

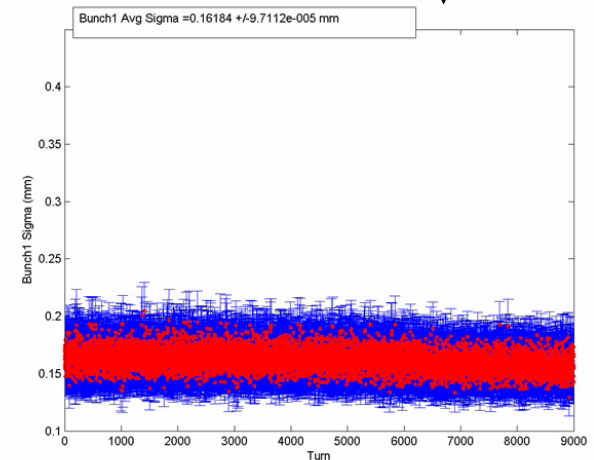
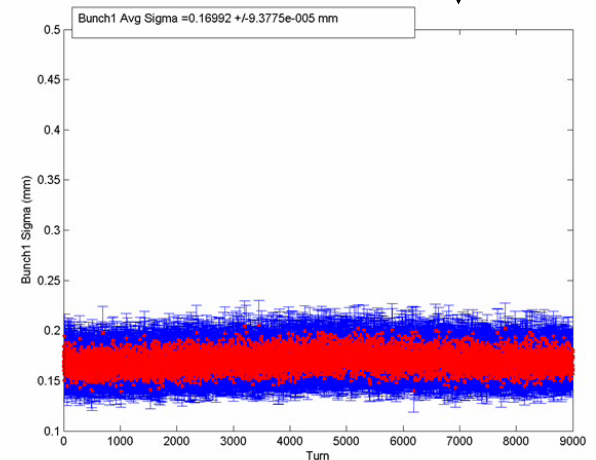
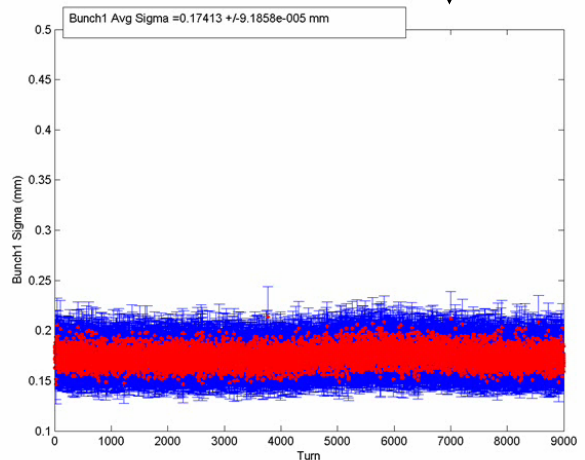
e+ σ_v along the train

- σ_v 9,000 turns for 54 bunches.
- Significant vertical beam size growth along each train-especially at high I

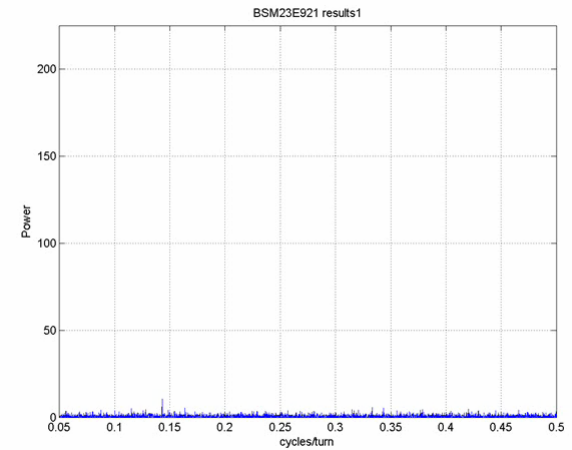
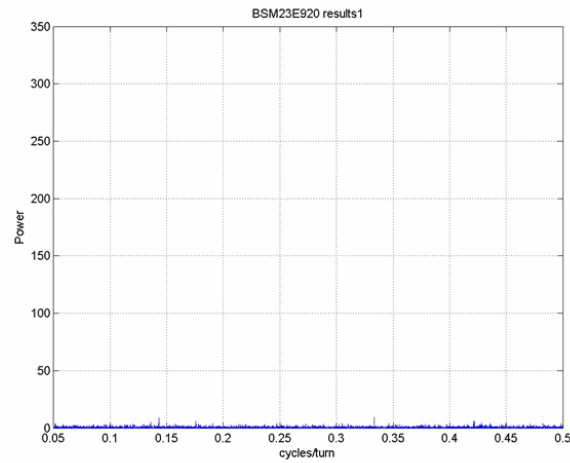
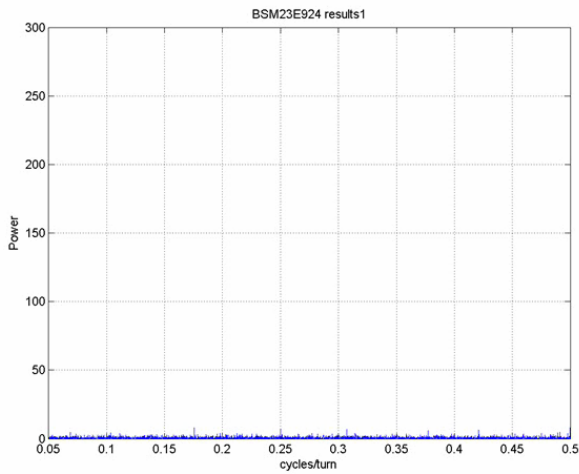
High I File:924
 $I_{e^+} = 3.7 \text{ mA/bunch}$ (movie)

