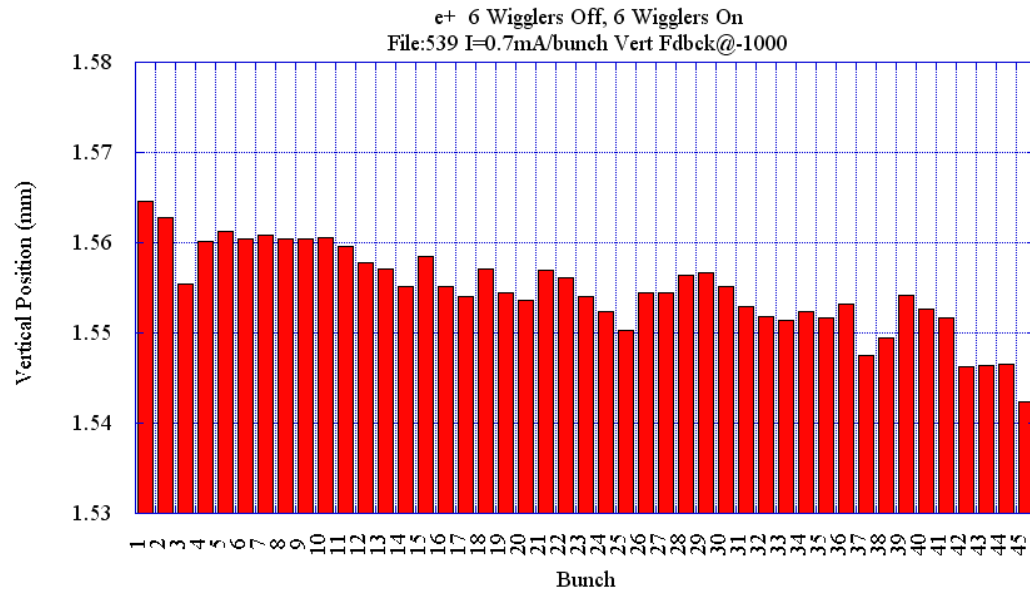
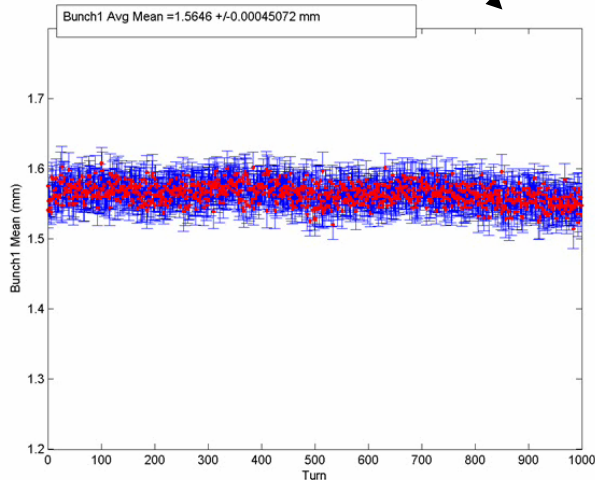


FFT Vertical position $I_{e^+}=0.7\text{mA/bunch}$
 File:539 e+ 6 wigglers on, 6 wigglers off
 Vert. Fdbck@-1000

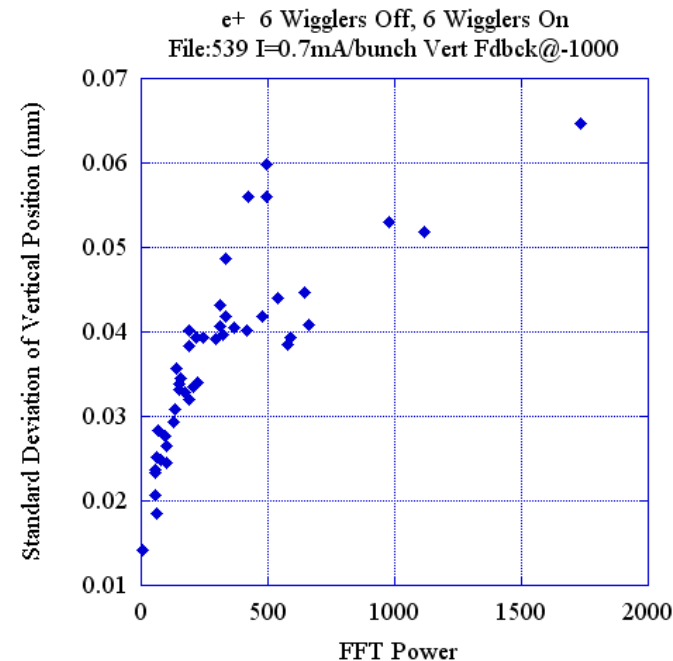


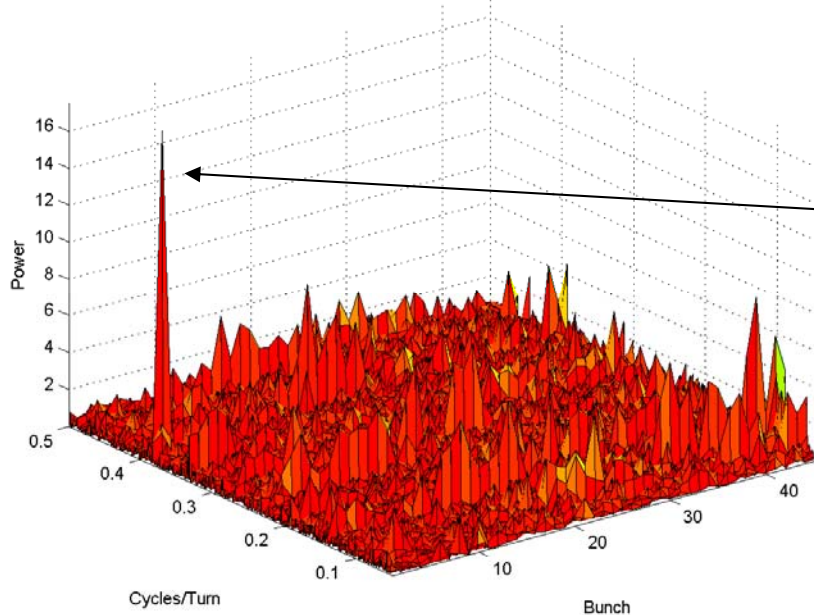
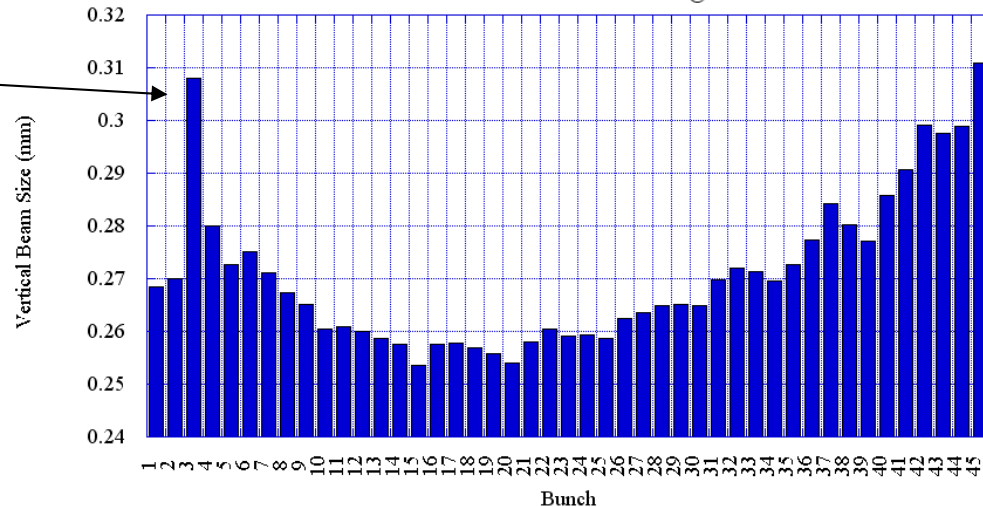
Vertical position movie



