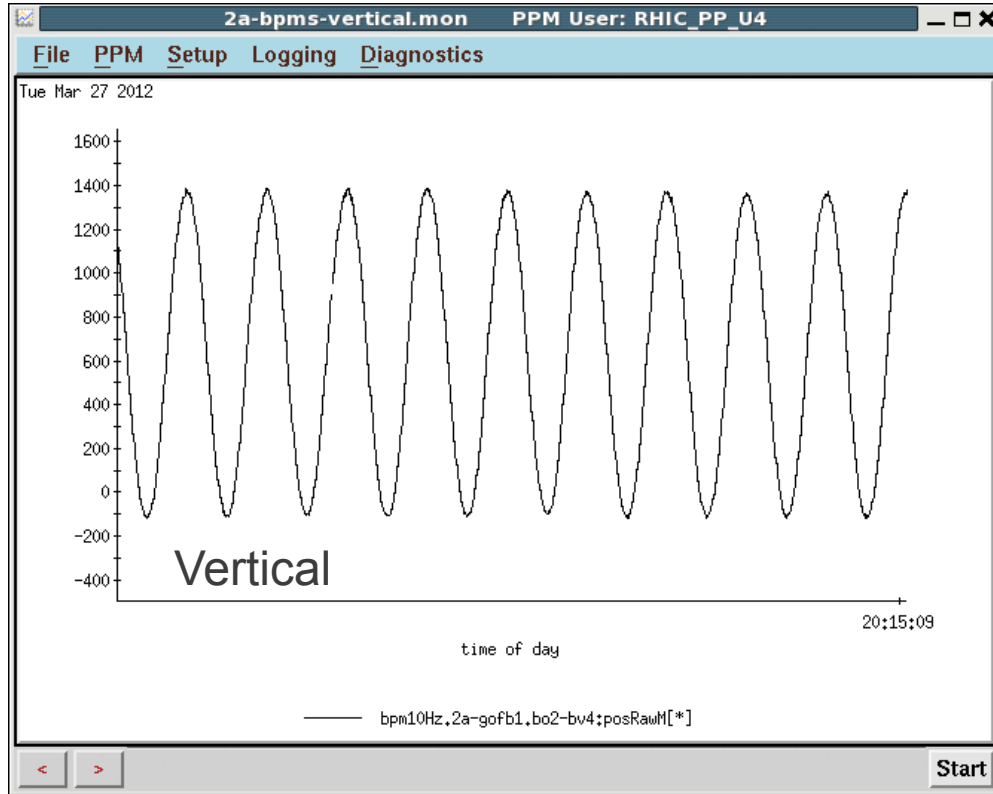


Horizontal coherent modes investigation



Why are there no coherent modes in the horizontal plane?
Seems like we are now running very close to or above the diagonal

