

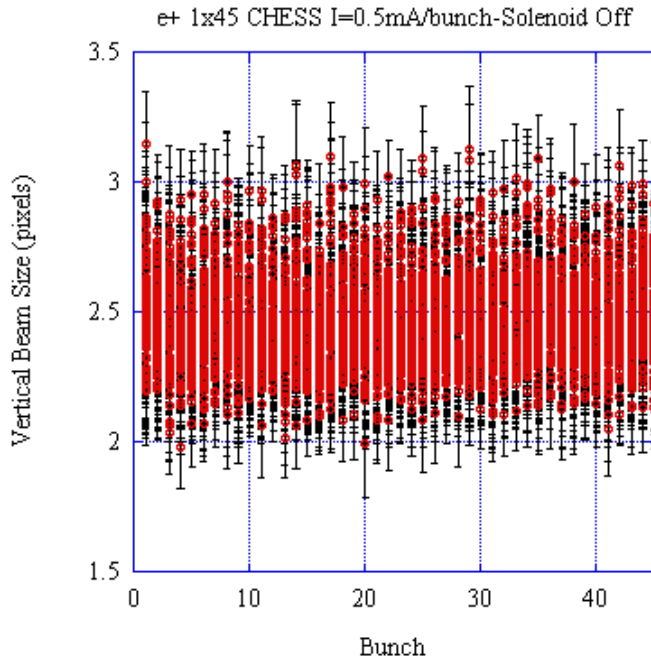
# CHESS e<sup>+</sup>/e<sup>-</sup> Long Train Vertical Beam Size-Part-II

At the CHESS energy and long train pattern (45 bunches) the relative vertical beam size change as a function of current was measured with the PMT array on 5/23/2006.

## Measurements

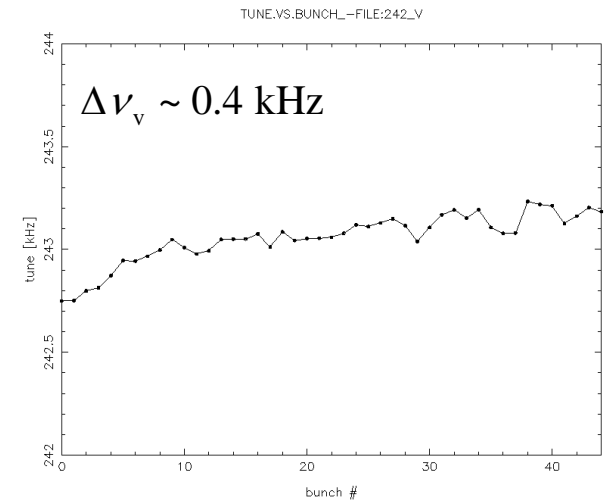
- I. CHESS e<sup>+</sup> vertical beam size and tune
- II. CHESS e<sup>-</sup> vertical beam size and tune
- III. Summary

# I. CHESS e+ Vertical Beam Size and Tune

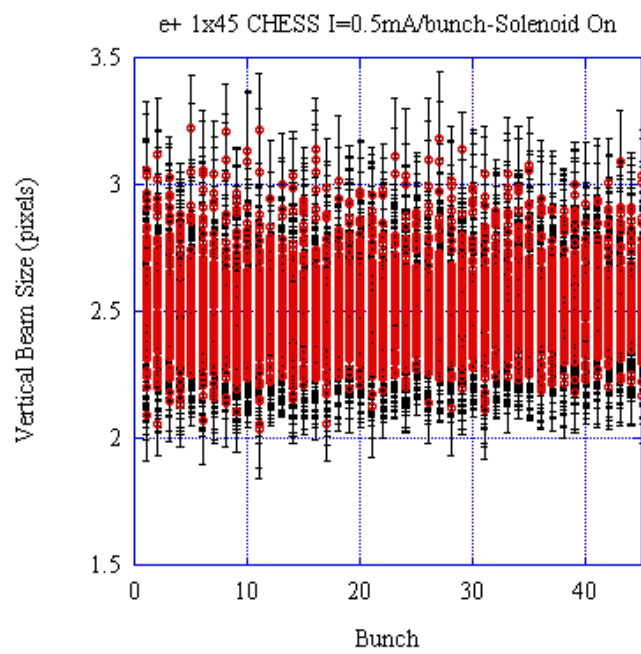


e+ I = 0.5 mA/bunch

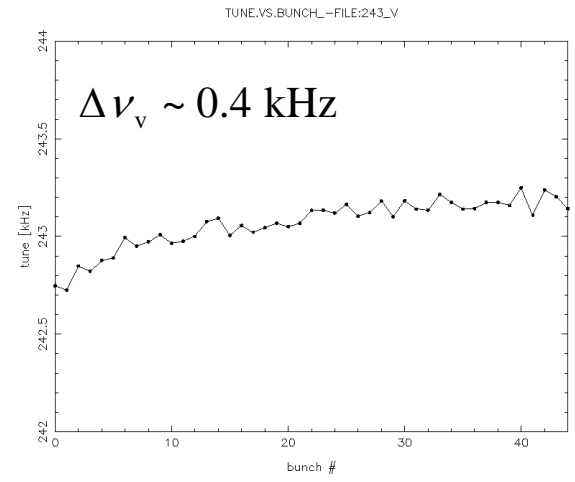
$$\bar{\sigma}_v = 2.47 \pm 0.1 \text{ pixels}$$

