

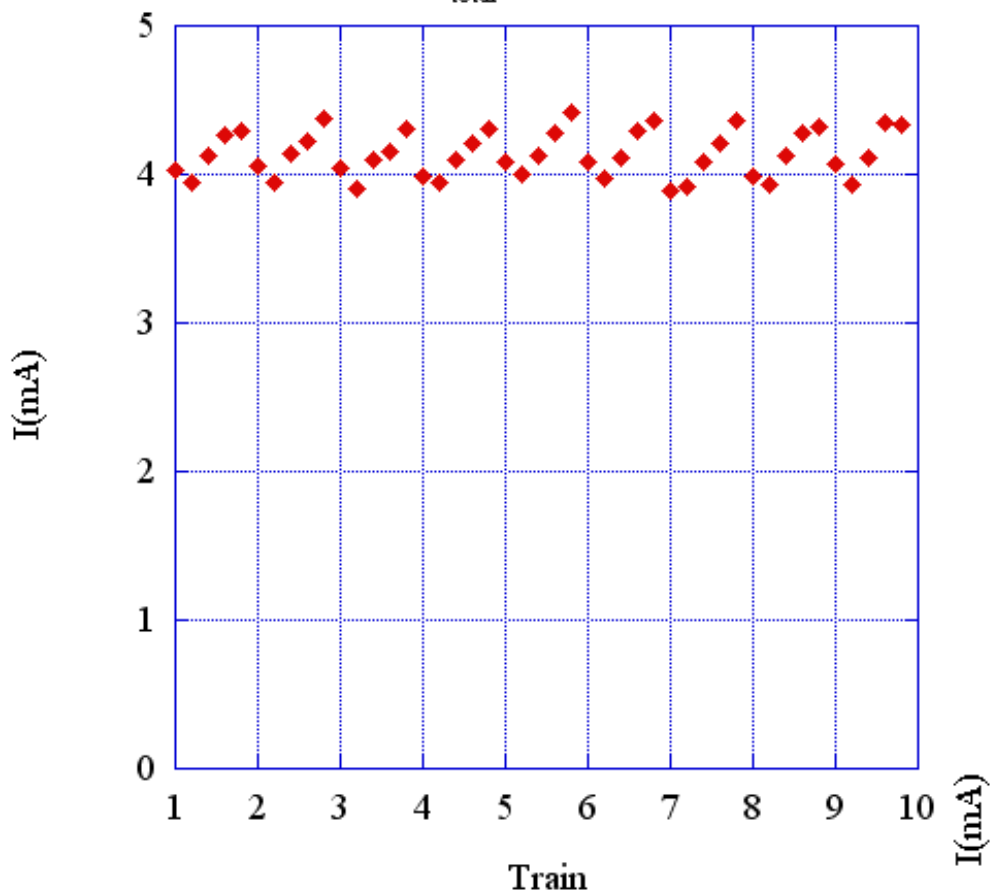
# Vertical Beam Size during CHESS Operation

R. Holtzapple, J. Kern, and E. Tanke

October 5, 2006

e+ CHESS 9x5 Pattern

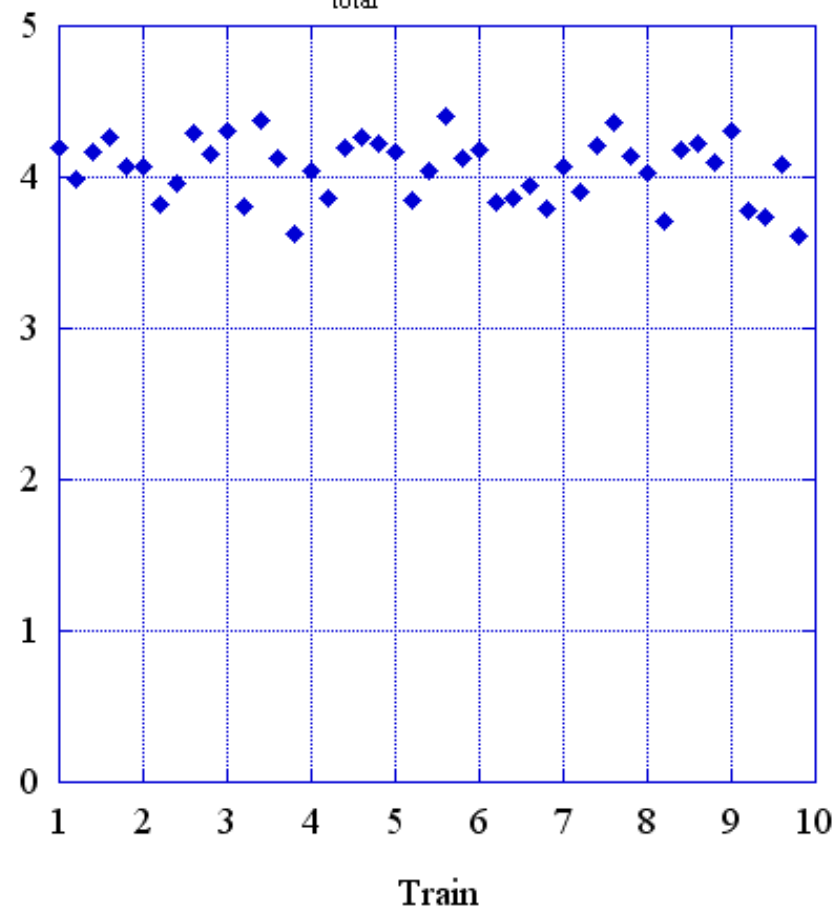
$I_{\text{total}} = 186.1 \text{ mA}$

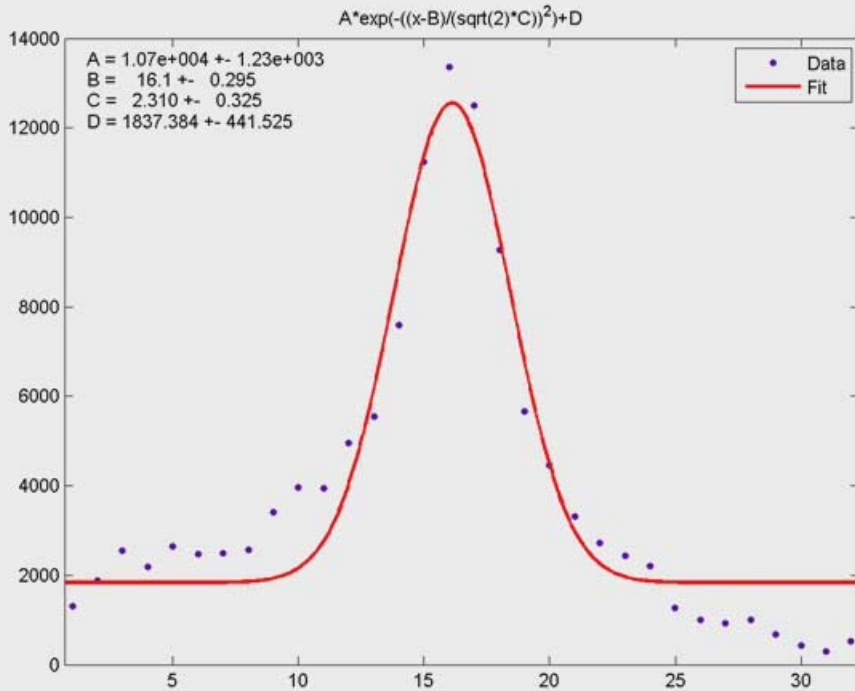


9x5 Pattern  
Single Bunch Current

e- CHESS 9x5 Pattern

$I_{\text{total}} = 182.5 \text{ mA}$

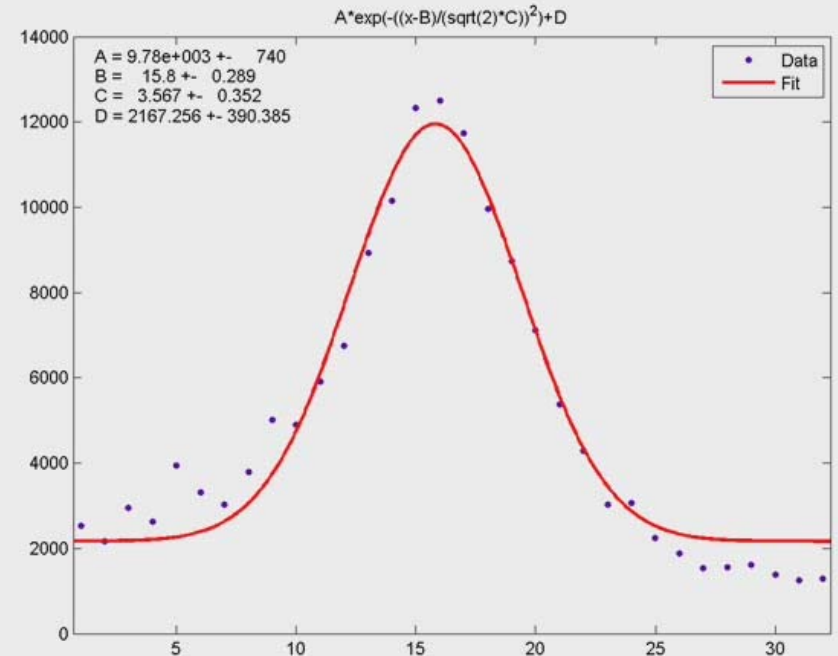




Bunch 1 Train 1  
1<sup>st</sup> five turns (movie)