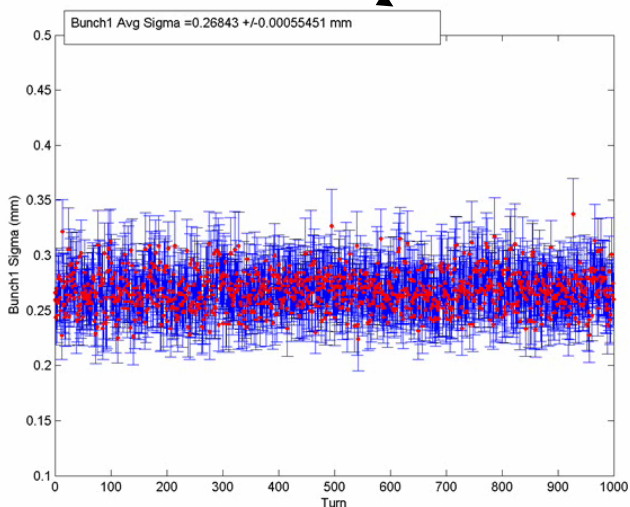
Slight increase in current and vertical feedback results in:

- A reduction in the vertical position oscillation amplitude.
- An increase in the secondary oscillation frequency signal.
- The oscillation amplitude increases with FFT power.

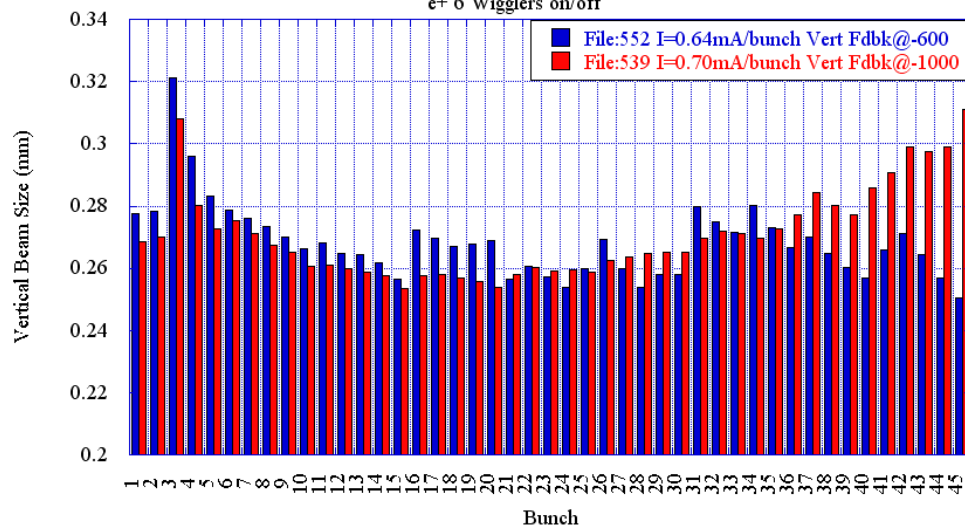


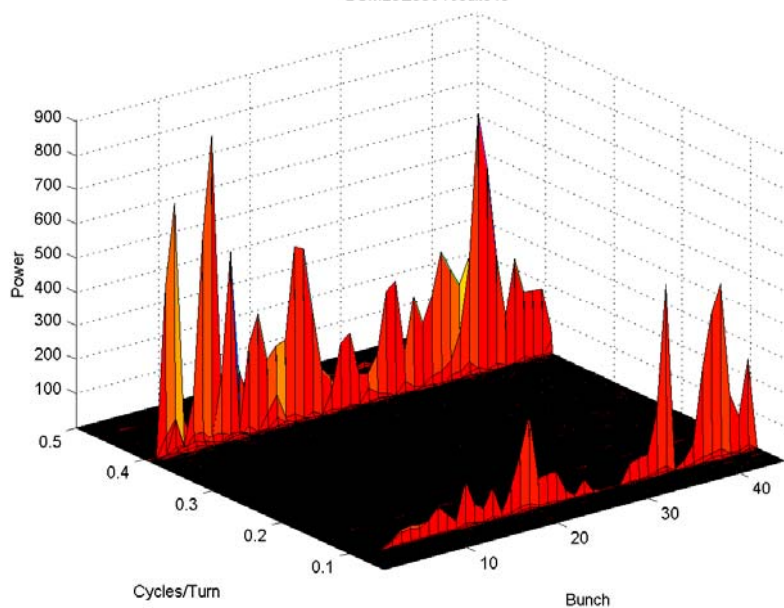
e+ 6 Wigglers Off, 6 Wigglers On
File:539 I=0.7mA/bunch Vert Fdbck@-1000

- Peak in the FFT spectrum correlates with bunch 3 σ_v .
- σ_v growth along the train start at bunch 25. No clear oscillation frequency in the vertical beam size is detected. Signature of incoherent oscillation.

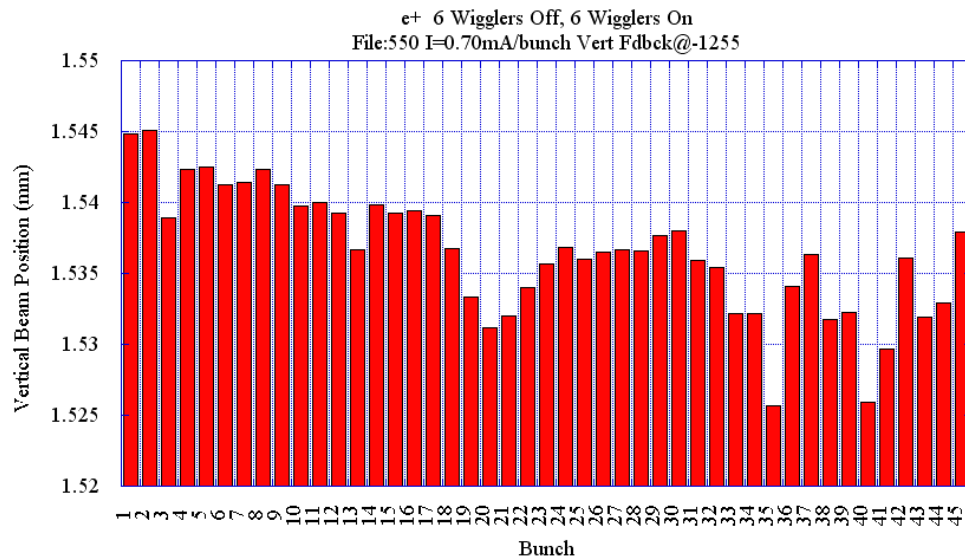
 σ_v movie

e+ 6 Wigglers on/off

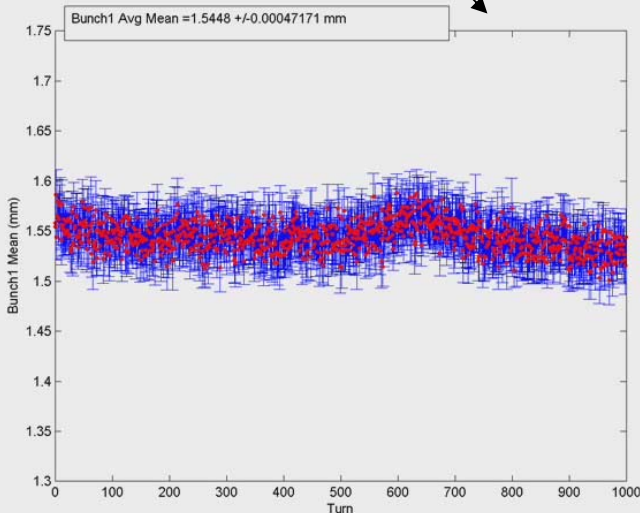




FFT Vertical position $I_{e^+}=0.70\text{mA/bunch}$
 File:550 e+ 6 wigglers on, 6 wigglers off
 Vert. Fdbck@-1255