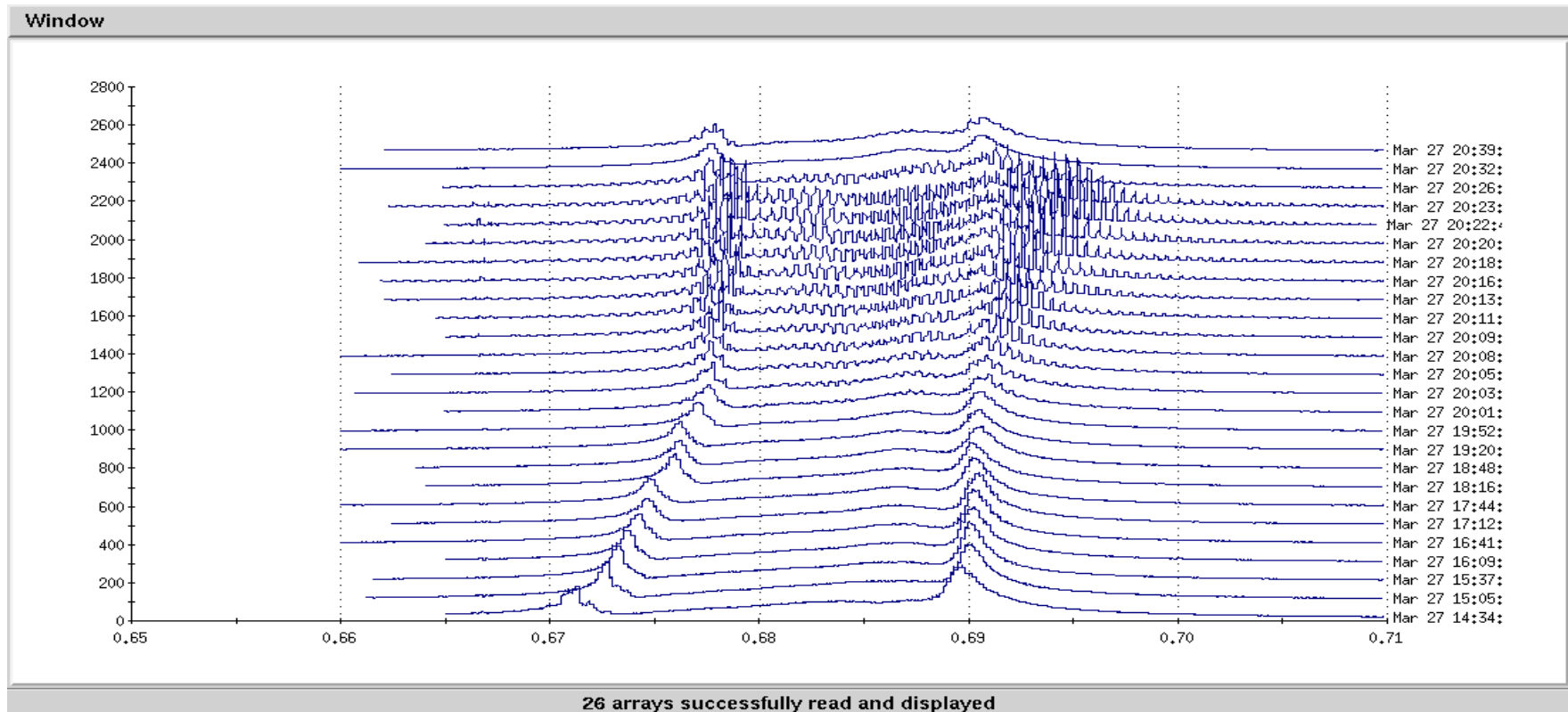
10 Hz modulation



Check whether the 10Hz modulations could affect coherent modes

Modulate air-coil magnet in the vertical plane → only orbit changes – scan amplitude

BTF data

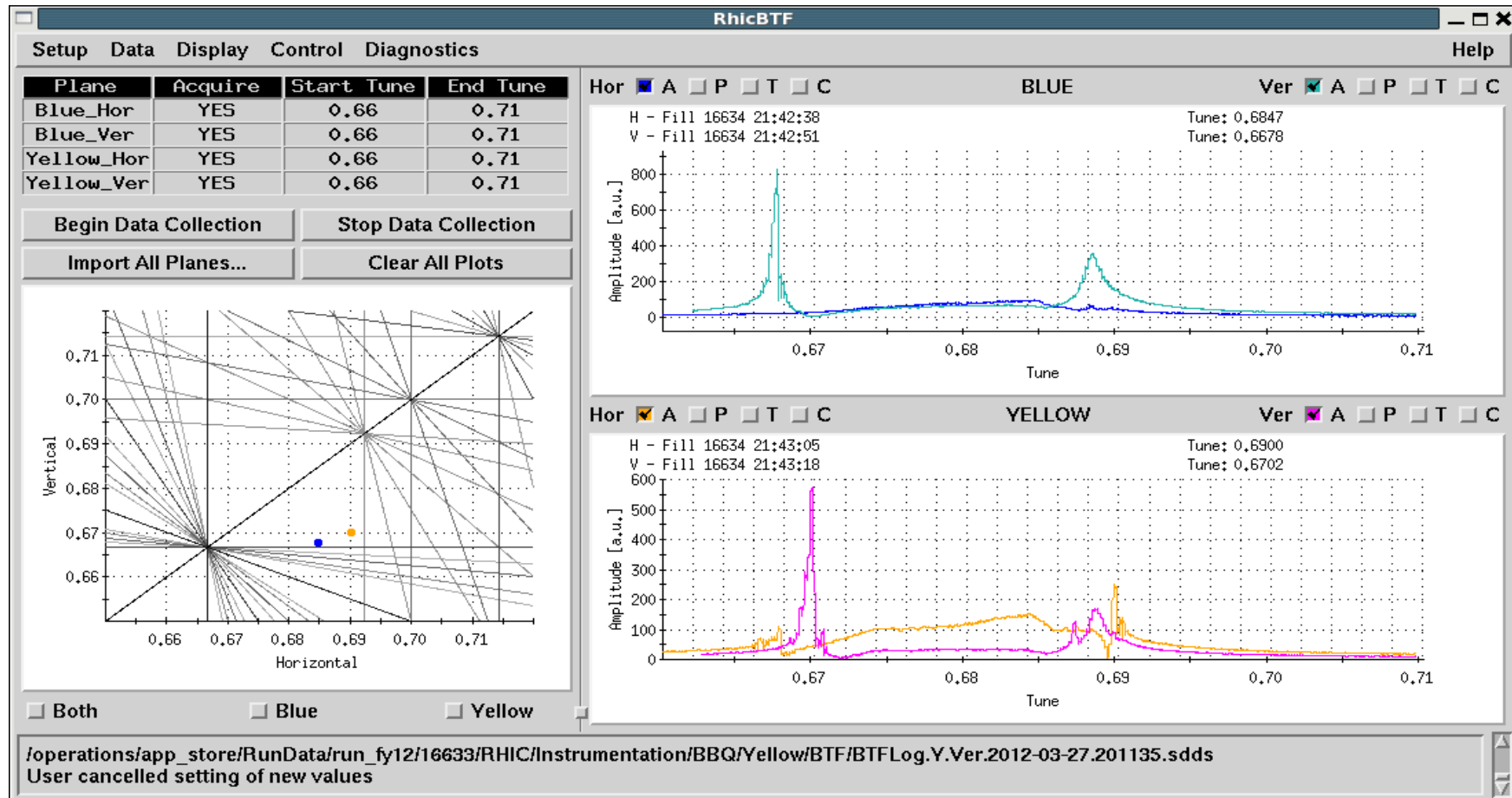


10Hz modulations clearly observed → Coherent modes could not be suppressed

Modulated the orbit by up to few mm in the triplet without success.

Emittance and polarization not affected!

