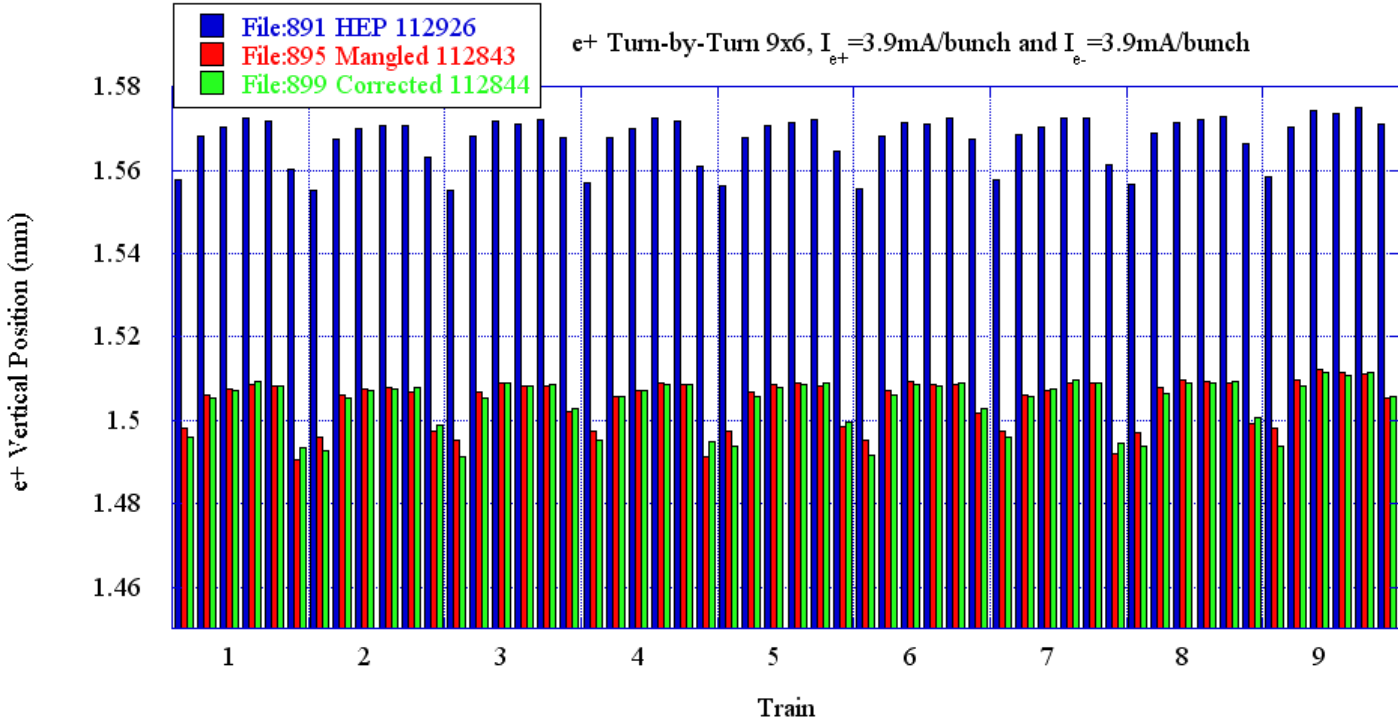# CHESS 9x6 Turn-By-Turn e-/e+, Coupling Test and Vertical Tune Study
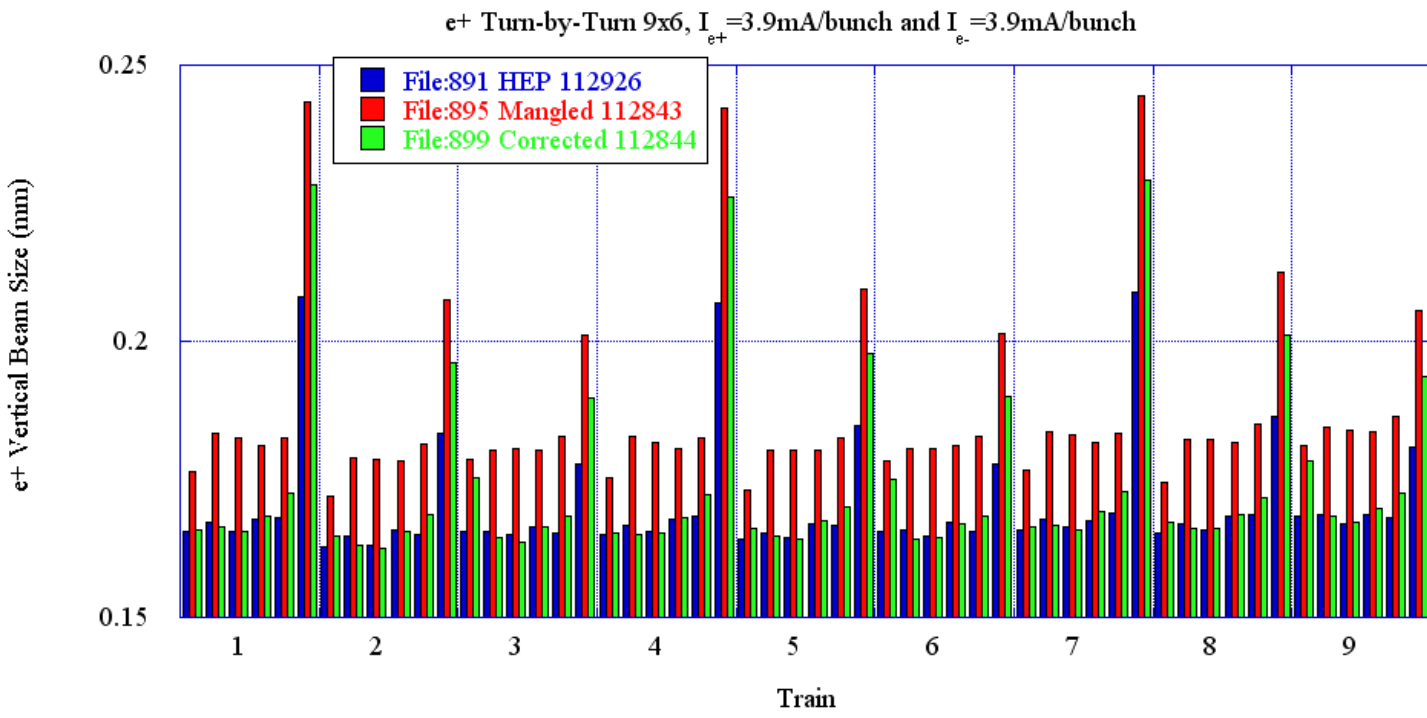
M. Forster, G. Codner, R. Holtzapple, J. Kern, and E.Tanke
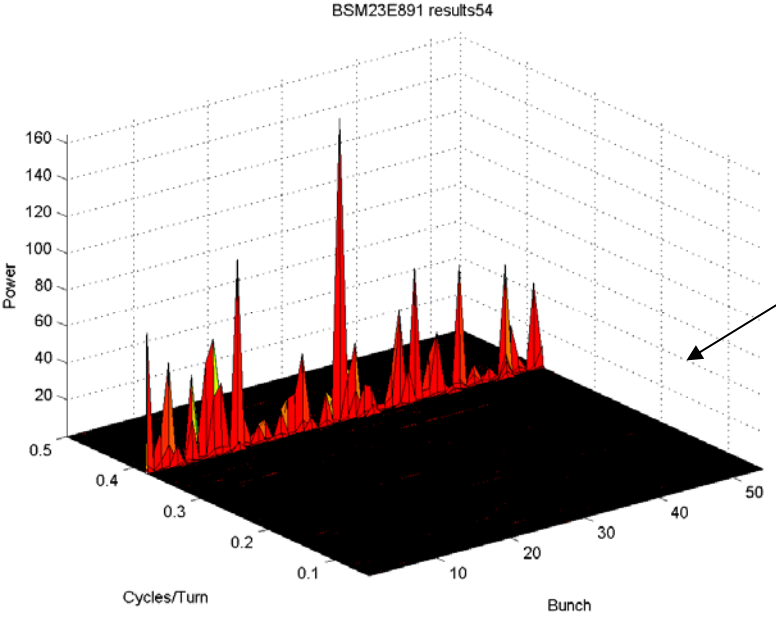
October 31, 2006