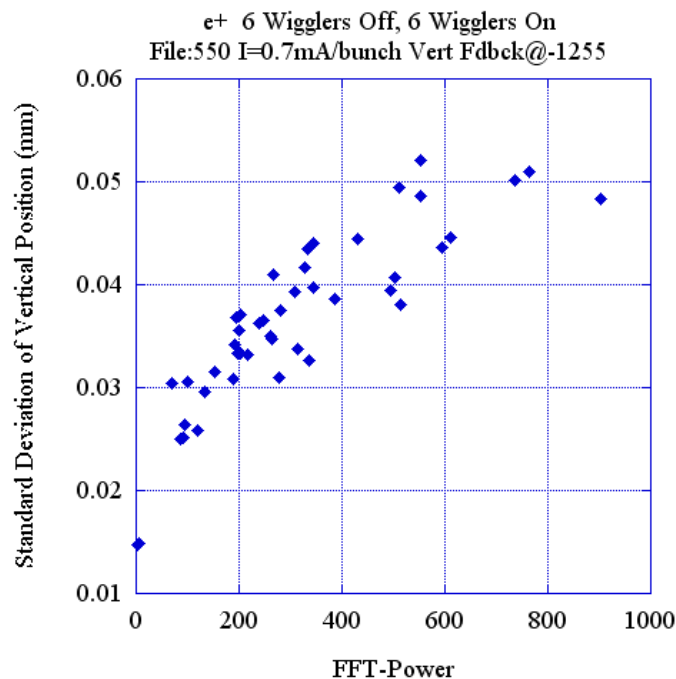


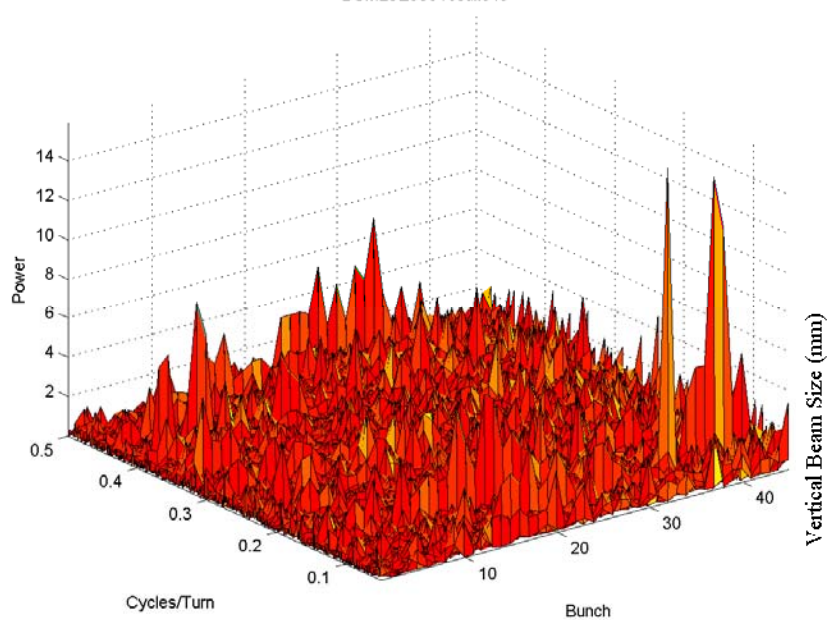
Vertical position movie



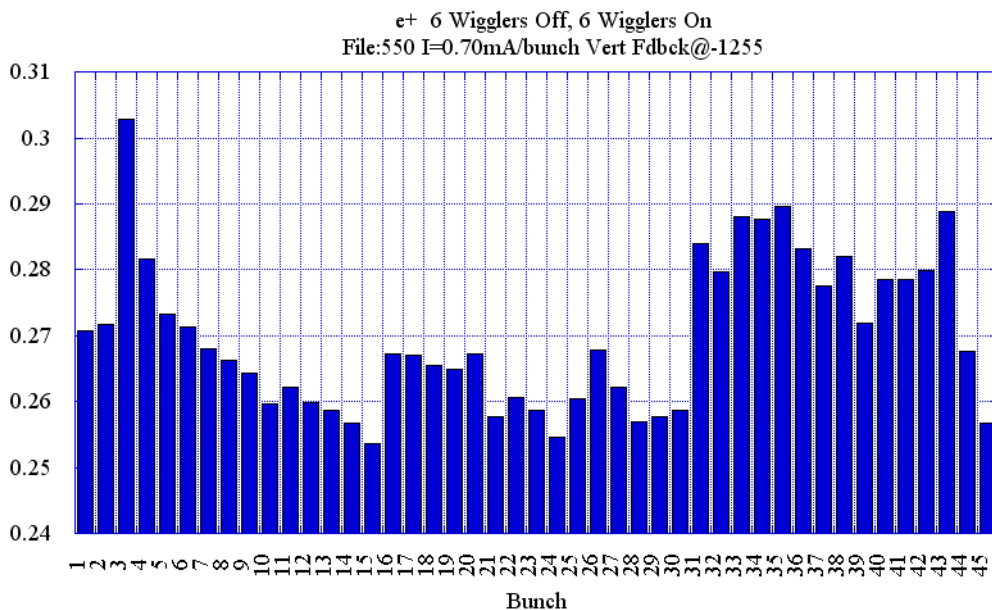
Increase in vertical feedback results in:

- Reduction in vertical position oscillation amplitude. The amplitude increases with FFT power.
- Increase in secondary oscillation frequency in the FFT spectrum.