Effect of Coupling



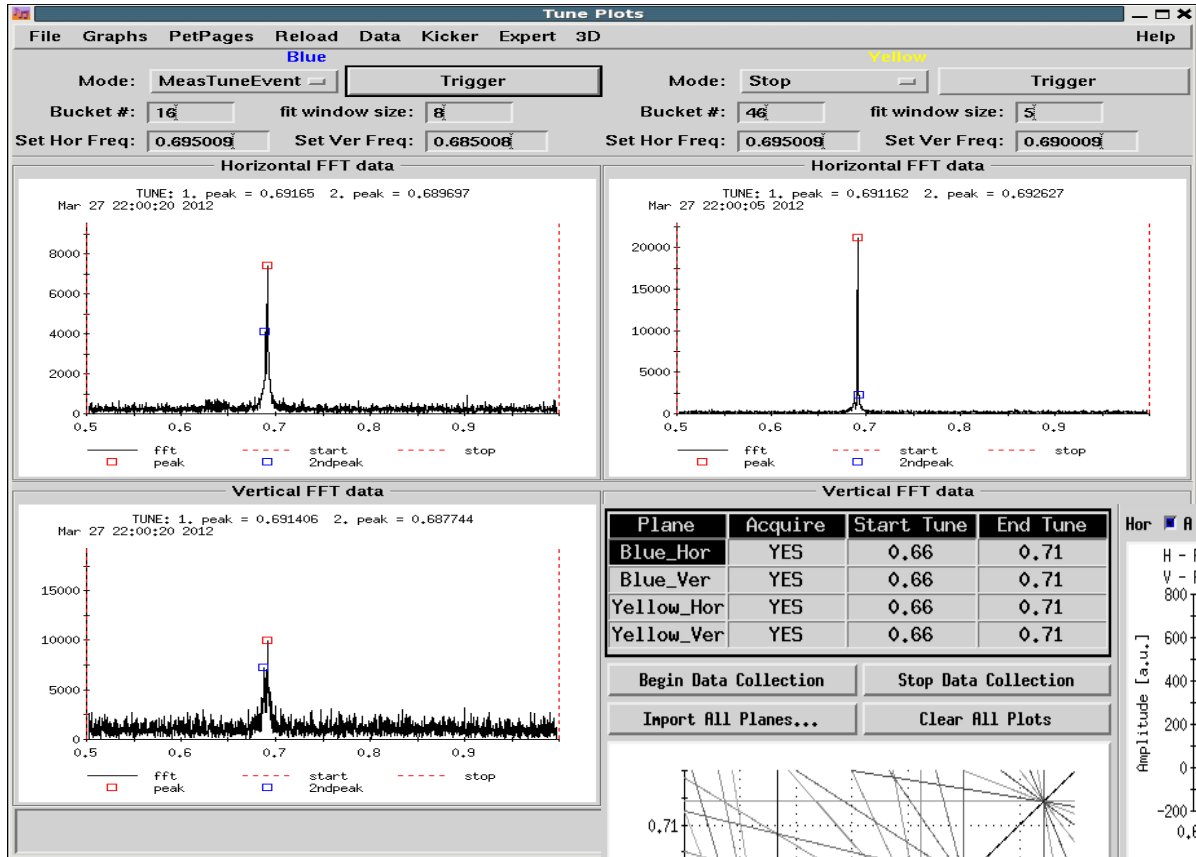
Situation at the beginning of the store:

→ Vertical pi-modes at different locations??

- Move to $Q_x=Q_y$ – see if modes appear in horizontal

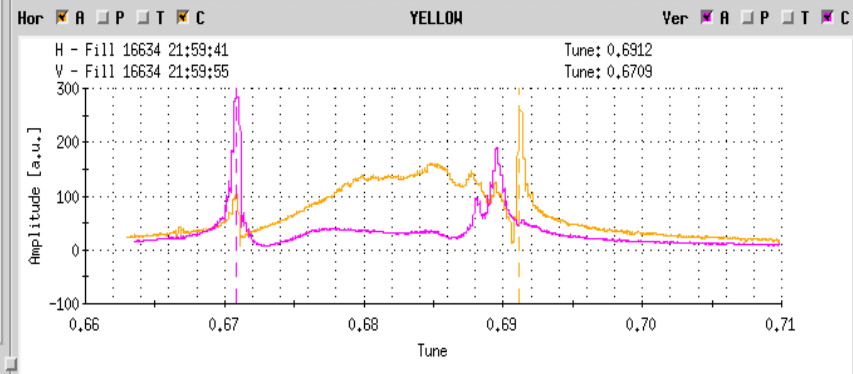
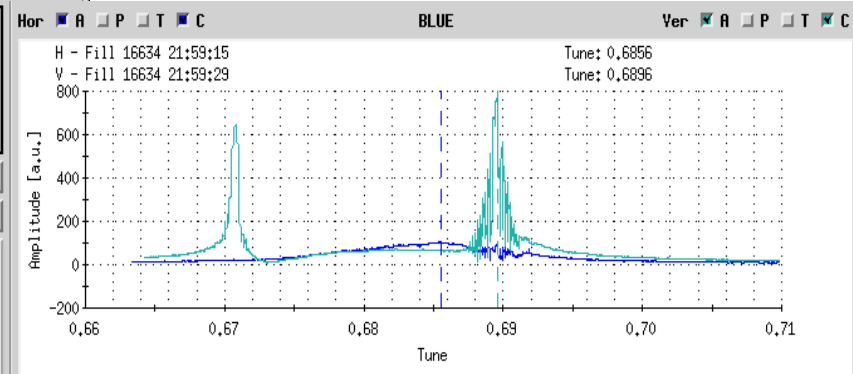
- Cross the tunes to check whether the situation is inverted