Medium I File:920
 $I_{e^+} = 3.5 \text{ mA/bunch}$ (movie)

Low I File:921
 $I_{e^+} = 3.1 \text{ mA/bunch}$ (movie)



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

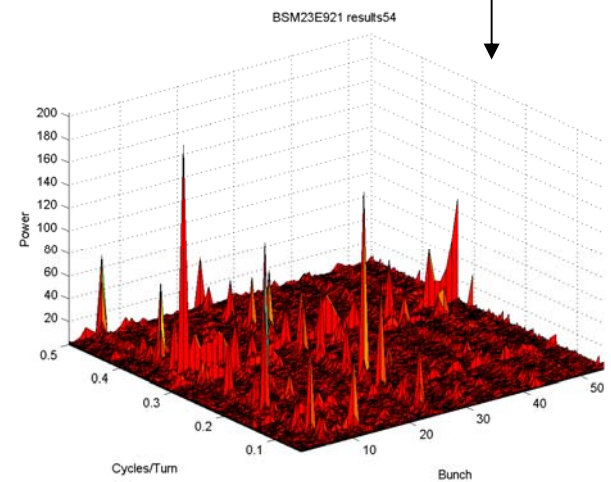
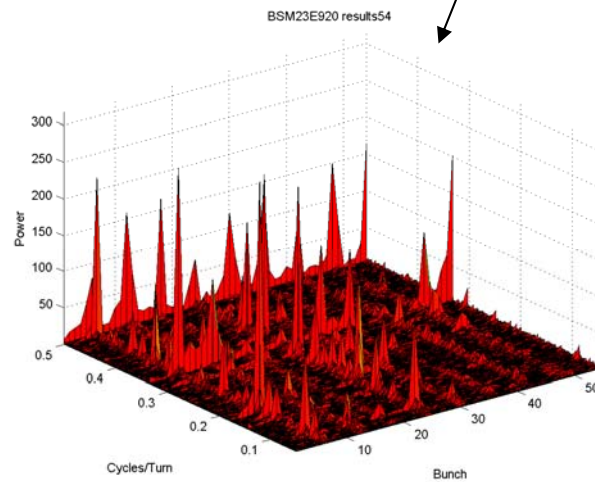
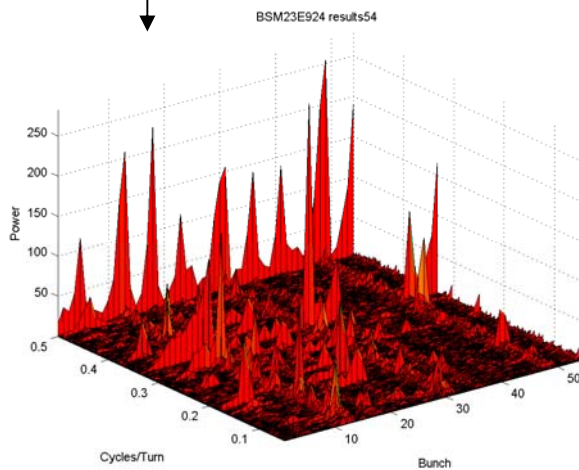


- FFT of σ_v for all 54 bunches
- No clear oscillation frequency in the vertical beam size-incoherent oscillation.