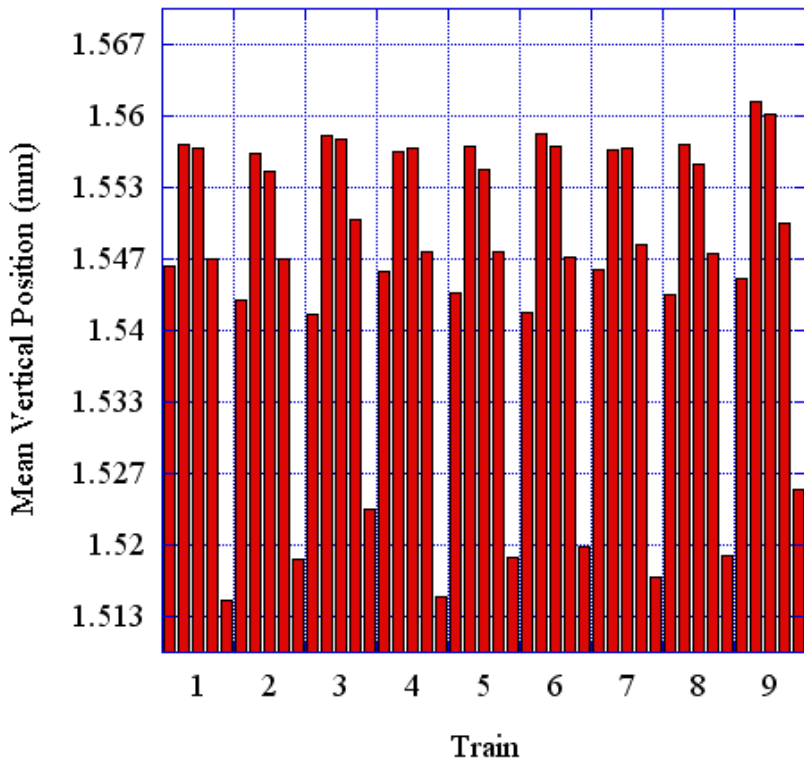
e+ single bunch vertical bunch distributions from the PMT array.

- 10,000 turns of all 45 e+/e- bunches.
- reflections are more prominent in the bunch distribution than in previous measurements



Bunch 1 Train 5  
1<sup>st</sup> five turns (movie)

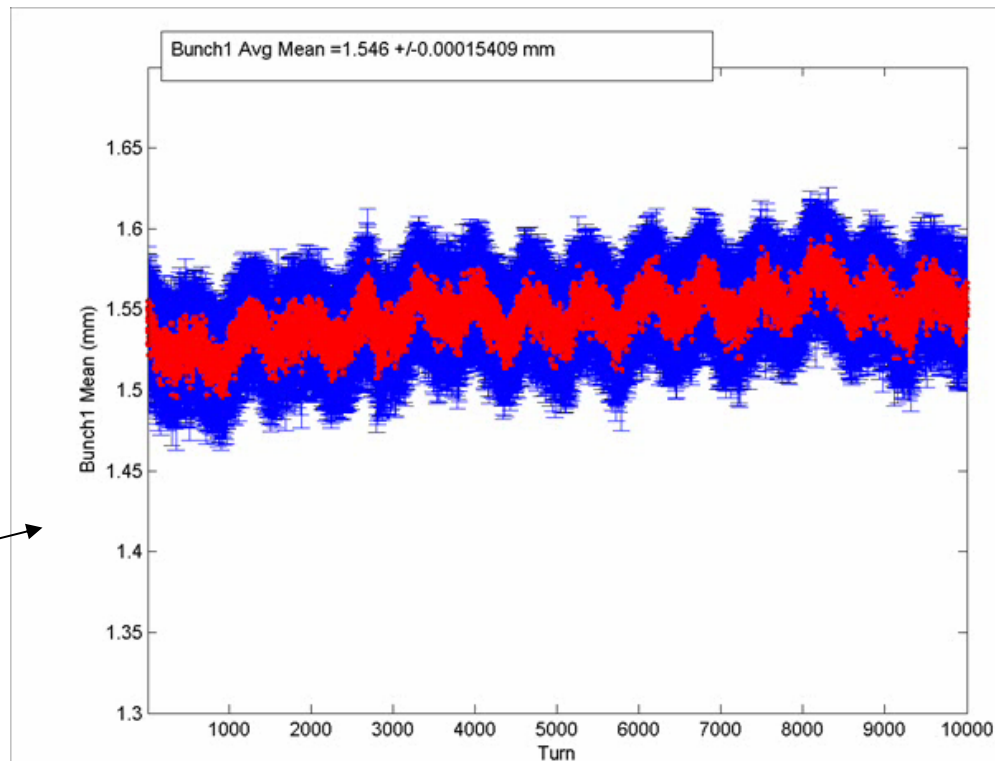
### e+ CHESS 9x5 Pattern



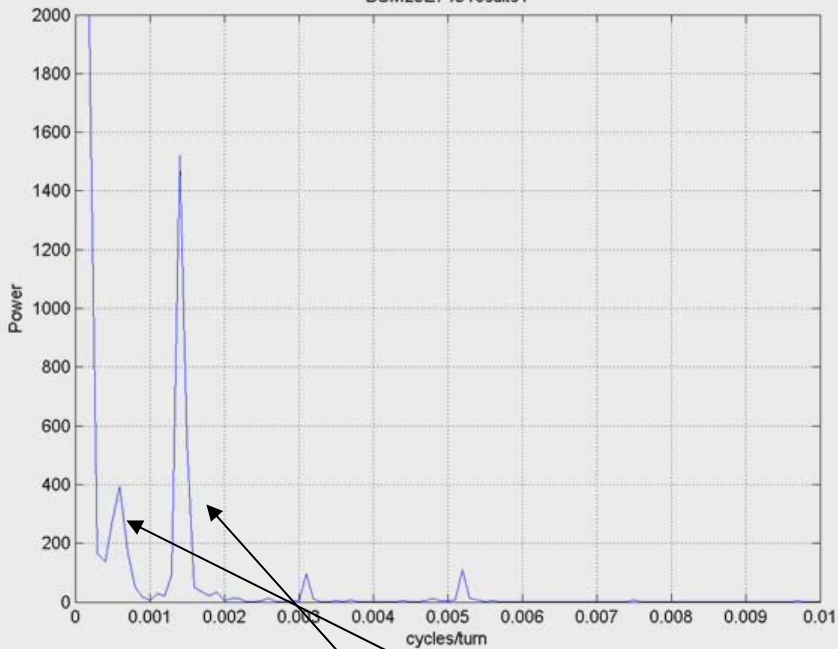
e+ mean vertical position along the train

- Last bunch in the train is vertically offset from other bunches.
- Low frequency vertical oscillation is denoted for all 45 bunches.

Mean vertical position for 10,000 turns for 45 bunches (movie)



BSM23E745 results1



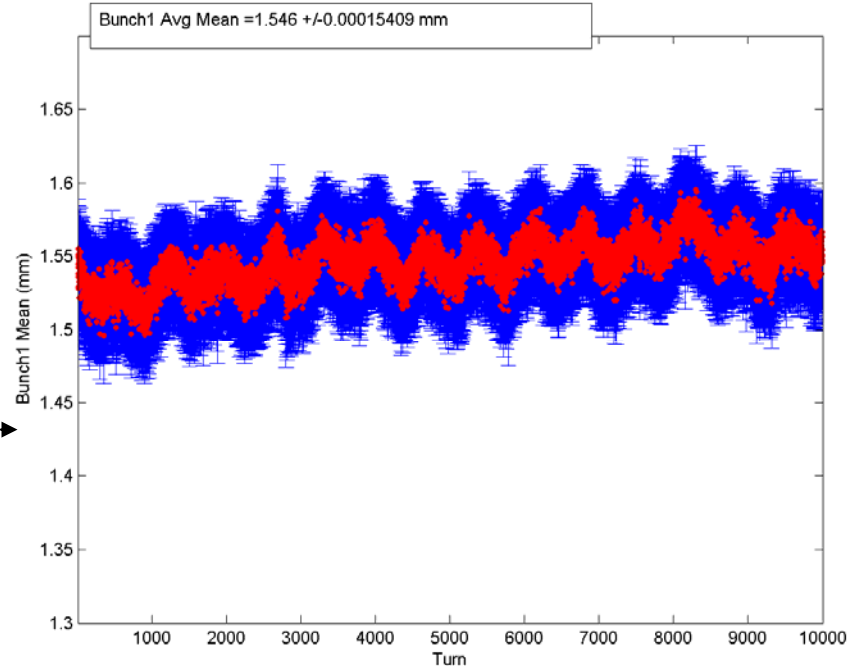
e+ low frequency vertical motion

FFT of mean vertical position for 10,000 turns (movie)