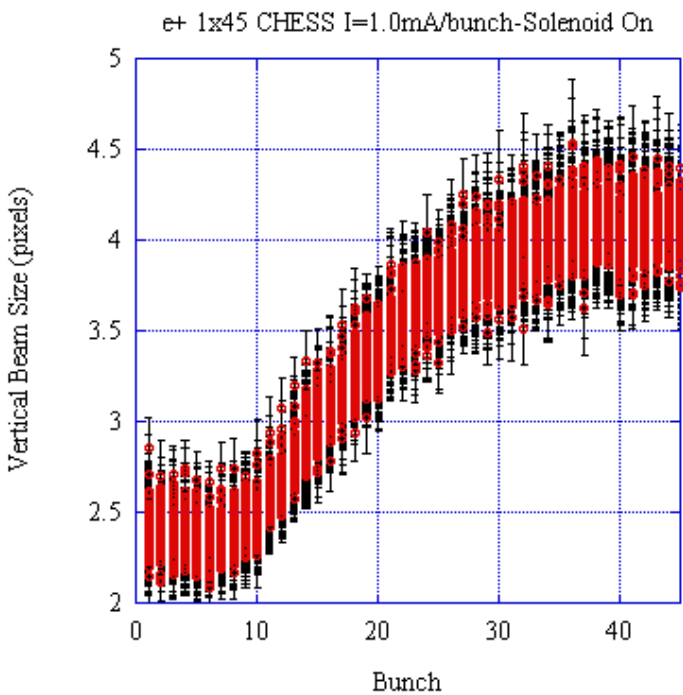
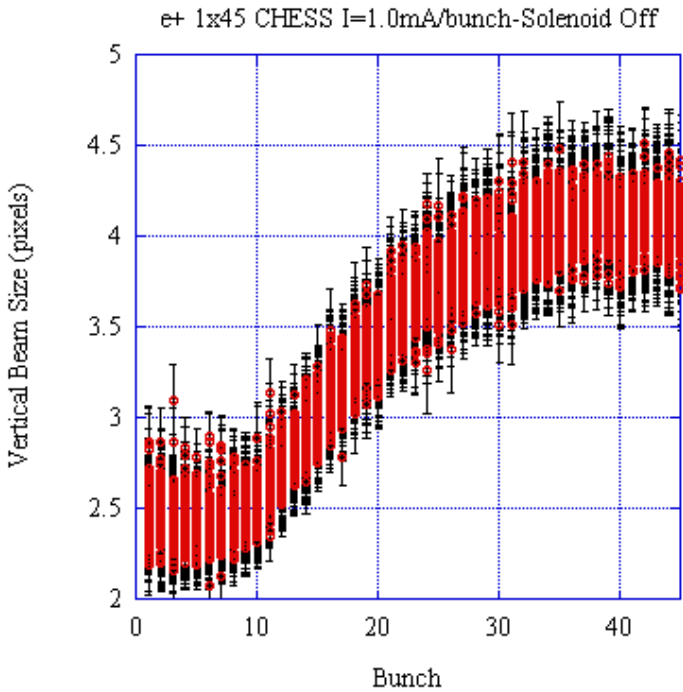


- e+ 1x45 PMT set for 100 turn average
- $\sigma_v$  is constant along the train
- No change in  $\sigma_v$  and tune with solenoid on/off