e+ Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch

File:891 HEP 112926
File:895 Mangled 112843
File:899 Corrected 112844

e+ Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch

File:891 HEP 112926
File:895 Mangled 112843
File:899 Corrected 112844

Coupling Test
Positrons
9x6 e+/e-
I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 891,895, 899
SL σ_v=167μm (891)
SL σ_v=190μm (895)
SL σ_v=180μm (899)
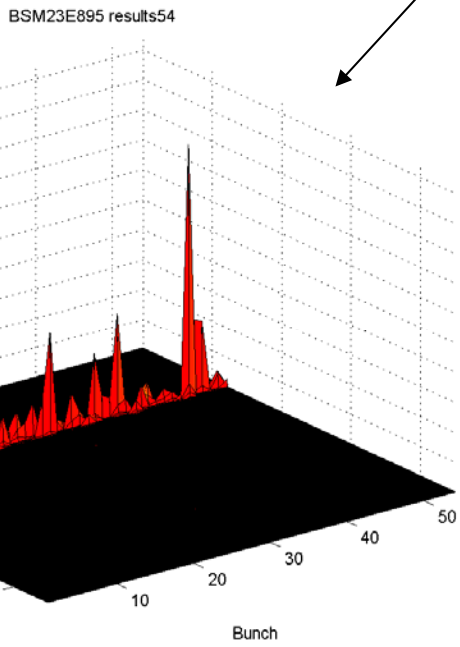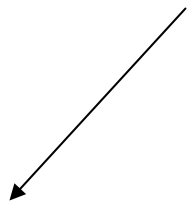
BSM23E891 results54

HEP 112926
File:891
Peak@~241kHz

Coupling Test
FFT of e+ vertical position
9x6 e+/e-
I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 891, 895, 899

Corrected 112844
File: 899
Peak@~241kHz
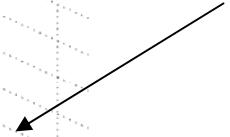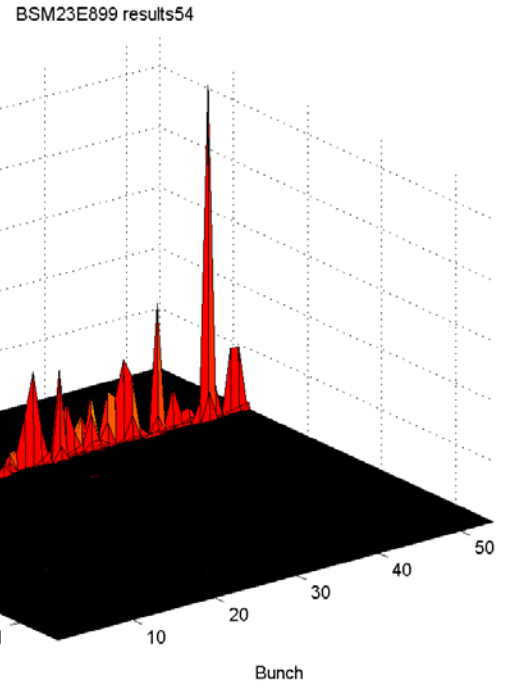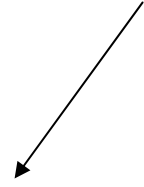
Mangled 112843
File: 895
Peak@~241kHz