High I File:924
 $I_{e^+}=3.7\text{mA/bunch}$ (movie)

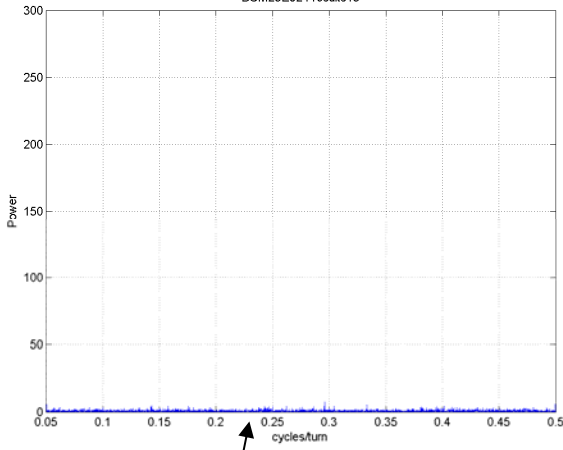
Medium I File:920
 $I_{e^+}=3.5\text{mA/bunch}$ (movie)

Low I File:921
 $I_{e^+}=3.1\text{mA/bunch}$ (movie)



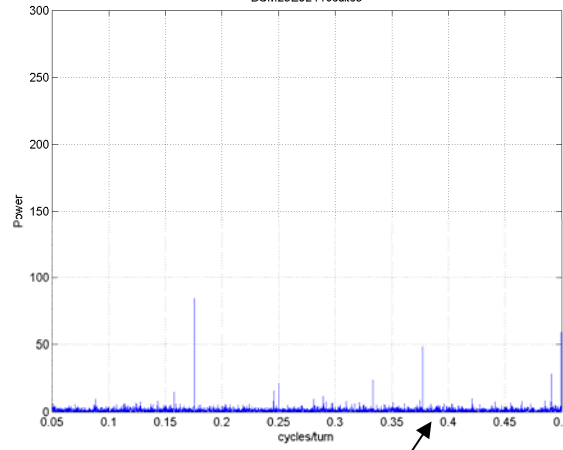
e+ high frequency σ_v oscillation frequency - FFT of σ_v - High I

BSM23E924 results15



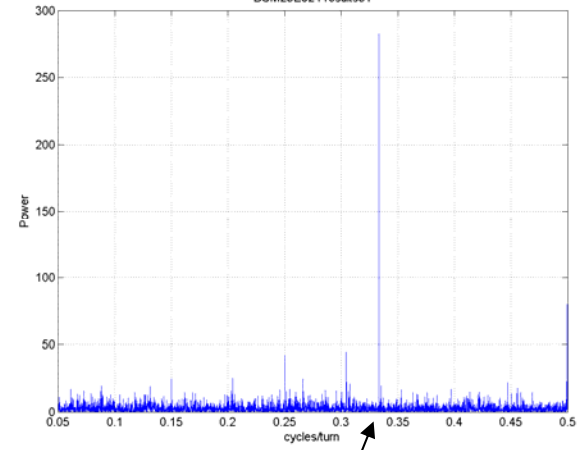
Bunch 15
 Peak Power=12@195.2kHz
 $\sigma_v=0.172\text{mm}$
 Std=0.009mm

BSM23E924 results5



Bunch 5
 Peak Power=116@195.2kHz
 $\sigma_v=0.236\text{mm}$
 Std=0.012mm

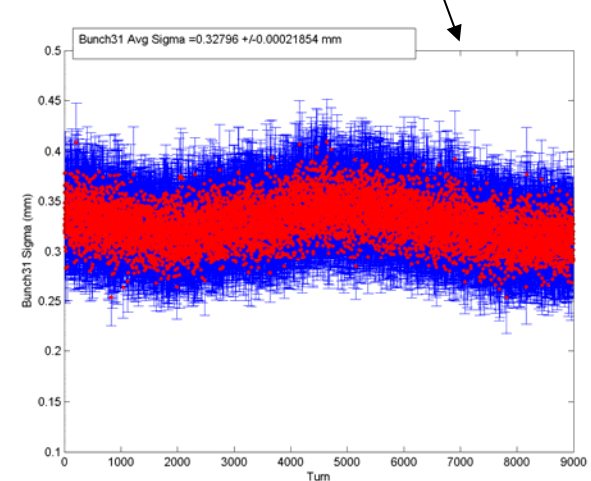
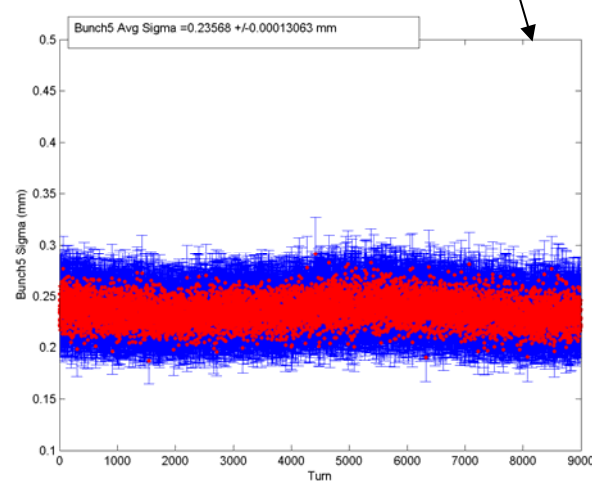
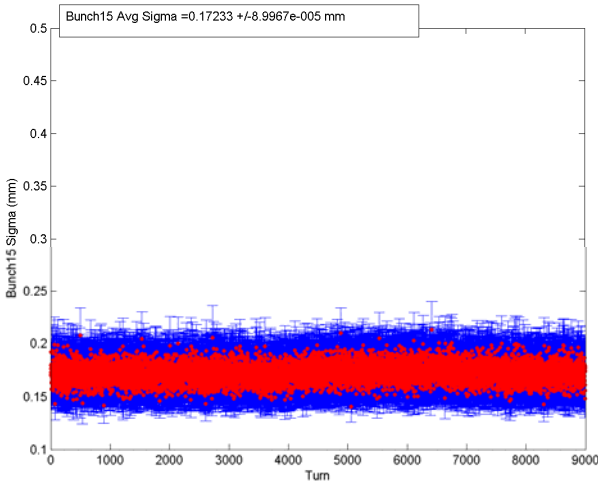
BSM23E924 results31