Move to $Q_x=Q_y$

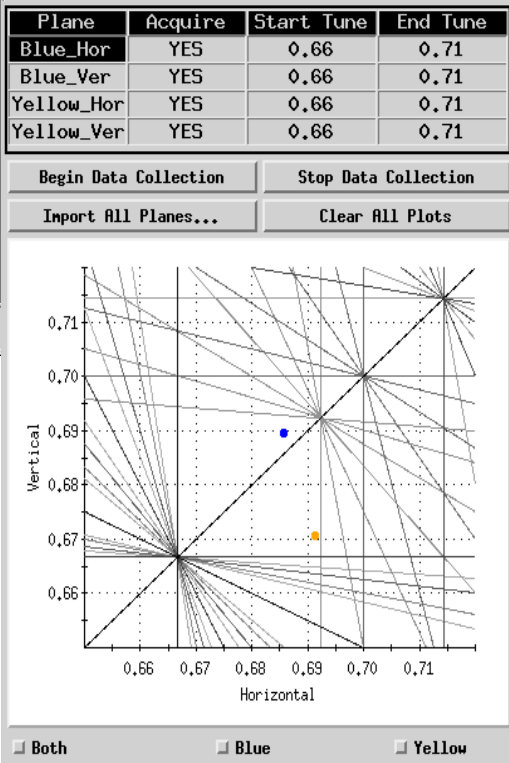


Had some problems with yellow Vertical

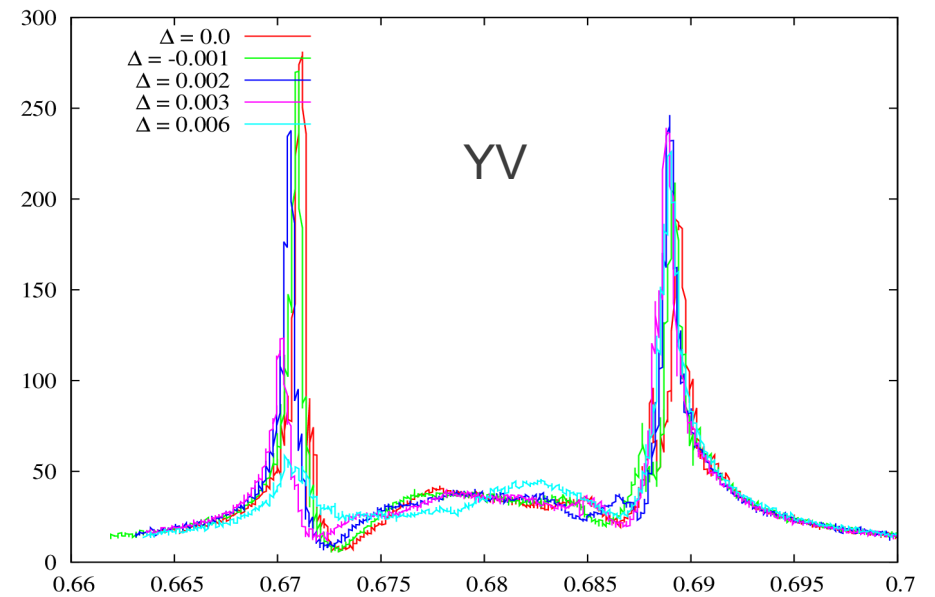
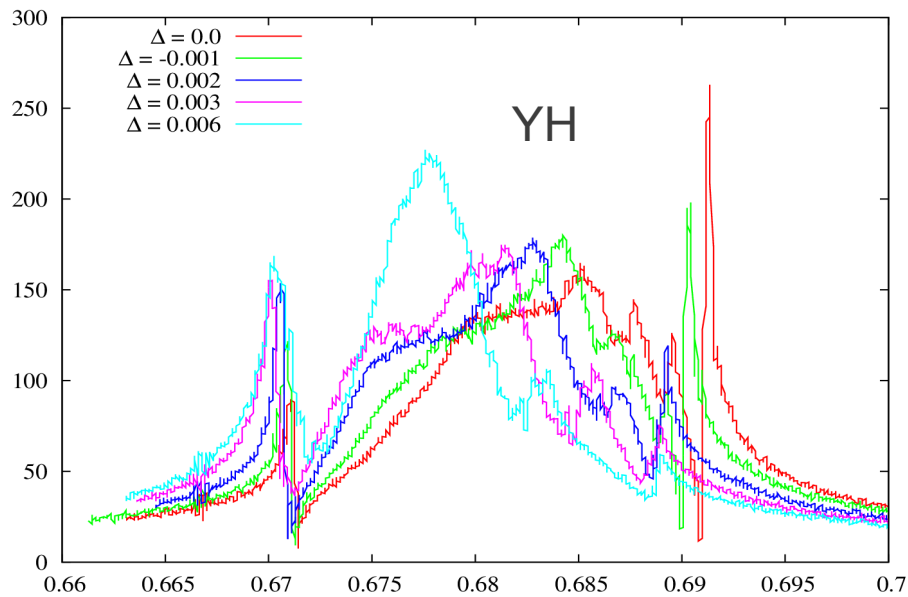
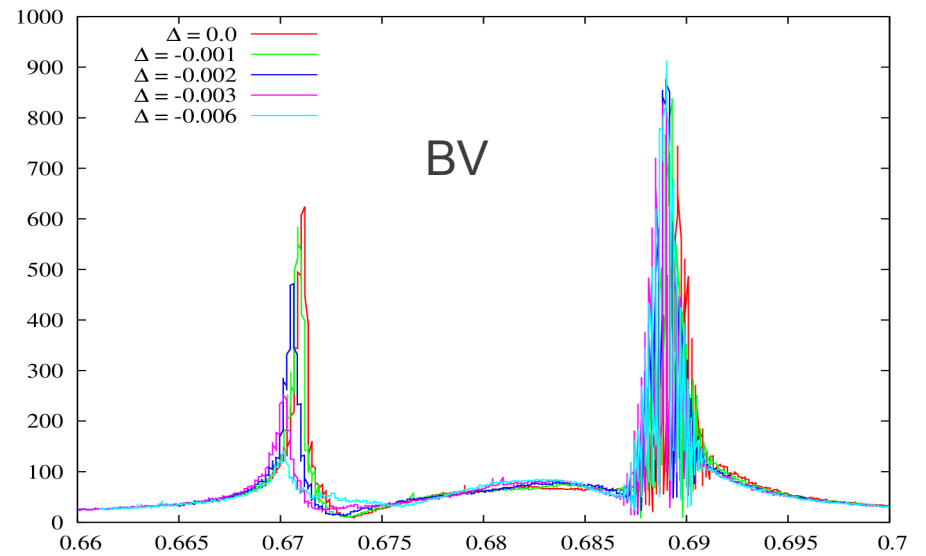
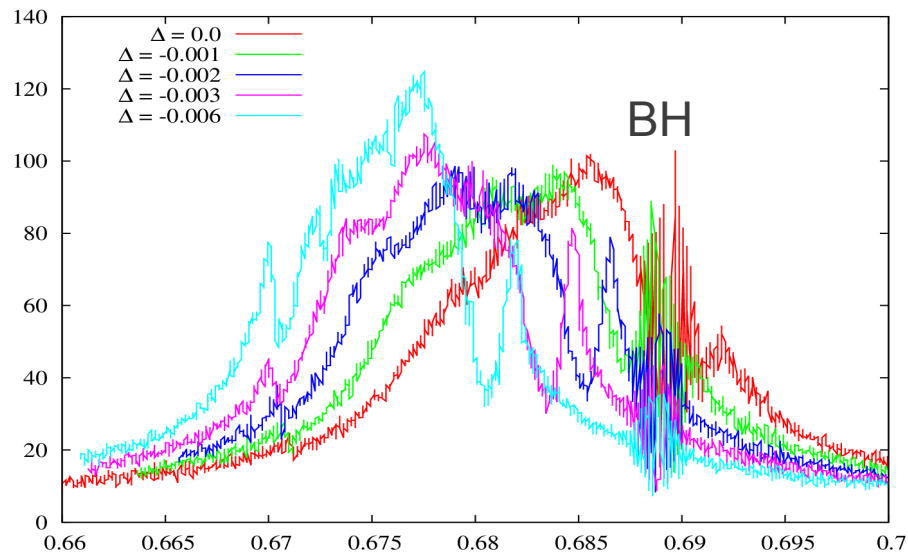
Moved only blue to the diagonal
 And applied the same change in yellow