BSM23E895 results54

BSM23E899 results54

BSM23E891 results54

HEP 112926
File:891

Coupling Test
FFT of e+ σ_v
9x6 e+/e-
I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 891, 895, 899
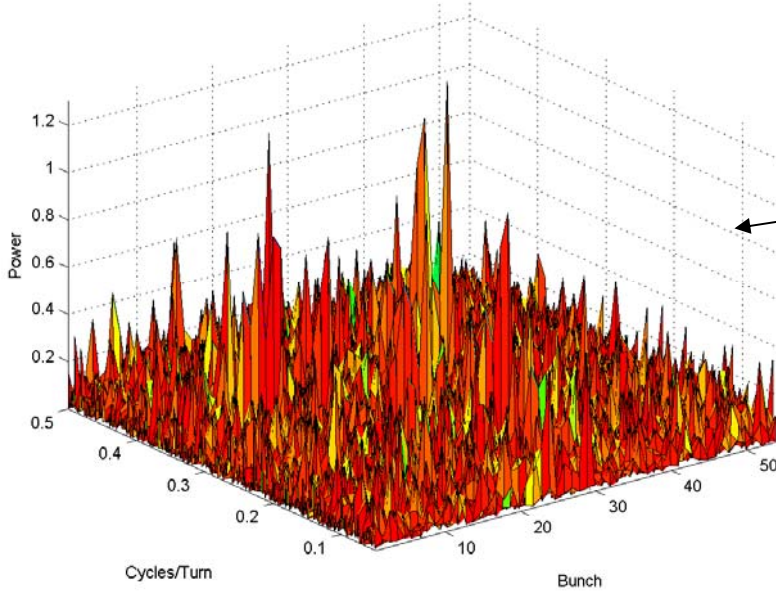
Mangled 112843
File: 895
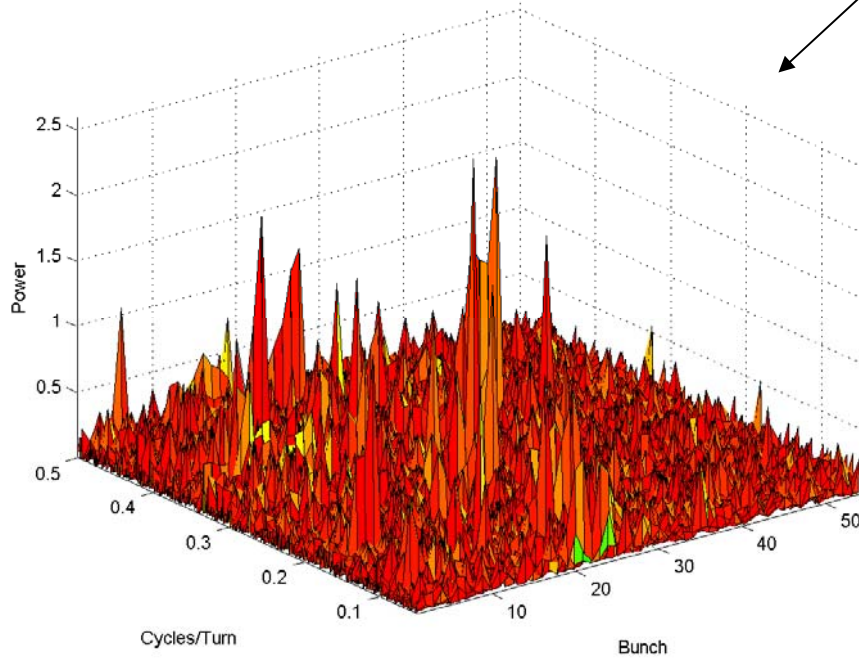
Corrected 112844
File: 899

BSM23E895 results54

BSM23E899 results54

e+ Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch

Legend (top plot):
- File:565 HEP 112926
- File:567 Mangled 112843
- File:569 Corrected 112844

Q_x (kHz) axis; Train axis

Legend (bottom plot):
- File:565 HEP 112926
- File:567 Mangled 112843
- File:569 Corrected 112844