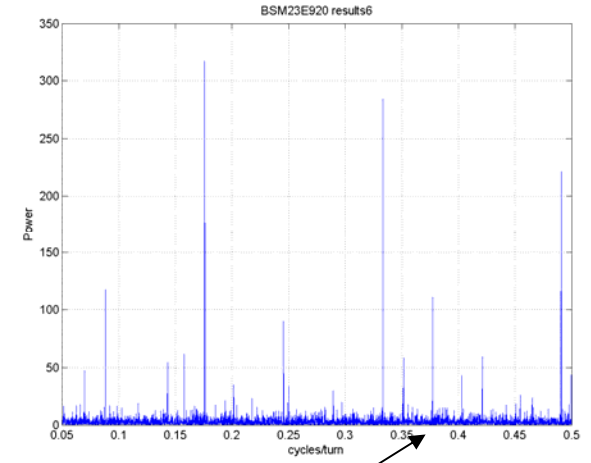
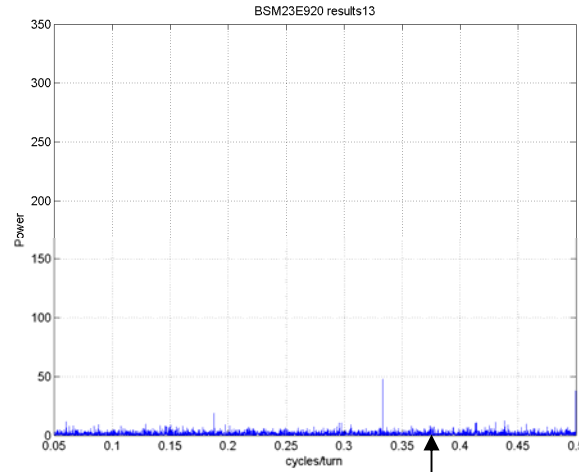
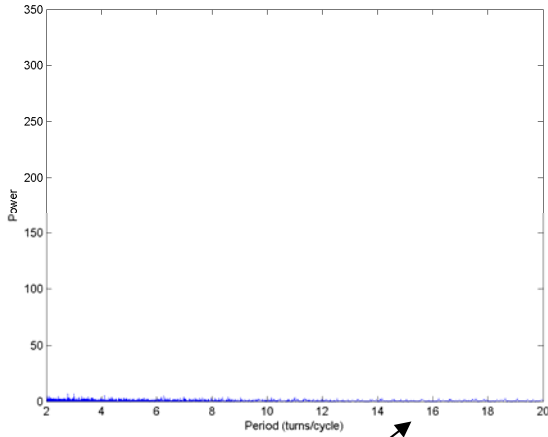
Bunch 31
 Peak Power=283@260.3kHz
 $\sigma_v=0.328\text{mm}$
 Std=0.021mm

File 924 $I_{e+}=3.7\text{mA/bunch}$

- Noisy FFT spectrum correlates with an increased σ_v .



