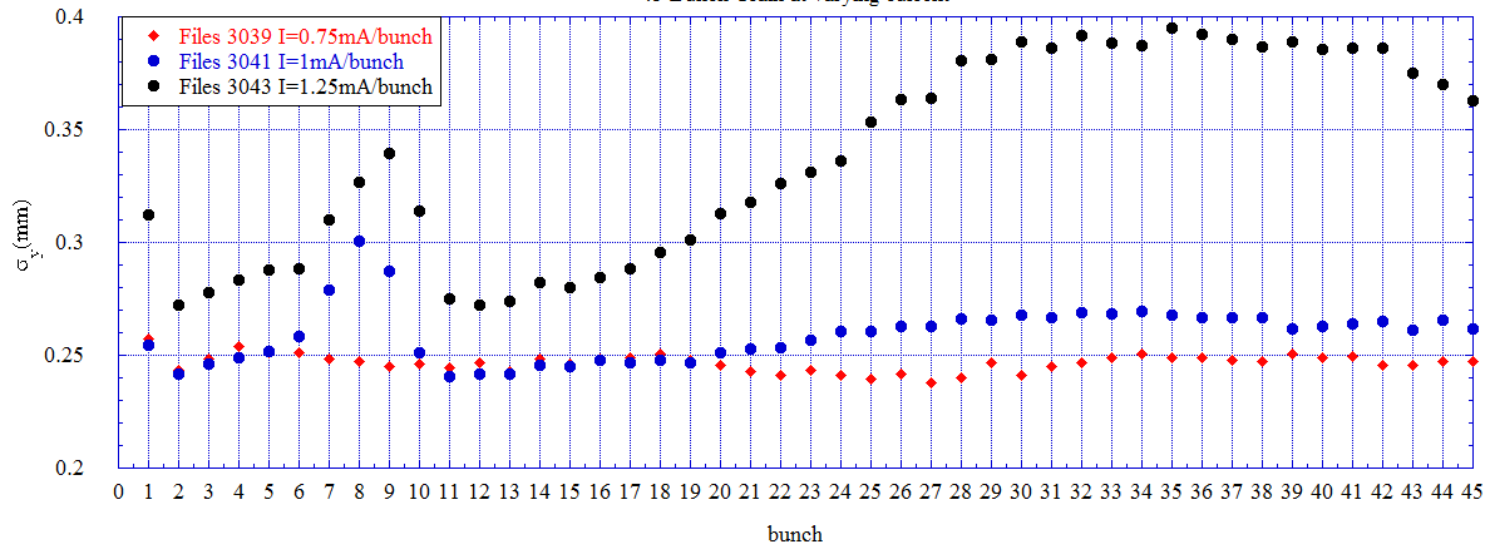


e- Cloud Studies-Tune Studies with 45 Bunch Trains

Filled CESR-TA with a low energy 45 bunch train (14ns bunch spacing) at three different bunch currents. Measured the single bunch horizontal and vertical tunes as well as the vertical beam size at each current.

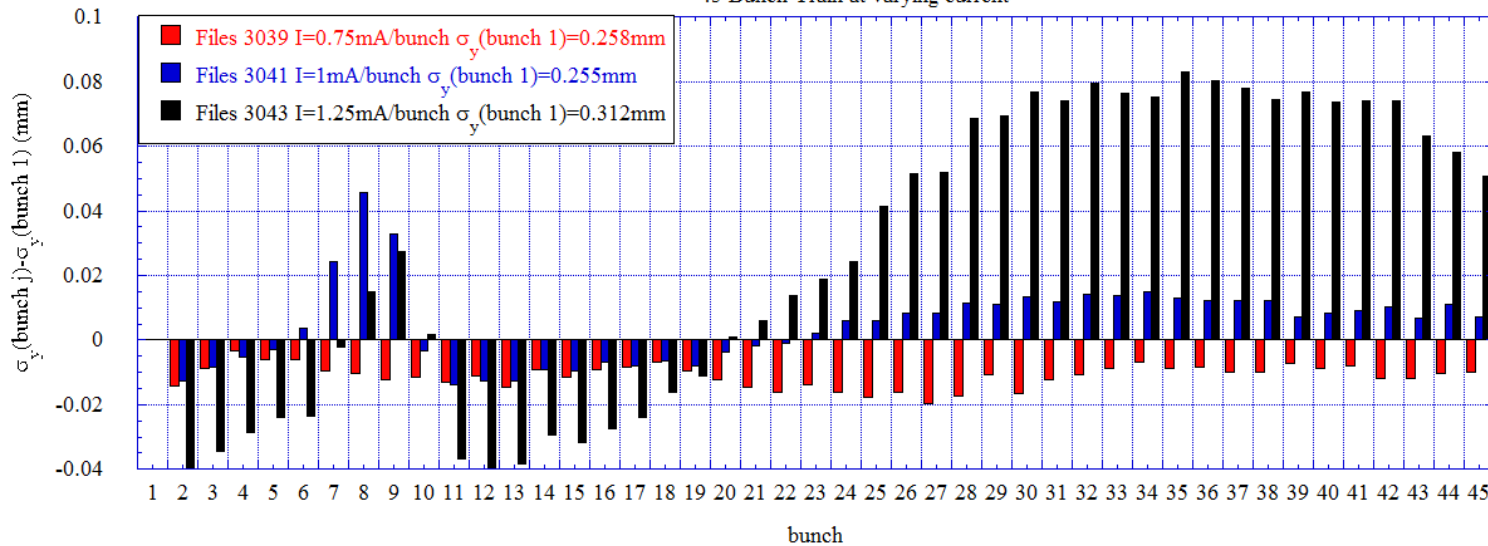
e+ Vertical Beam Size E=2.1GeV
45 Bunch Train at varying current



PMT single bunch vertical beam size for the 45 bunch train at three different bunch currents.