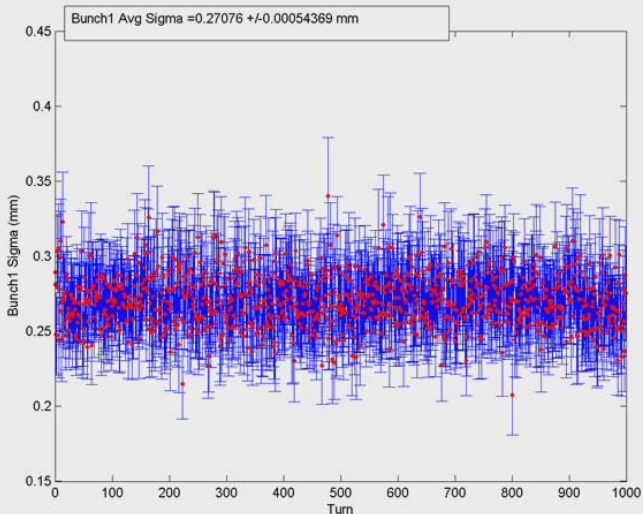




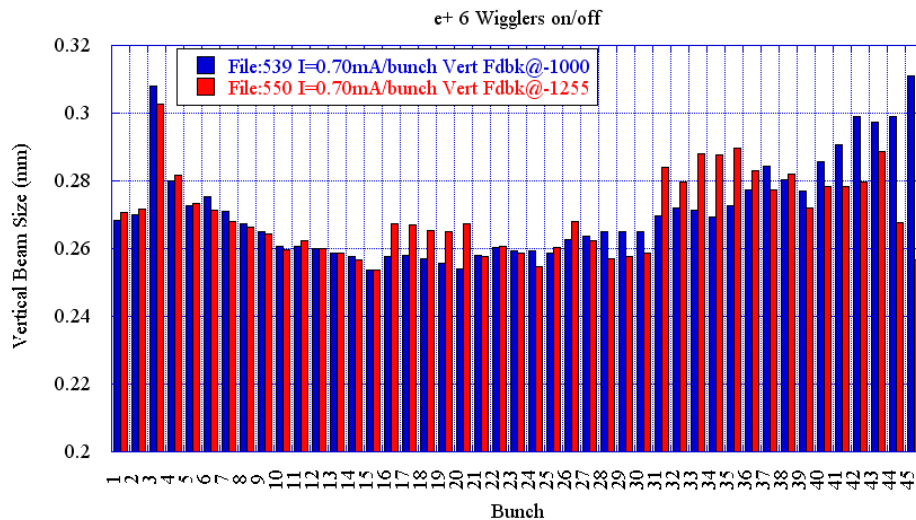
FFT $\sigma_v I_{e^+}=0.70\text{mA/bunch}$
 File:550 e+ 6 wigglers on, 6 wigglers off
 Vert. Fdbck@-1255

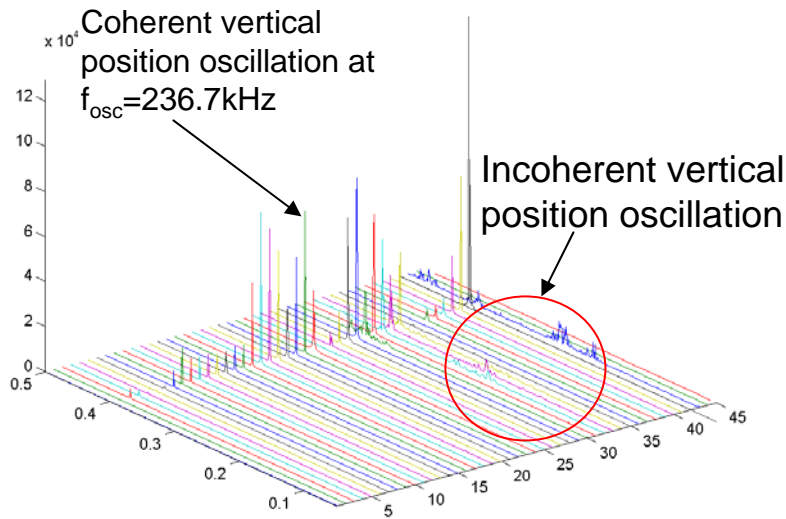


σ_v movie

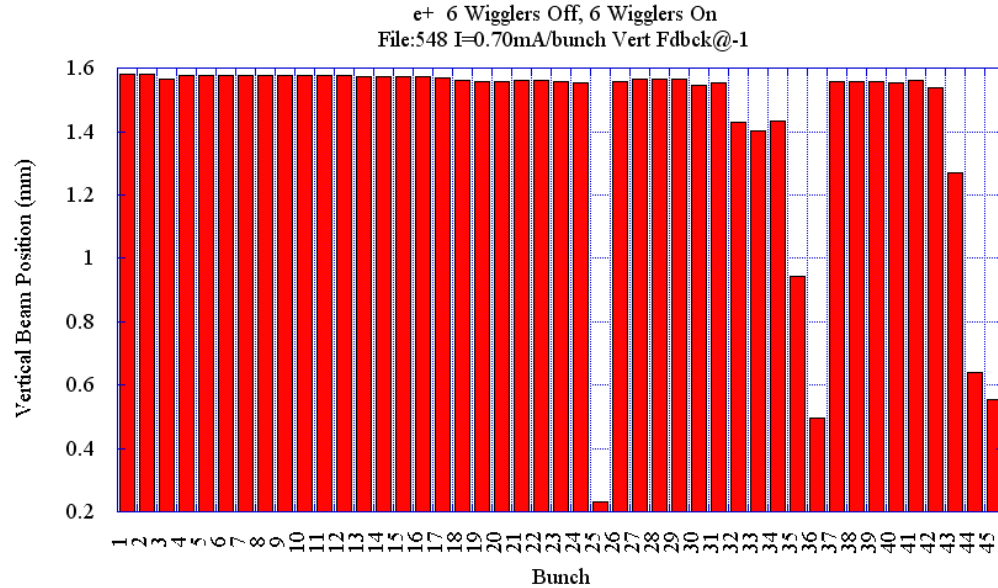


- Further reduction in σ_v of bunch 3. The peak in the beam spectrum is no longer present.
- σ_v growth along the train starts at bunch 31 (moved later in the train).



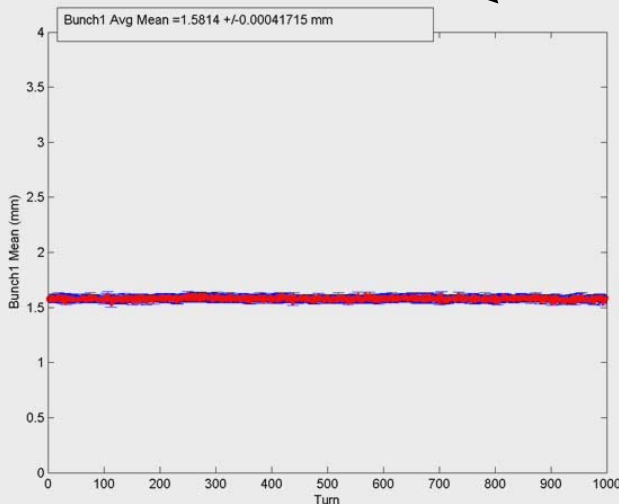


FFT Vertical position $I_{e^+}=0.75\text{mA/bunch}$
 File:548 e+ 6 wigglers on, 6 wigglers off
 Vert. Fdbck@-1

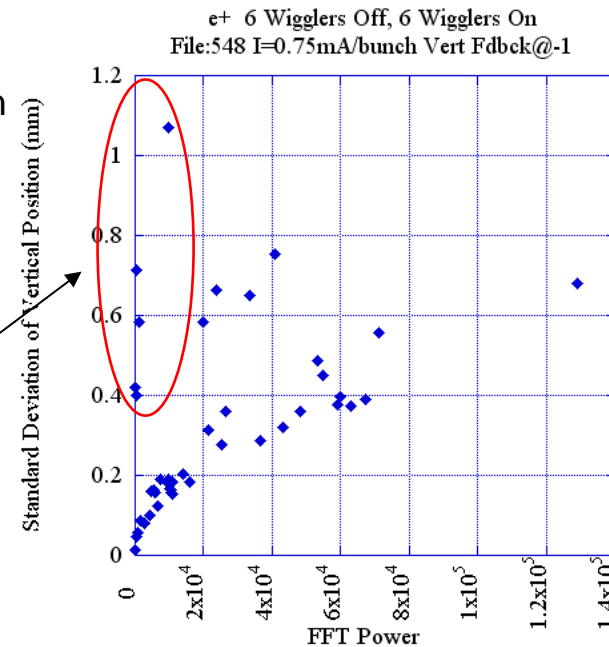


At $I=0.75\text{mA/bunch}$ turning off the vertical feedback resulted in:

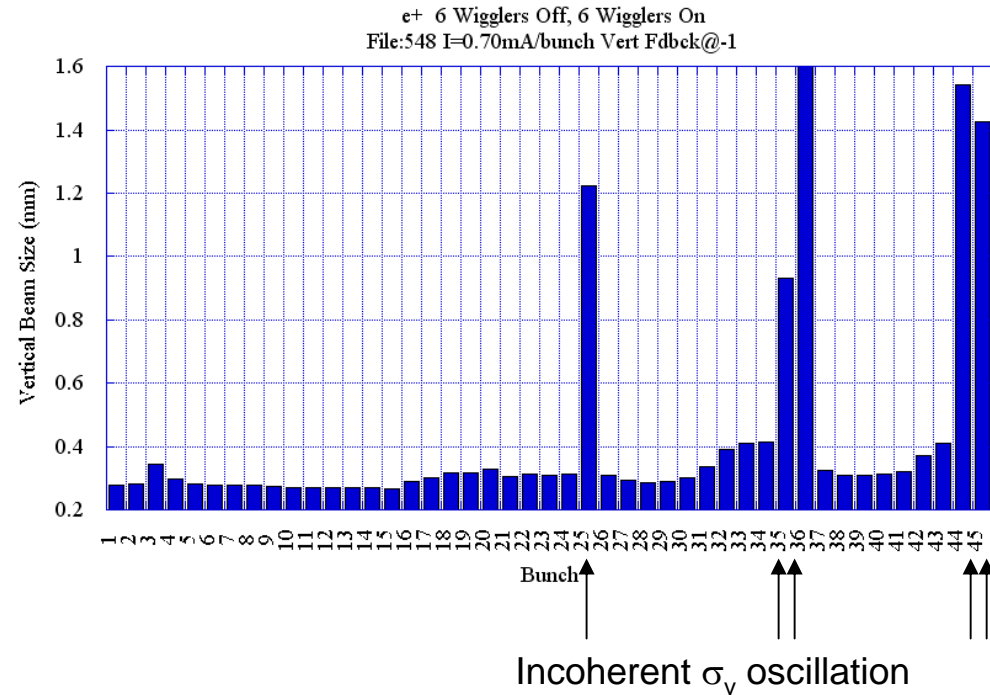
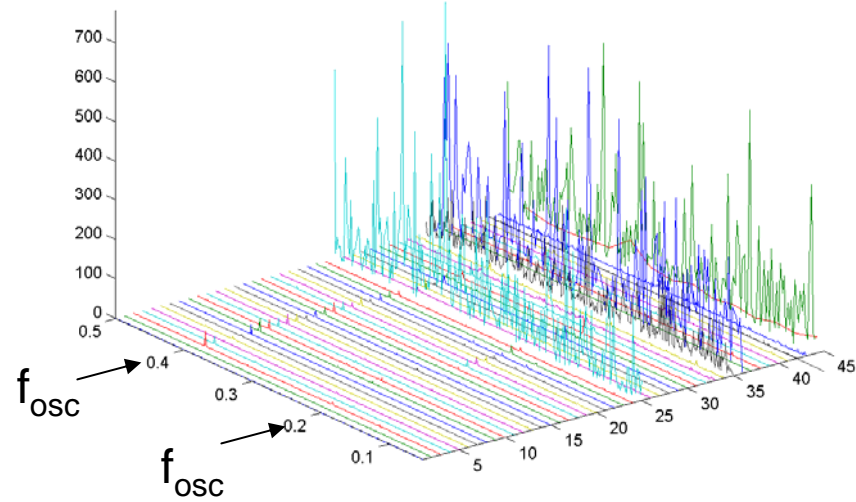
Vertical position movie



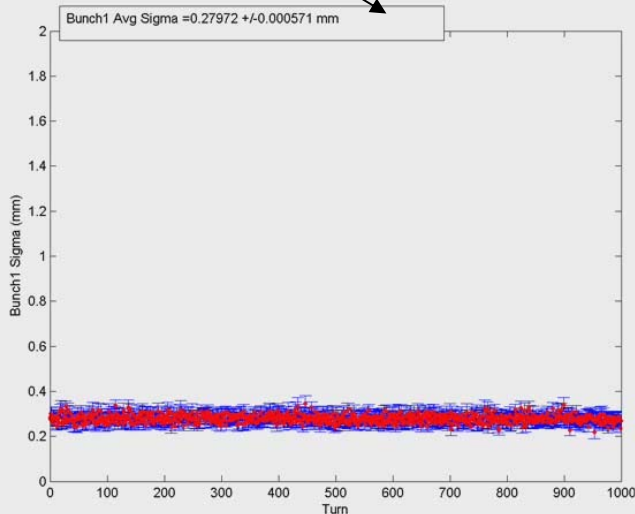
- An increase in the vertical position oscillation amplitude at $f_{osc}=236.7\text{kHz}$
- A vertical position oscillation for bunches 25, 35, 36, and 43-45 where:
 - the oscillation amplitude does not correlate with FFT power.
 - A wide spectrum of frequency oscillations are present in the FFT spectrum.



FFT σ_v $I_{e^+}=0.75\text{mA/bunch}$
 File:548 e+ 6 wigglers on, 6 wigglers off
 Vert. Fdbck@-1



σ_v movie

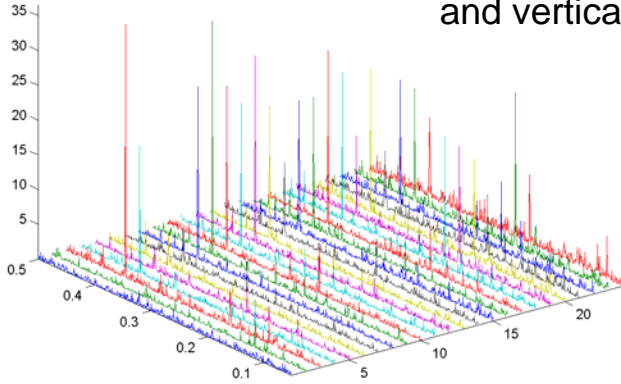


At $I=0.75\text{mA/bunch}$ and no vertical feedback:

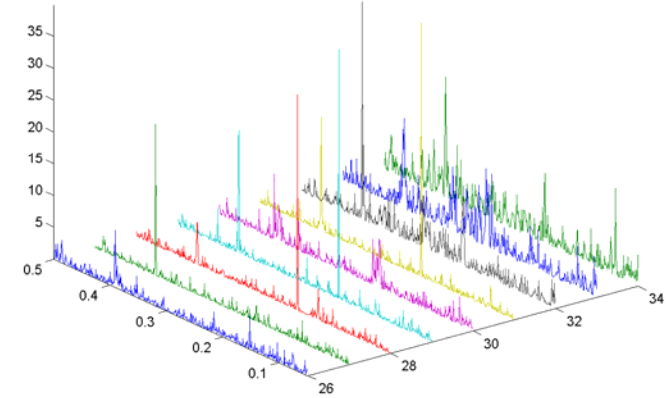
- σ_v growth along the train starts at bunch 16.
- Two oscillations frequencies are present, at $f_{osc}=236.6\text{kHz}$ and $f_{osc}=306.5\text{kHz}$.
- Along the train the vertical position oscillation amplitude increases until a significant σ_v blows-up occurs. The process repeats three times over the 45 bunches.

Bunches 1-24

Spectrum and bunch distribution leading up to beam blow-up for $I=0.75\text{mA/bunch}$ and vertical feedback off.