$$\bar{\sigma}_v = 2.52 \pm 0.1 \text{ pixels}$$



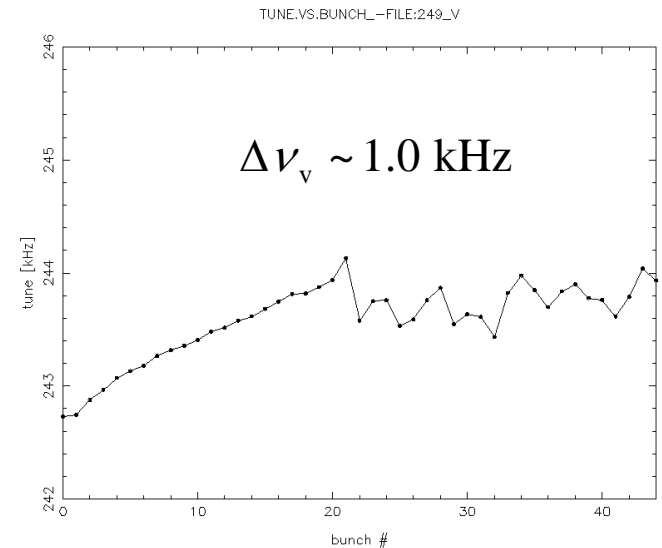
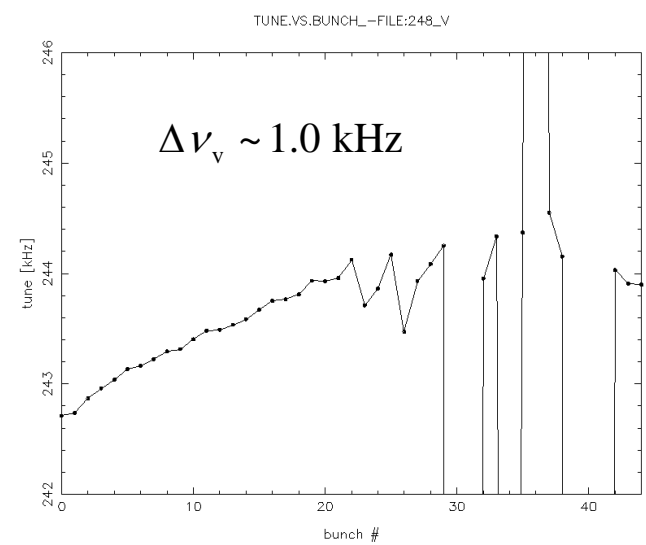


## e+ I=1.0mA/bunch

- $\sigma_v$  growth along the train starting at  $\sim$  bunch 10 which levels off at  $\sim$  bunch 30.

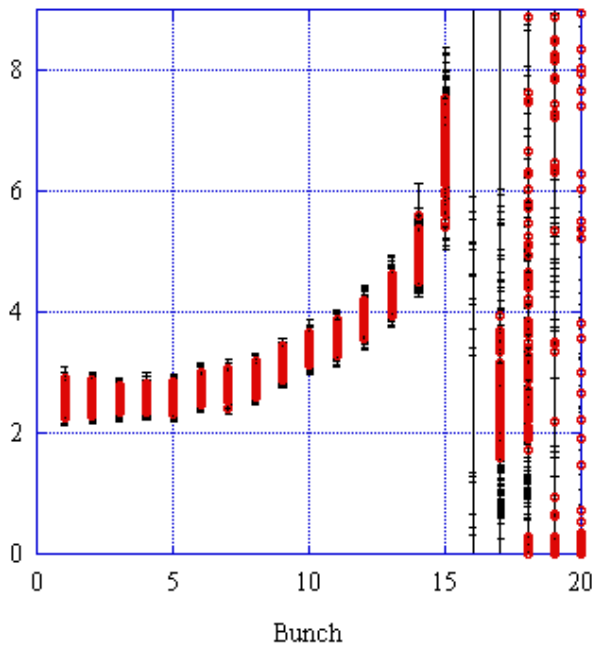
- Linear tune shift along train up until bunch 20.

- Virtually no difference in  $\sigma_v$  and vertical tune with solenoids on and off.



e+ 1x20 CHESS I=1.5mA/bunch-Solenoid Off

Vertical Beam Size (pixels)