e+ Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch

Q_y (kHz) axis; Train axis
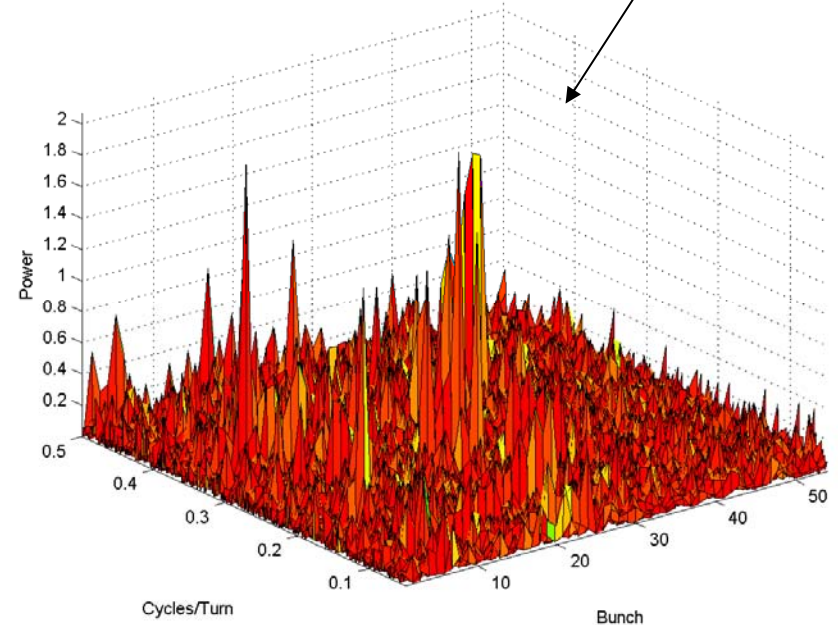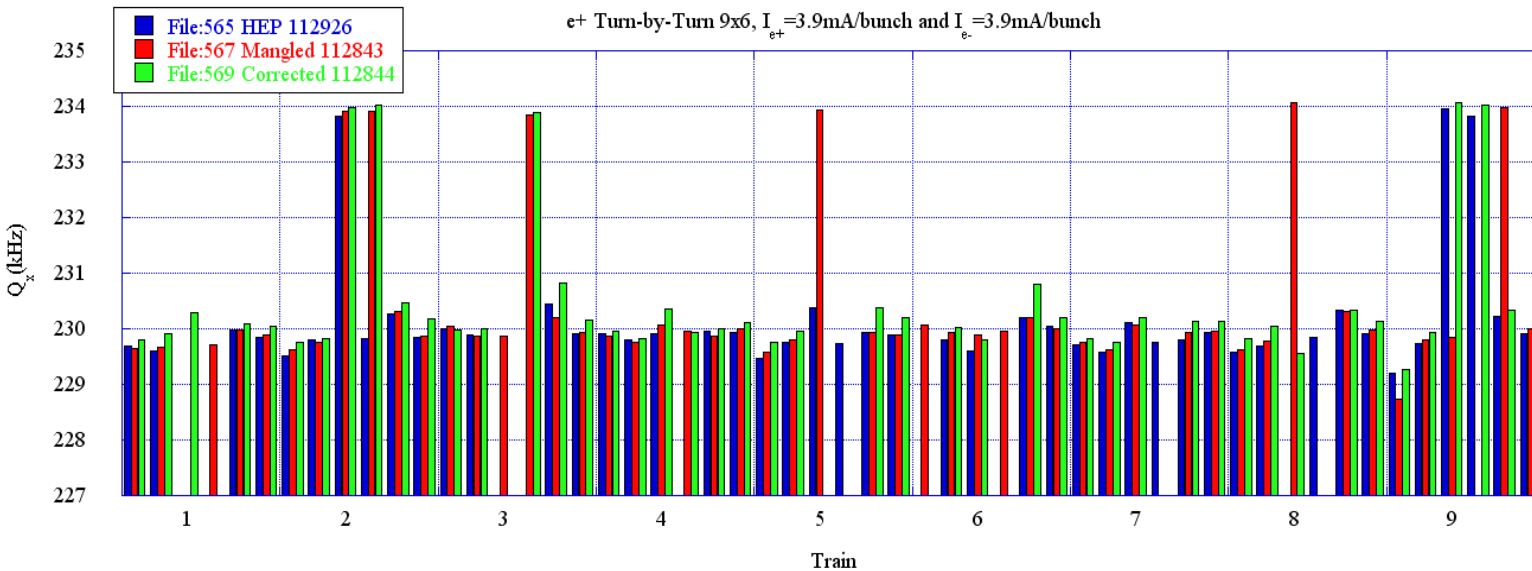
Coupling Test