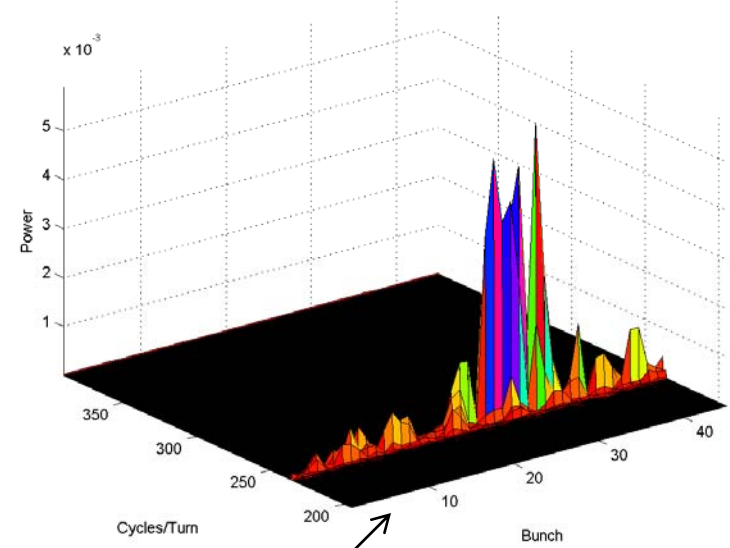
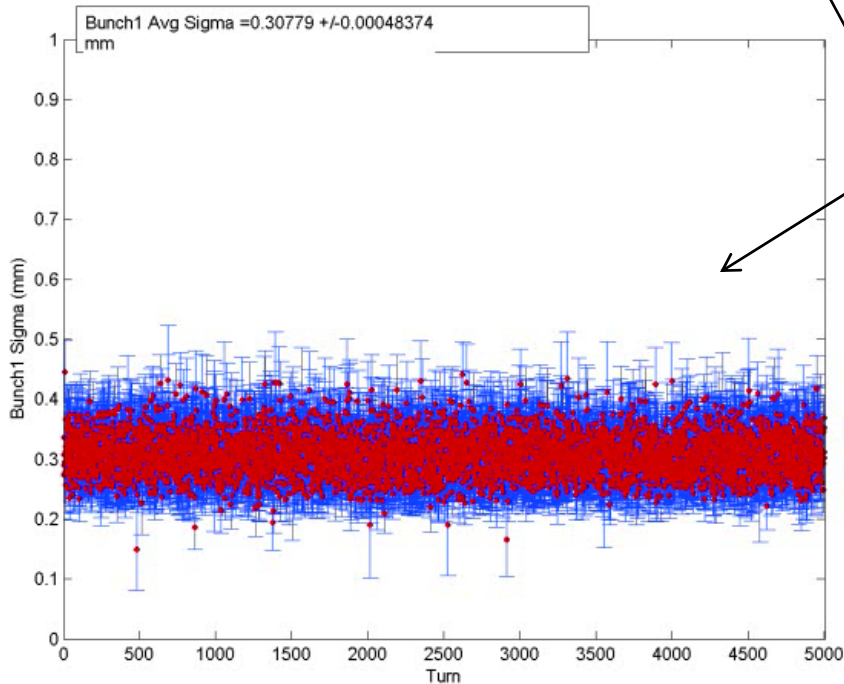
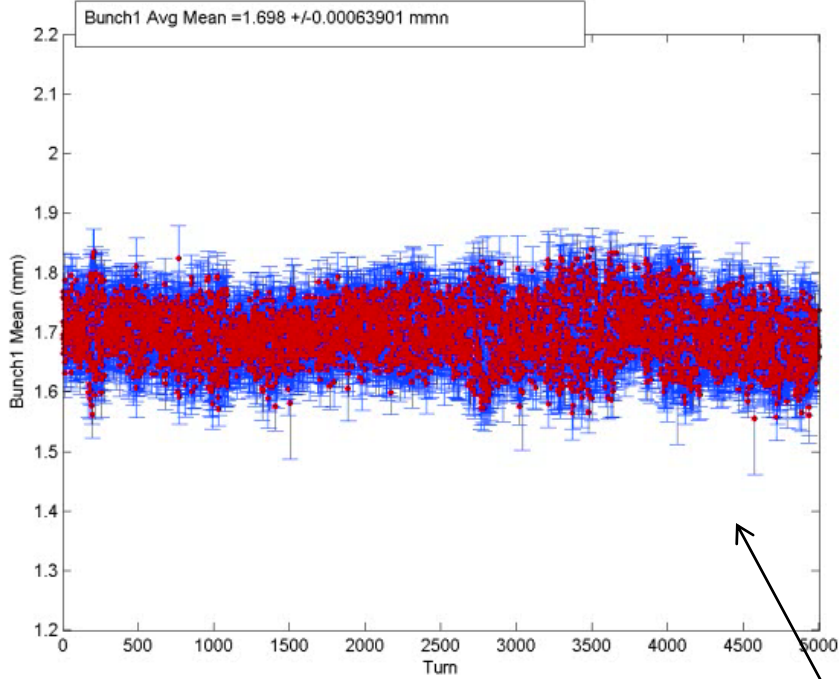
- Resolution correction of 170 μ m included in results.

e+ Vertical Beam Size Normalized to 1st Bunch E=2.1GeV
45 Bunch Train at varying current



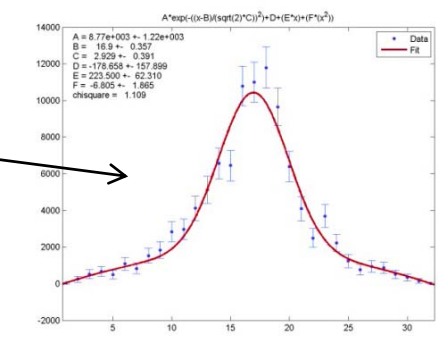
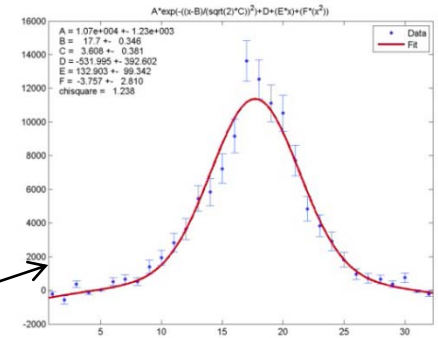
File 3039 I=0.75mA/bunch

bsm23e paw 03039 mod curbk wt results



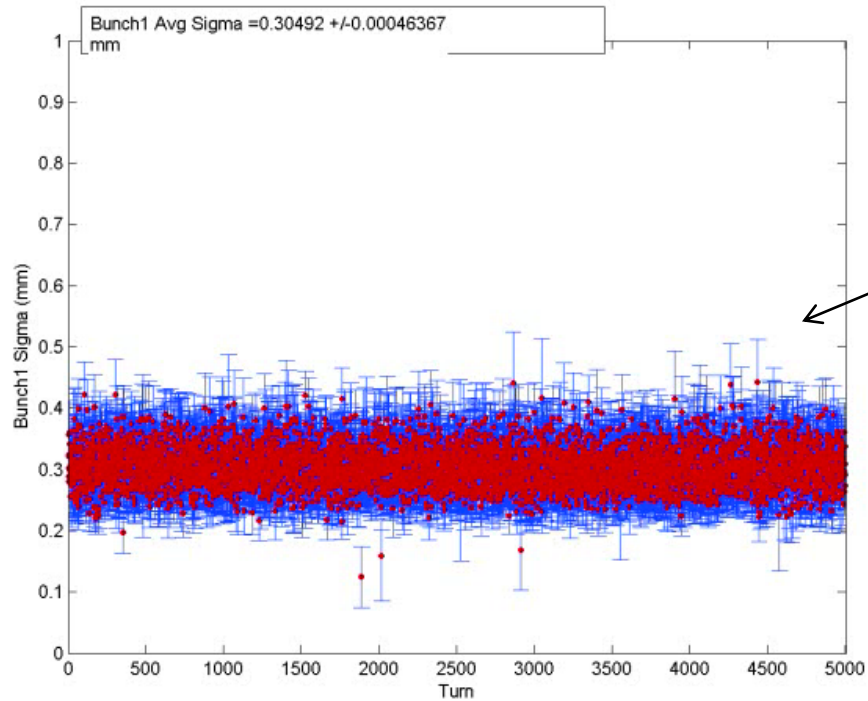
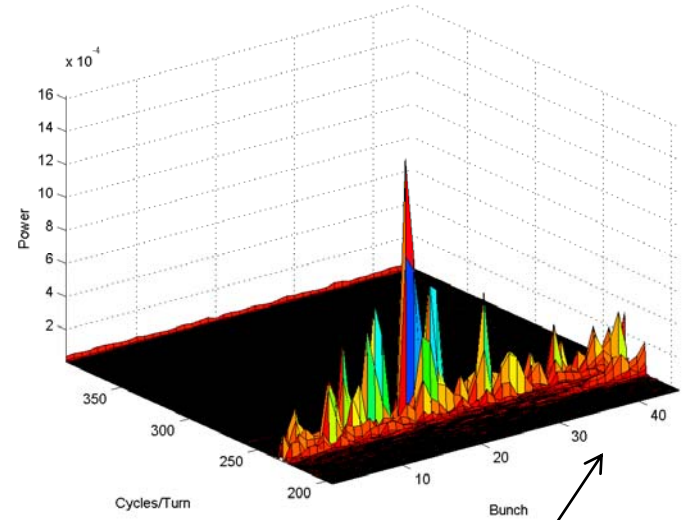
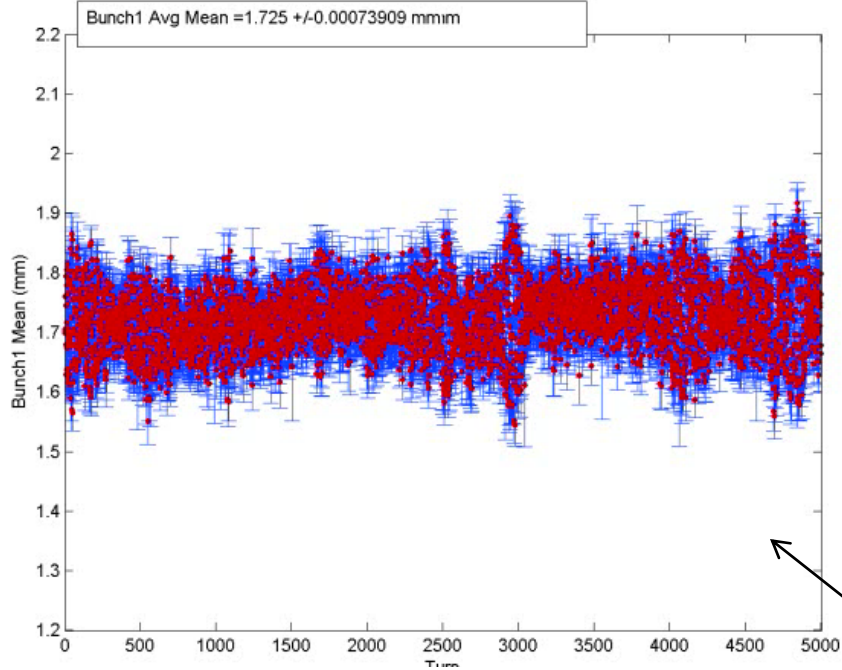
Turn-by-turn results for 5k turns