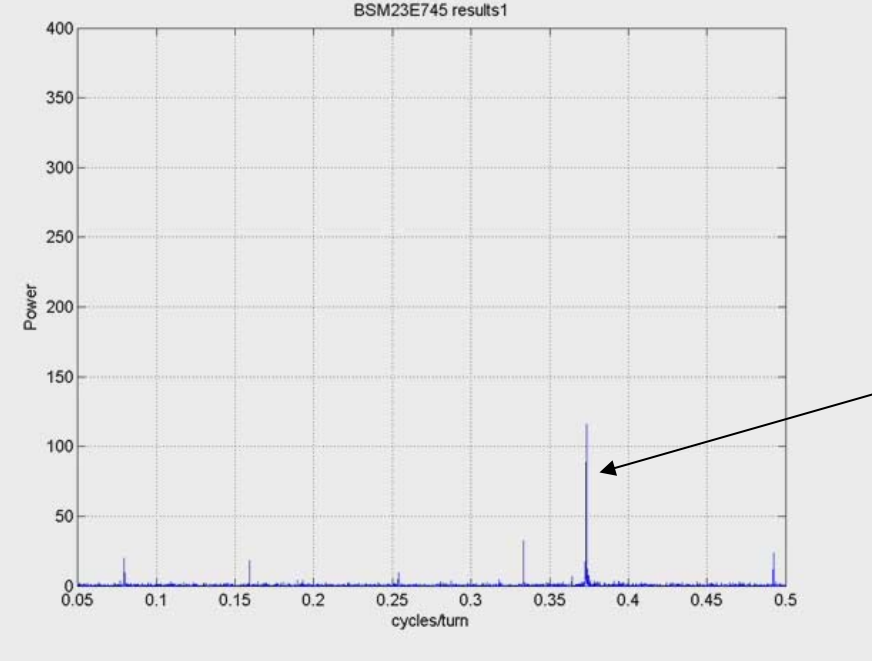


Vertical oscillation at ~714 and 1667 turns

714 turn oscillation is the dominant frequency and is clearly evident for all 45 bunches

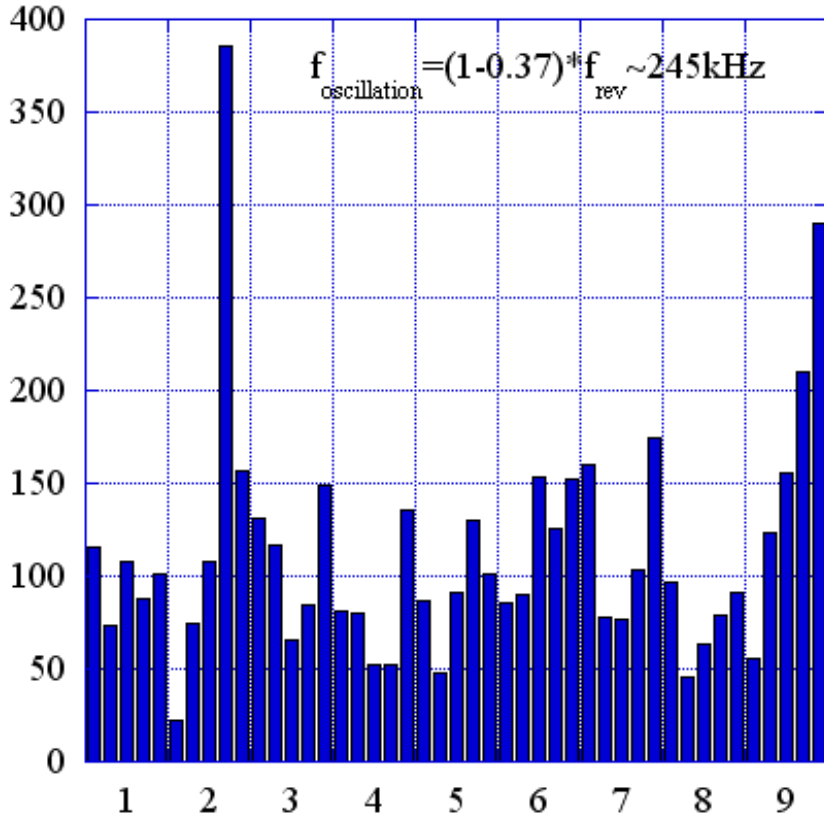
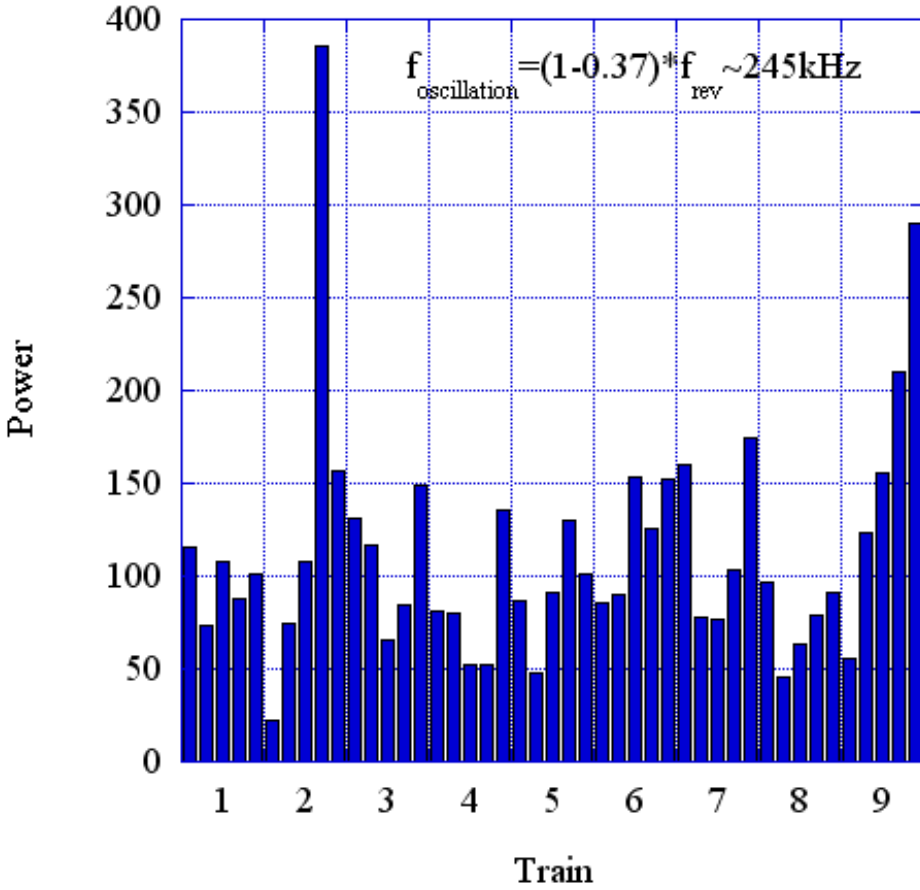


# e+ high frequency vertical motion

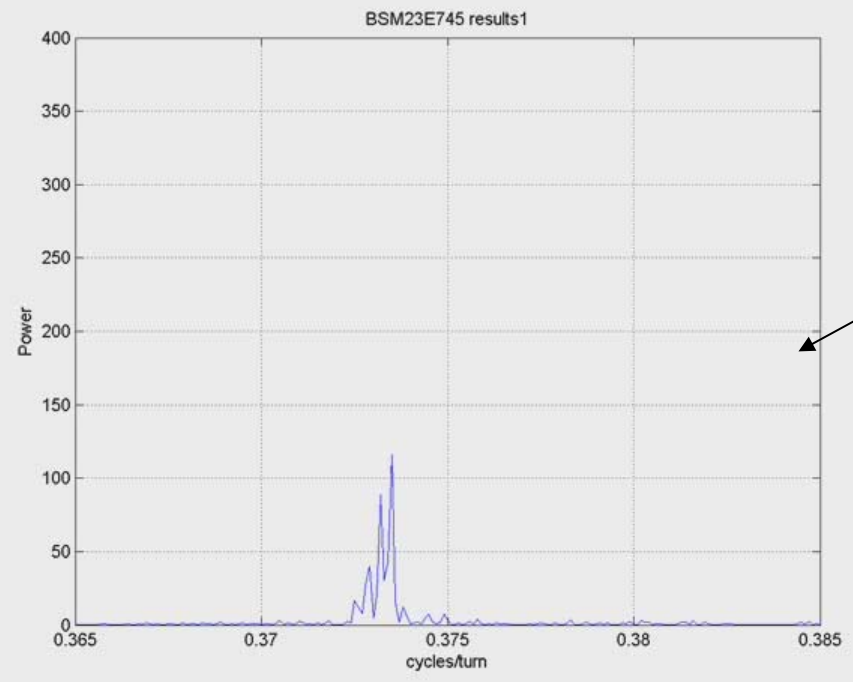


Vertical oscillation at the vertical tune is evident (movie)