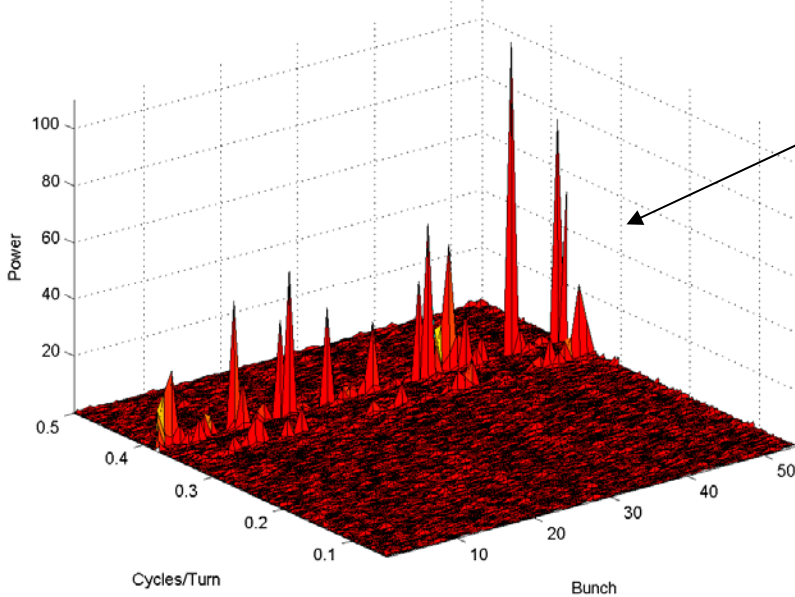e+ Tunes
9x6 e+/e-
I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 565,567,569
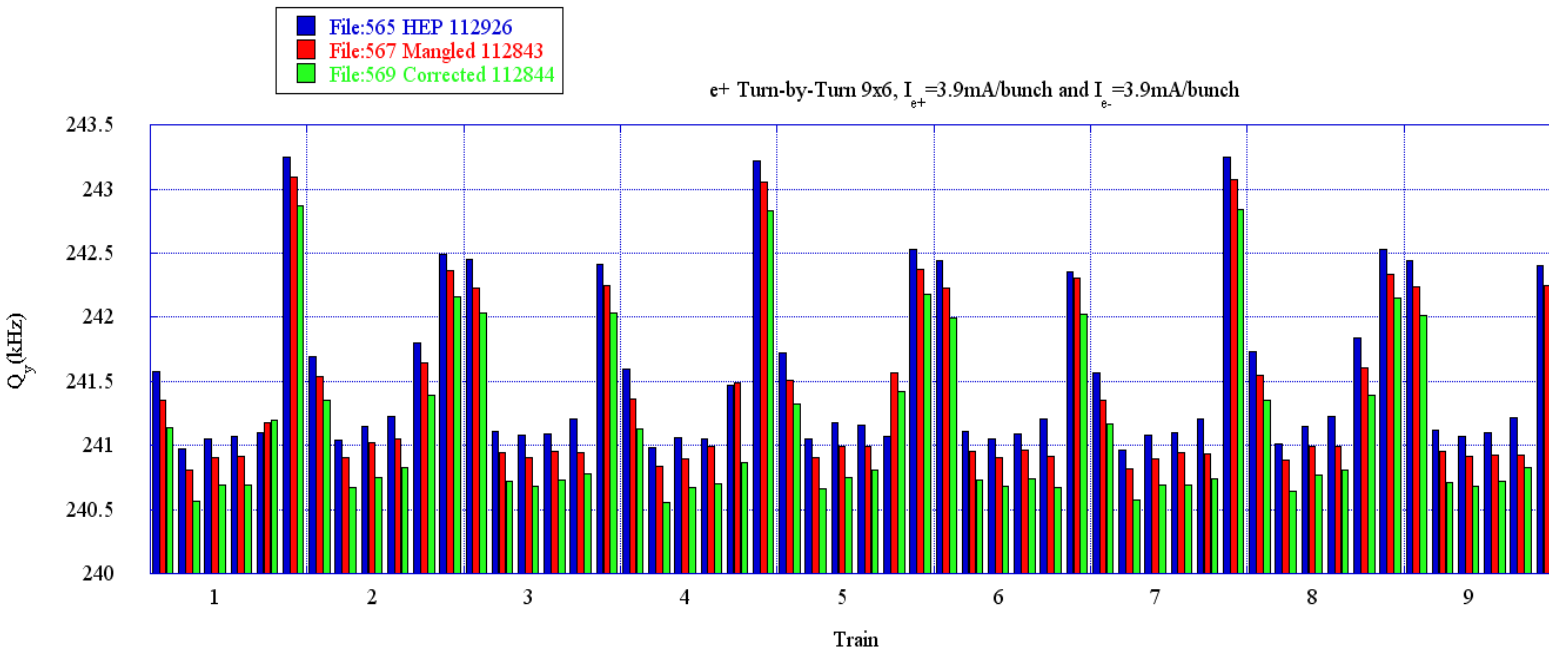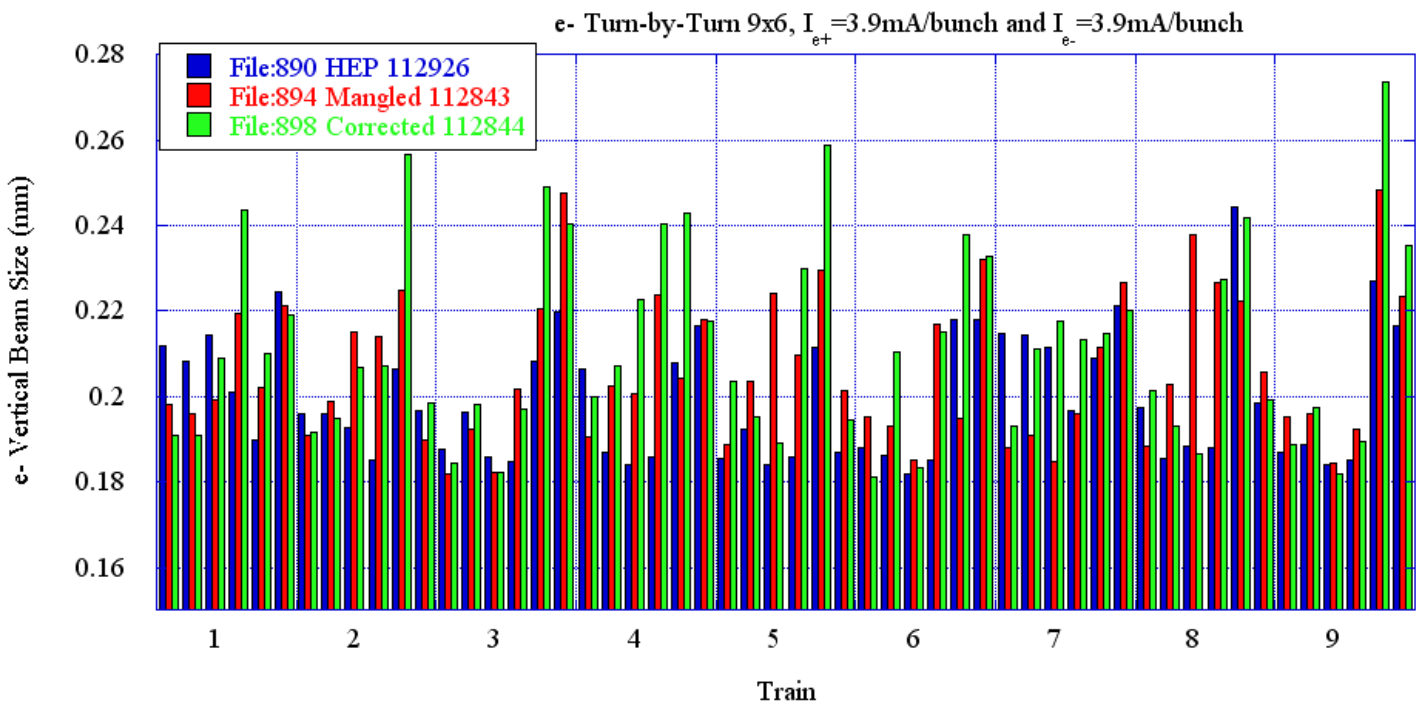