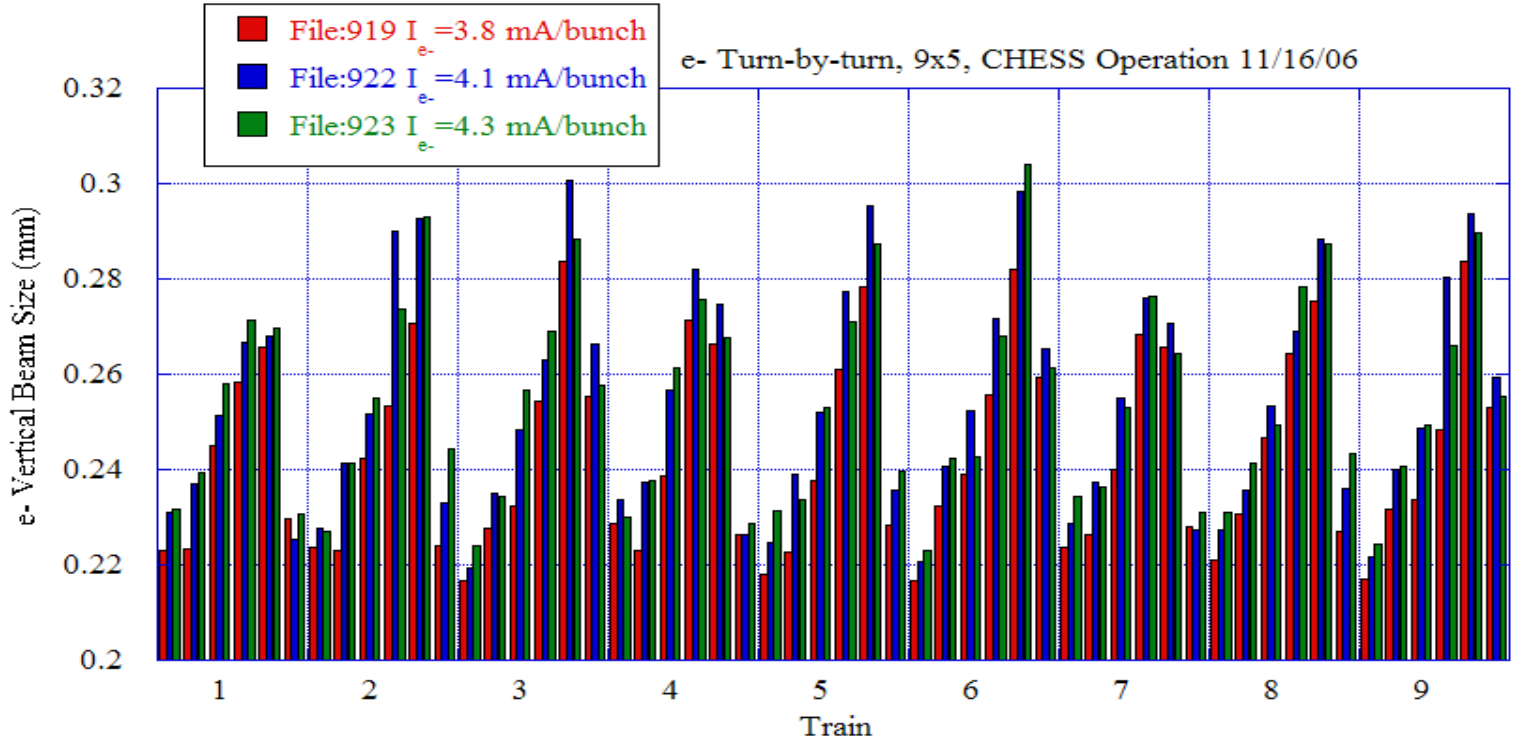
e- σ_v along the train

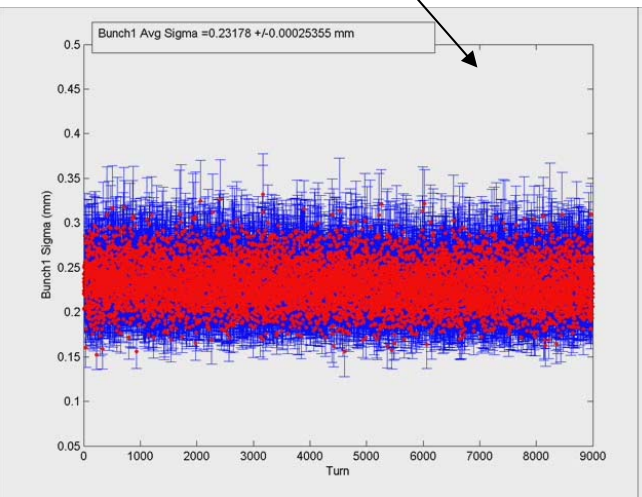


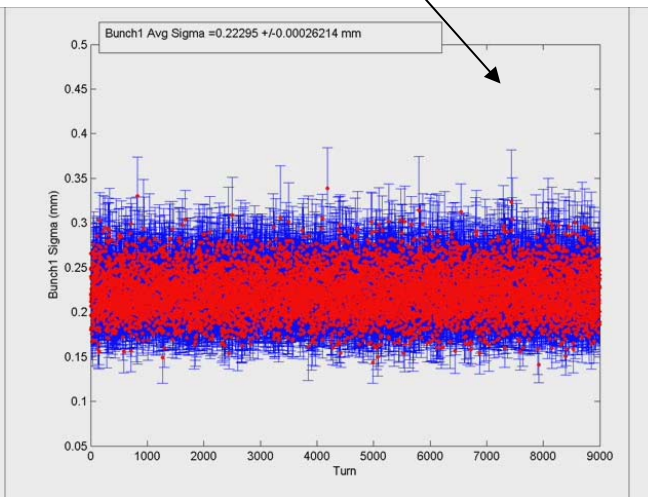
- σ_v 9,000 turns for 54 bunches.
- Vertical beam size growth along each train.

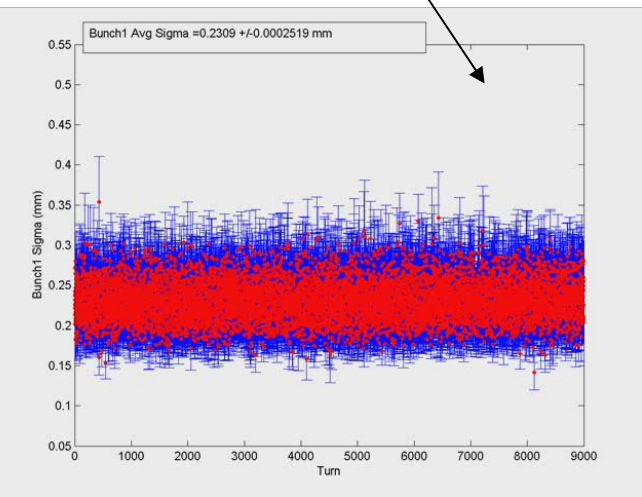
High I File:923
I_{e-}=4.3mA/bunch (movie)

Medium I File:922
I_{e-}=4.1mA/bunch (movie)

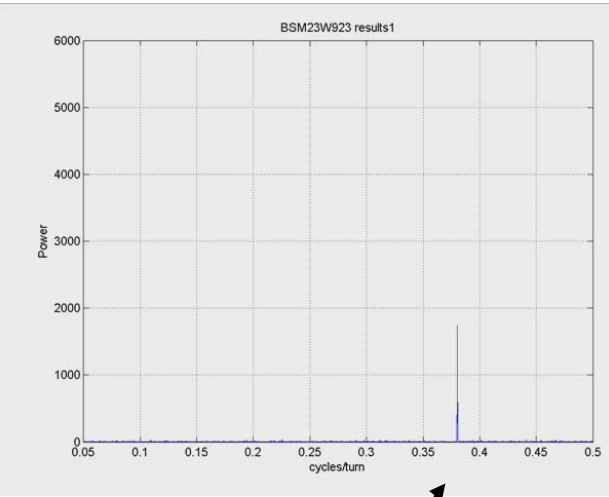
Low I File:919
I_{e-}=3.8mA/bunch (movie)