FFT of e+ CHESS bunches @245kHz



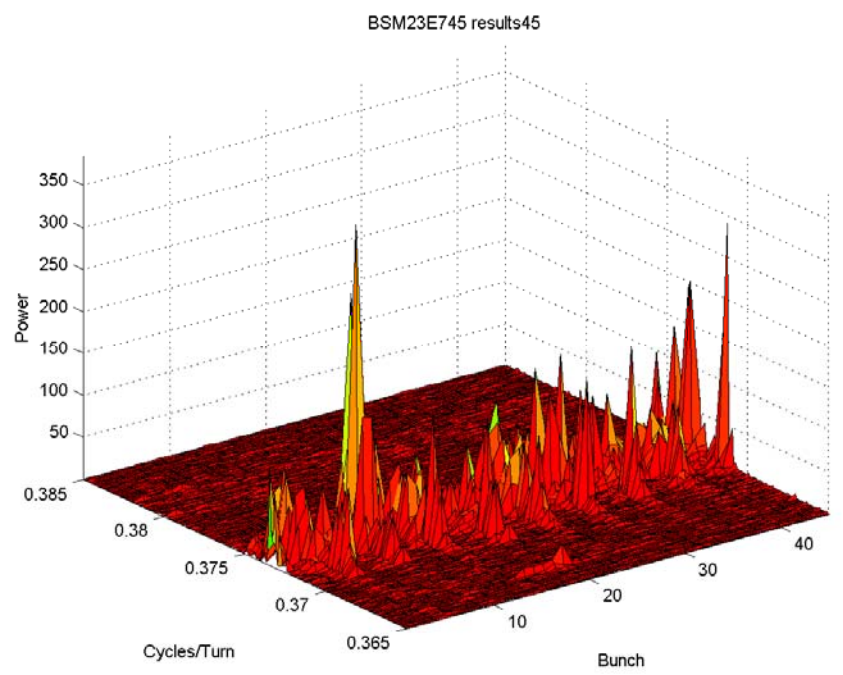
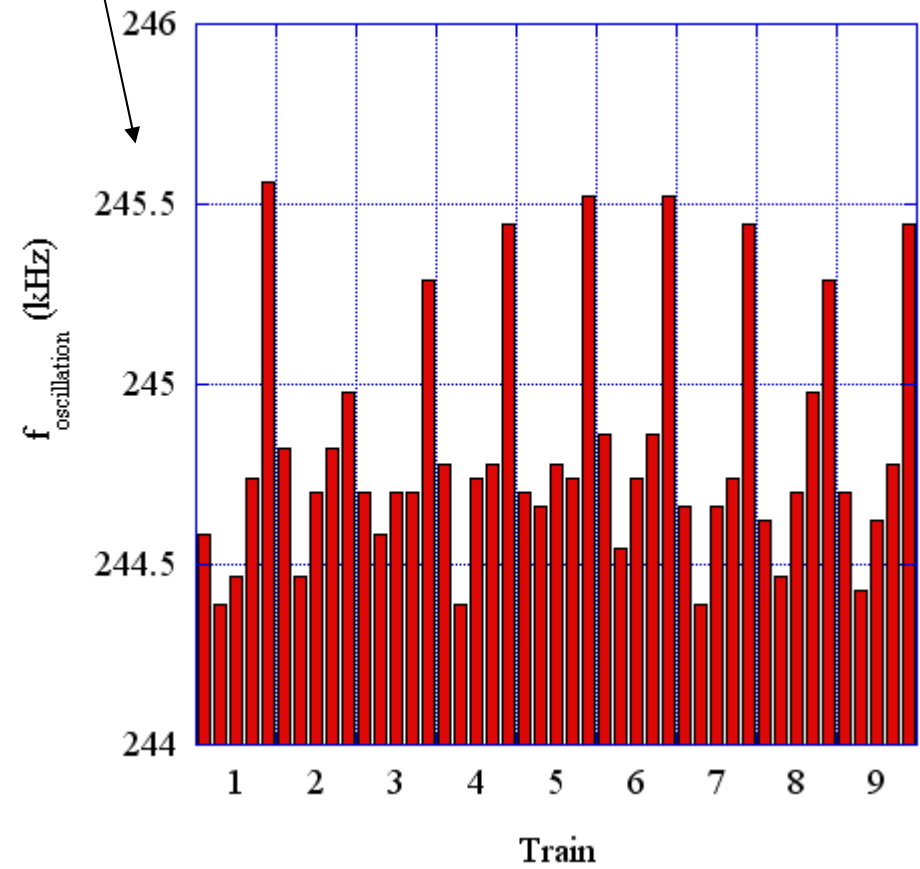
# e+ high frequency vertical motion: Close-up



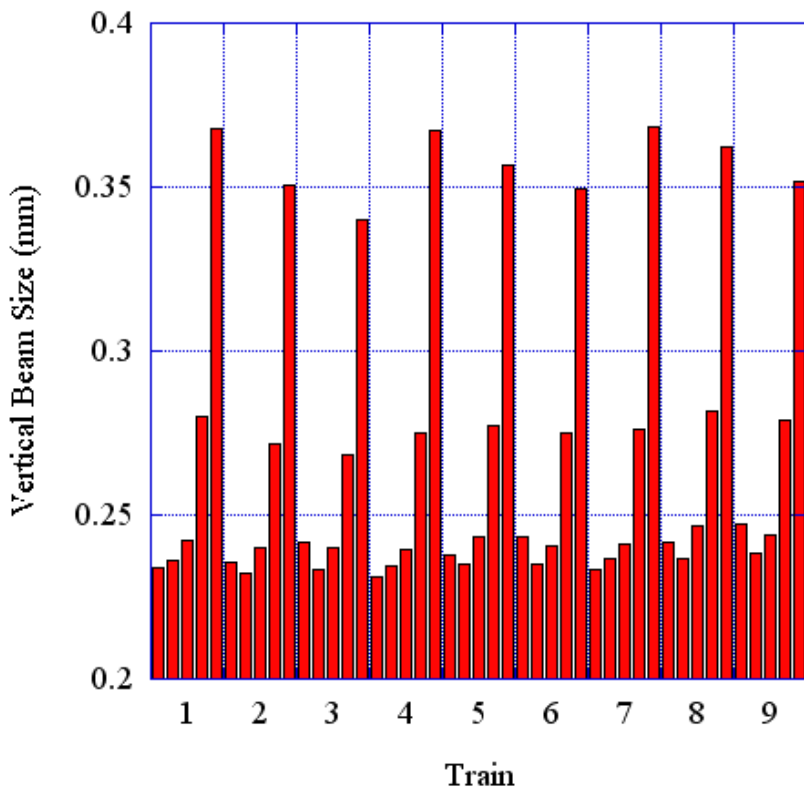
Close-up of FFT (movie)