- Mean position (movie-double click to start)
- Beam Size (movie)
- FFT mean position
- Stable bunch (bunch4-movie)
- Unstable bunch (bunch 27-movie)



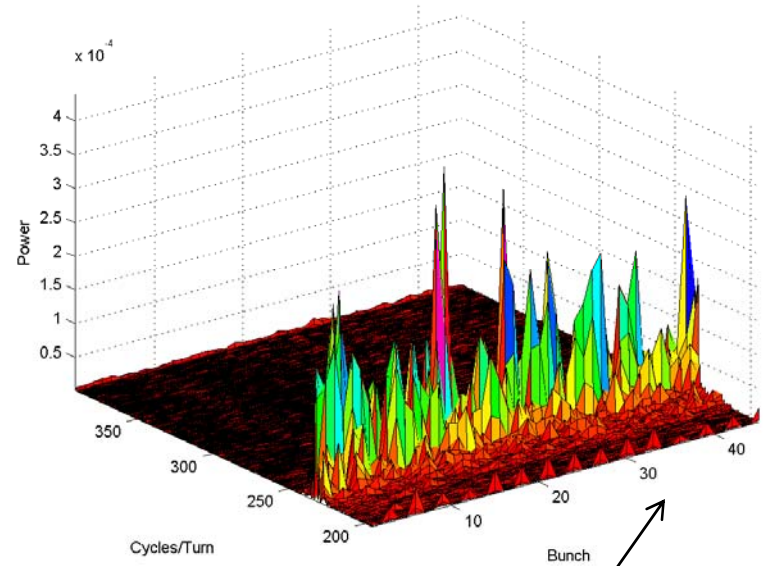
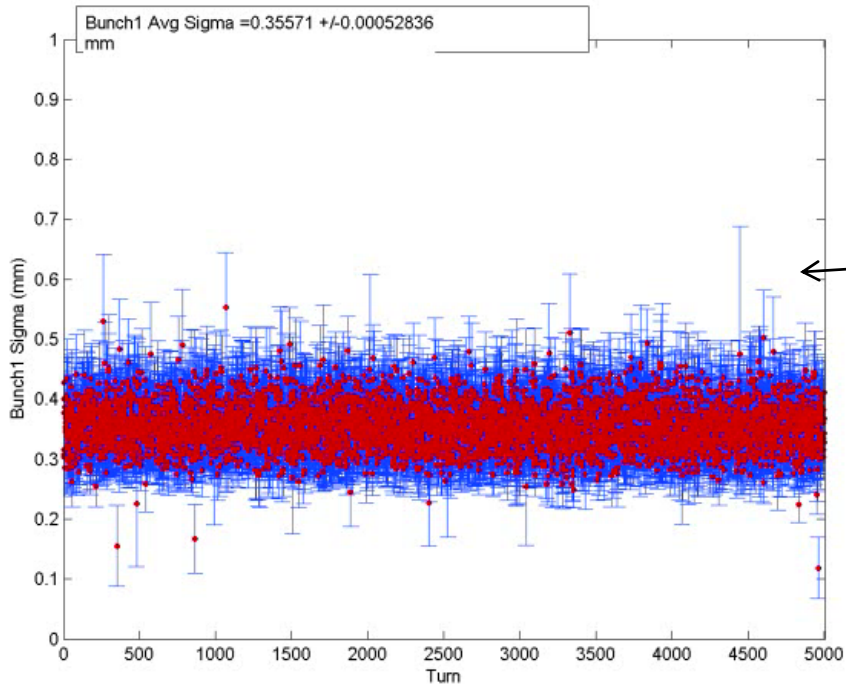
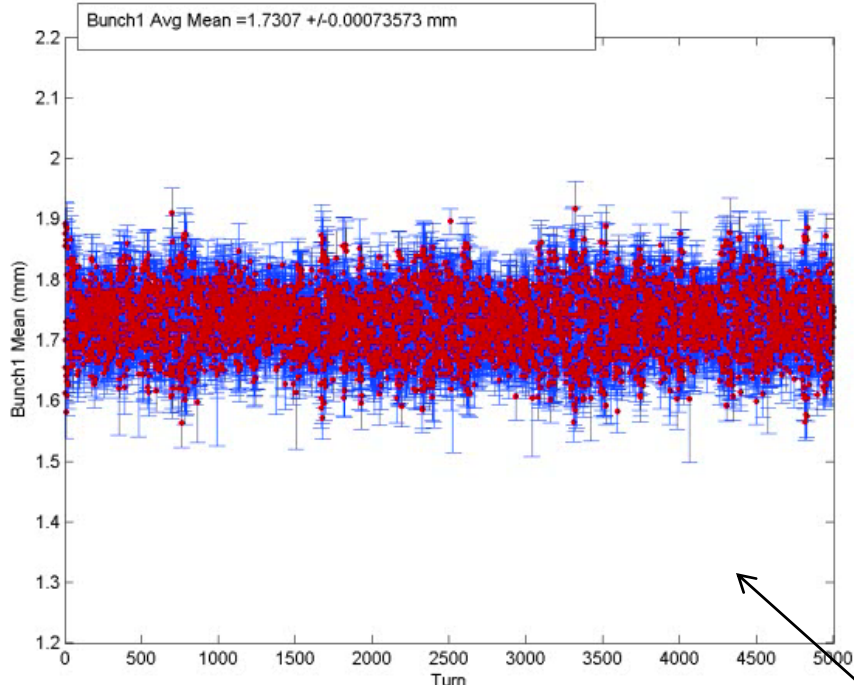
File 3041 I=1mA/bunch