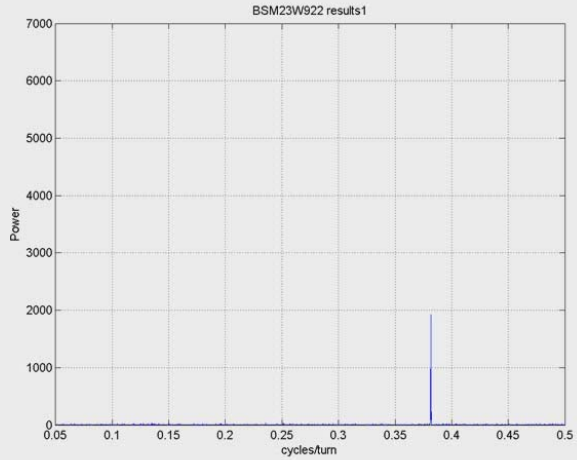


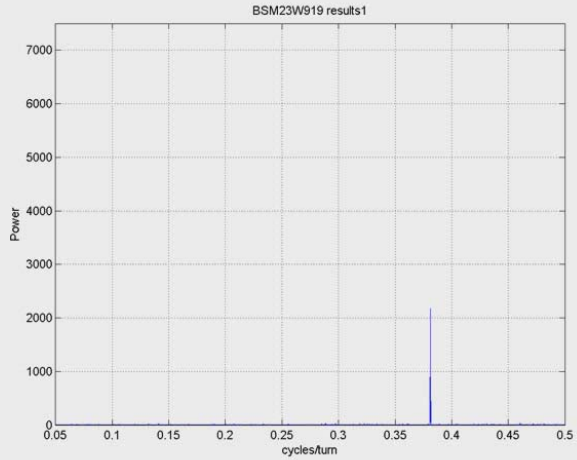




e- high frequency σ_v oscillation frequency-FFT of σ_v for 9,000 turns





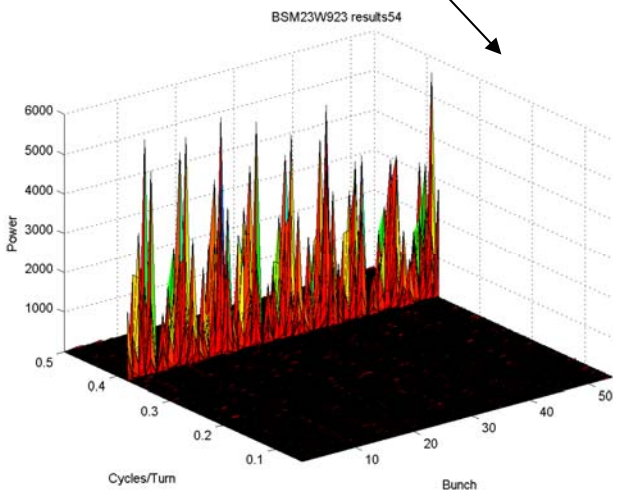


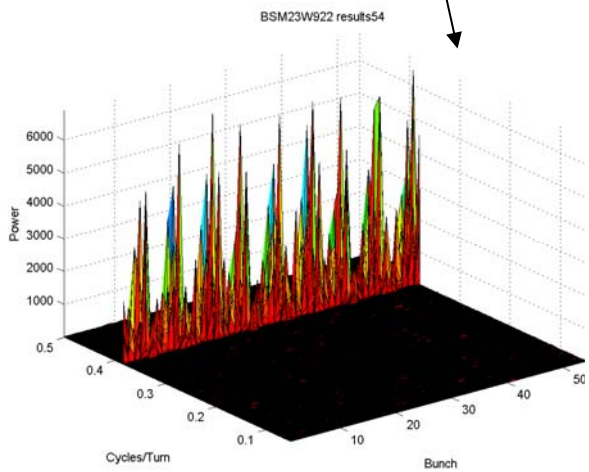
High I File:923
I_{e-}=4.3mA/bunch (movie)

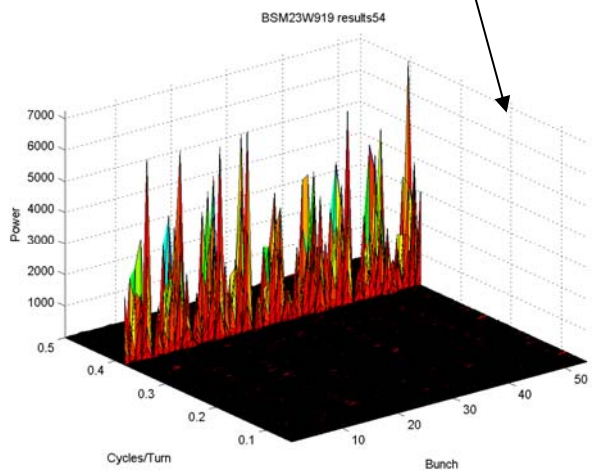
Medium I File:922
I_{e-}=4.1mA/bunch (movie)

Low I File:919
I_{e-}=3.8mA/bunch (movie)

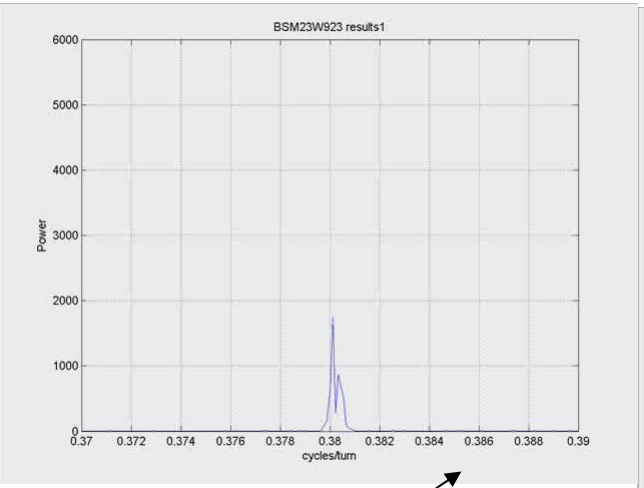
- FFT of σ_v for all 54 bunches
- Strong σ_v oscillation signal.

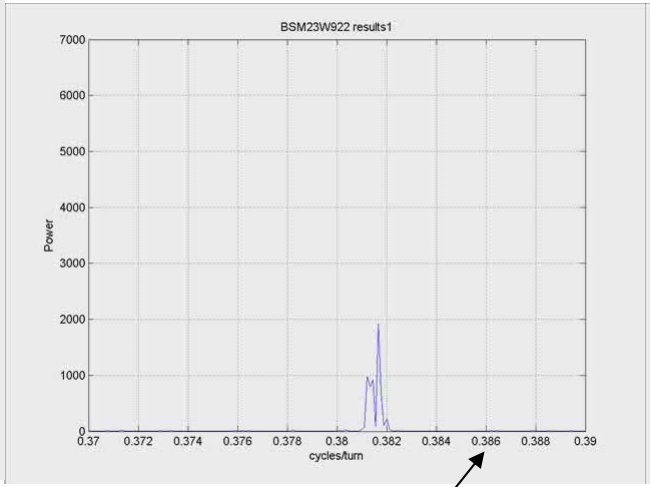


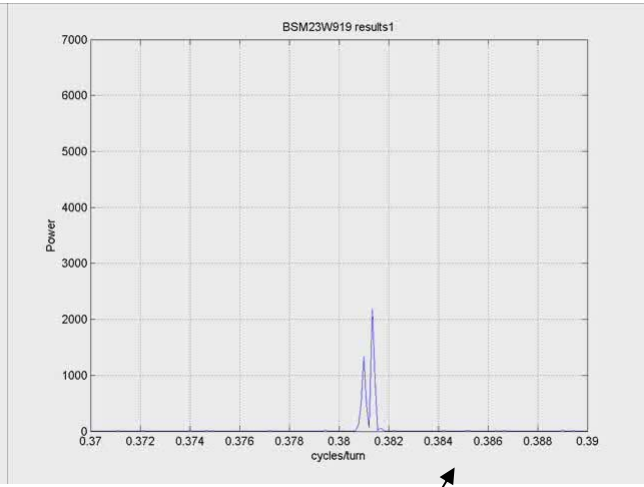




e- high frequency σ_v oscillation frequency-FFT of σ_v-Close up of the oscillation frequency $f_{oscillation}$