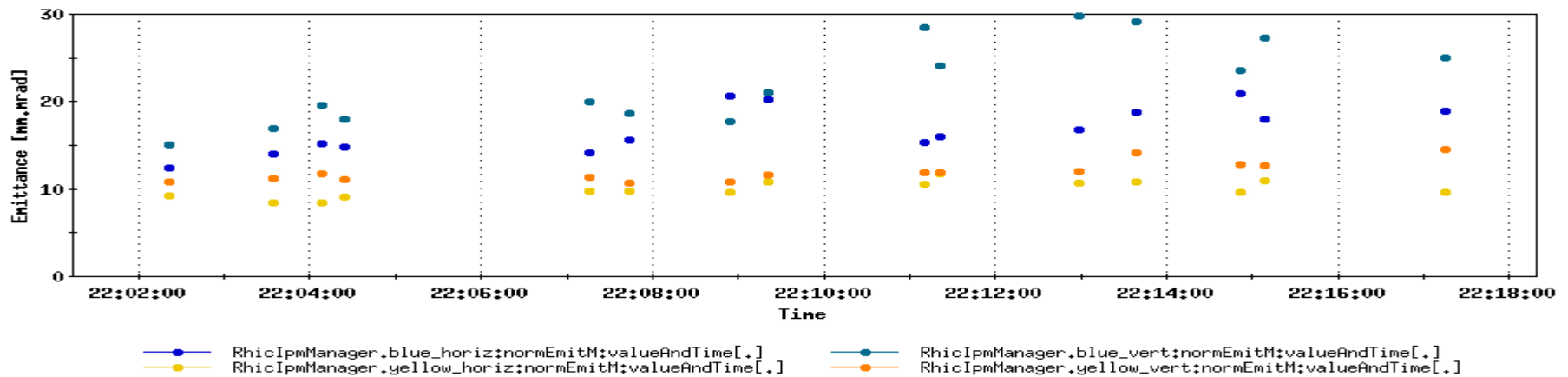
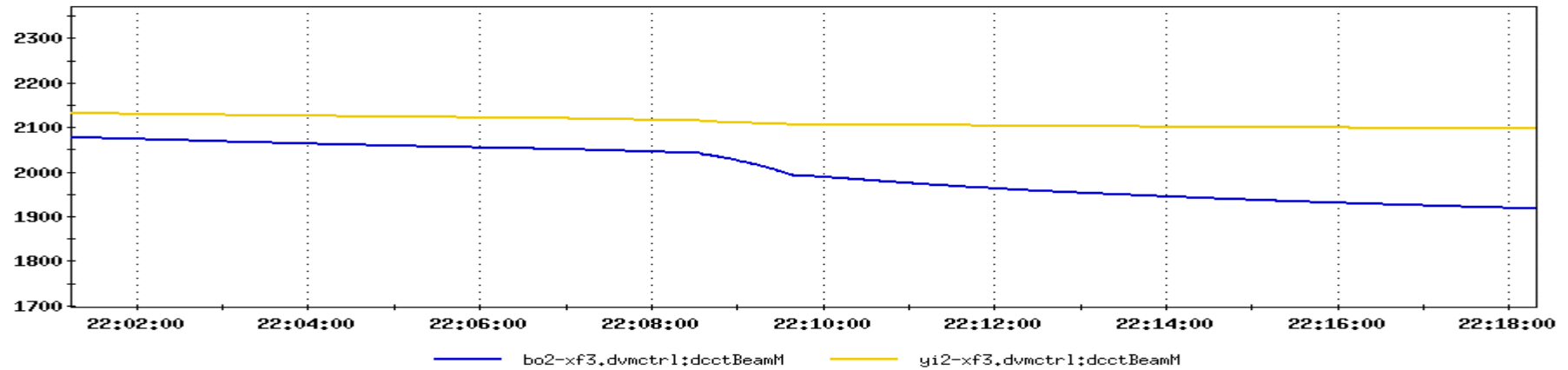
Corresponding BTF:
 No apparent changes