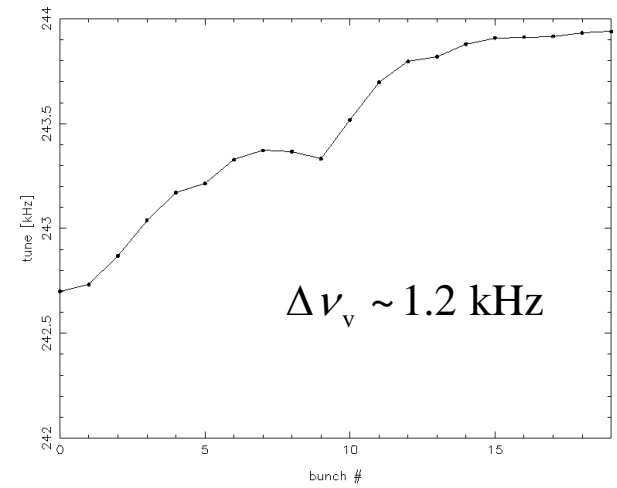


e+ I=1.5mA/bunch

20 Bunch Train

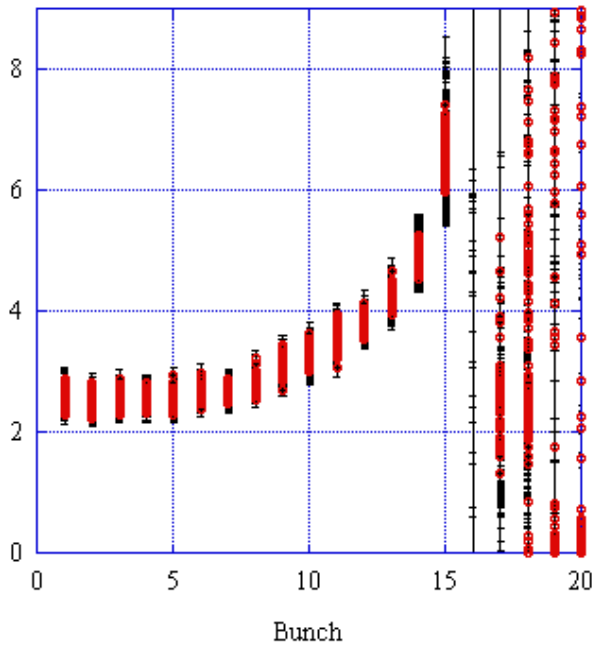
- Strong  $\sigma_v$  growth along the train starting at  $\sim$  bunch 10.
- Large  $\sigma_v$  and centroid oscillation at  $\sim$ bunch 16.

TUNE.VS.BUNCL-FILE:240\_V



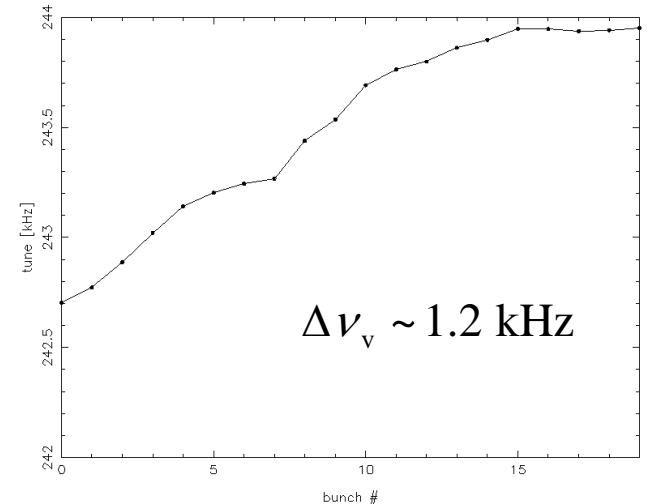
e+ 1x20 CHESS I=1.5mA/bunch-Solenoid On

Vertical Beam Size (pixels)