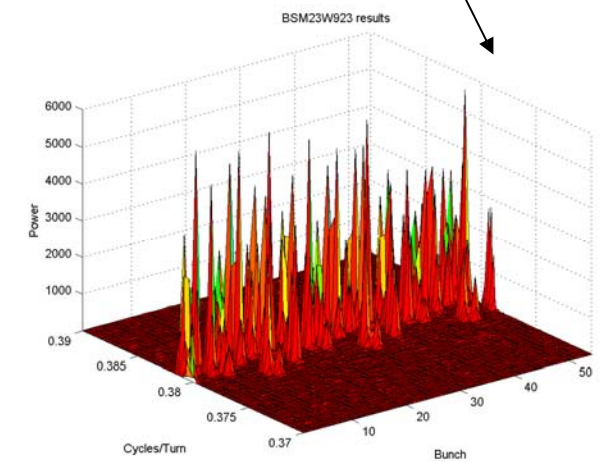


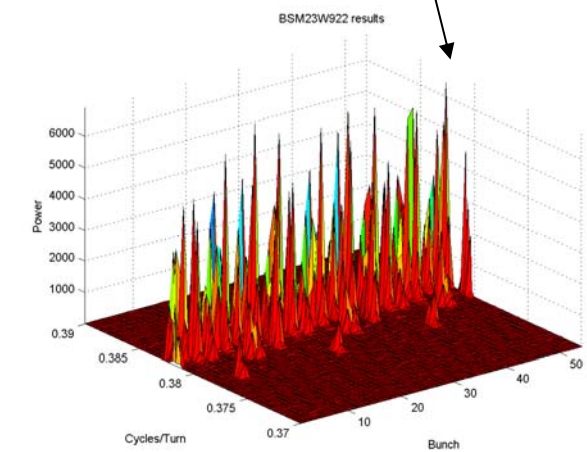
High I File:923
I_{e-}=4.3mA/bunch (movie)

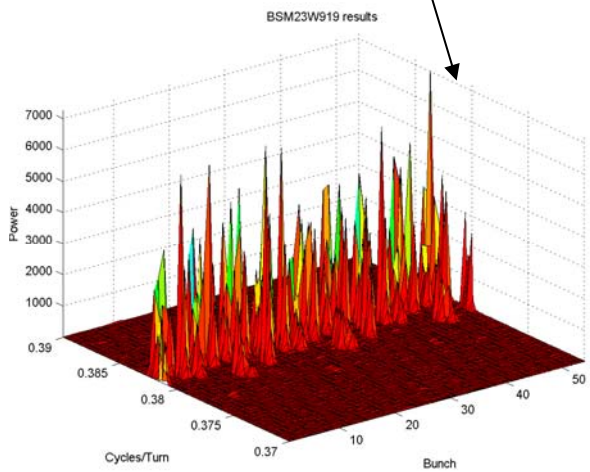
Medium I File:922
I_{e-}=4.1mA/bunch (movie)

Low I File:919
I_{e-}=3.8mA/bunch (movie)

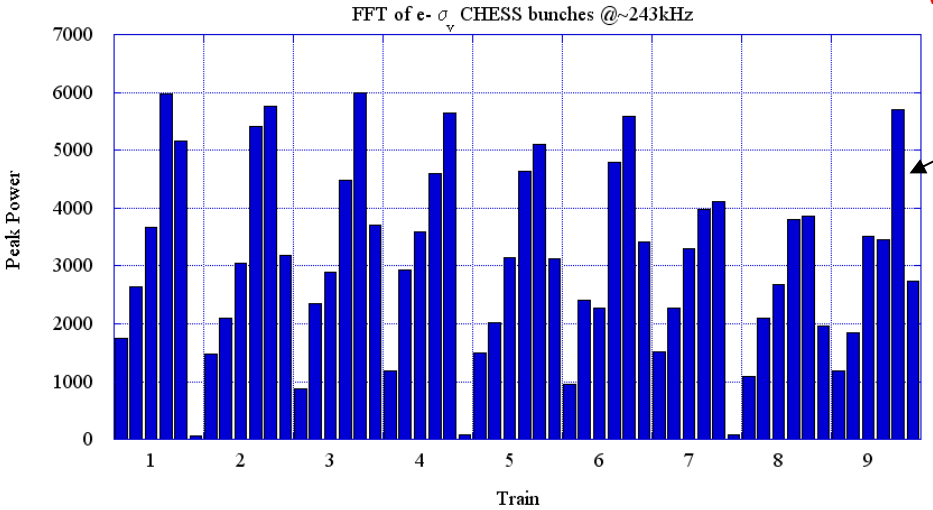
- σ_v oscillation frequency shifts along the train.



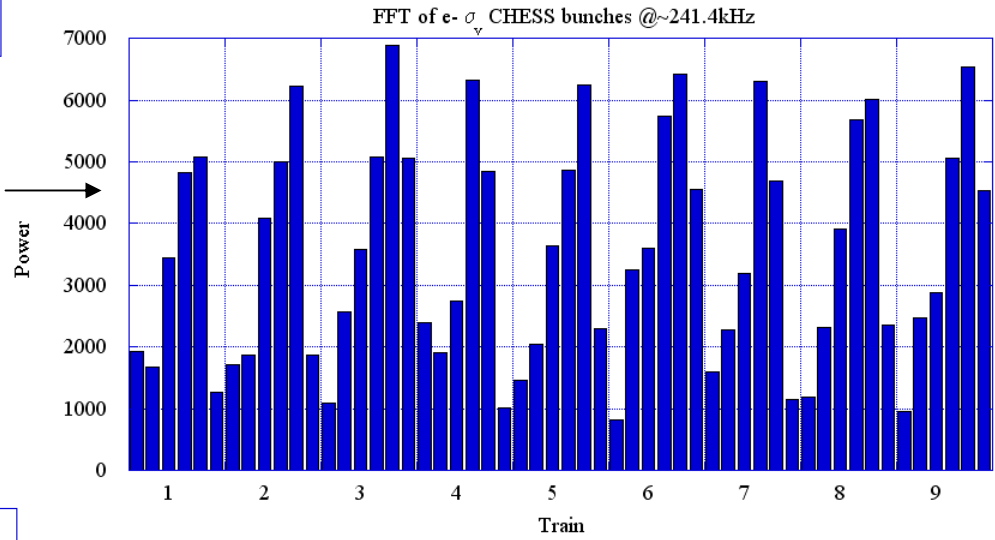




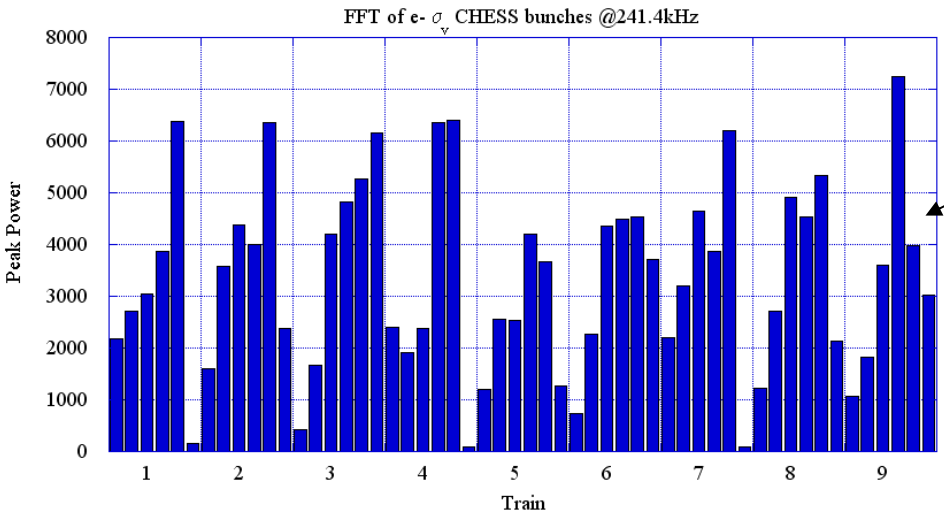
e- high frequency σ_v oscillation-FFT Power