bsm23e paw 03041 mod curbk wt results



Turn-by-turn results for 5k turns

- Mean position (movie)
- Beam Size (movie)
- FFT mean position



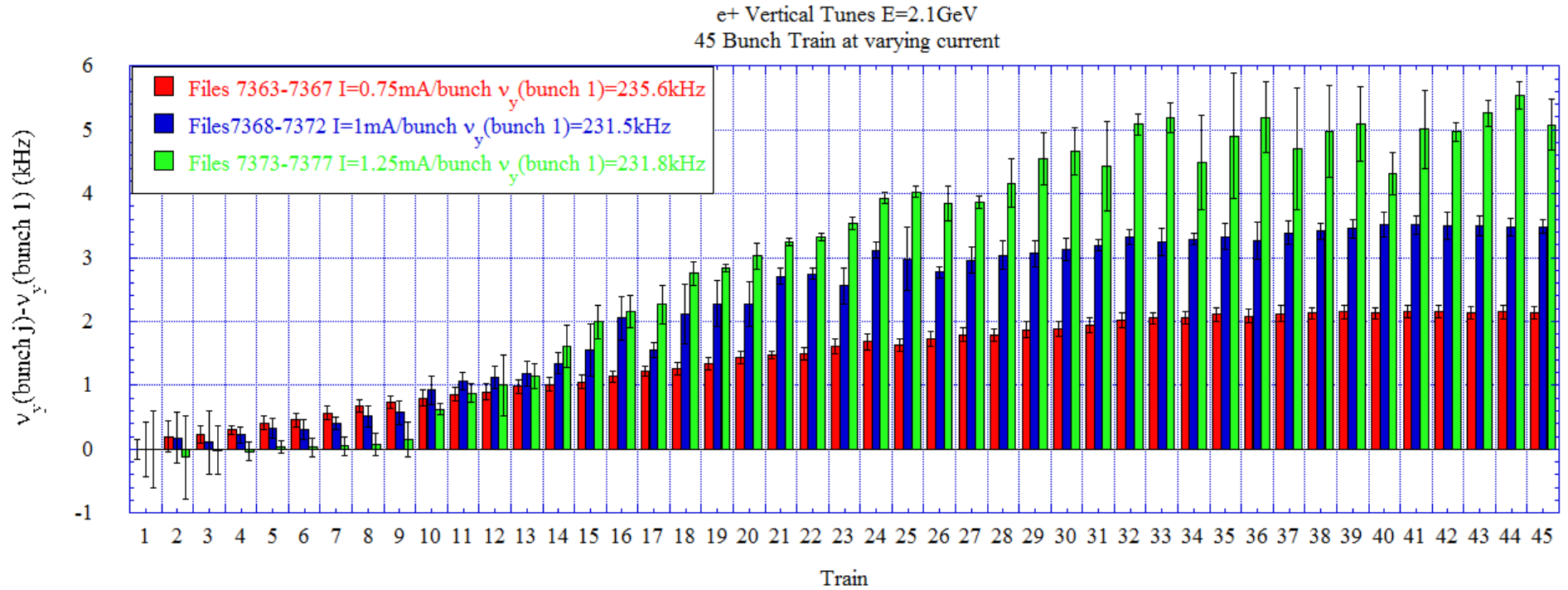
Turn-by-turn results for 5k turns

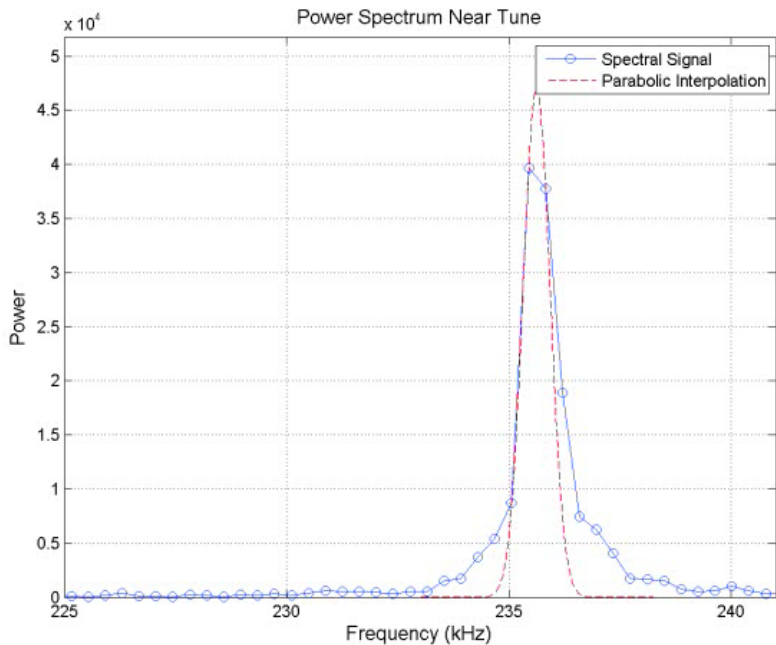
• Mean position (movie)

• Beam Size (movie)

• FFT mean position

Vertical tune for the 45 bunch train at various bunch current. Shown here is the mean vertical tune shift for the 45 bunch train.





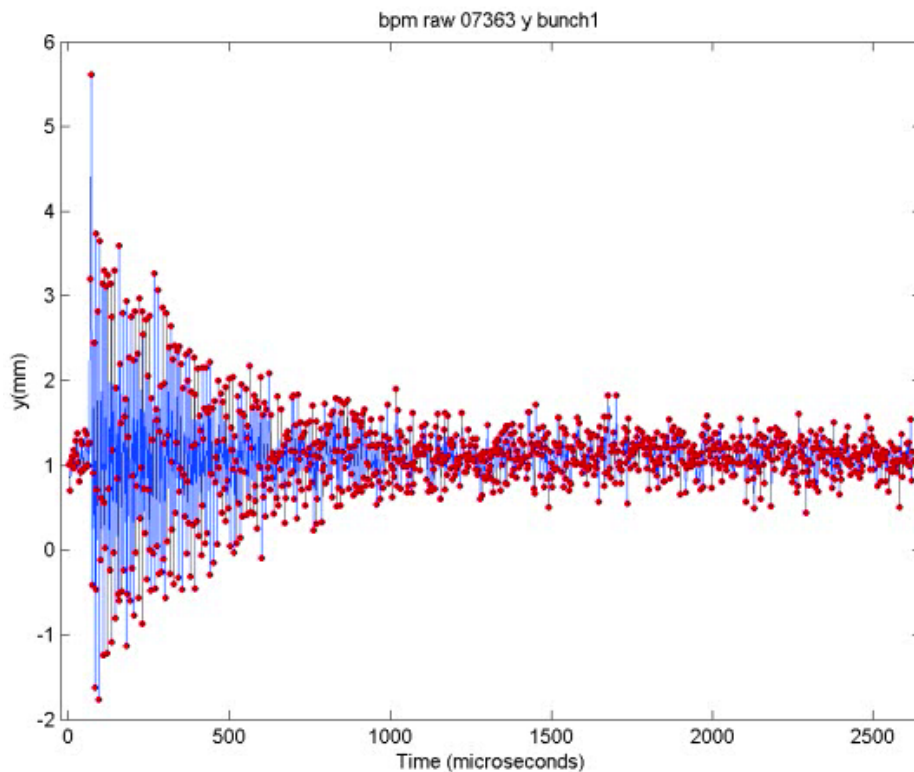
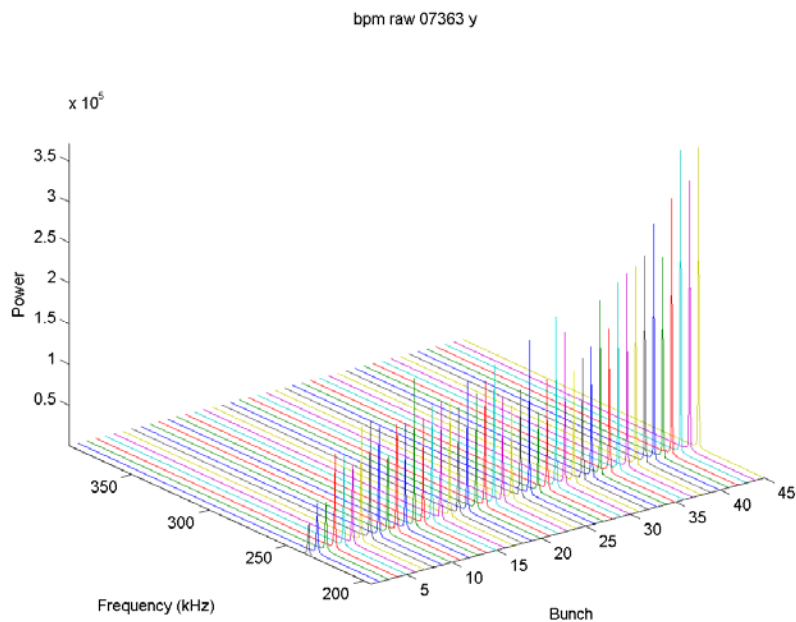
Movie (click to start) of the vertical spectrum of each bunch in the 45 bunch train with $I=0.75\text{mA/bunch}$.

- A vertical tune shift along the train is evident until \sim bunch 32.