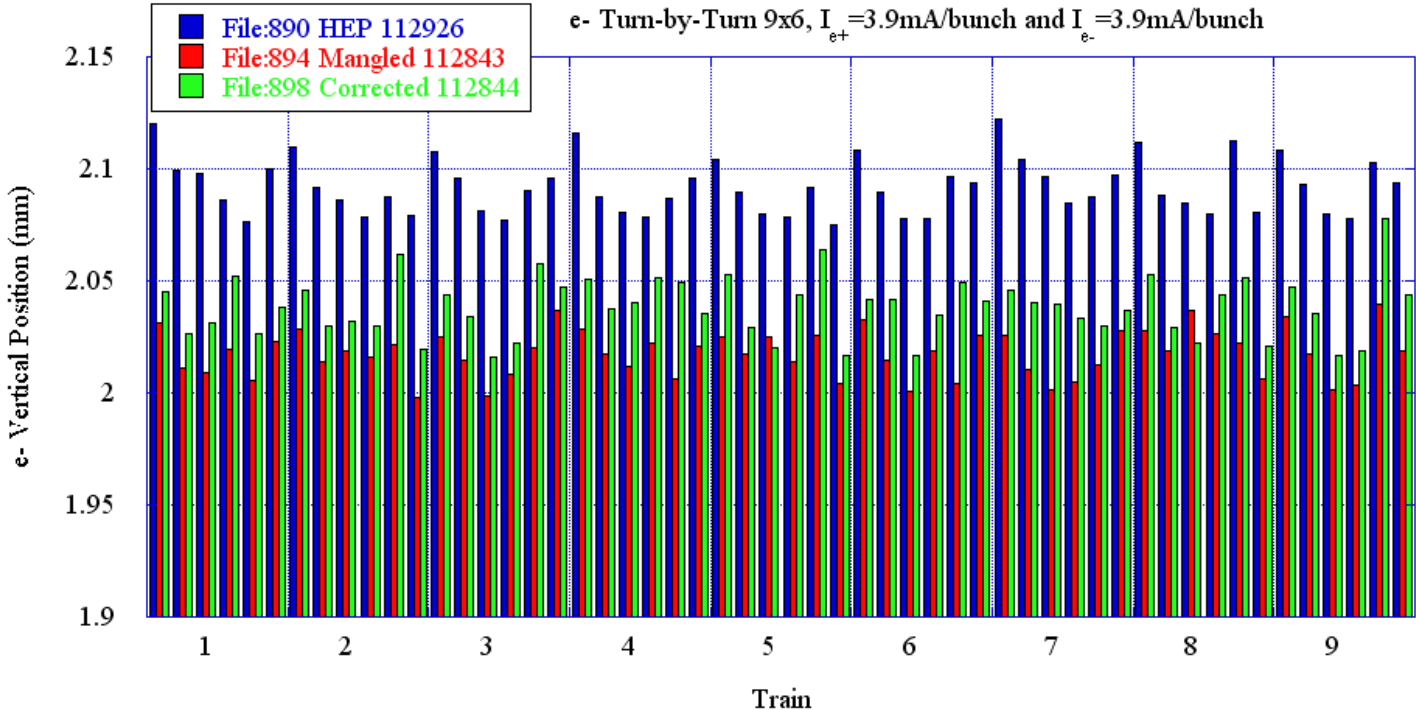
Coupling Test
e-
9x6 e+/ e-
I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 890,894,898
SL σ_v=163µm (890)
SL σ_v=172µm (894)
SL σ_v=174µm (898)