High I File:923
I_{e-}=4.3mA/bunch



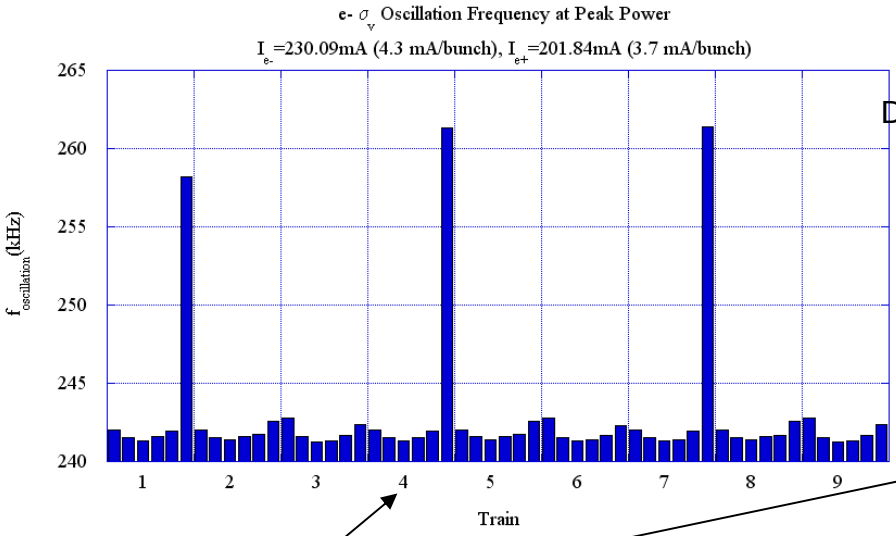
Medium I File:922
I_{e-}=4.1mA/bunch



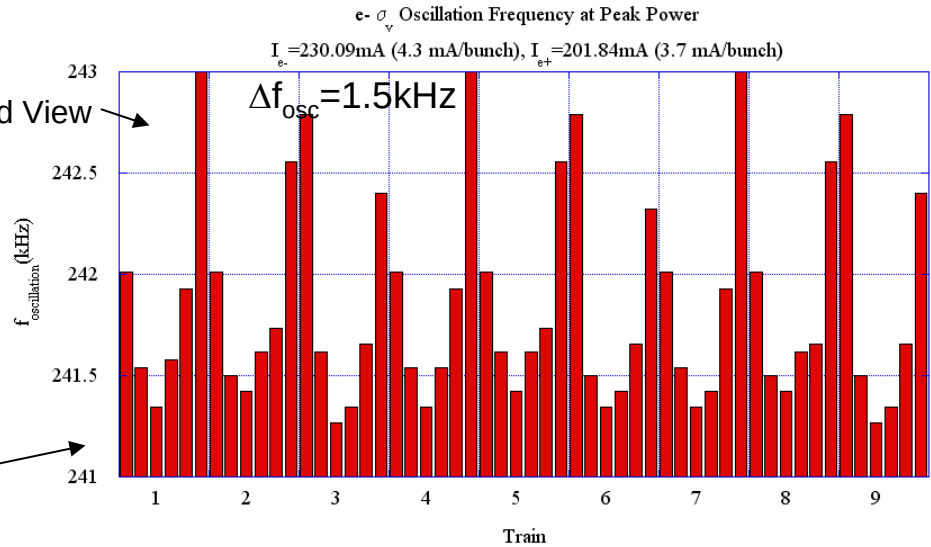
Low I File:919
I_{e-}=3.8mA/bunch

- FFT power of σ_v grows along the train except for bunch 6 in trains 1,4,7 (note different f_{osc} for these bunches on the next page).