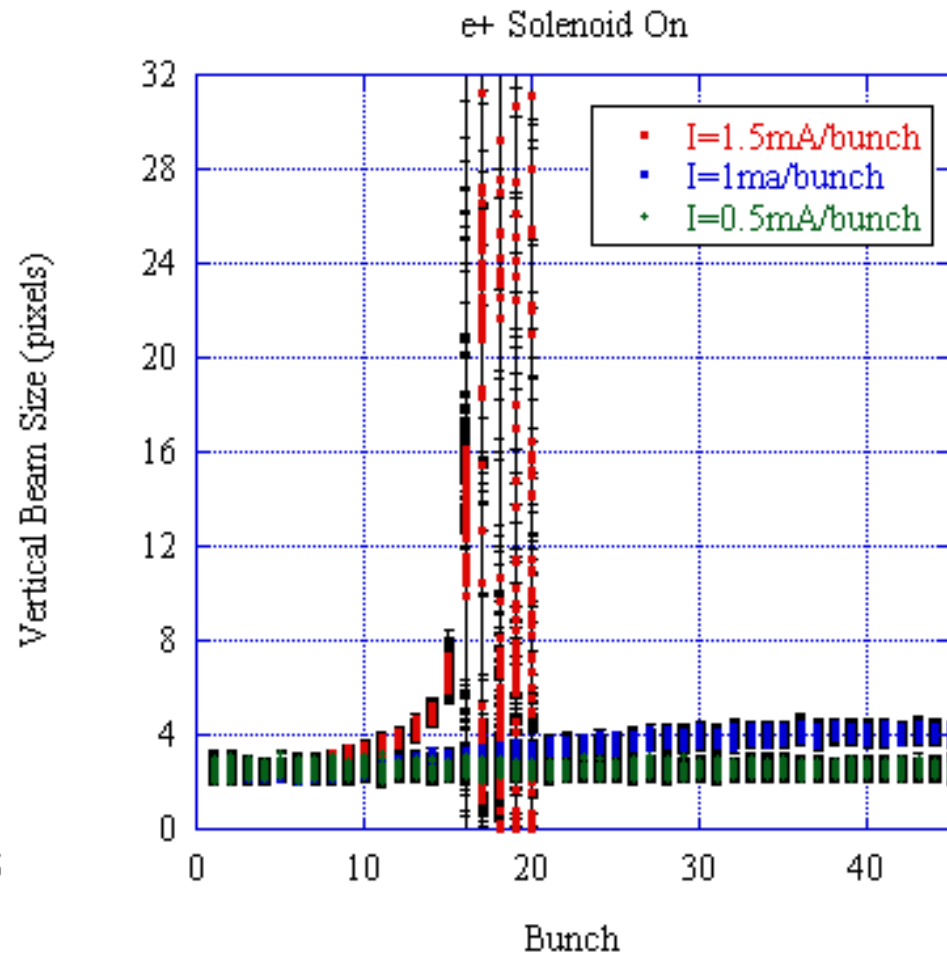
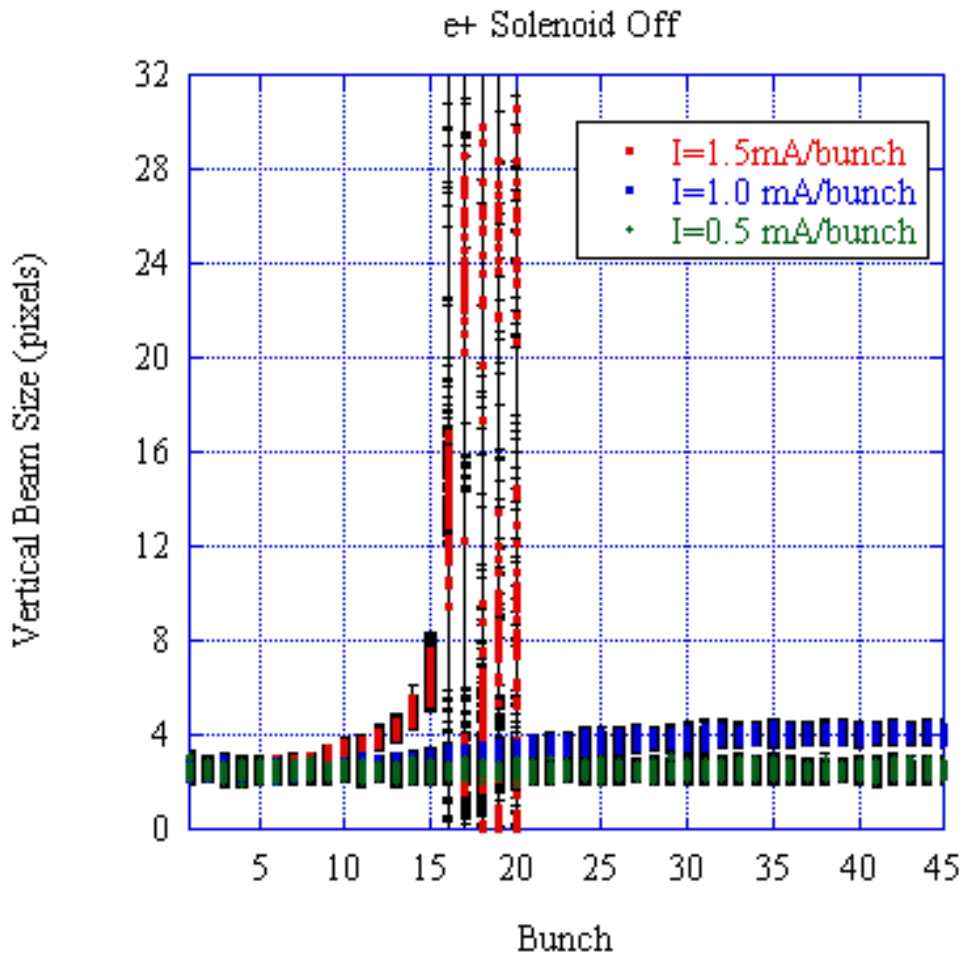


- No difference in behavior in the  $\sigma_v$  and tune with solenoid on and off.