Crossed tunes $Q_x \ll Q_y$

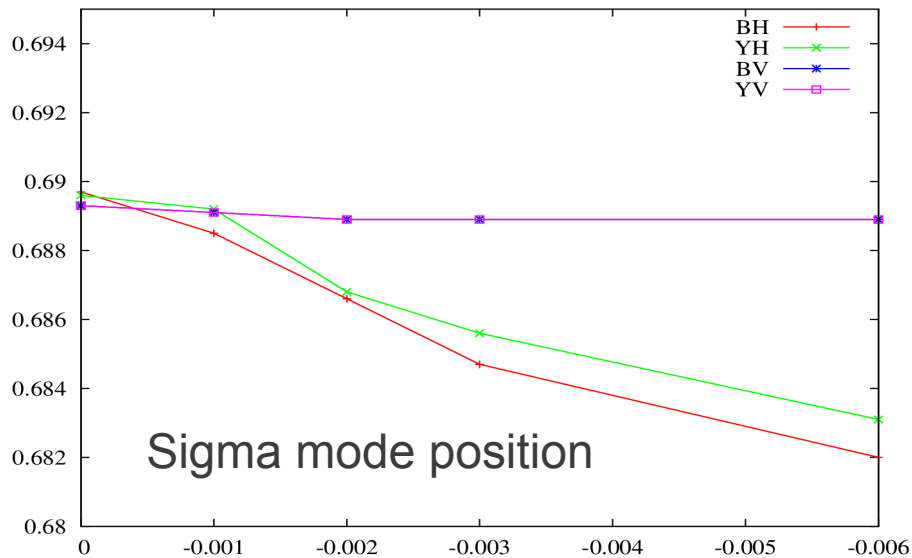
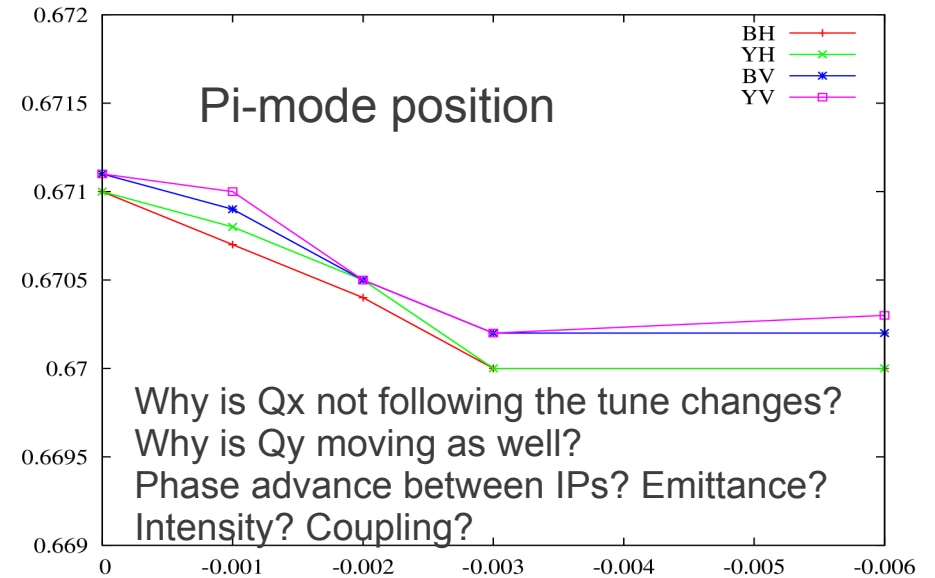
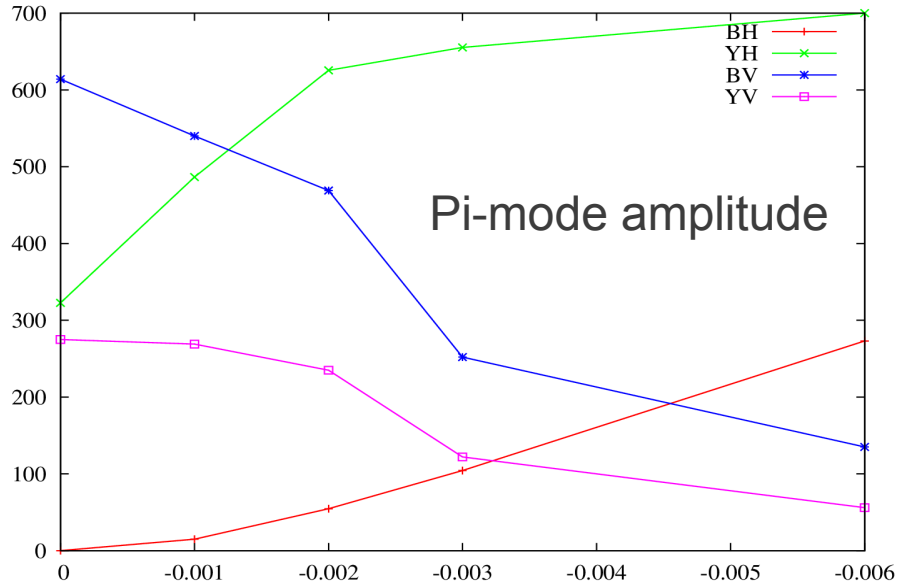