e- high frequency σ_v oscillation-Frequency of Oscillation

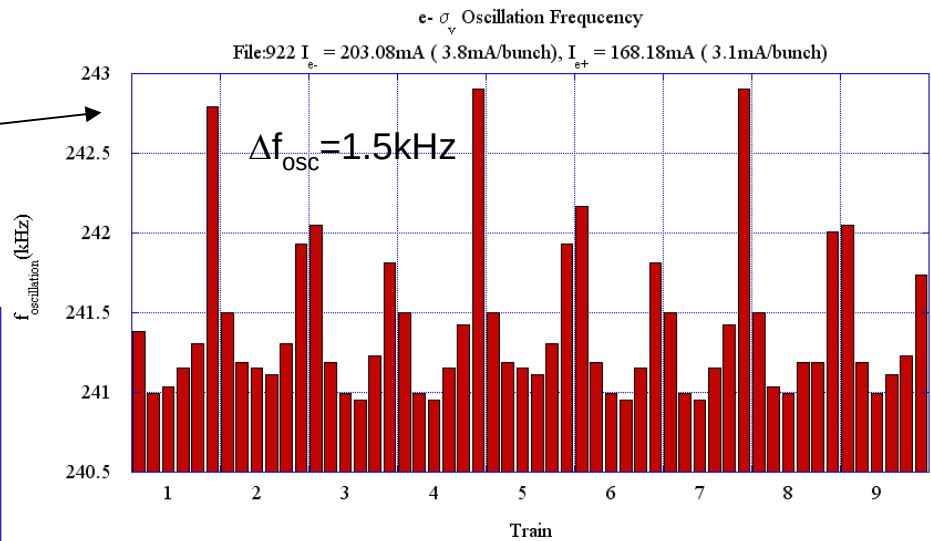


Detailed View

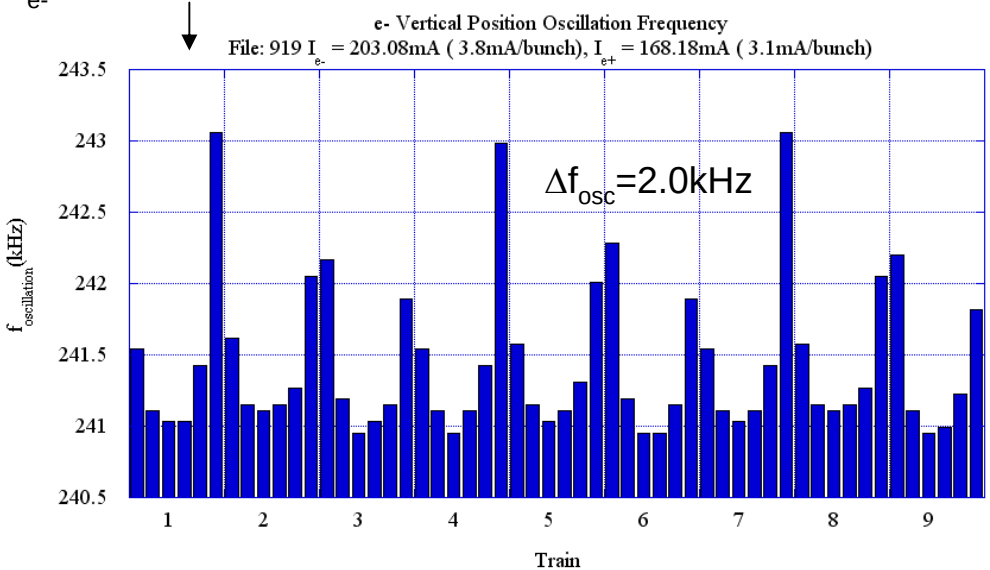


High I File:923
I_{e-}=4.3mA/bunch

Medium I File:922
I_{e-}=4.1mA/bunch

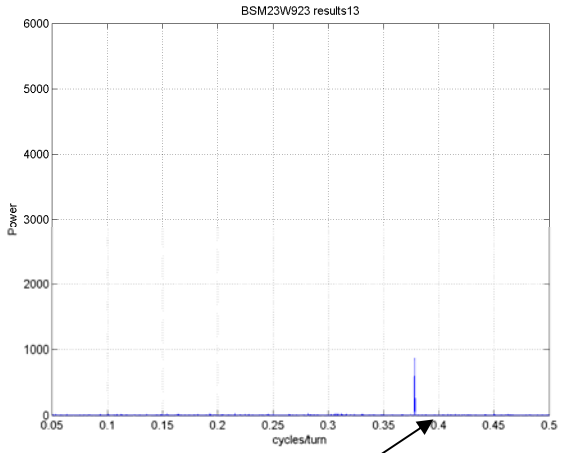


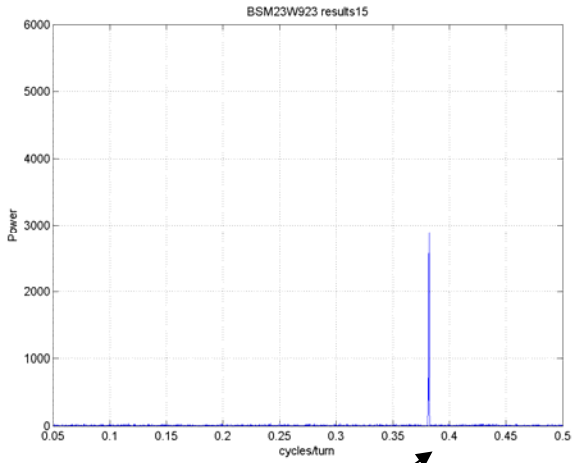
Low I File:919
I_{e-}=3.8mA/bunch

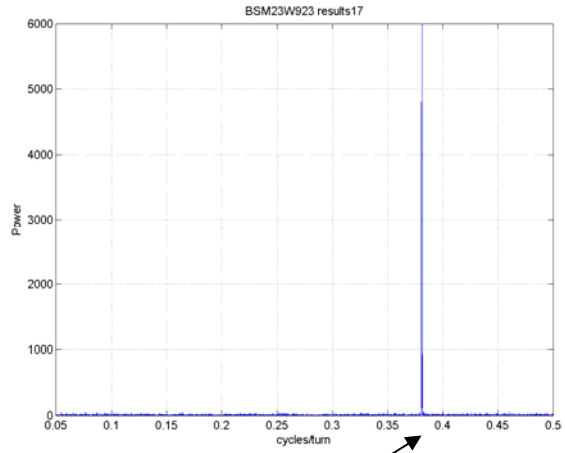


- An oscillation frequency shift, Δf_{osc}, is noted along the trains.
- A large frequency jump is noted for bunch 6 in trains 1, 4, and 7.

e- high frequency σ_v oscillation - FFT of σ_v – High I







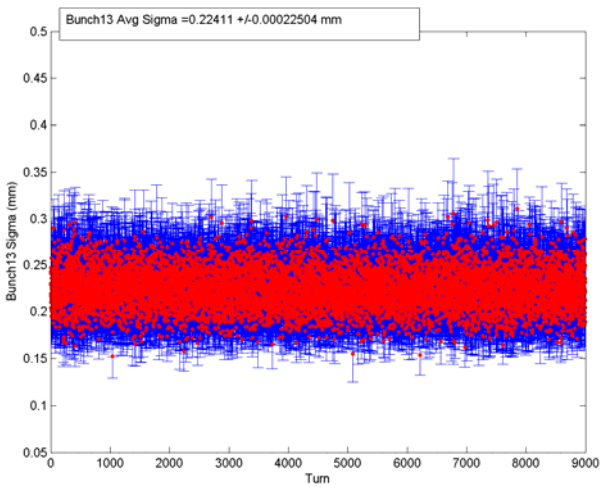
Bunch 13
Peak Power=880@242.8kHz
σ_v=0.224mm
Std=0.021mm

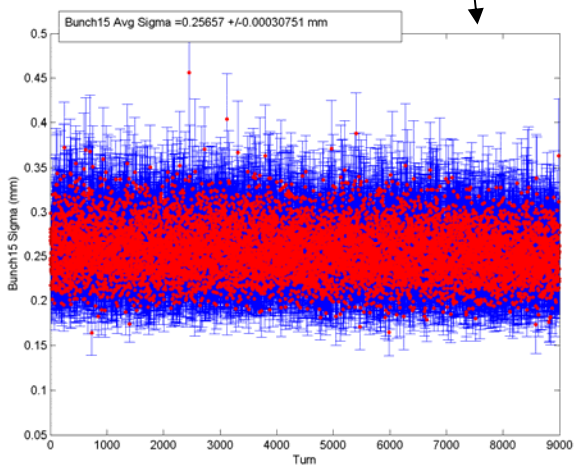
Bunch 15
Peak Power=2892@241.3kHz
σ_v=0.256mm
Std=0.029mm

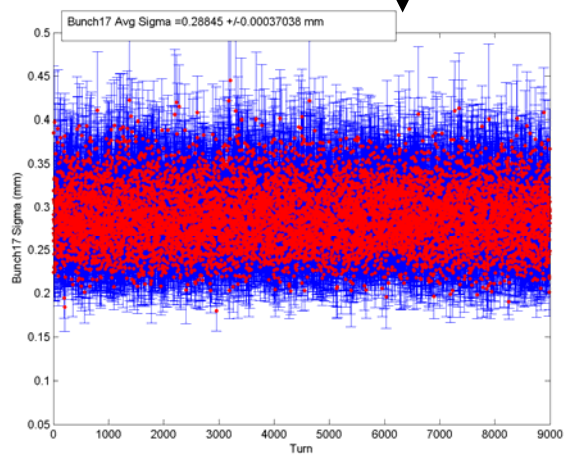
Bunch 17
Peak Power=6002@241.7kHz
σ_v=0.288mm
Std=0.035mm

File:923 I_{e-}=4.3mA/bunch

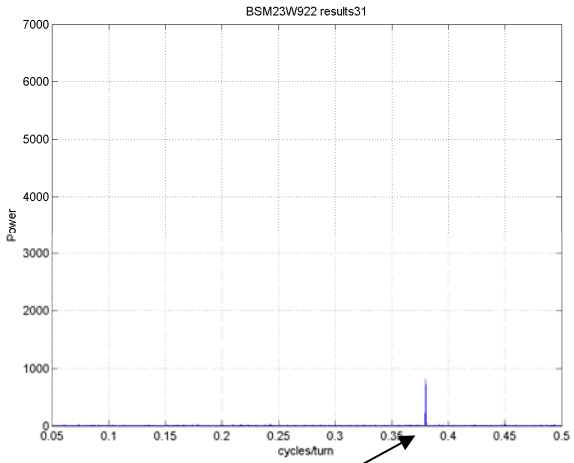
- σ_v oscillation amplitude correlates with FFT power