Bunches 26-34



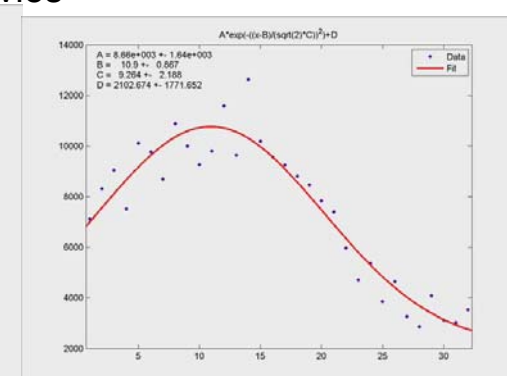
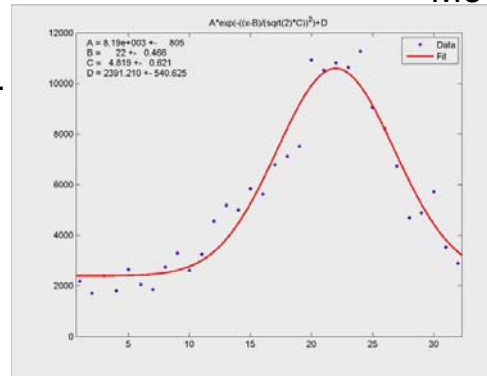
Characteristics of σ_v blow-up along the train:

- Increase in FFT power at $f_{\text{osc}}=236.6\text{kHz}$ and $f_{\text{osc}}=306.5\text{kHz}$.
- Increase in vertical position oscillation amplitude (bunch 34).
- Substantial increase in σ_v (bunches 34-36).
- Stable vertical position and σ_v (bunch 37).
- Repeat process.

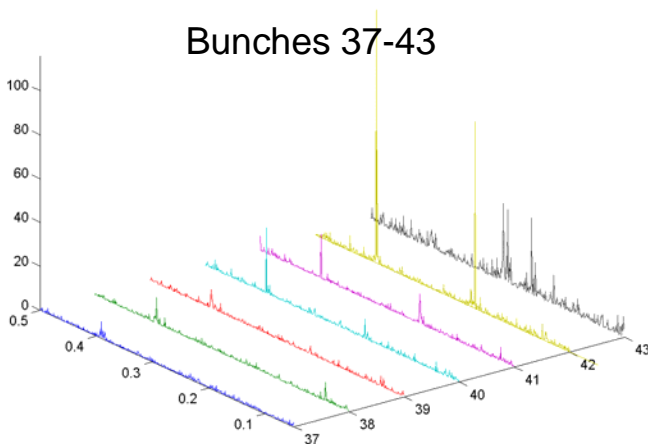
Bunch 34 $I=0.86\text{mA}$

Movies

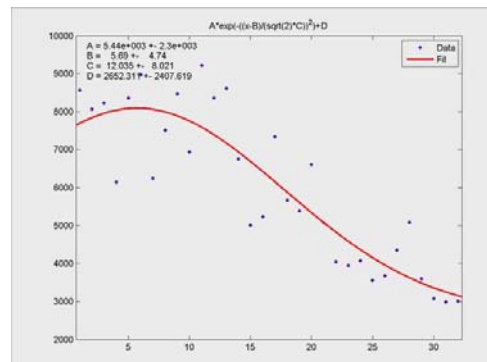
Bunch 35 $I=0.62\text{mA}$



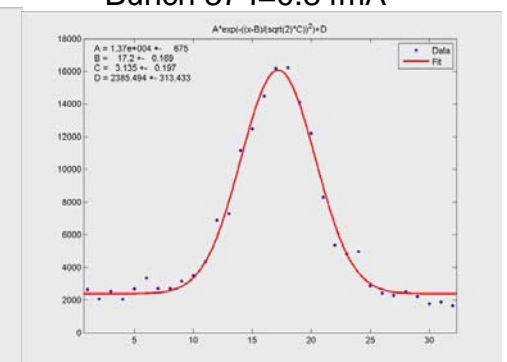
Bunches 37-43



Bunch 36 $I=0.52\text{mA}$



Bunch 37 $I=0.84\text{mA}$



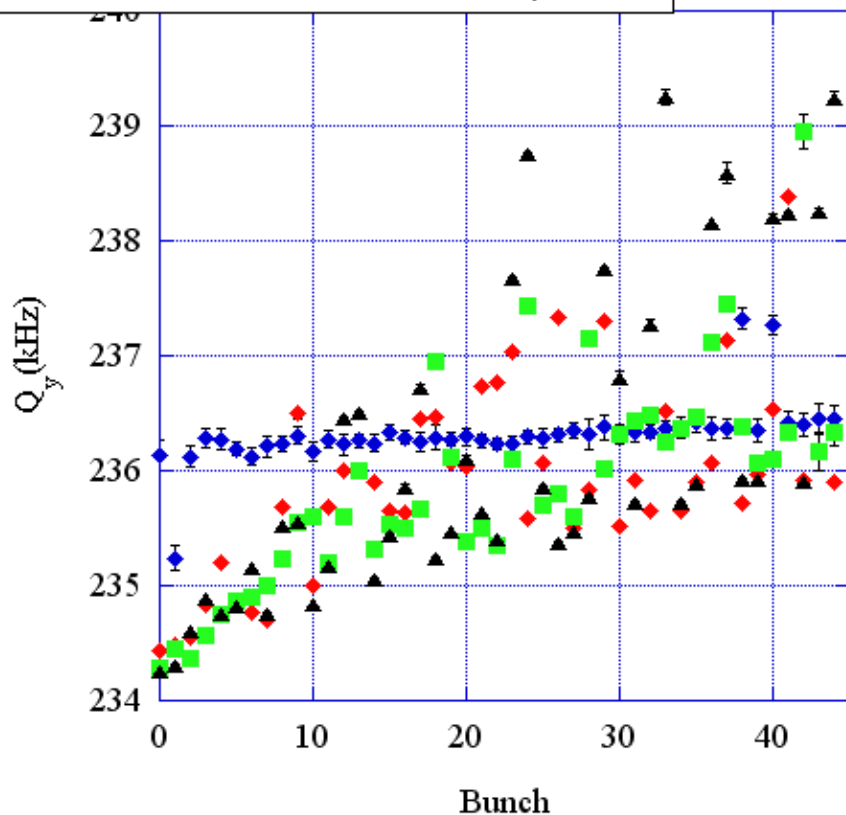
Summary e+ vertical dynamics with 6 wigglers on/off

- As the bunch current increases, the vertical tune shift along the 45 bunch train increases.
- A vertical position oscillation along the 45 bunch train is always present at bunch currents measured. The position oscillation amplitude increases with current and decreases with vertical feedback. The FFT power from the vertical position correlates with the vertical oscillation amplitude.
- At low current, a substantial σ_v increase was measured for bunches 3-11. As the current and vertical feedback is increased, the σ_v for these bunches is reduced.
- As the bunch current is increased, σ_v growth along the 45 bunch train occurs. If vertical feedback is turned off, a large vertical position oscillation amplitude causes a significant increase in σ_v . This σ_v blow-up appears to be incoherent due to the lack of structure in the FFT spectrum.