Emittance & Intensity



Observed emittance growth and losses during the tune scan, location of the pi-mode may be difficult to interpret

Modes



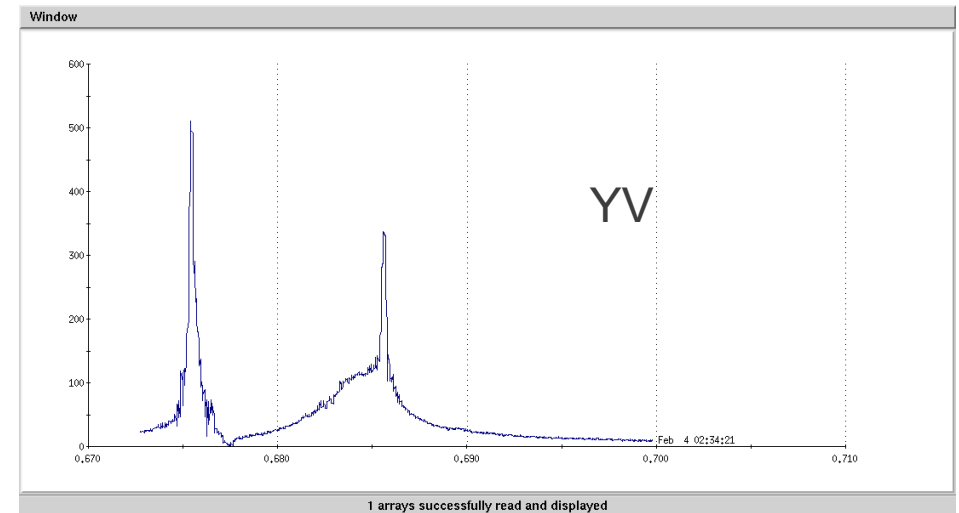
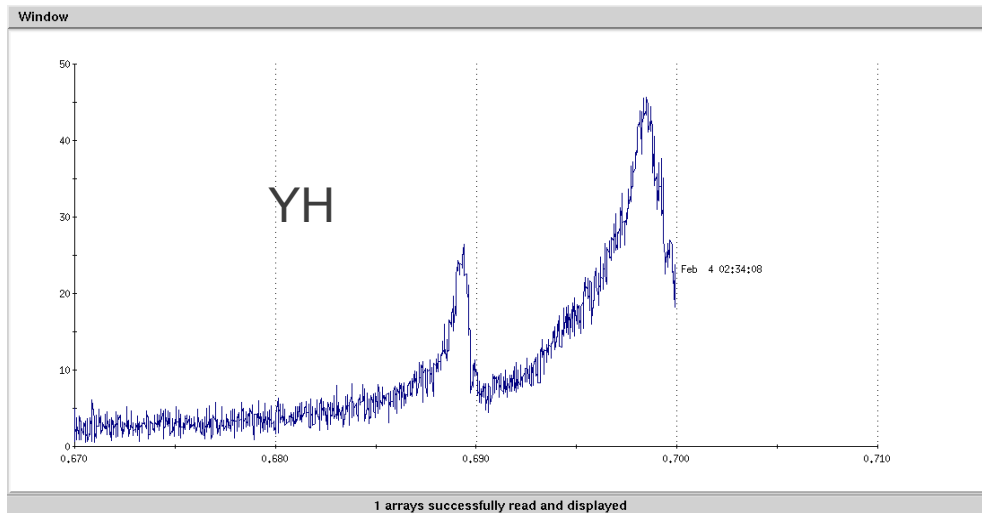
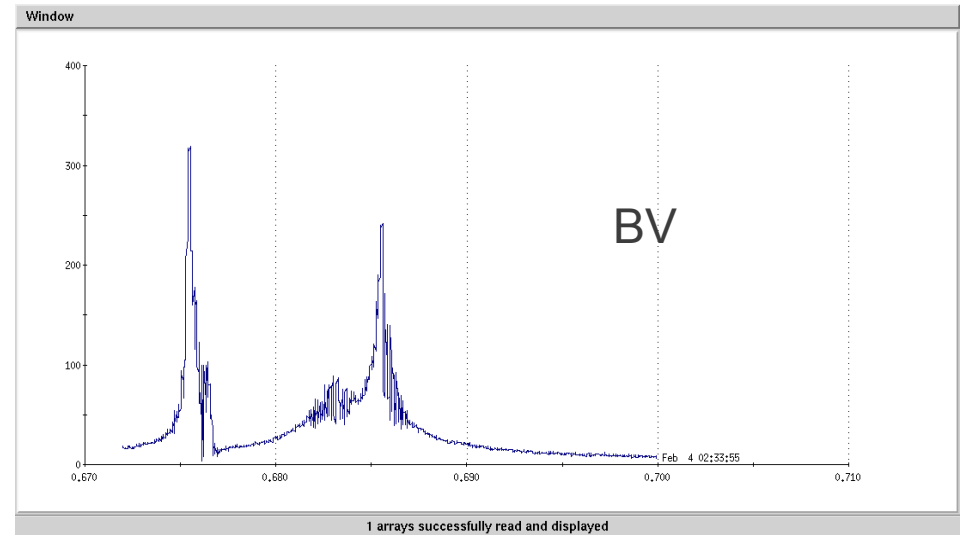
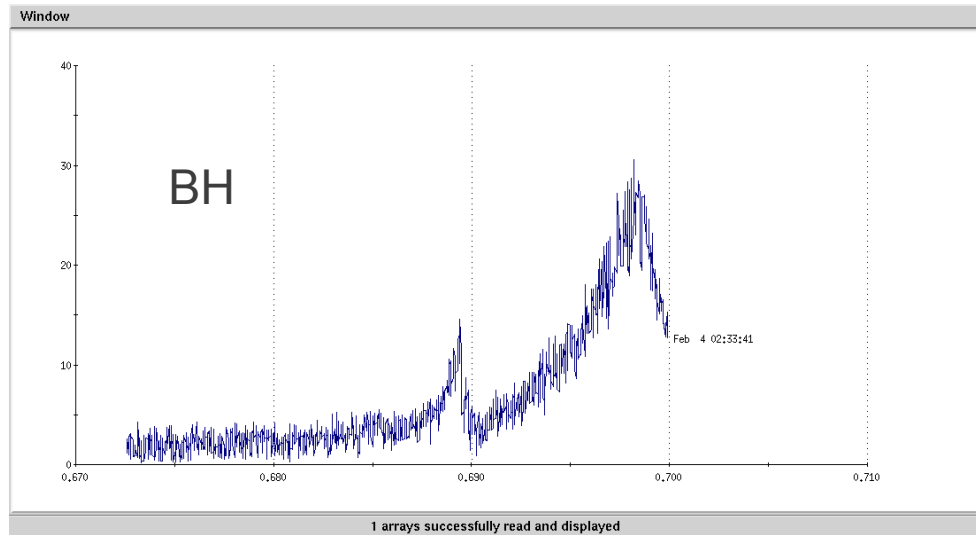
Position and amplitude of the modes as a function of the difference between Qx and Qy