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



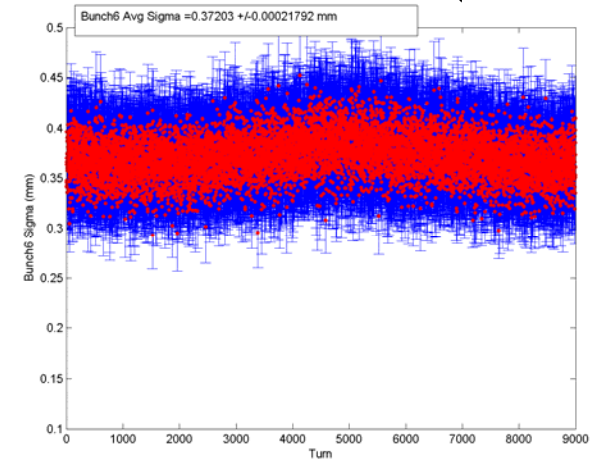
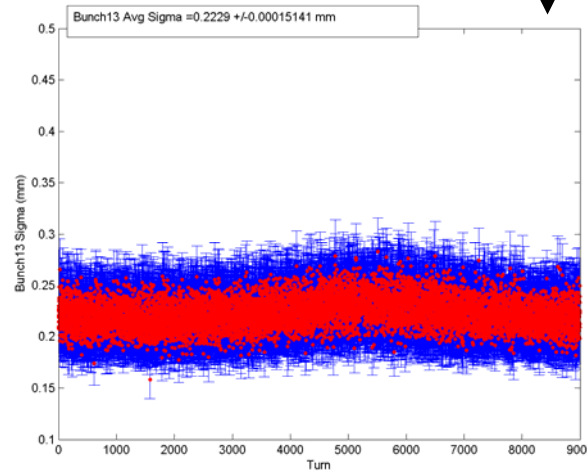
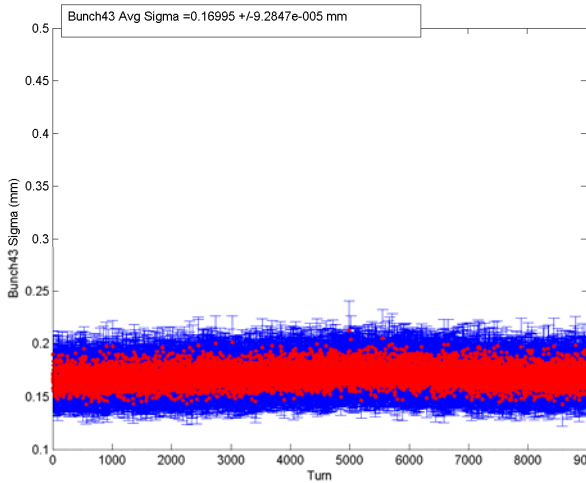
Bunch 43
Peak Power=8@195.2kHz
 $\sigma_v=0.170\text{mm}$
Std=0.009mm

Bunch 13
Peak Power=73@195.2kHz
 $\sigma_v=0.223\text{mm}$
Std=0.014mm

Bunch 6
Peak Power=78@312.8kHz
 $\sigma_v=0.372\text{mm}$
Std=0.021mm

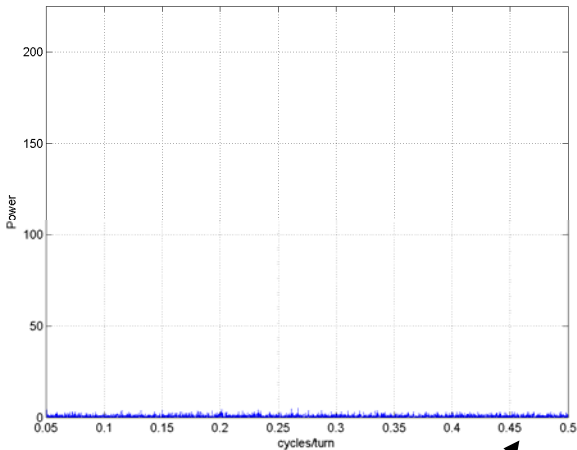
File 920 $I_{e^+}=3.5\text{mA/bunch}$

- Noisy FFT spectrum correlates with an increased σ_v .