III. e+ 12 wigglers on

- ◆ I=0.25mA/bunch File:429 Vert Fdbk@-1 $\Delta Q_y \sim 2.1\text{kHz}$
- ◆ I=0.75mA/bunch File:426 Vert Fdbk@-1 $\Delta Q_y \sim 4.0\text{kHz}$
- ◆ I=0.84mA/bunch File:423 Vert Fdbk@-600 $\Delta Q_y \sim 4.8\text{kHz}$
- ◆ I=0.86mA/bunch File:425 Vert Fdbk@-1 $\Delta Q_y \sim 5.0\text{kHz}$

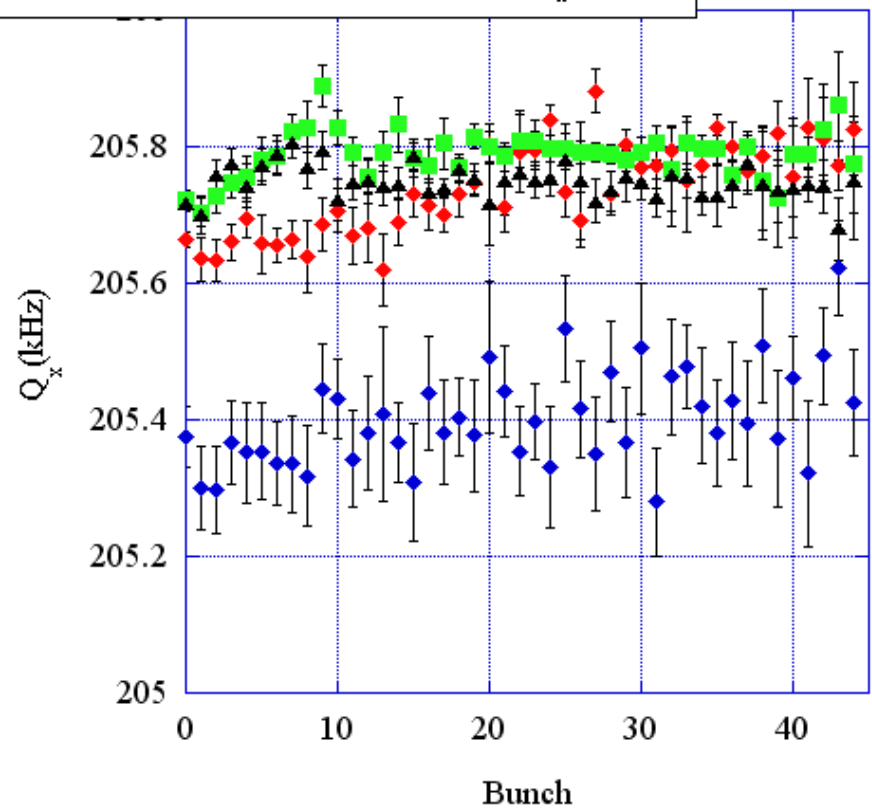
e+
12 Wigglers On



Along the 45 bunch train,
 $\Delta Q_y (12 \text{ wigglers on}) > \Delta Q_y (6 \text{ wigglers on/off})$

- ◆ I=0.25mA/bunch File:429 Vert Fdbk@-1 $\Delta Q_x \sim 0.3\text{kHz}$
- ◆ I=0.75mA/bunch File:426 Vert Fdbk@-1 $\Delta Q_x \sim 0.3\text{kHz}$
- ◆ I=0.84mA/bunch File:423 Vert Fdbk@-600 $\Delta Q_x \sim 0.2\text{kHz}$
- ◆ I=0.86mA/bunch File:425 Vert Fdbk@-1 $\Delta Q_x \sim 0.1\text{kHz}$

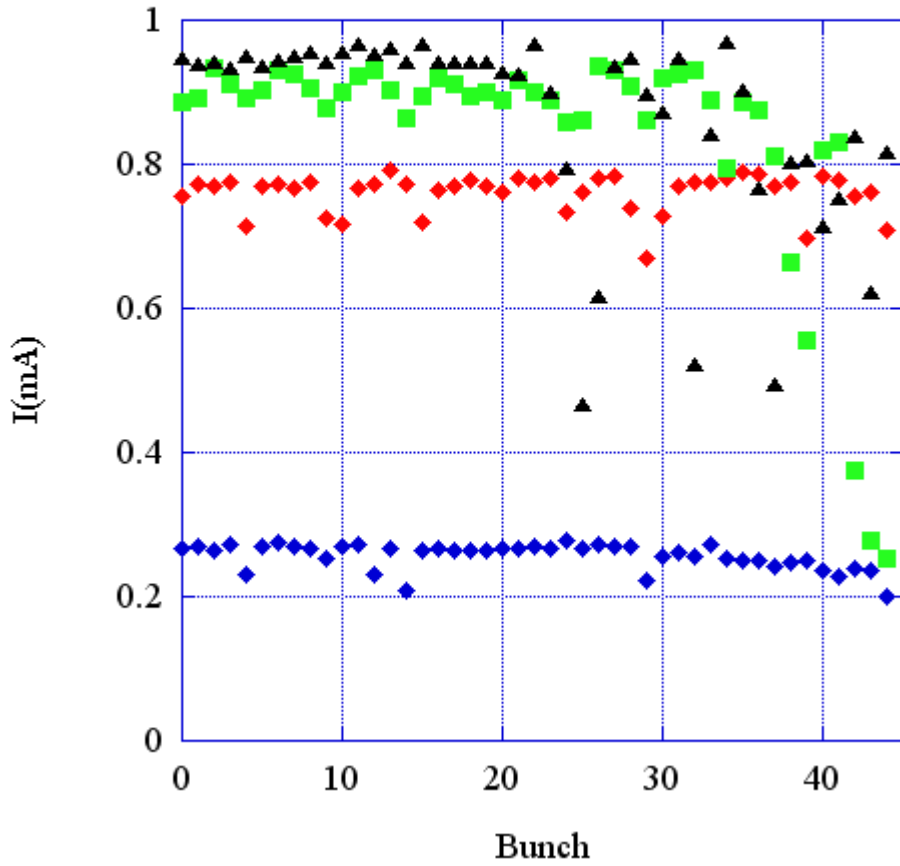
e+
12 Wigglers On



Bunch

e+
12 Wigglers On

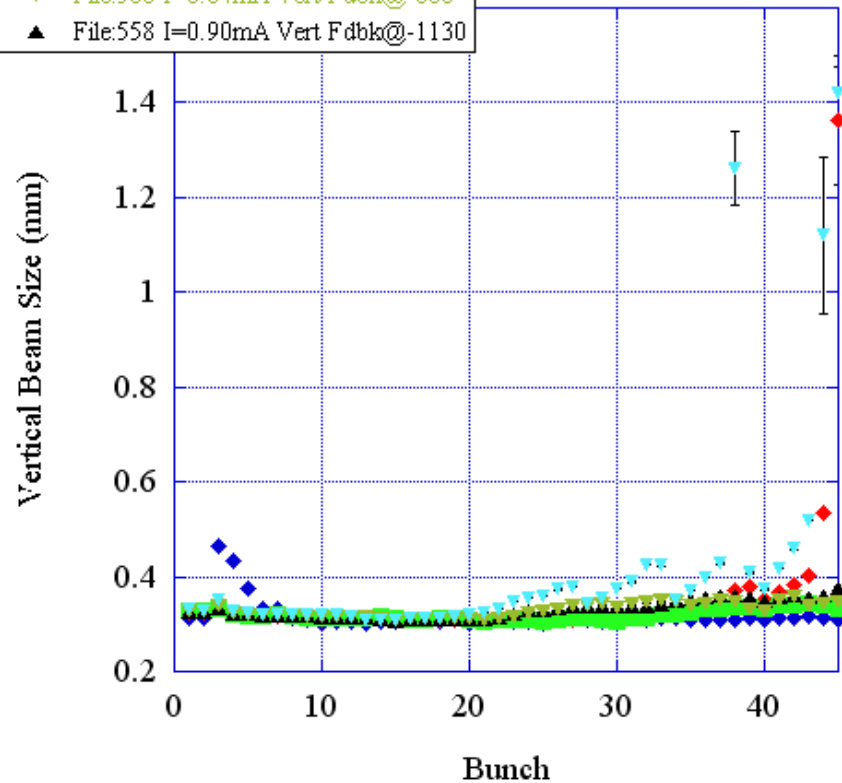
- ◆ I=0.25mA/bunch File:429 Vert Fdbk@-1
- ◆ I=0.75mA/bunch File:426 Vert Fdbk@-1
- I=0.84mA/bunch File:423 Vert Fdbk@-600
- ▲ I=0.86mA/bunch File:425 Vert Fdbk@-1



Large fluctuations in bunch current along the train at higher bunch current.