TUNE.VS.BUNCL-FILE:241\_V

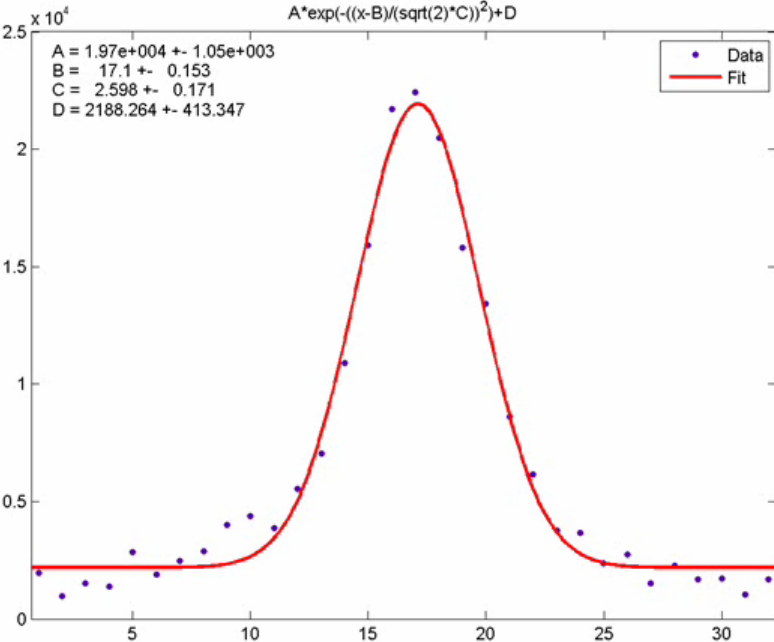


# Comparison of e<sup>+</sup> vertical beam size across currents

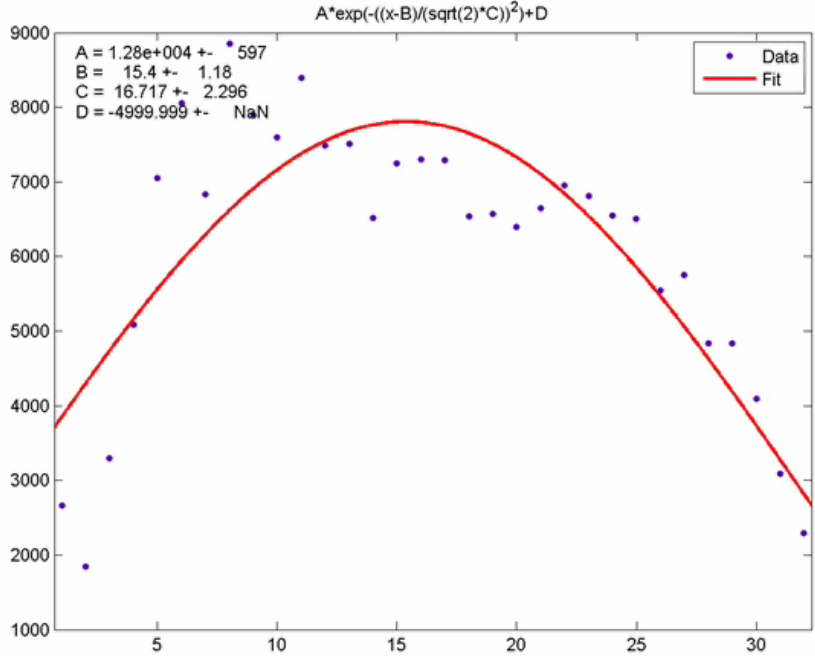


- Significant spike  $\sigma_v$  increase at 1.5mA/bunch. This drastic change  $\sigma_v$  between 1.0 mA and 1.5 mA/bunch calls for finer measurements.