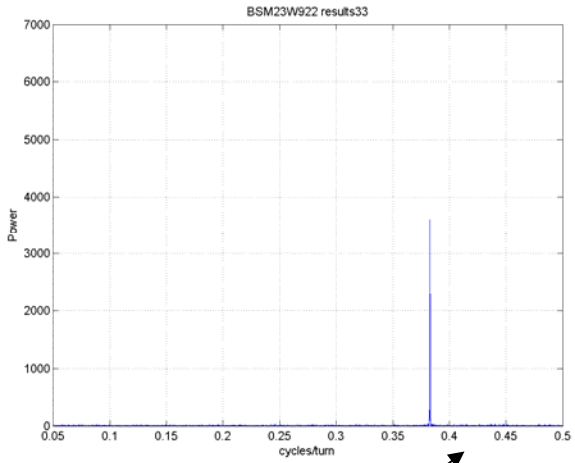


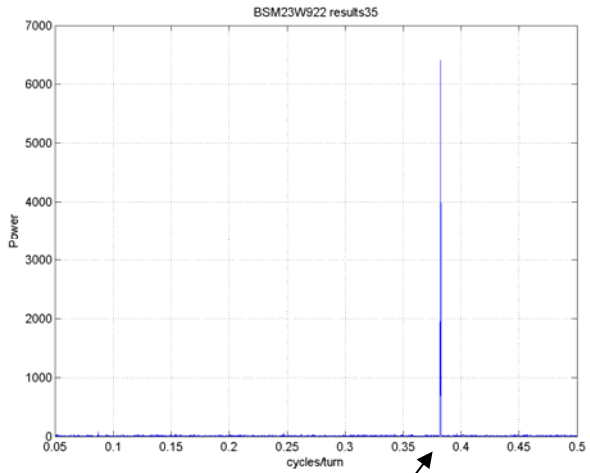




e- high frequency σ_v oscillation - FFT of σ_v – Medium I







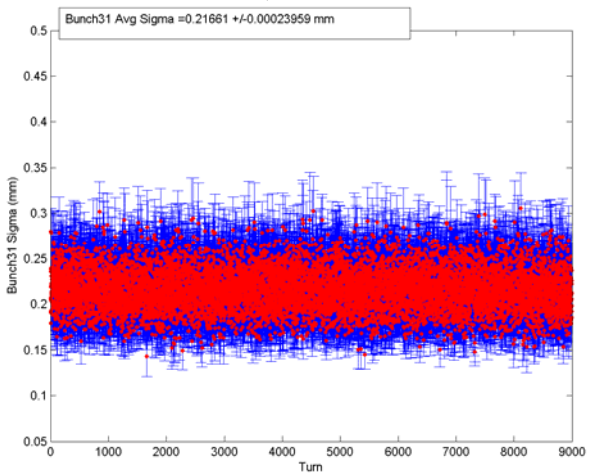
Bunch 31
Peak Power=812@242.2kHz
σ_v=0.217mm
Std=0.023mm

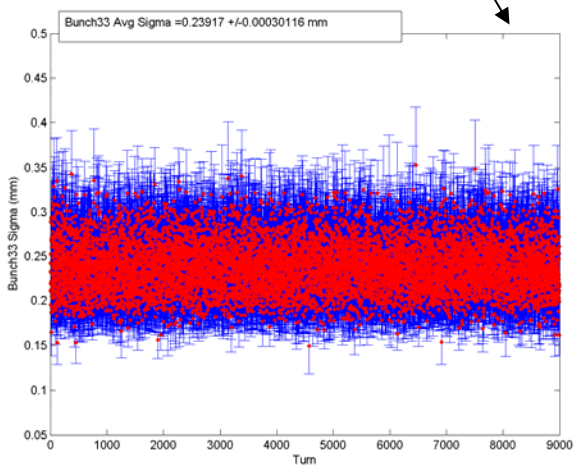
Bunch 33
Peak Power=3602@241.0kHz
σ_v=0.239mm
Std=0.029mm

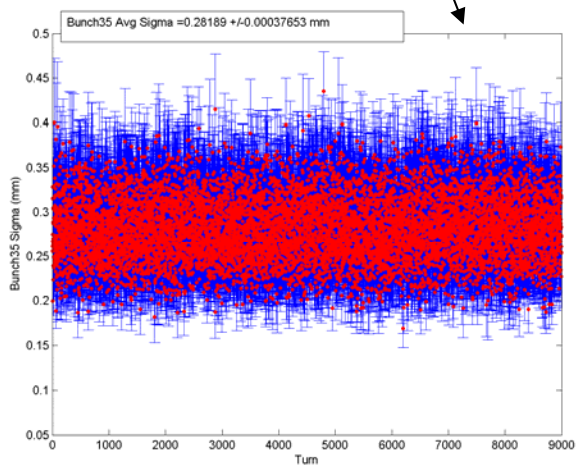
Bunch 35
Peak Power=6415@241.2kHz
σ_v=0.282mm
Std=0.036mm

File:922 I_{e-}=4.1mA/bunch

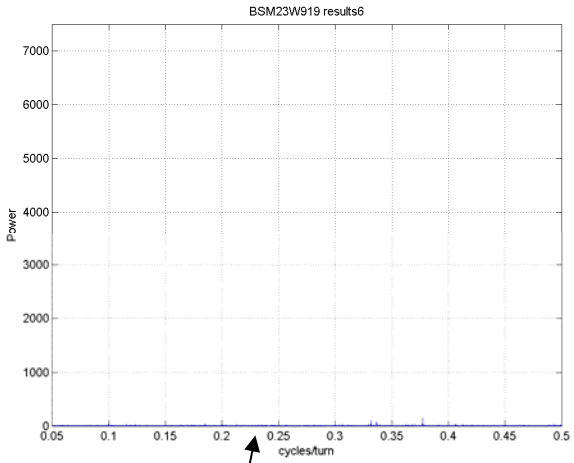
- σ_v oscillation amplitude correlates with FFT power