BSM23W890 results54

Coupling Test
FFT of e- vertical position
9x6 e-/e+
I_{e-}=3.9mA/bunch
I_{e+}=3.9mA/bunch
Files: 890, 894, 898

HEP 112926
File:890
Peaks@~241kHz
and 258kHz
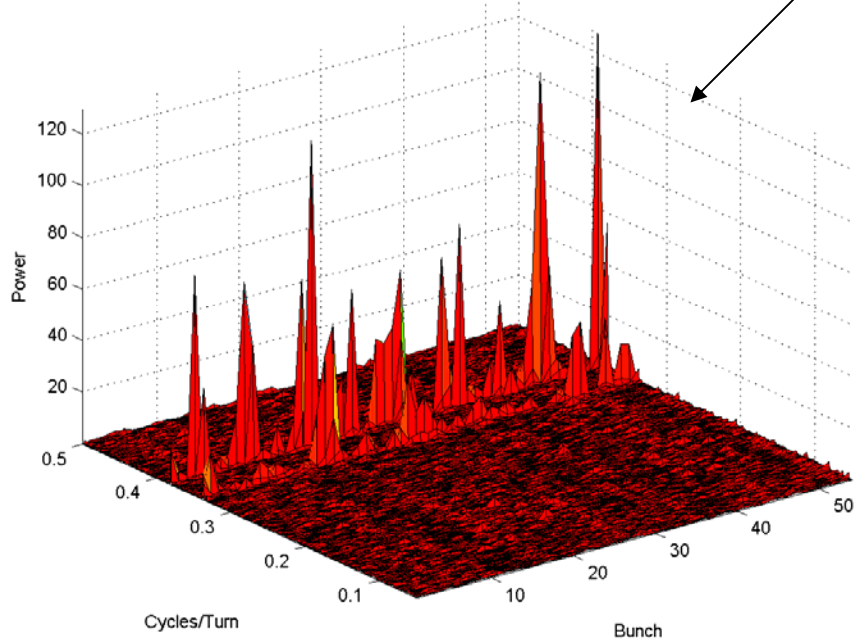
e- vertical position oscillation is
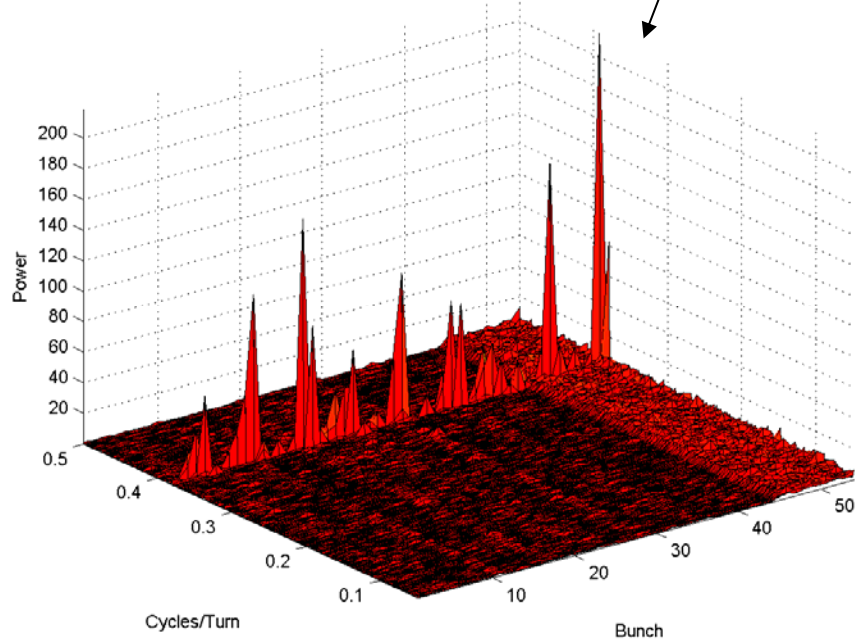the at e+ vertical tune

Mangled 112843
File: 894
Peaks@~241kHz
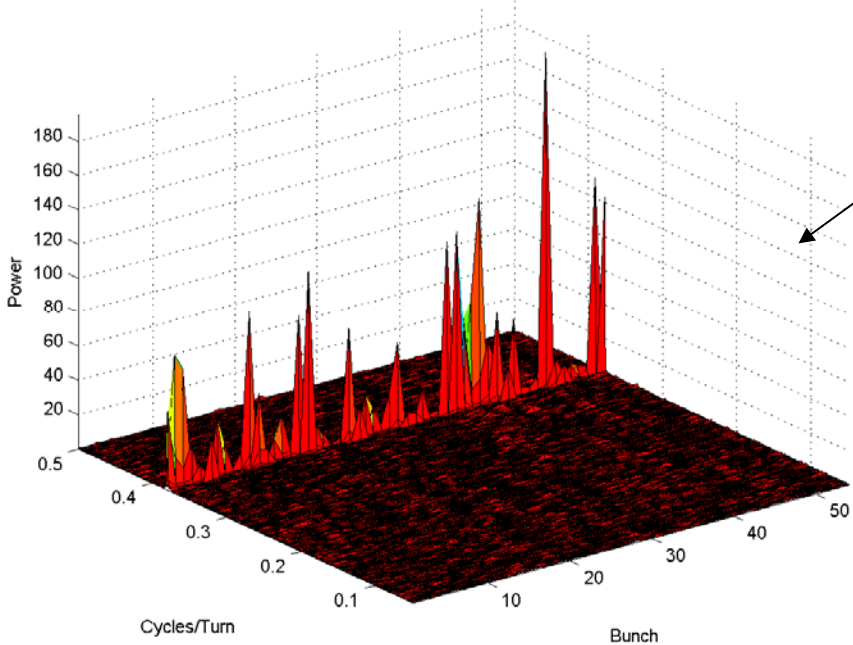and 258kHz

Corrected 112844
File: 898
Peak@~241kHz

BSM23W894 results54
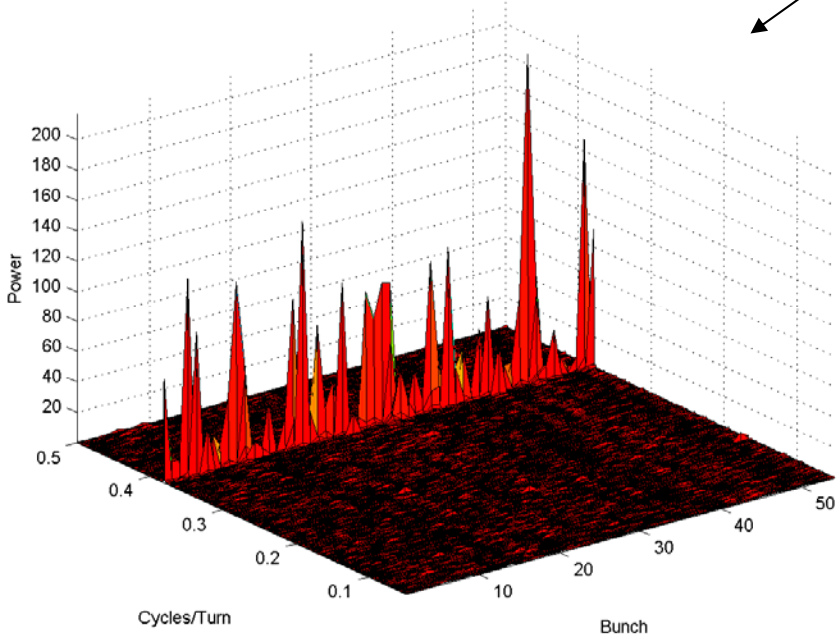
BSM23W898 results54

BSM23W890 results54

HEP 112899
File:890

Peak@~241kHz

Coupling Test
FFT of e- σ_v
9x6 e-/e+
I_{e-}=3.9mA/bunch
I_{e+}=3.9mA/bunch
Files: 890, 894, 898