Frequency of oscillation along the train

FFT of e+ mean position for CHESS 9x5 pattern



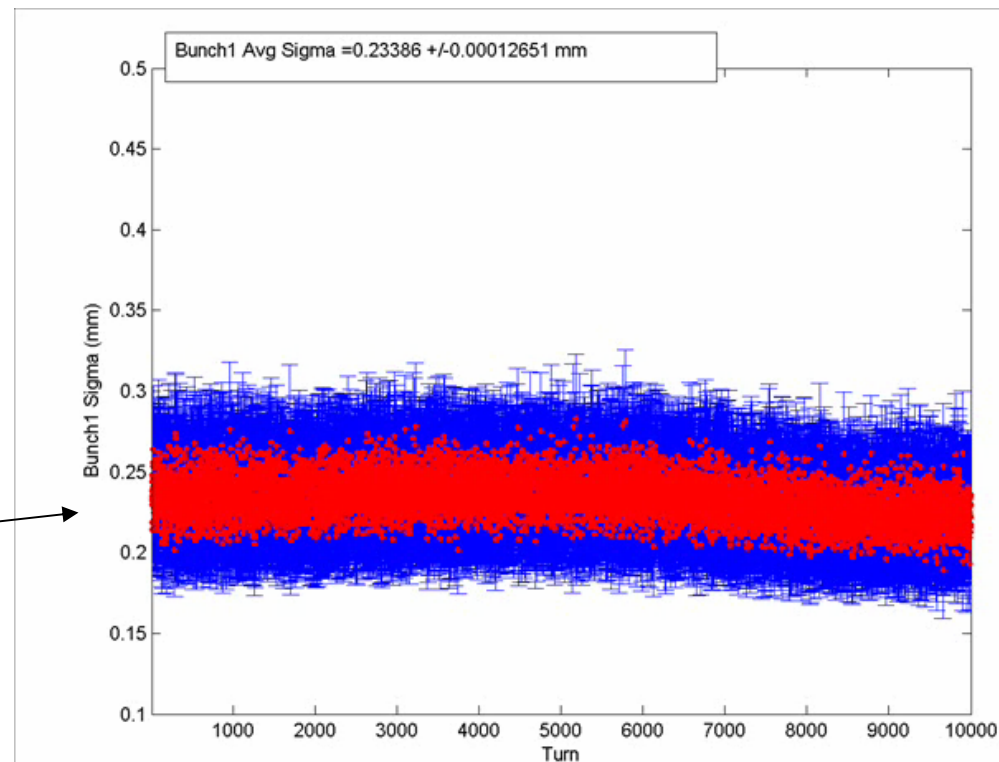
### e+ CHESS 9x5 Pattern



e+  $\sigma_v$  along the train

- Significant vertical beam size growth along each train.

$\sigma_v$  10,000 turns for 45 bunches (movie)



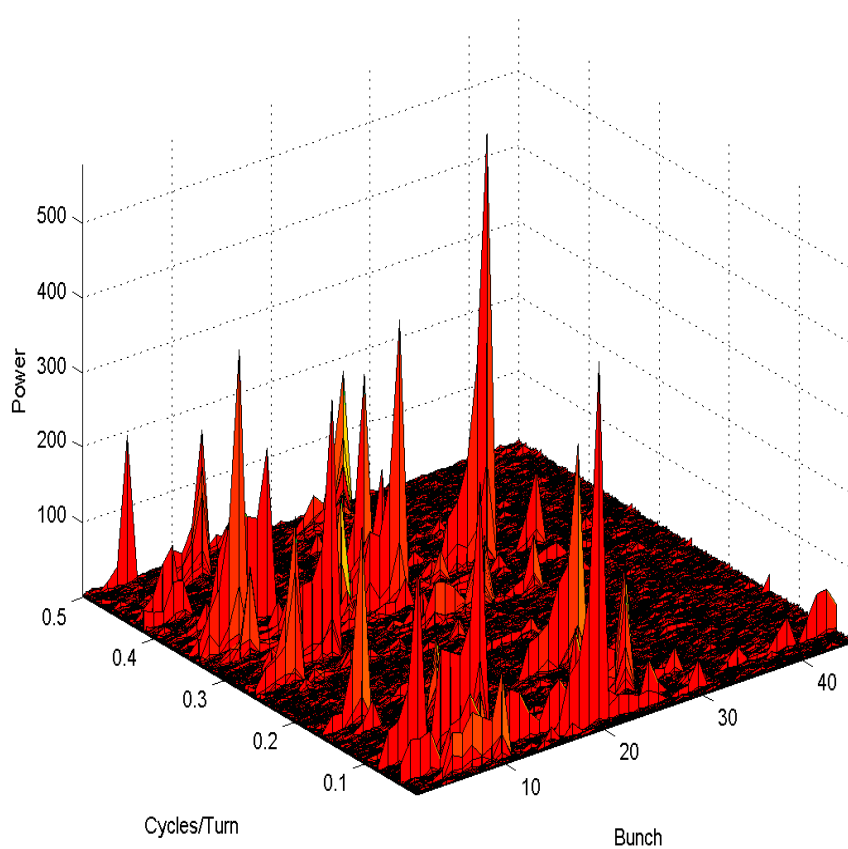


e+ high frequency motion of  $\sigma_v$

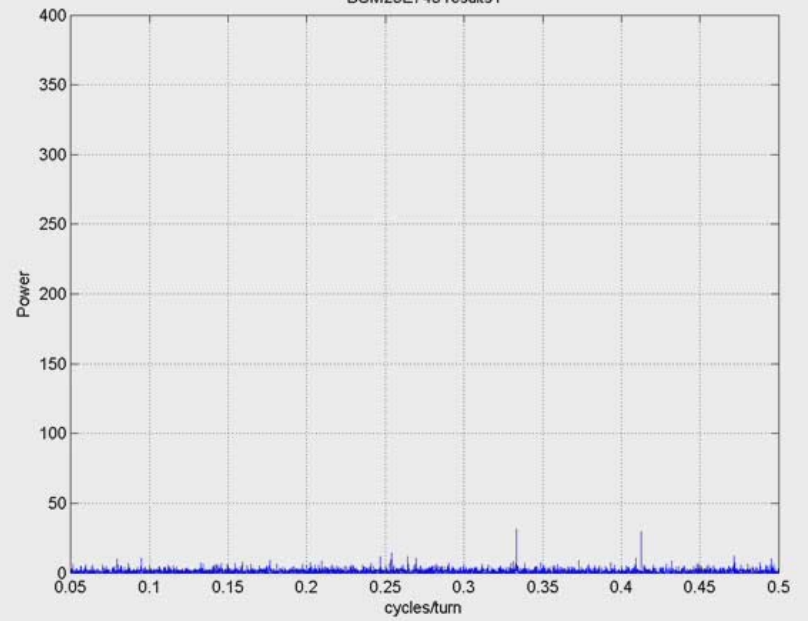
FFT of vertical beam size (movie)