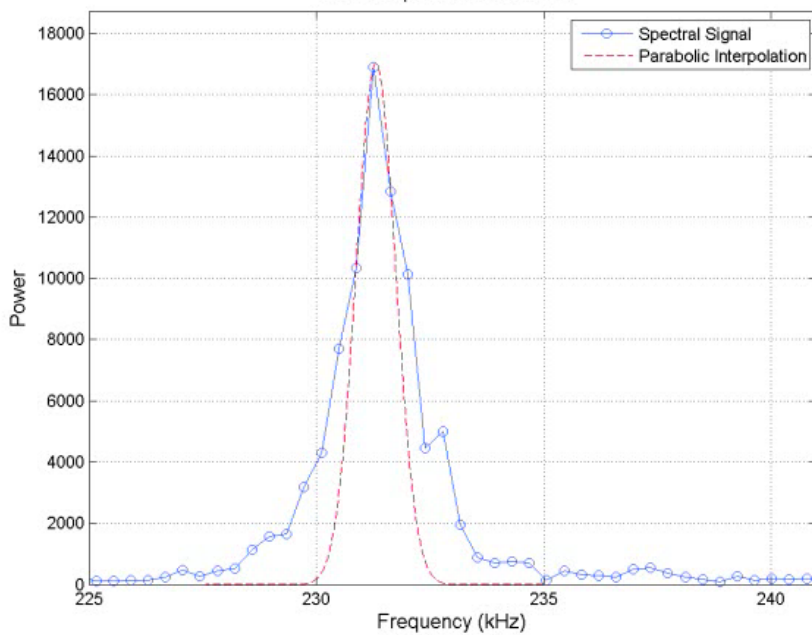
Movie (click to start) of the vertical position of each bunch at the beam position monitor for the 45 bunch train with $I=0.75\text{mA/bunch}$.

- The strong vertical kick from the pinger decays in $\sim 1\text{ms}$ (strong vertical damping). The damping time increases along the train.

Vertical spectrum for all 45 bunches-signal grows along the train



Power Spectrum Near Tune



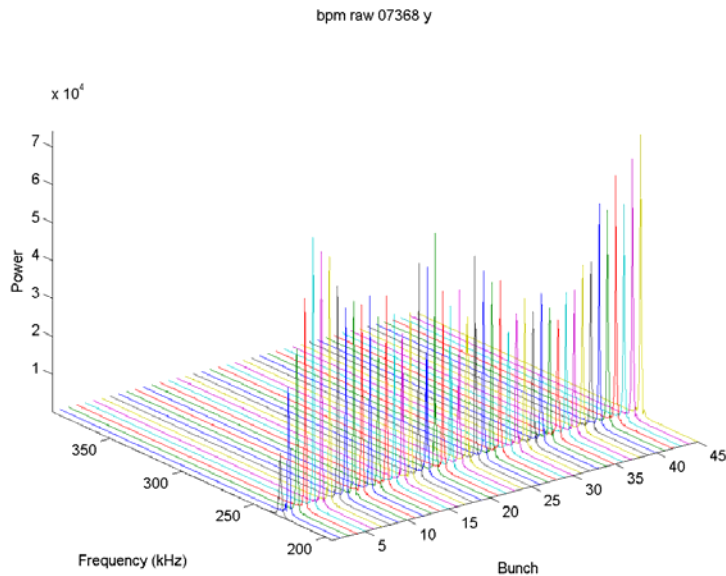
Movie (click to start) of the vertical spectrum of each bunch in the 45 bunch train with $I=1\text{mA}/\text{bunch}$.

- A vertical tune shift along the train is evident until \sim bunch 32.
- The spectrum width has increased from the $0.75\text{mA}/\text{bunch}$ case.

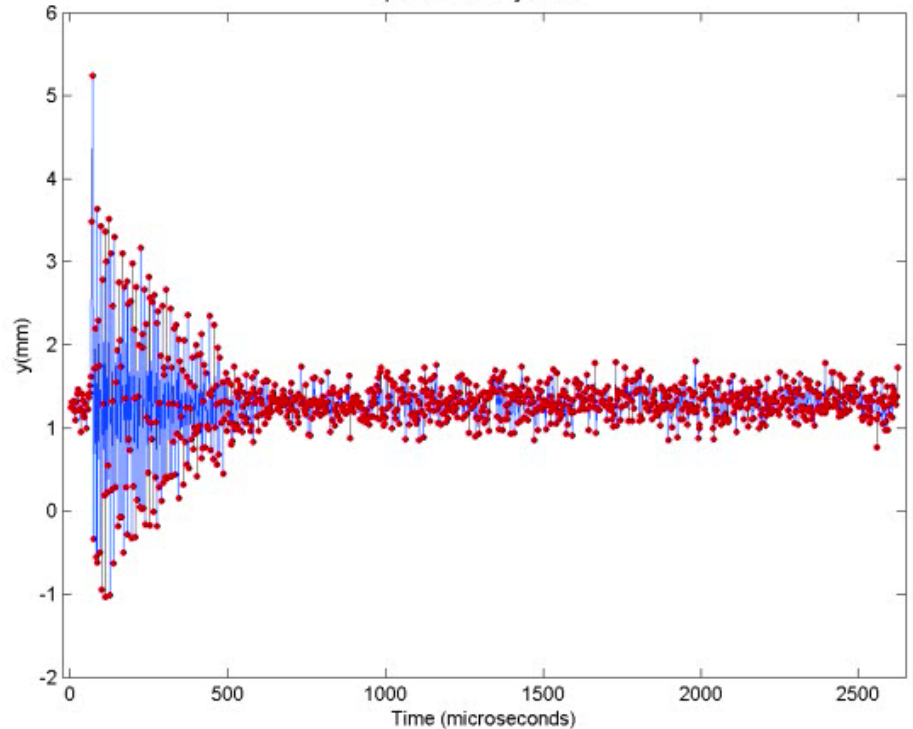
Movie (click to start) of the vertical position of each bunch at the beam position monitor for the 45 bunch train with $I=1\text{mA}/\text{bunch}$.

- A hint of a vertical instability occurs for several bunches (\sim bunch 20) in the 45 bunch train.

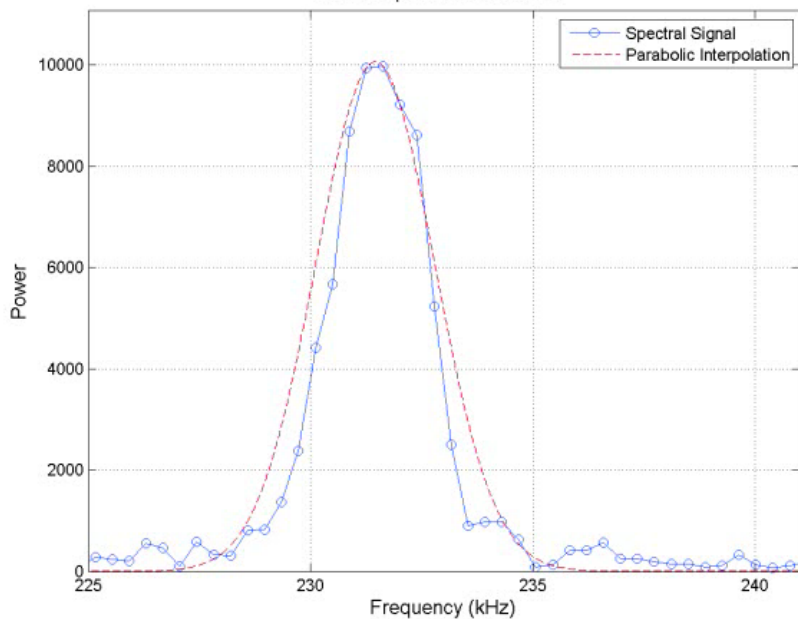
Vertical spectrum for all 45 bunches-signal reaches a peak rather quickly



bpm raw 07368 y bunch1



Power Spectrum Near Tune



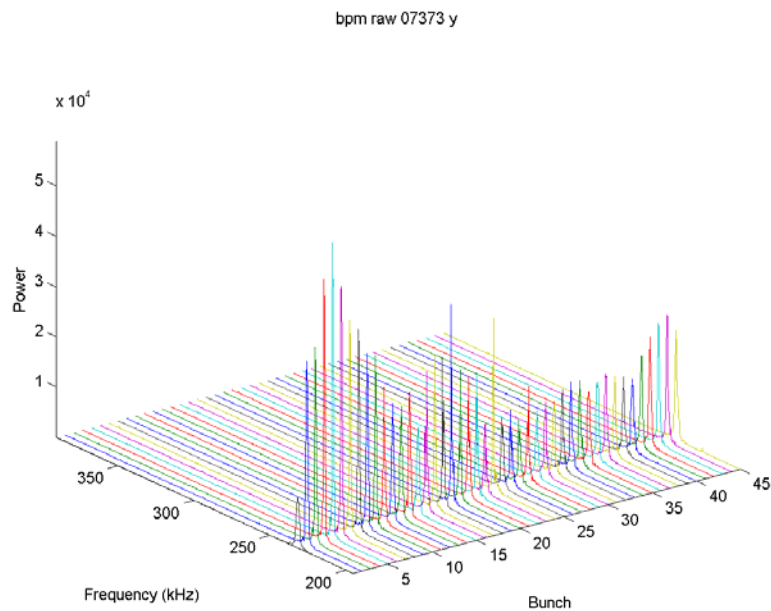
Movie (click to start) of the vertical spectrum of each bunch in the 45 bunch train with $I=1.25\text{mA/bunch}$.