→ Amplitude of x pi-mode grows as amplitude of y pi-mode decreases

→ Damping trough coupling??

→ Evolution of pi-mode position not fully understood

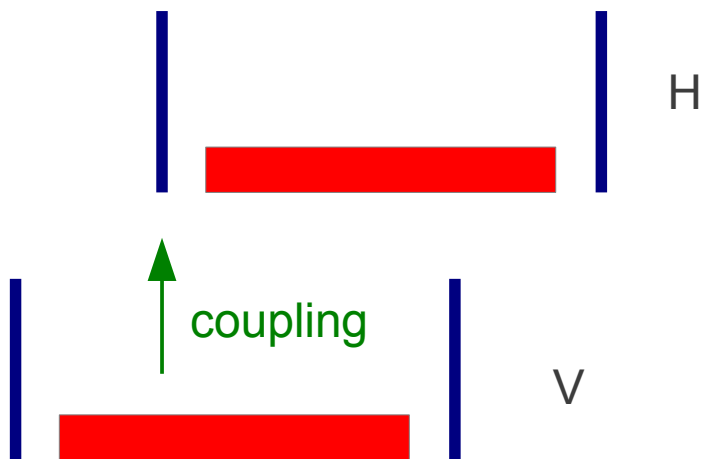
Beginning of the run



X/Y tunes well separated → coherent modes observed in both planes

Damping through Coupling

- We usually run with $Q_x > Q_y \rightarrow$ the horizontal pi-mode lies inside the vertical tune spread
- We know we have strong local coupling
- This coupling could transfer the vertical tune spread into the horizontal plane and provide damping



Unfortunately last APEX we got hit by the resonance and could scan the horizontal far enough

This could be reproduced in a controlled experiment with smaller tune spread, i.e only one IP colliding, and fully scan the two tunes across each other

Summary

- The 10Hz modulation have no effect on beam-beam, emittance or polarization → rather good news
- The absence of horizontal coherent modes could be related to damping through coupling
- Next week we host CERN visitors to conduct beam-beam & noise experiments
- The behavior of the BTF under coupling is not fully understood – pi-modes at different locations for the two beams? White noise should provide an alternate measurement
- We could maybe take $\frac{1}{2}$ hour out of this experiment to check the coupling hypothesis – fully move the tunes across each other with small tune spread