No clear oscillation in the vertical beam size

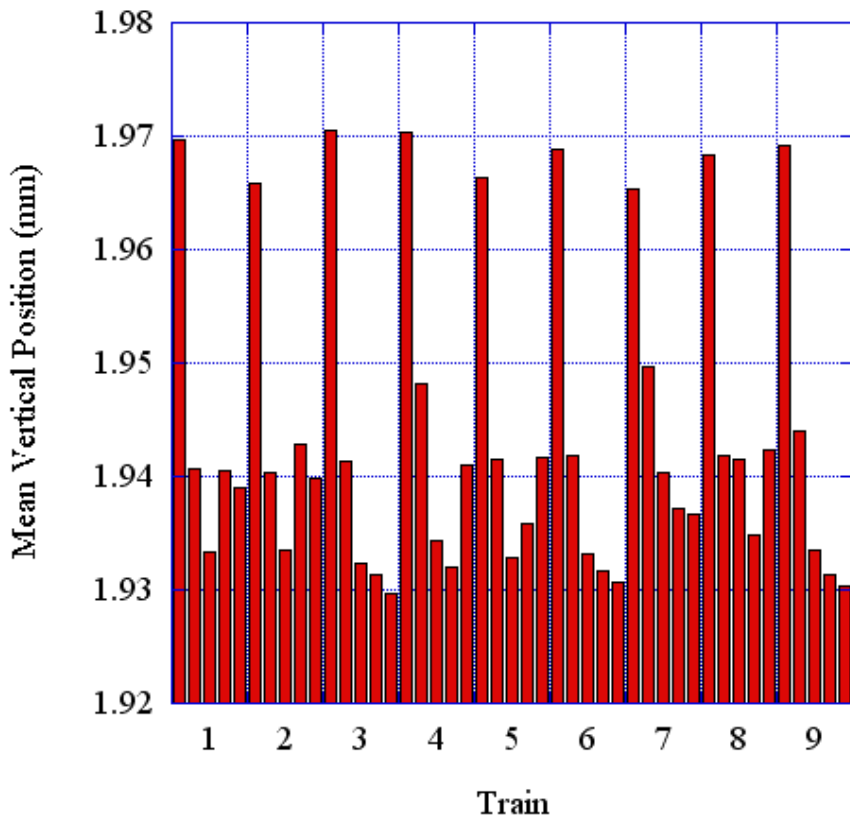
BSM23E745 results45



BSM23E745 results1



### e- CHESS 9x5 Pattern

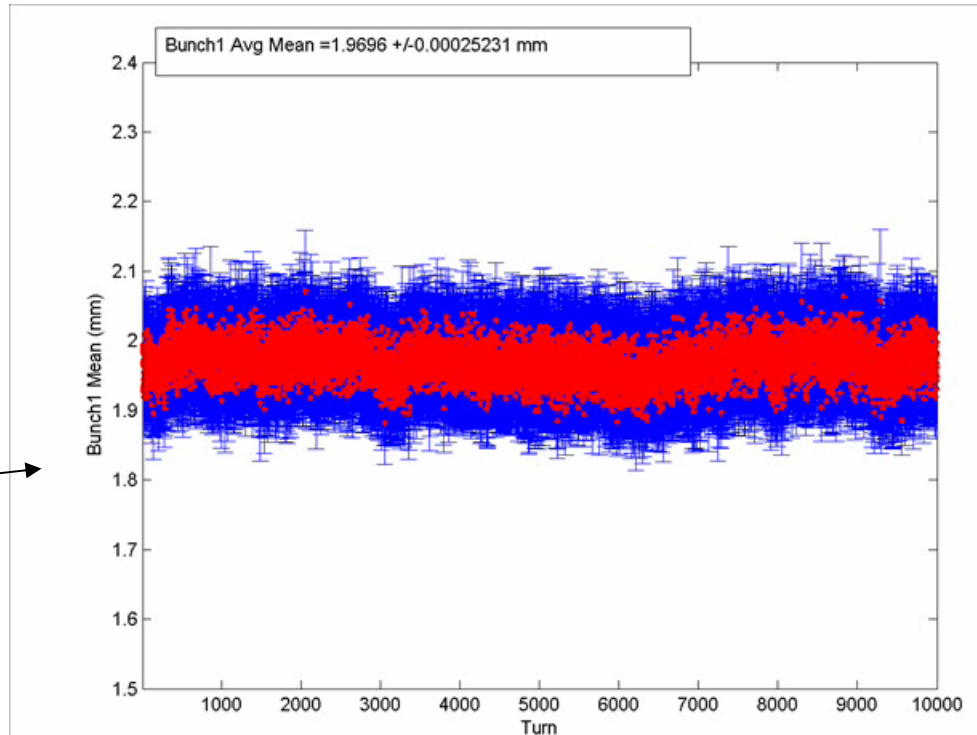


e- mean vertical position along the train

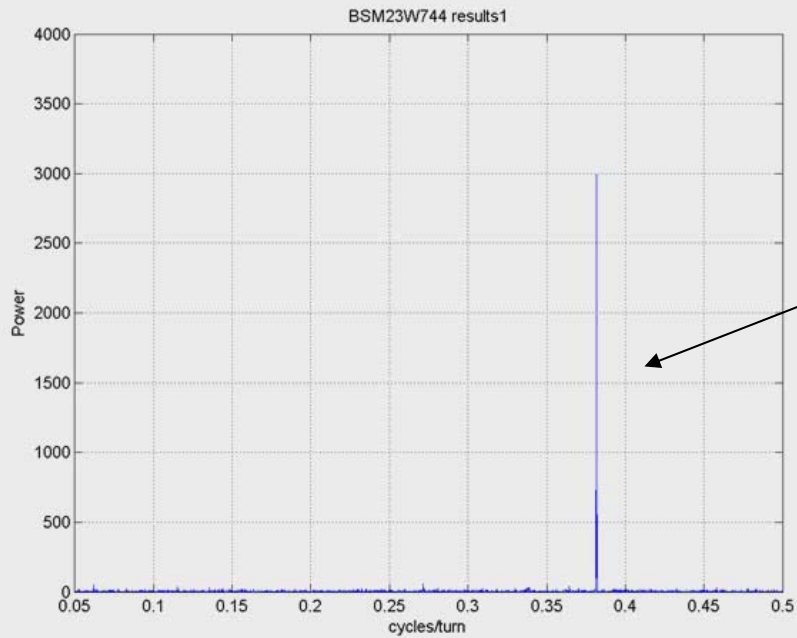
First bunch in the train is vertically offset from other bunches.

No clear low frequency vertical oscillation is denoted for all 45 bunches.

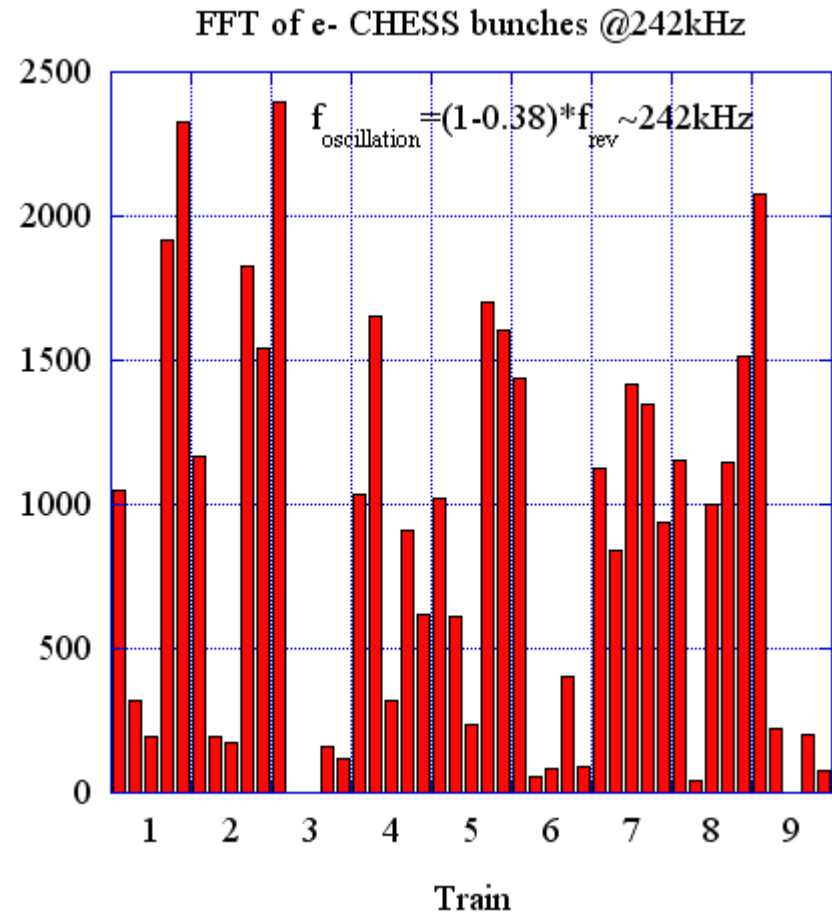
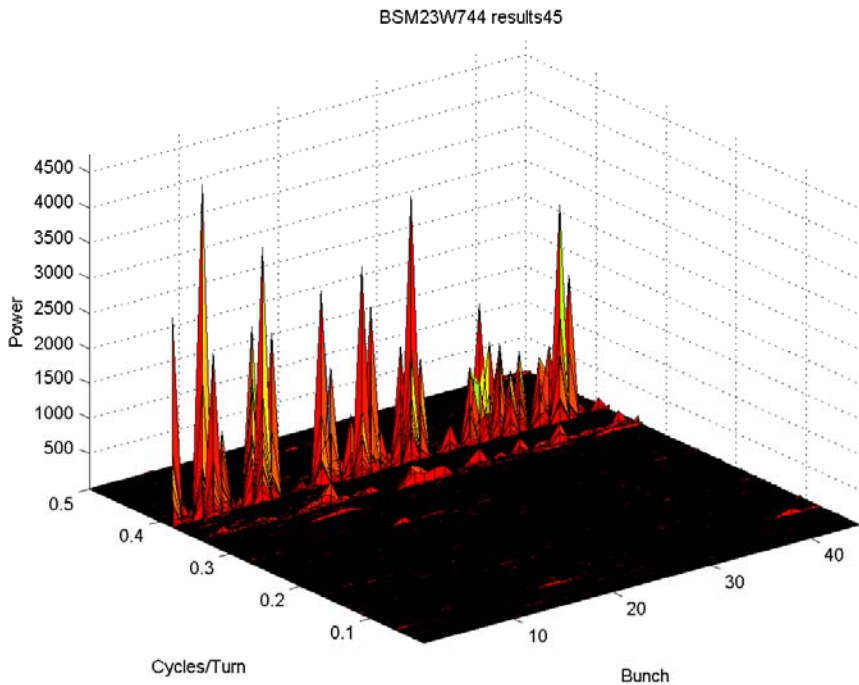
Mean vertical position for 10,000 turns for 45 bunches (movie)