- A vertical tune shift along the train is evident until \sim bunch 32.
- The single bunch spectrum width is quite large for several bunches along the train (especially bunch 1).

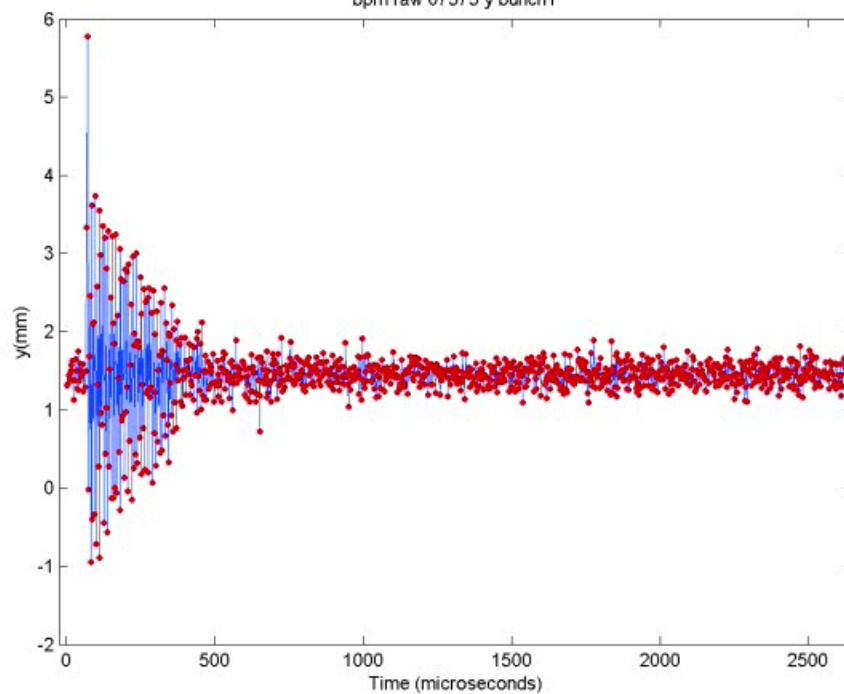
Movie (click to start) of the vertical position at the beam position monitor for the 45 bunch train with $I=1.25\text{mA/bunch}$.

- A hint of a vertical instability occurs for several bunches (\sim bunch 20) in the 45 bunch train.

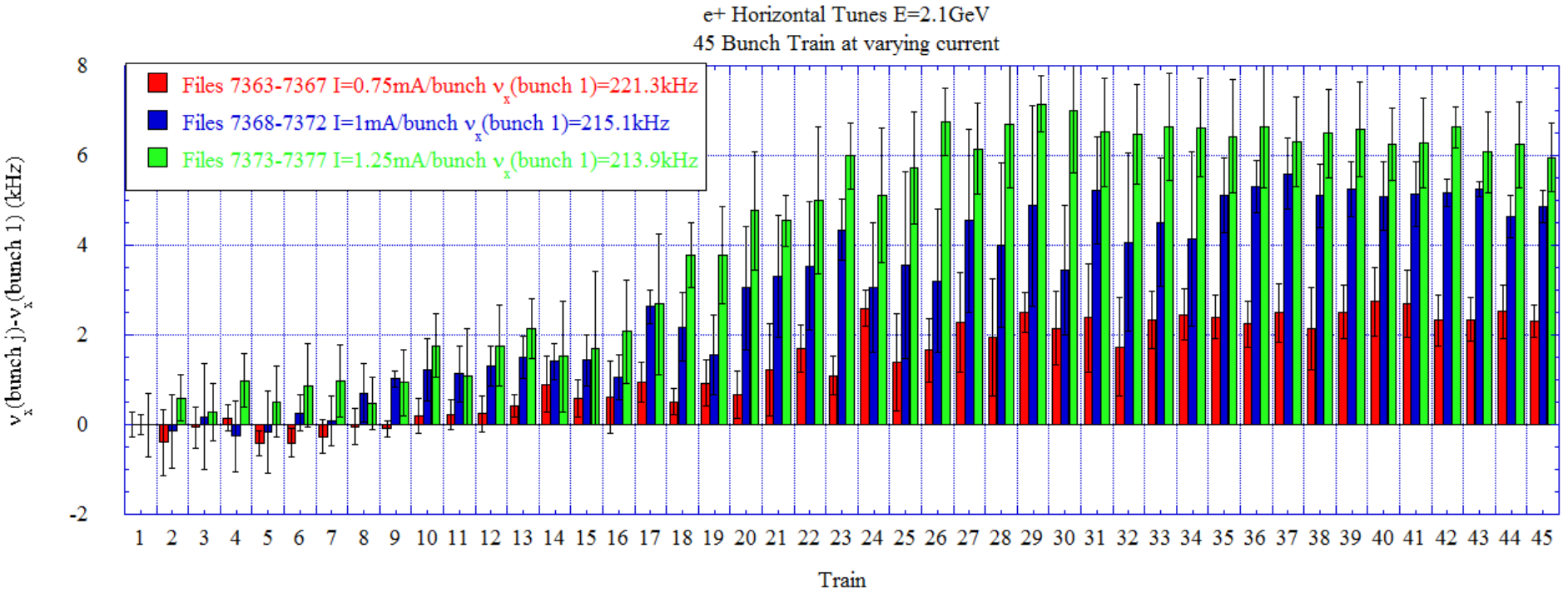
Vertical spectrum for all 45 bunches



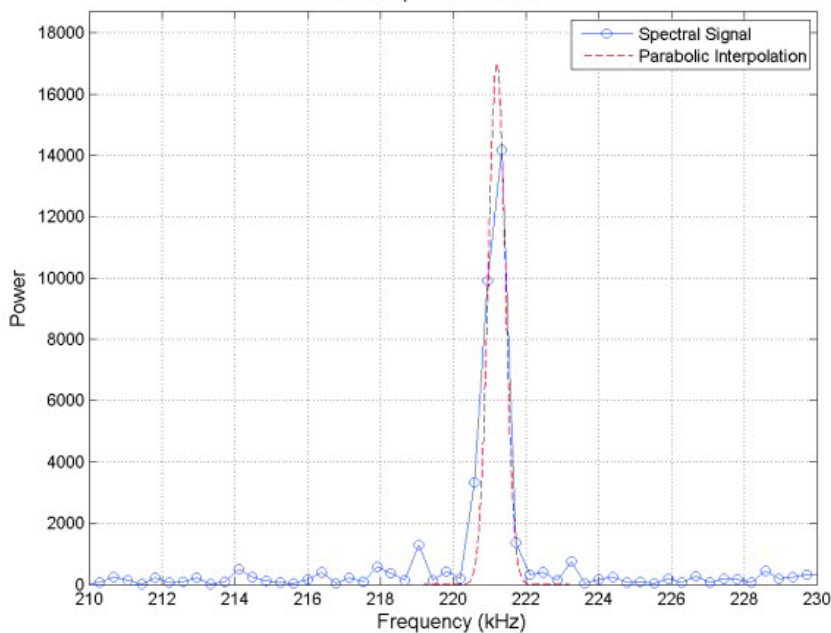
bpm raw 07373 y bunch1



Horizontal tune for the 45 bunch train at various bunch current. Shown here is the mean horizontal tune shift for the 45 bunch train.



Power Spectrum Near Tune



Movie (click to start) of the horizontal spectrum of each bunch in the 45 bunch train with $I=0.75\text{mA/bunch}$.