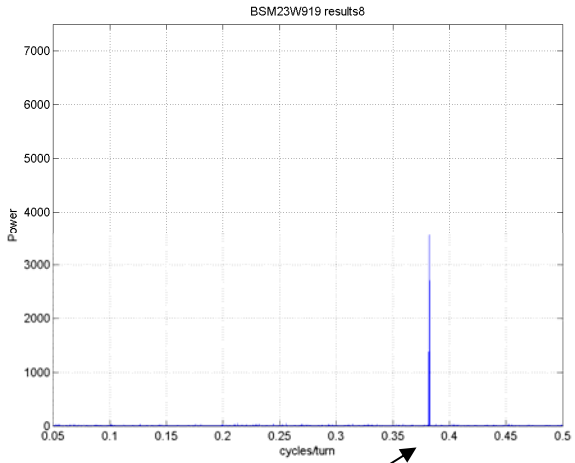


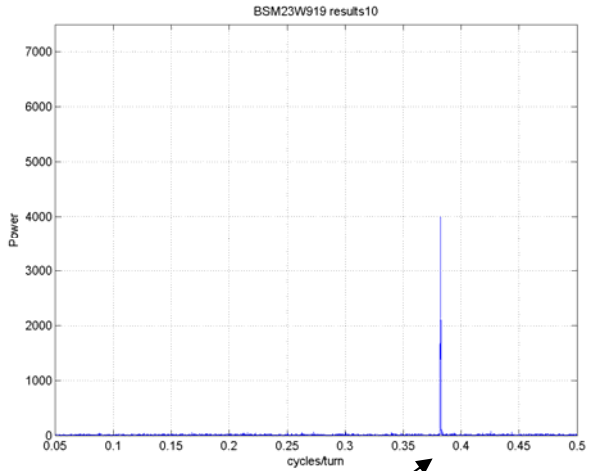




e- high frequency σ_v oscillation - FFT of σ_v – Low I





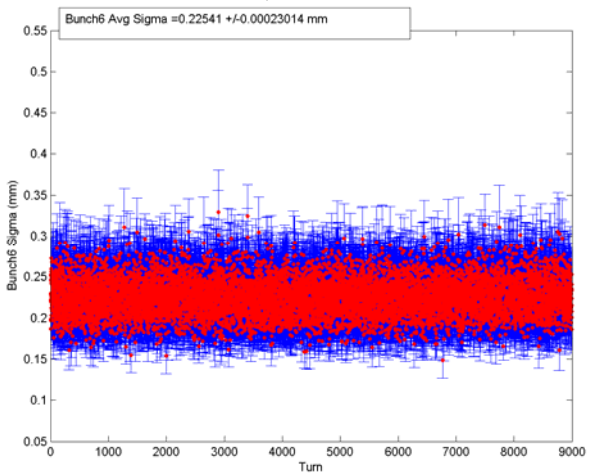


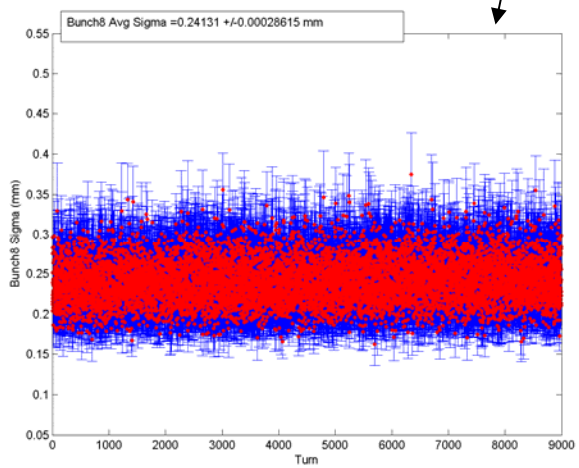
Bunch 6
Peak Power=148@243.1kHz
σ_v=0.225mm
Std=0.022mm

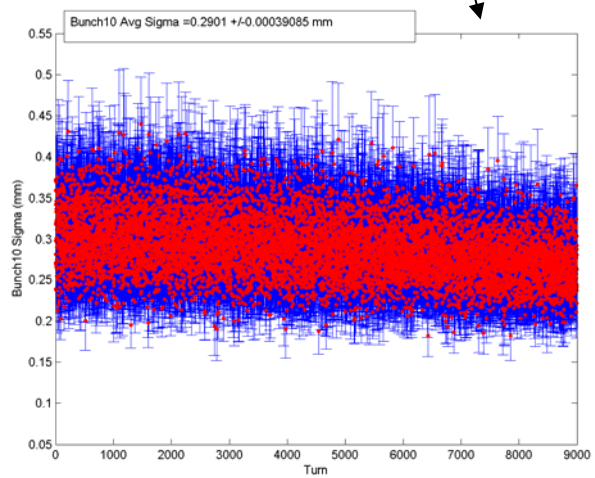
Bunch 8
Peak Power=3570@241.2kHz
σ_v=0.241mm
Std=0.027mm

Bunch 10
Peak Power=3998@241.2kHz
σ_v=0.290mm
Std=0.037mm

File:919 I_{e-}=3.8mA/bunch
- σ_v oscillation amplitude correlates with FFT power.

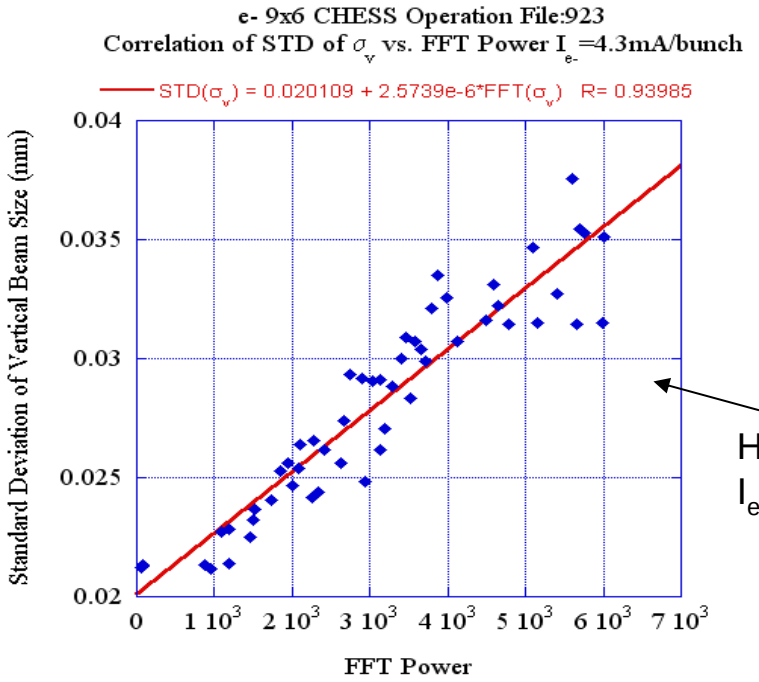




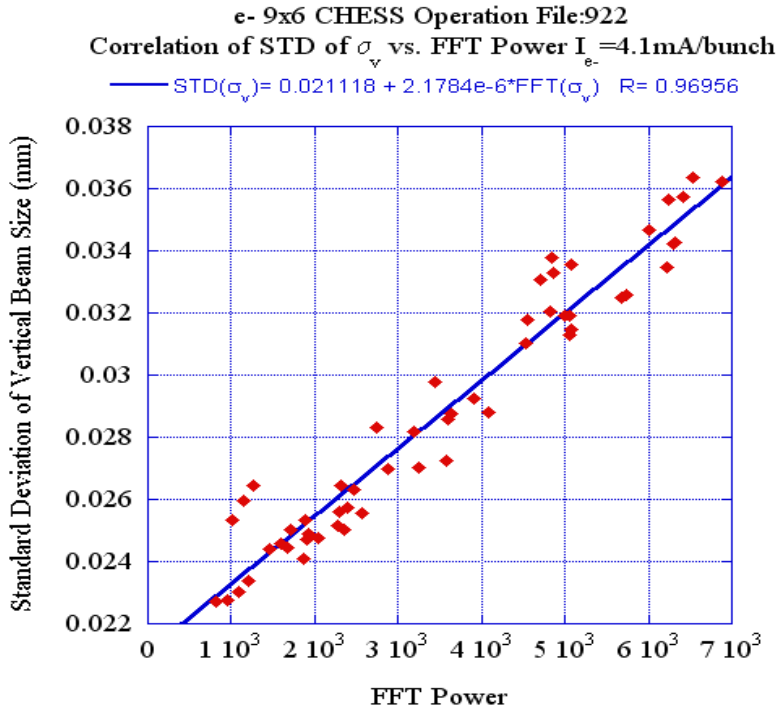


e- σ_v oscillation amplitude correlation with FFT Power

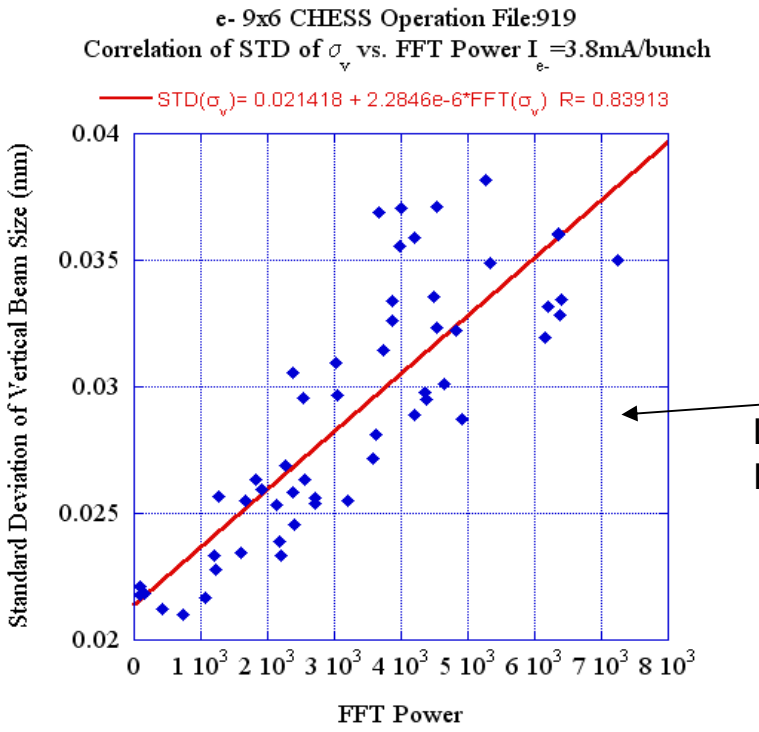
•Direct correlation between σ_v oscillation amplitude (standard deviation of σ_v) and FFT power- coherent oscillation of σ_v oscillation amplitude.