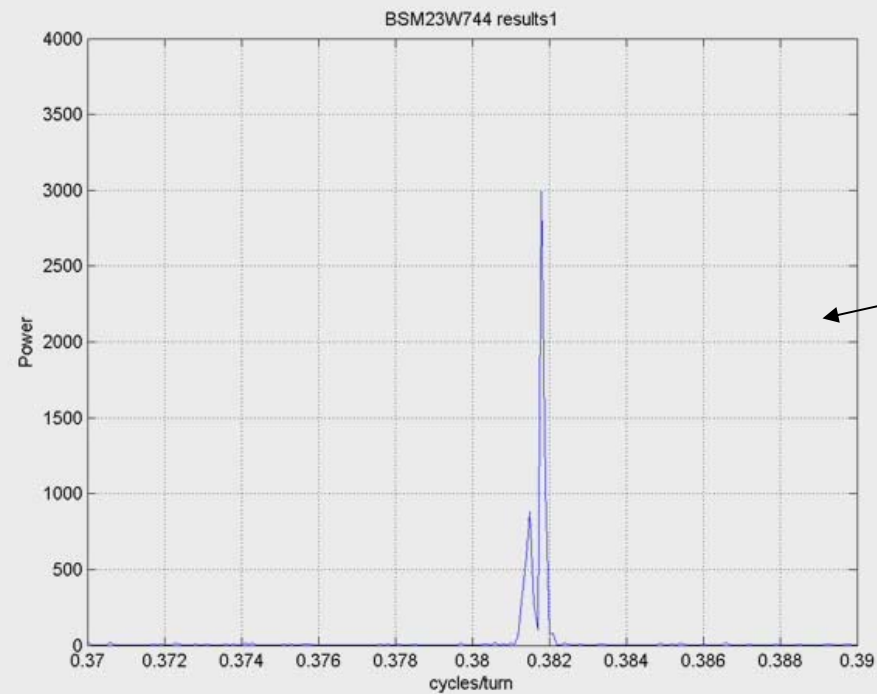


# e- high frequency vertical motion



Vertical oscillation at the vertical tune is evident (movie)



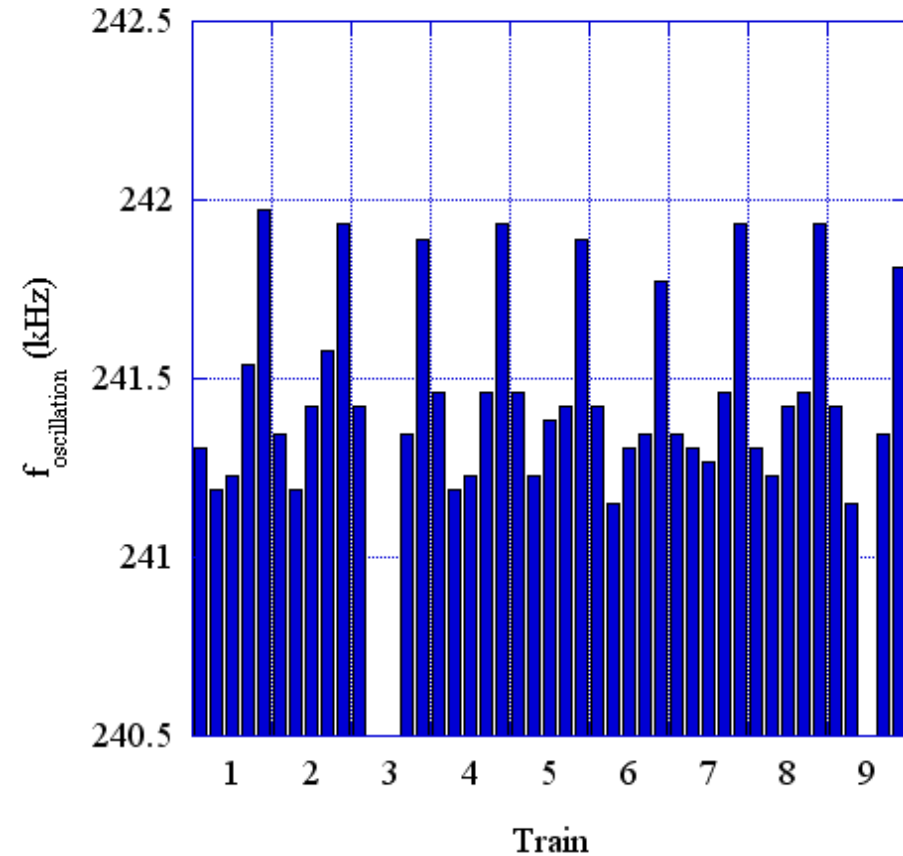
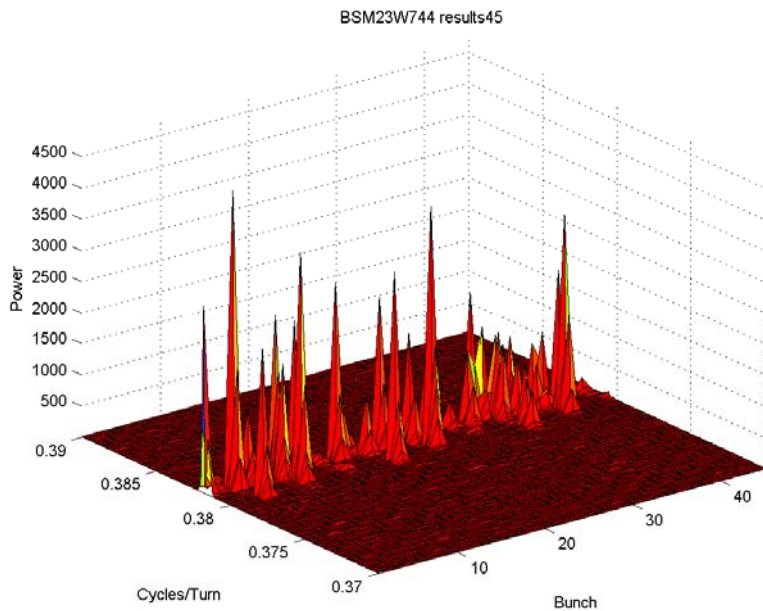


e- high frequency vertical motion: Close-up

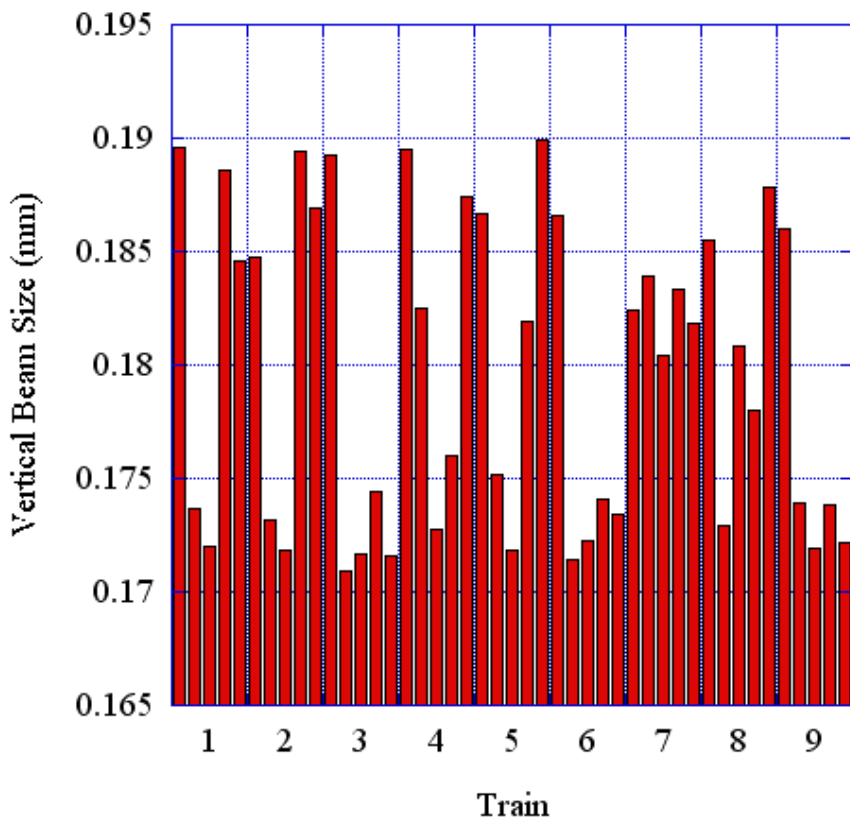
Close-up of FFT (movie)