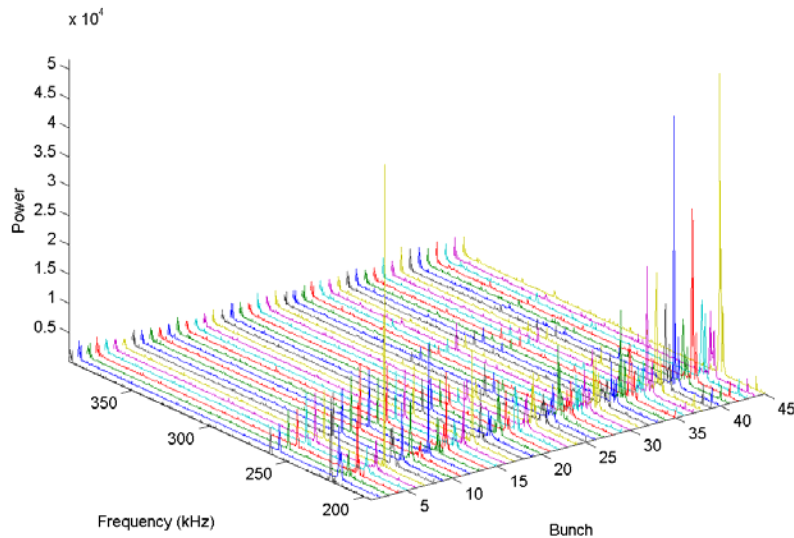
- A horizontal tune shift along the train is evident BUT the tune signal is weak and noisy for many of the bunches.

Movie (click to start) of the horizontal position of each bunch at the beam position monitor for the 45 bunch train with $I=0.75\text{mA/bunch}$.

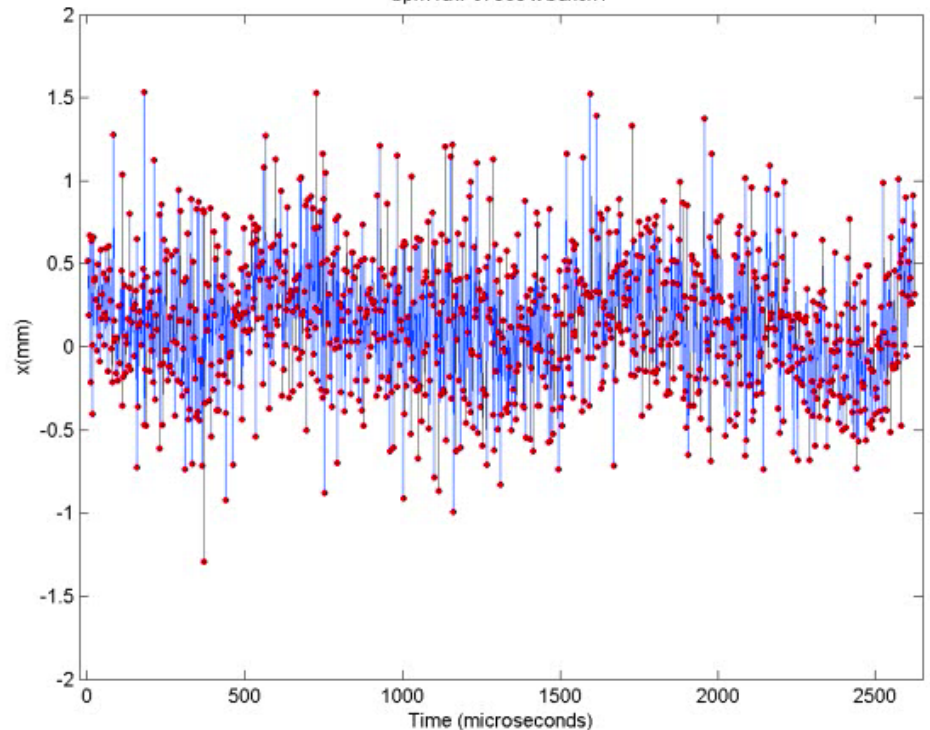
- The horizontal kick from the pinger is almost non-existent which is why the horizontal spectrum signal is weak and noisy. Not a reliable tune measurement.

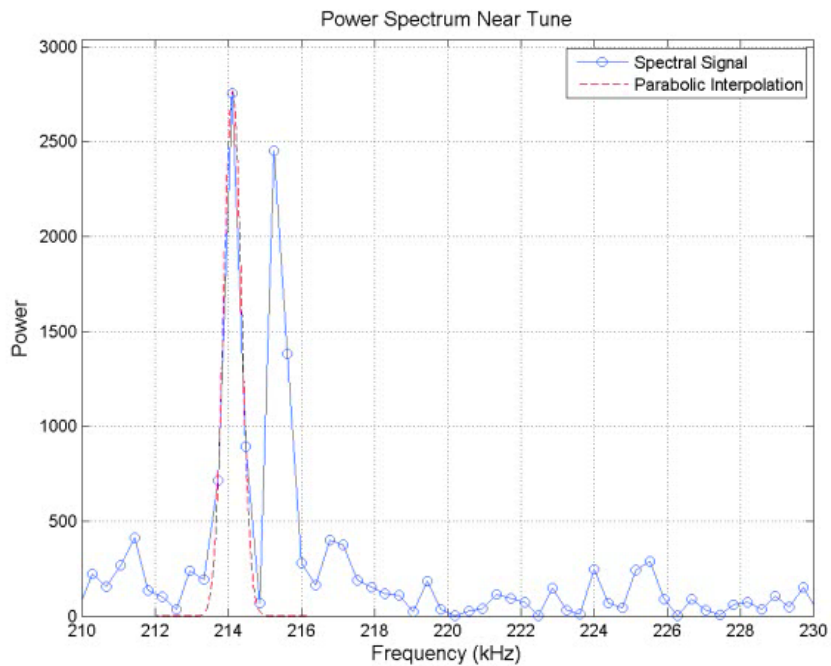
Horizontal spectrum for all 45 bunches

bpm raw 07363 x



bpm raw 07363 x bunch1





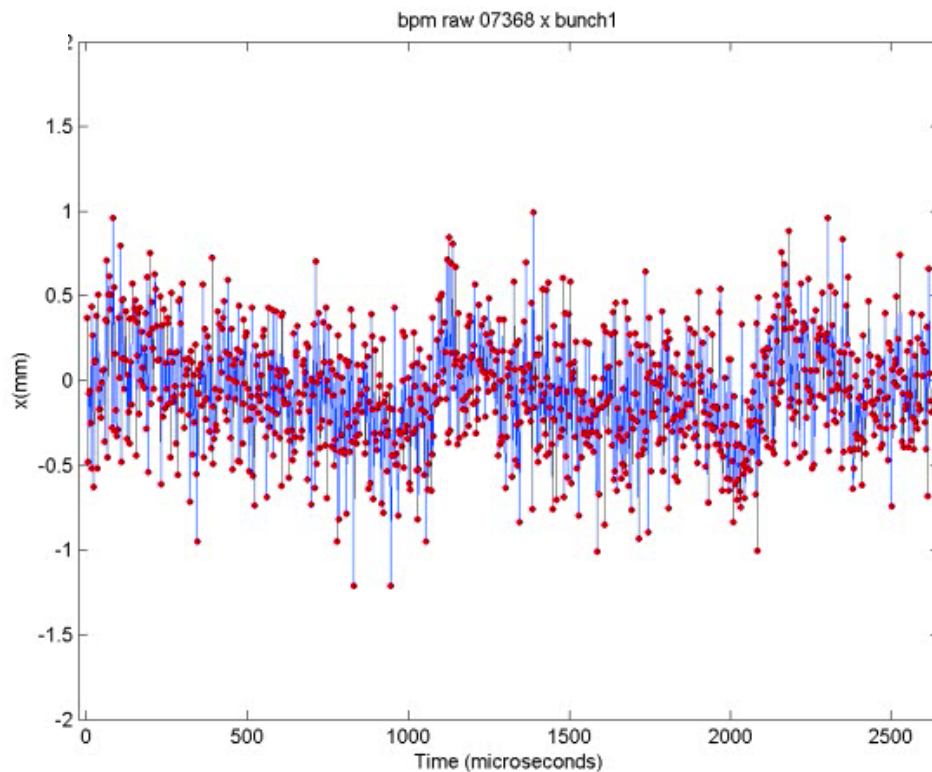
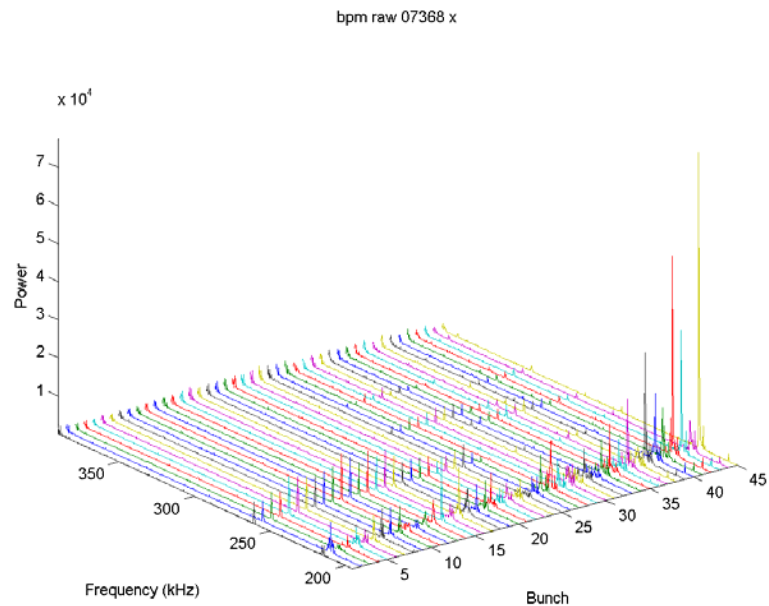
Movie (click to start) of the horizontal spectrum of each bunch of the 45 bunch train with $I=1\text{mA/bunch}$.