Movie: Bunch 1 Solenoid off I=1.5mA/bunch

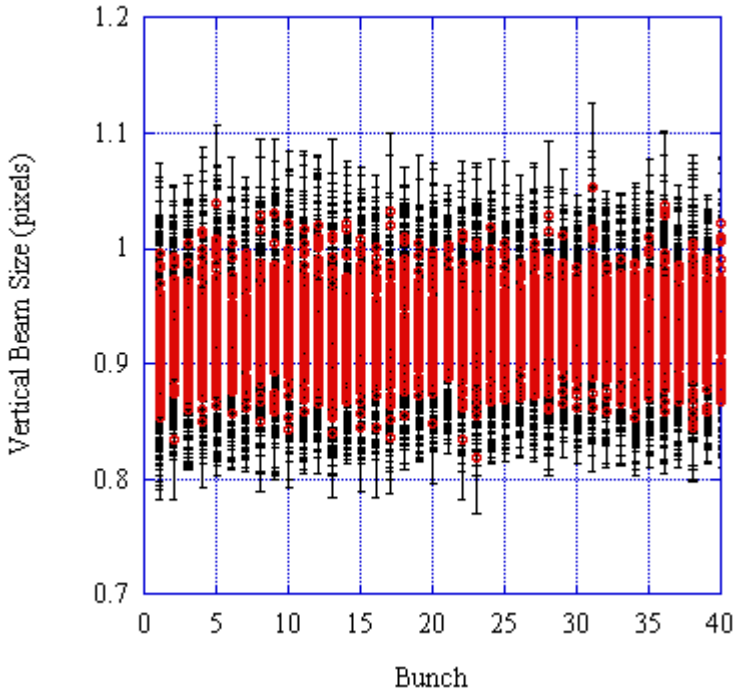


Movie: Bunch 16 Solenoid off I=1.5mA/bunch



## II. CHESSE e- Vertical Beam Size

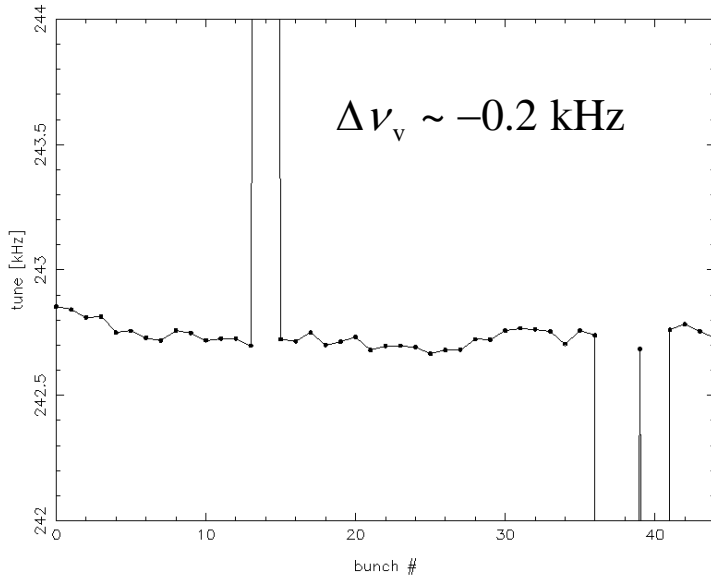
e- I=0.5mA/bunch



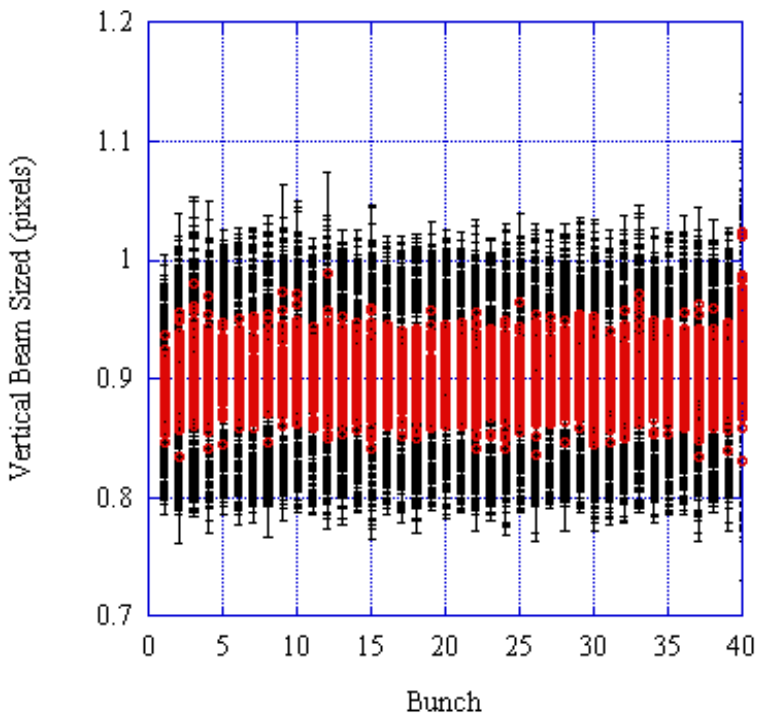
$$\bar{\sigma}_v = 0.93 \pm 0.03 \text{ pixels}$$

- $\sigma_v$  is constant along the train.
- Negative tune shift along the train.