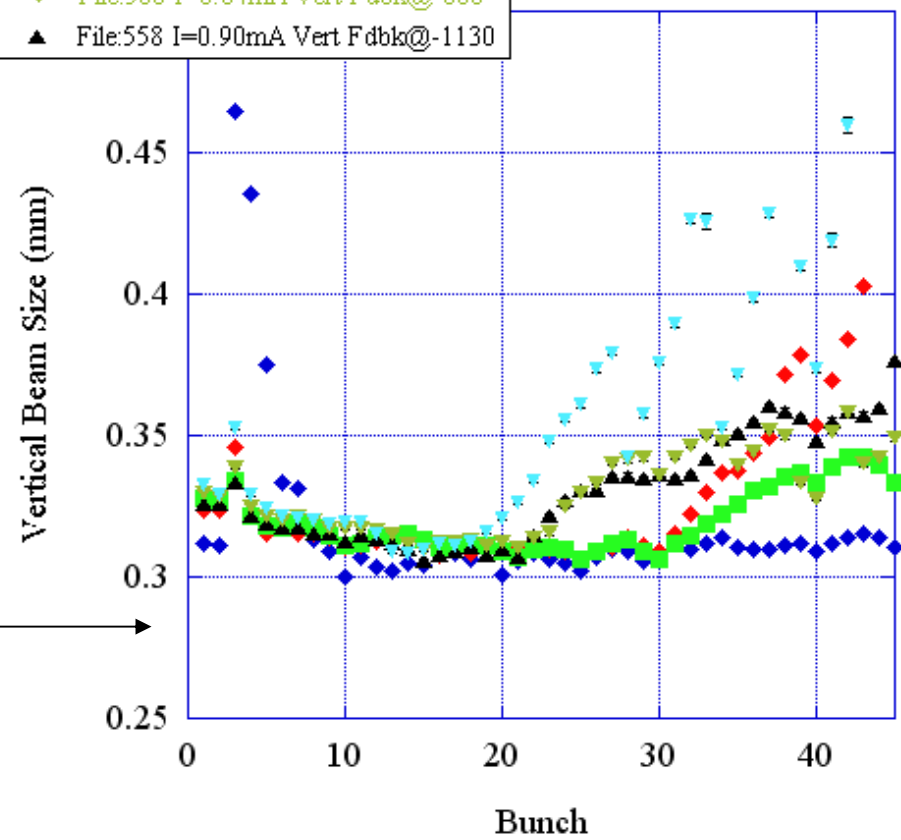
e+ 12 Wigglers On
Average Single Turn Beam Size

- ◆ File:570 I=0.25mA Vert Fdbk@-1
- ◆ File:564 I=0.75mA Vert Fdbk@-1
- File:565 I=0.75mA Vert Fdbk@-1130
- ▼ File:562 I=0.84mA Vert Fdbk@-1
- ▼ File:560 I=0.84mA Vert Fdbk@-600
- ▲ File:558 I=0.90mA Vert Fdbk@-1130

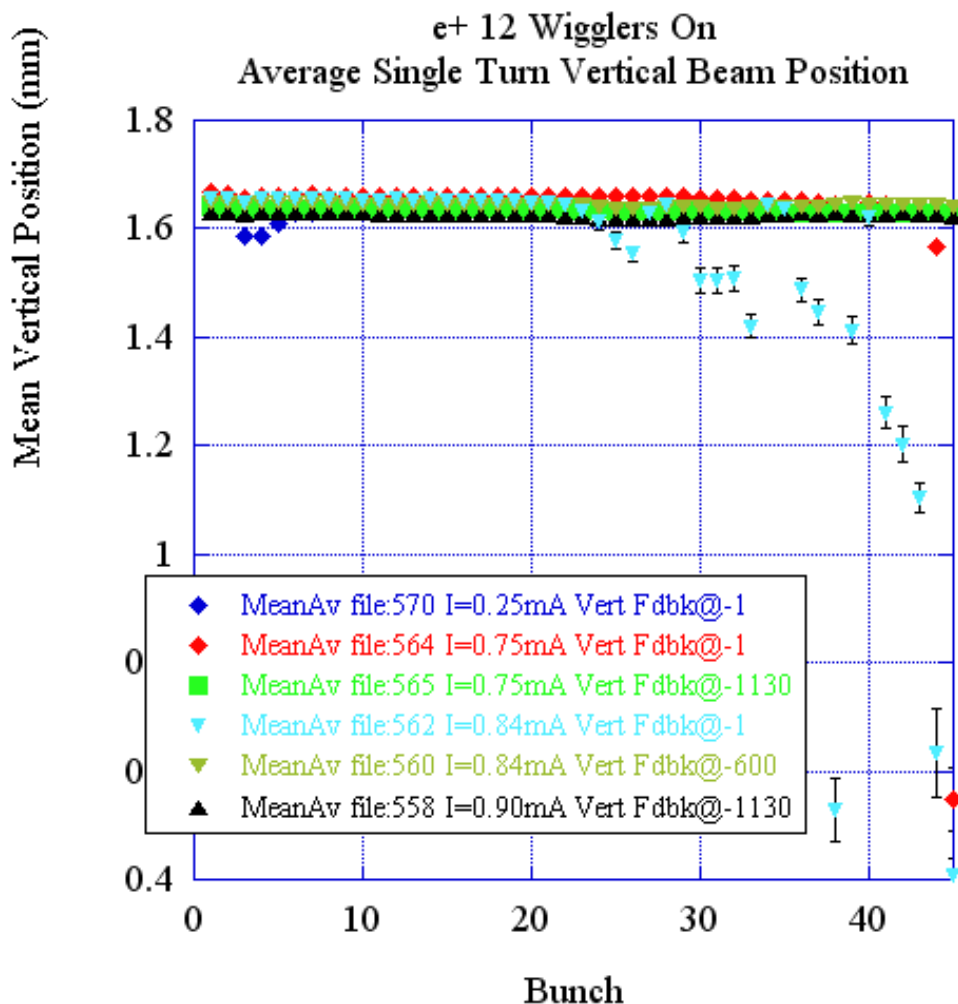


e+ 12 Wigglers On
Average Single Turn Beam Size

- ◆ File:570 I=0.25mA Vert Fdbk@-1
- ◆ File:564 I=0.75mA Vert Fdbk@-1
- File:565 I=0.75mA Vert Fdbk@-1130
- ▼ File:562 I=0.84mA Vert Fdbk@-1
- ▼ File:560 I=0.84mA Vert Fdbk@-600
- ▲ File:558 I=0.90mA Vert Fdbk@-1130



Detailed view →



Detailed view