- Again, the tune signal is weak and noisy for many of the bunches.

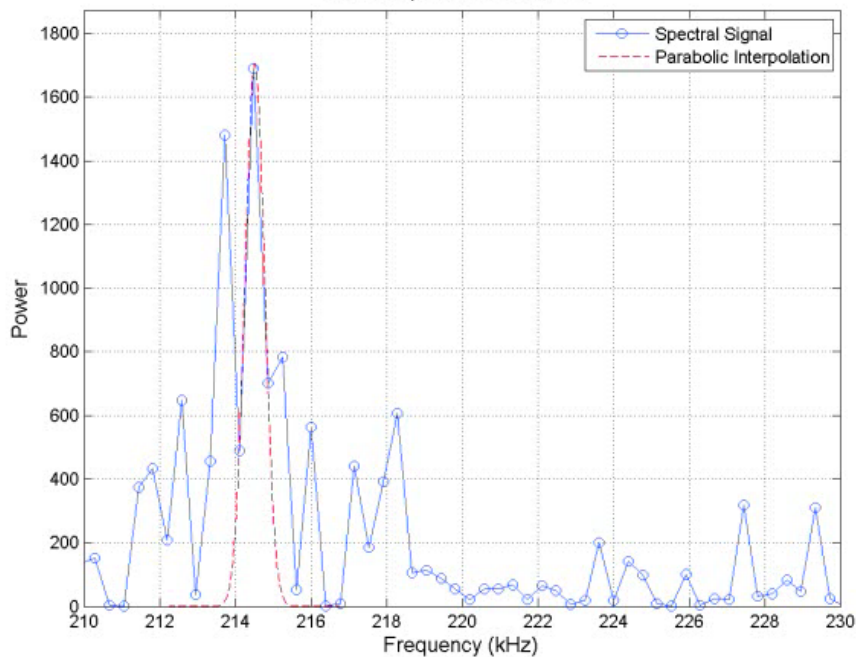
Movie (click to start) of the horizontal position of each bunch at the beam position monitor for the 45 bunch train with $I=1\text{mA/bunch}$.

- The horizontal kick from the pinger is almost non-existent.

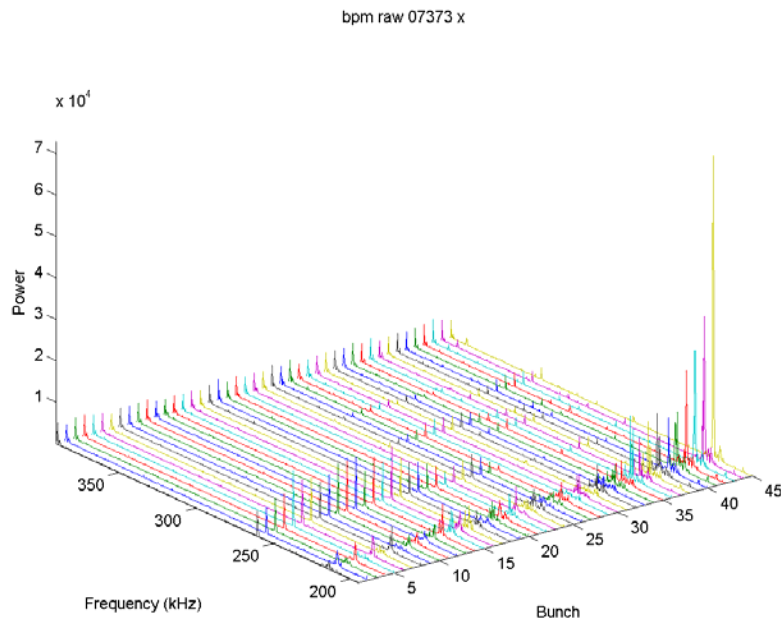
Horizontal spectrum for all 45 bunches



Power Spectrum Near Tune



Horizontal spectrum for all 45 bunches

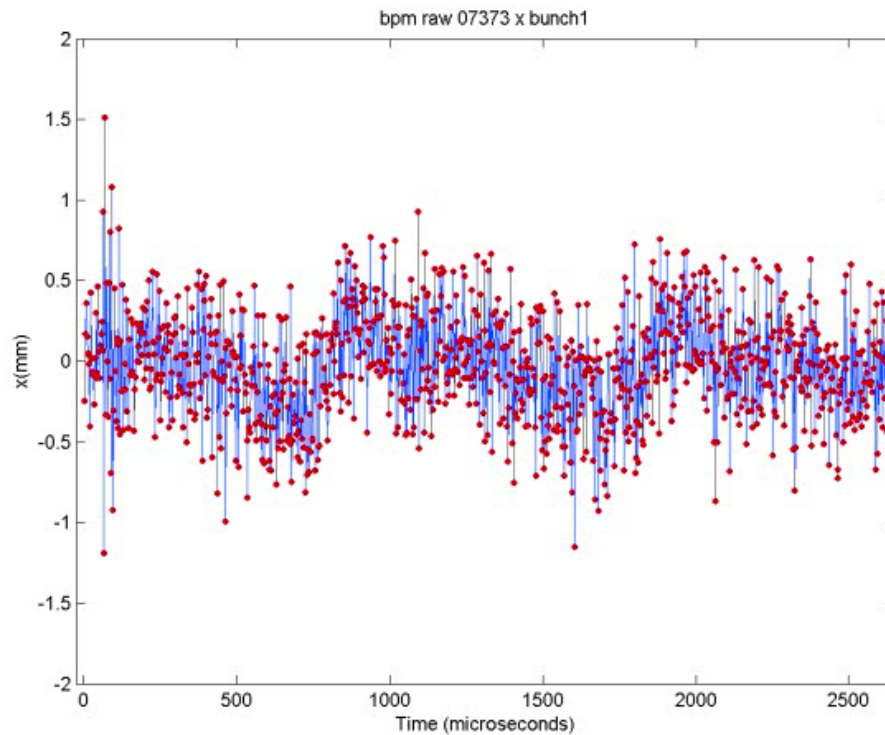


Movie (click to start) of the horizontal spectrum of each bunch of the 45 bunch train with $I=1.25\text{mA/bunch}$.

- Again, the tune signal is weak and noisy for many of the bunches.

Movie (click to start) of the horizontal position of each bunch at the beam position monitor for the 45 bunch train with $I=1.25\text{mA/bunch}$.

- The horizontal kick from the pinger is almost non-existent.
- These measurements need to be repeated with the horizontal pinger working properly.



Comparison between PMT and BPM vertical tunes