TUNE.VS.BUNCH\_-FILE:253\_V



e- 1x40 CHESS I=1.0mA/bunch

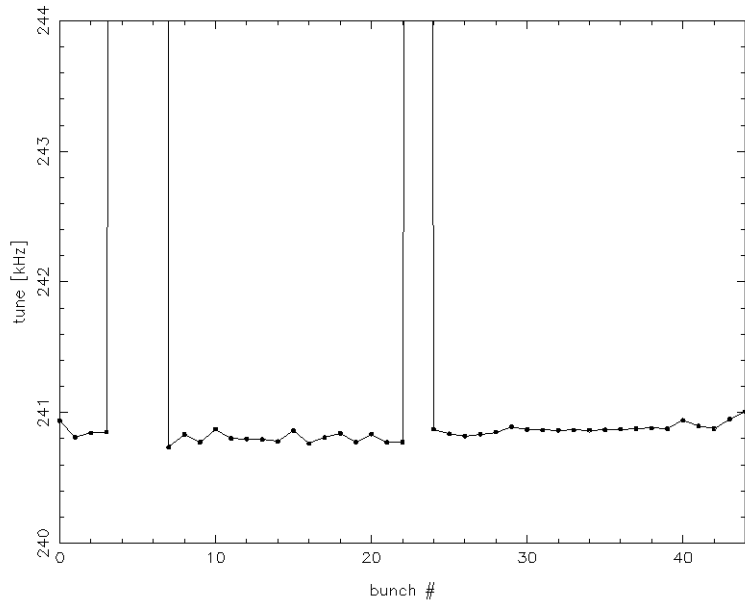


e- I=1mA/bunch

$$\bar{\sigma}_v = 0.90 \pm 0.02 \text{ pixels}$$

- $\sigma_v$  fairly constant along the train

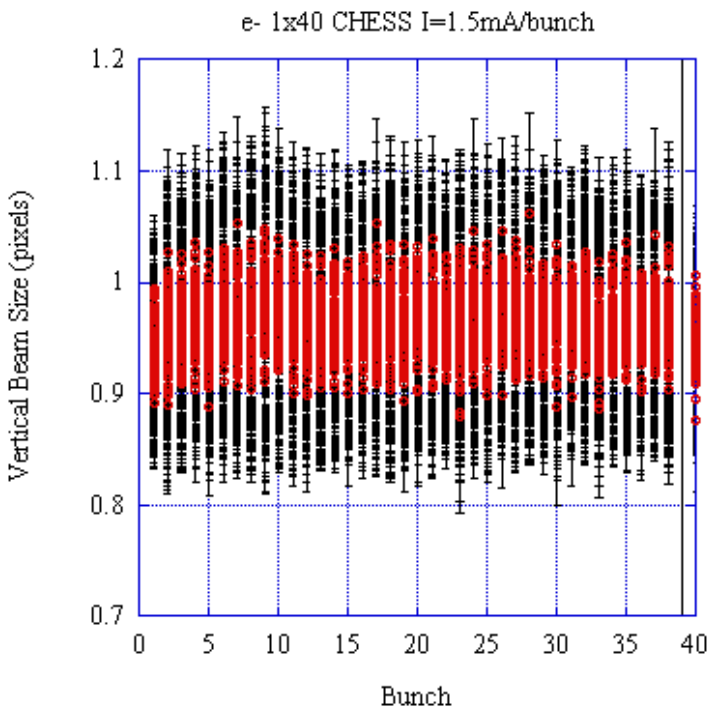
TUNE.VS.BUNCH\_-FILE:254\_V



- Slight tune shift along the train

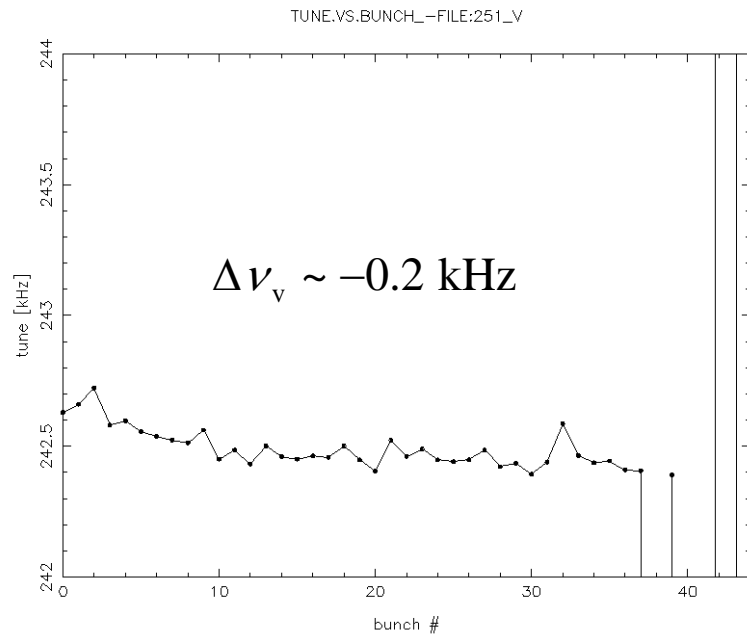


e-  $I=1.5\text{mA/bunch}$



$$\bar{\sigma}_v = 1.01 \pm 0.02 \text{ pixels}$$

- $\sigma_v$  fairly constant along the train
- Bunch 39 was lost before the experiment.
- $\sigma_v$  increased by 10% from 1mA to 1.5mA/bunch.
- Negative tune shift along the train.



# III. Summary

## e+ Measurements:

- At 0.5mA/bunch the vertical beam size and centroid is stable along the 45 bunch train. A positive vertical tune shift of 0.4kHz.
- At 1mA/bunch the vertical beam size grows at bunch 10 and levels off at bunch 30. The vertical tune shift along the train is 1.0kHz.
- At 1.5mA/bunch the tune shift along the 20 bunch train is 1.2kHz. The vertical beam size growth is dramatic from bunch 8-20.
- The present solenoid windings in CESR have virtually no affect on  $\sigma_v$  or the vertical tune.

## e- Measurements:

- No substantial vertical beam size growth was measured over the 45 bunch trains. The beam size did change by 10% when the bunch current was raised from 1 to 1.5mA/bunch.
- The vertical tune shift along the train is negative and small

Results are consistent with previous measurements made on 5/16/05 at different currents levels and tunes.