High I File:923
I_{e-}=4.3mA/bunch



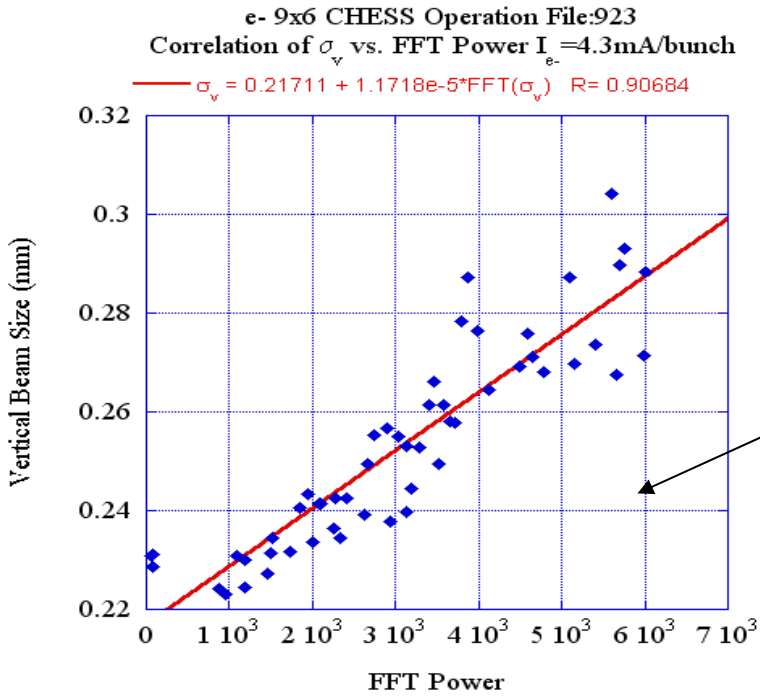
Medium I File:922
I_{e-}=4.1mA/bunch



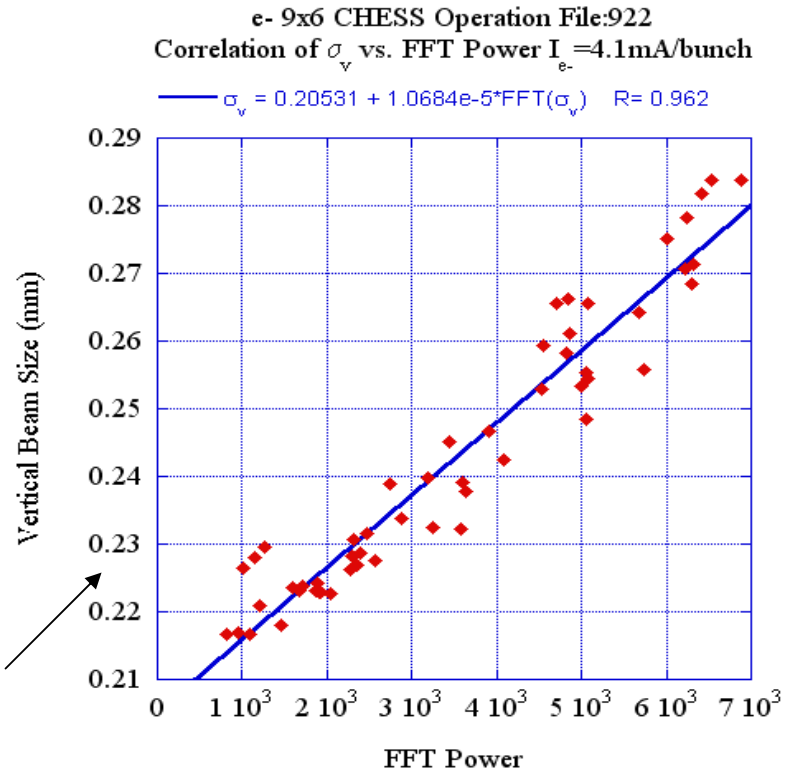
Low I File:919
I_{e-}=3.8mA/bunch

e- σ_v correlated with FFT Power

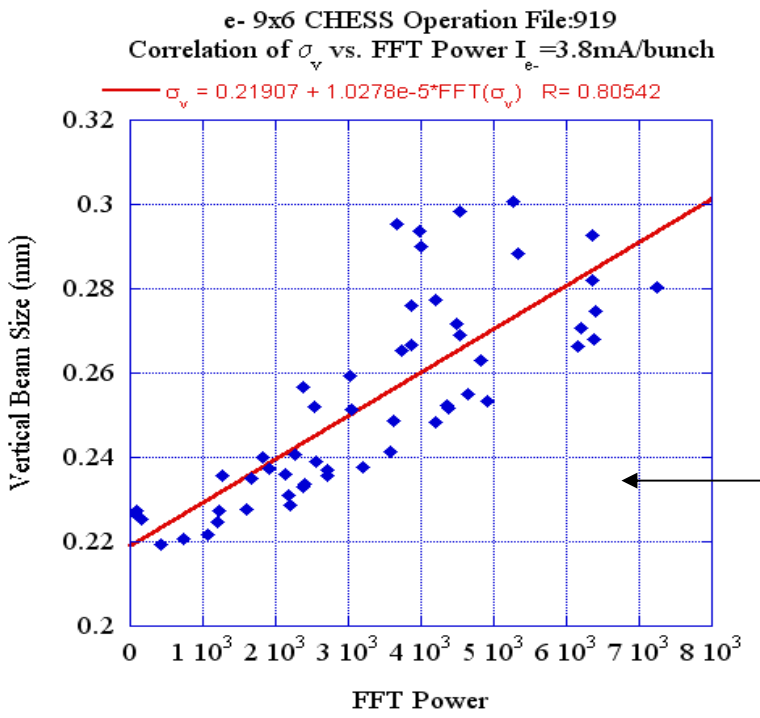
•Direct correlation between σ_v oscillation and FFT power- σ_v growth due to coherent instability



High I File:923
I_{e-}=4.3mA/bunch



Medium I File:922
I_{e-}=4.1mA/bunch



Low I File:919
I_{e-}=3.8mA/bunch

IV Summary

e+ turn-by-turn vertical dynamics:

•The e+ vertical position oscillation is denoted in the FFT spectrum of the vertical position. The vertical position oscillation frequency shifts along the train. Occasionally, a large jump in the oscillation frequency was noted. As the bunch current is increased the oscillation frequency shift increases along the train. The vertical position oscillation amplitude is not dependent on the FFT power but correlates with noise in the FFT spectrum.

•Significant e+ σ_v growth along each train was measured and is dependent on the bunch current. No clear oscillation frequency of σ_v was measured and σ_v's growth correlates with the noise in the FFT spectrum This is a signature that an incoherent instability causes the σ_v growth along the train. In addition, the e+ σ_v oscillation amplitude correlates with FFT power.

e- turn-by-turn vertical dynamics:

• The e- vertical position oscillation is prominent in the FFT spectrum and the oscillation frequency shifts along the train increase slightly with current. Occasionally, a large jump in the oscillation frequency was noted for bunch 6 in trains 1,4,7. The vertical oscillation amplitude correlates with the FFT power which is a signature of a coherent oscillation.

•A σ_v growth and oscillation along the e- trains was measured. The σ_v oscillation frequency shifts along the train. The σ_v oscillation amplitude (standard deviation of σ_v) correlates with the FFT power. A direct correlation between σ_v and FFT power suggests a coherent instability is the cause of the σ_v growth along the trains.

Differences from 11/2/06 results are denoted in red.