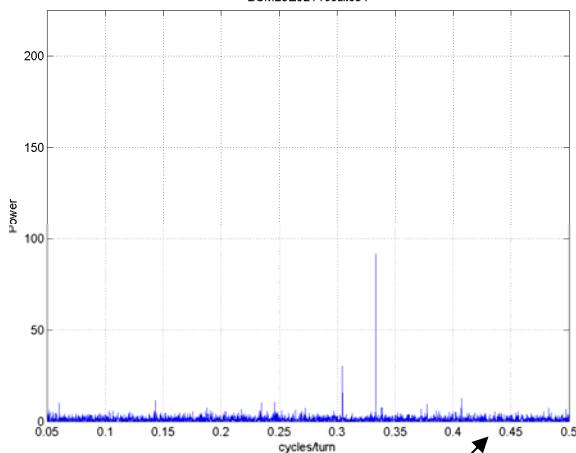


e+ high frequency σ_v oscillation frequency- FFT of σ_v - Low I

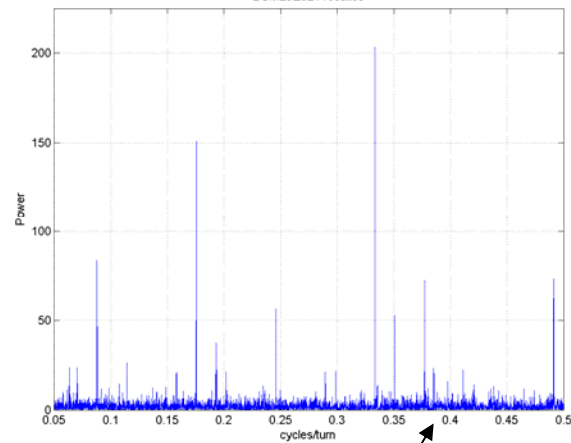
BSM23E921 results25



BSM23E921 results54



BSM23E921 results6



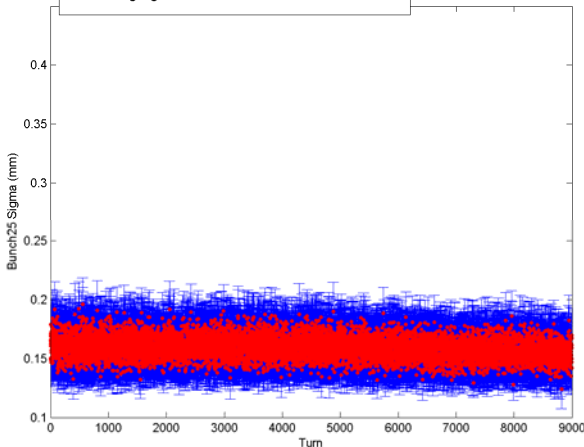
Bunch 25
 Peak Power=55 @ 286.2kHz
 $\sigma_v=0.159\text{mm}$
 Std=0.009mm

Bunch 54
 Peak Power=91 @ 260.3kHz
 $\sigma_v=0.221\text{mm}$
 Std=0.013mm

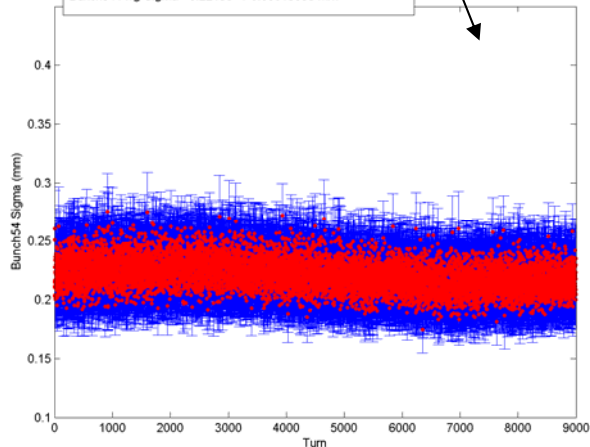
Bunch 6
 Peak Power=204 @ 260.3kHz
 $\sigma_v=0.301\text{mm}$
 Std=0.018mm

File 921 $I_{e+}=3.1\text{mA/bunch}$
 • At low I the vertical beam size growth is reduced (still correlates with FFT noise).
 σ_v is largest for last bunch in each train.

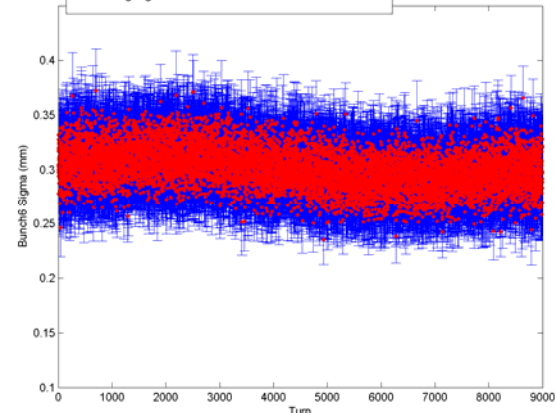
Bunch25 Avg Sigma =0.15915 +/-9.4706e-005 mm