Frequency of oscillation along the train

FFT of e- mean position for CHESS 9x5 pattern

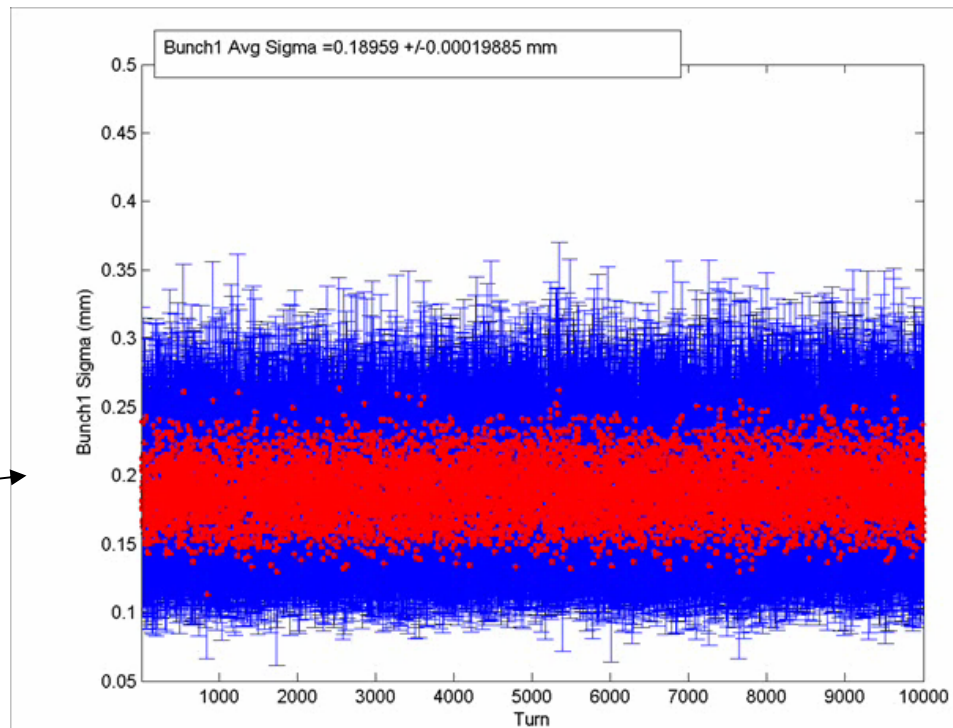
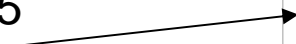


e- CHESS 9x5 Pattern

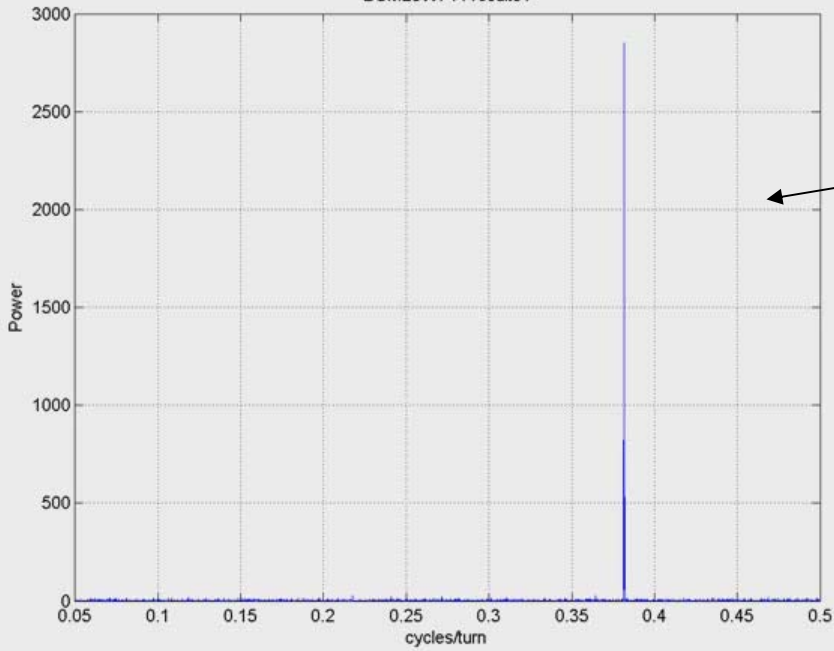


e-  $\sigma_v$  along the train

$\sigma_v$  10,000 turns for 45 bunches (movie)



BSM23W744 results1

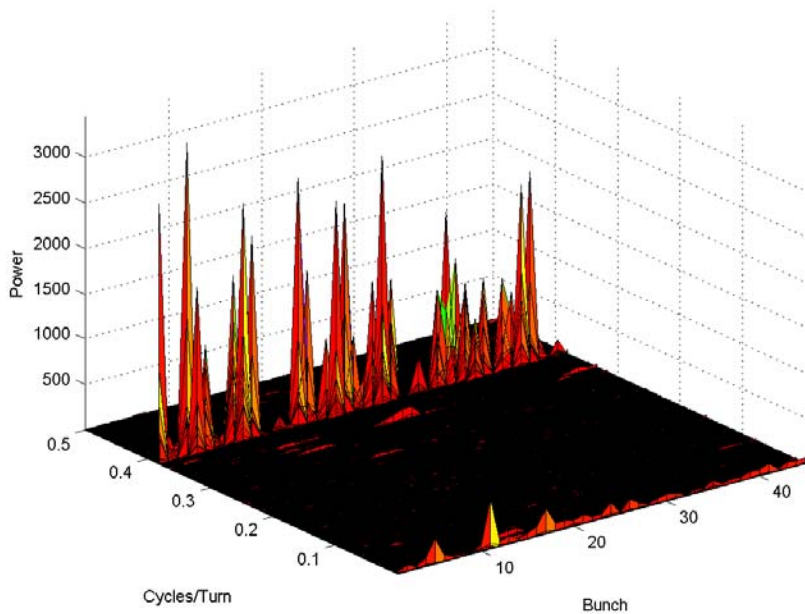


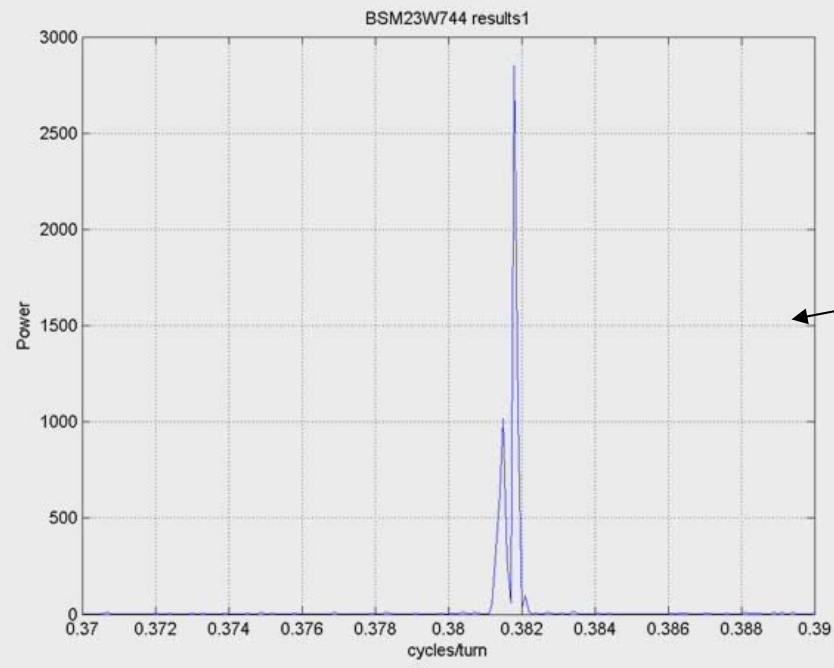
e- high frequency motion of  $\sigma_v$

FFT of vertical beam size (movie)

Strong oscillation in the vertical beam size at vertical tune.

BSM23W744 results45

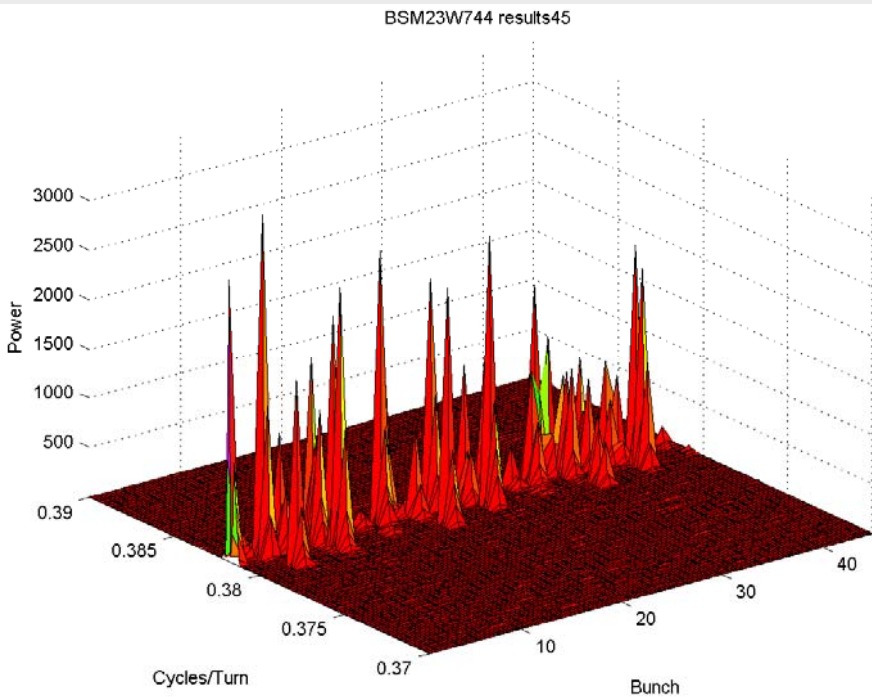




e- high frequency motion of  $\sigma_v$ : Close-up

Close-up of FFT (movie)

Frequency of oscillation along the train



FFT of e-  $\sigma_v$  for CHESS 9x5 pattern