Bunch54 Avg Sigma =0.22139 +/-0.00013693 mm



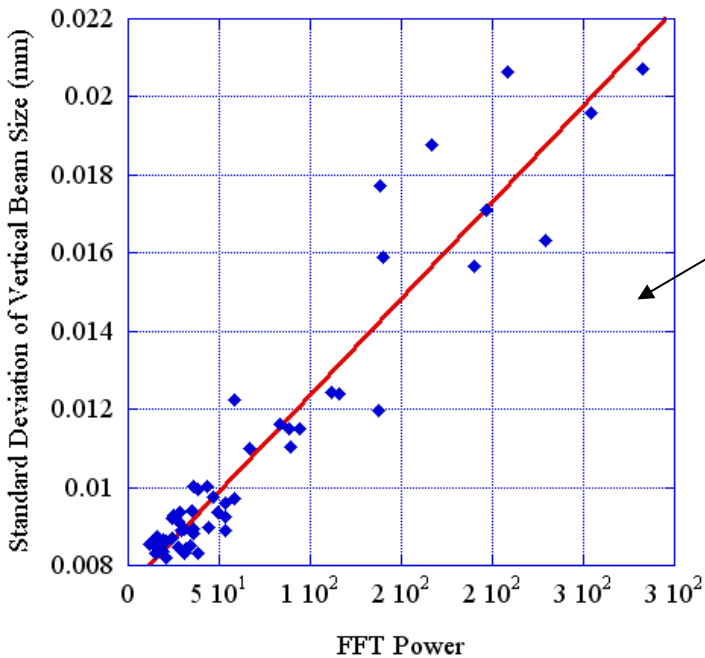
Bunch6 Avg Sigma =0.30137 +/-0.00019362 mm



e+ 9x6 CHESS Operation File:924

Correlation of STD of σ_v vs. FFT Power $I_{e^-} = 3.7\text{mA/bunch}$

— $\text{STD}(\sigma_v) = 0.0074489 + 4.9377\text{e-}5 \cdot \text{FFT}(\sigma_v)$ $R = 0.95184$



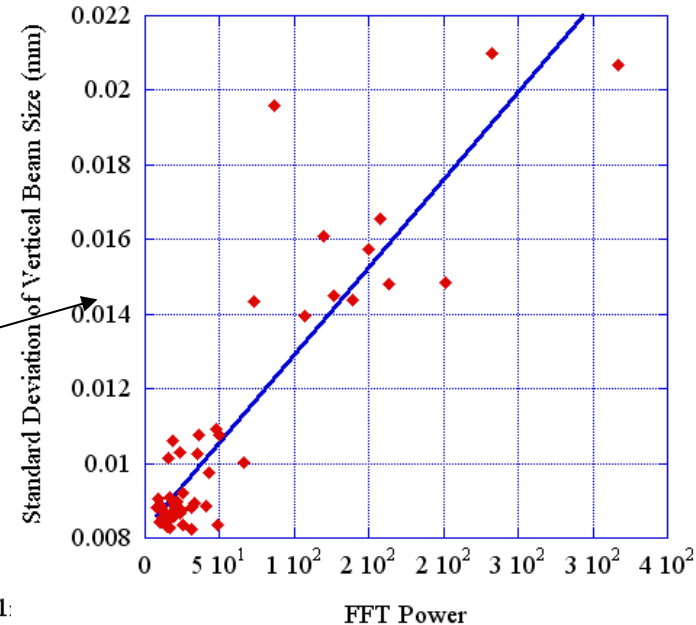
High I File:924
 $I_{e^+} = 3.7\text{mA/bunch}$

Medium I File:920
 $I_{e^+} = 3.5\text{mA/bunch}$

e+ 9x6 CHESS Operation File:920

Correlation of STD of σ_v vs. FFT Power $I_{e^-} = 3.5\text{mA/bunch}$

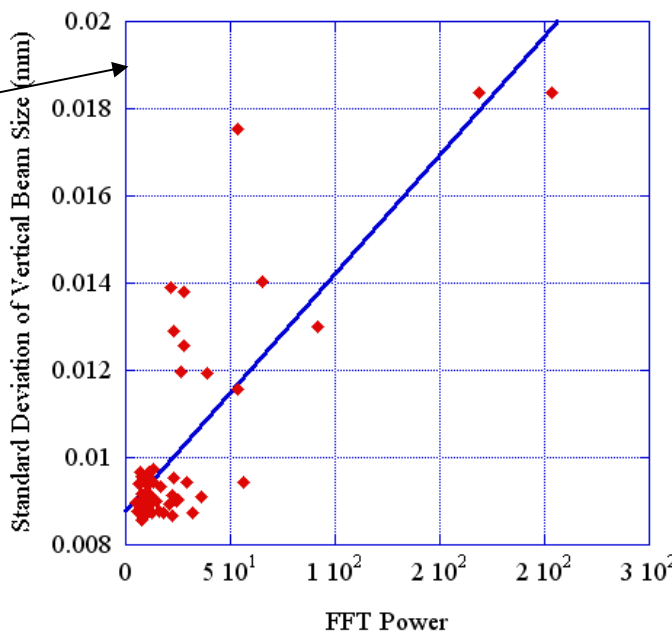
— $\text{STD}(\sigma_v) = 0.0081981 + 4.6893\text{e-}5 \cdot \text{FFT}(\sigma_v)$ $R = 0.9044$



e+ 9x6 CHESS Operation File:921
Correlation of STD of σ_v vs. FFT Power $I_{e^-} = 3.1$:

— $\text{STD}(\sigma_v) = 0.0087826 + 5.4289\text{e-}5 \cdot \text{FFT}(\sigma_v)$ $R = 0.80505$

Low I File:921
 $I_{e^+} = 3.1\text{mA/bunch}$

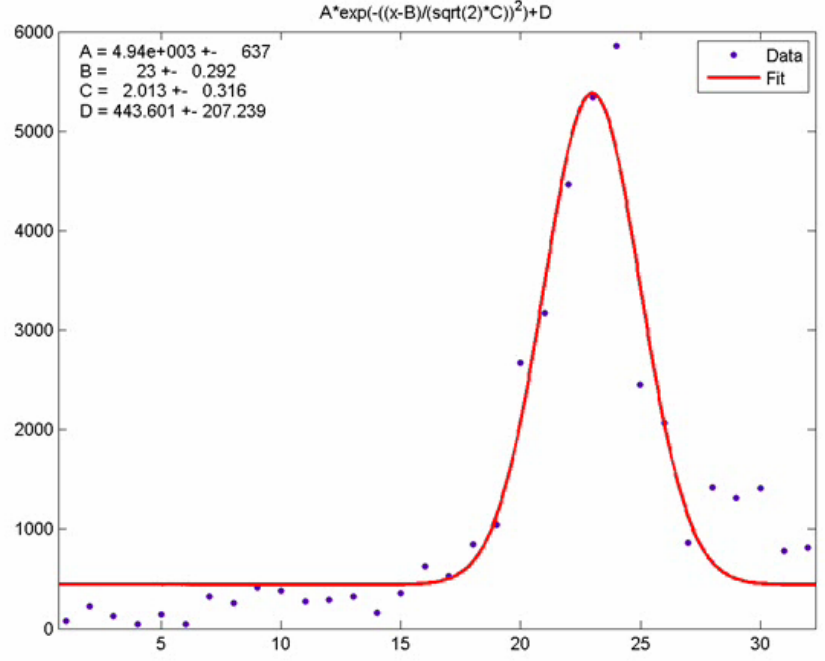


e+ σ_v oscillation amplitude
(standard deviation of σ_v)
correlates with FFT power.

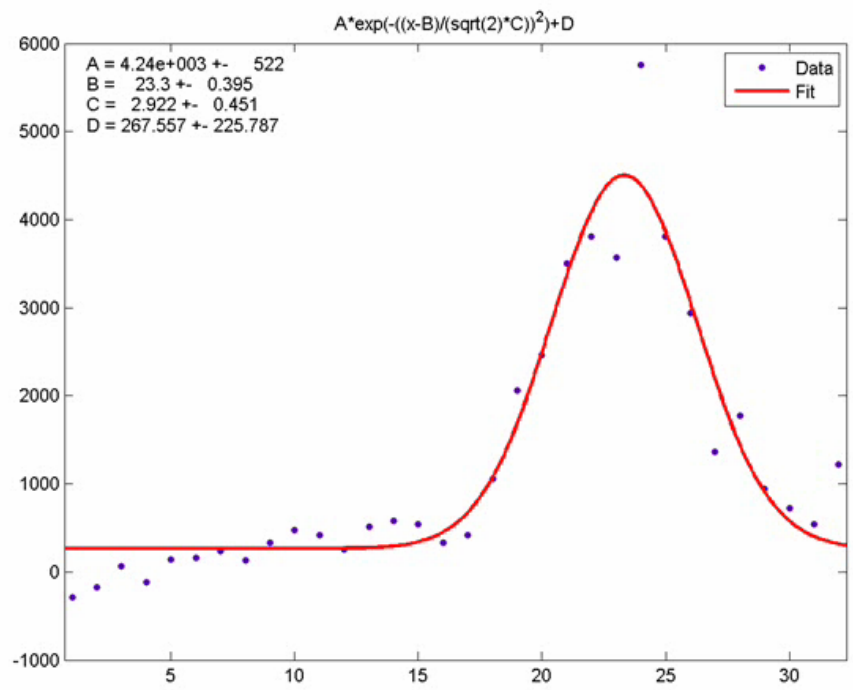
III. e- turn-by-turn measurements

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

- 9,000 turns of all 54 e+/e- bunches.
- High I File:923 $I_{e^-}=4.3\text{mA/bunch}$
- Note difference in σ_v



e- Bunch 1 Train 1
1st ten turns (movie)



e- Bunch 5 Train 6
1st ten turns (movie)