e- σ_v oscillation is at the at e+ vertical tune

Mangled 112843
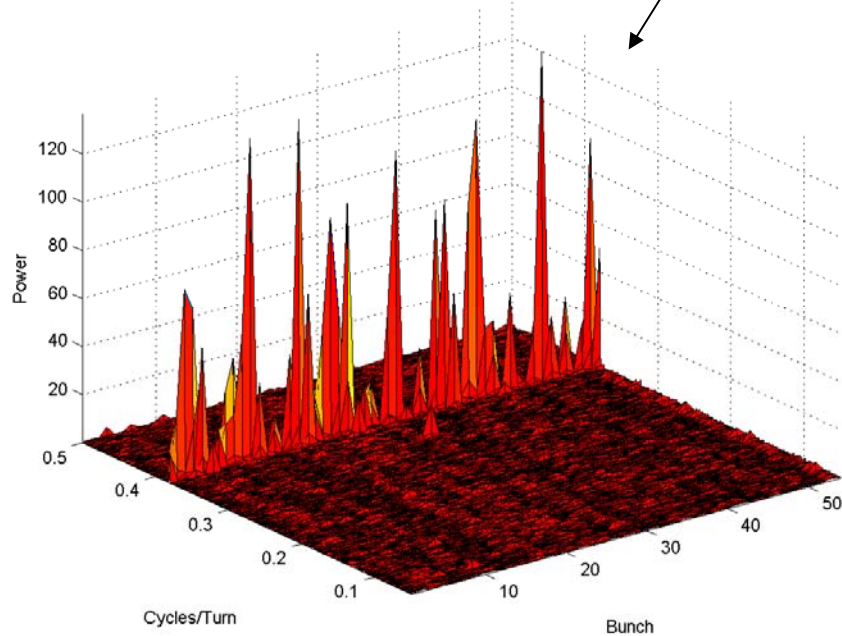File: 894
Peak@~241kHz

Corrected 112844
File: 898
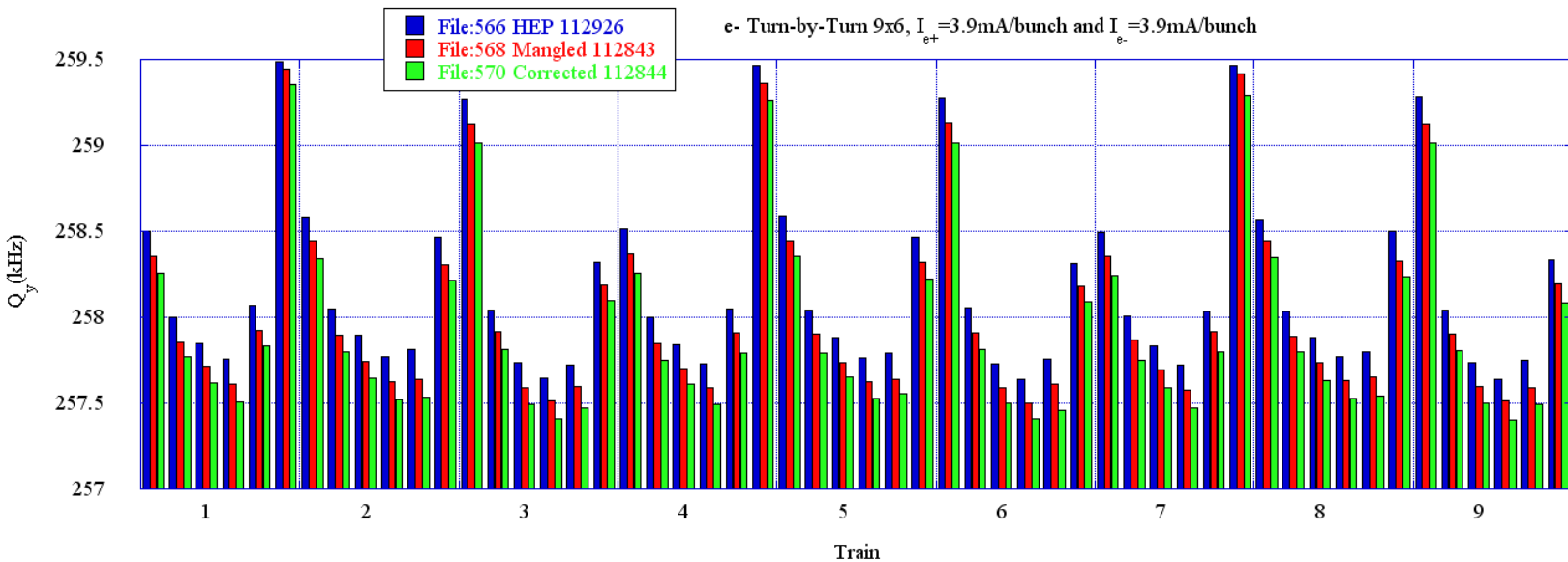Peak@~241kHz

BSM23W894 results54
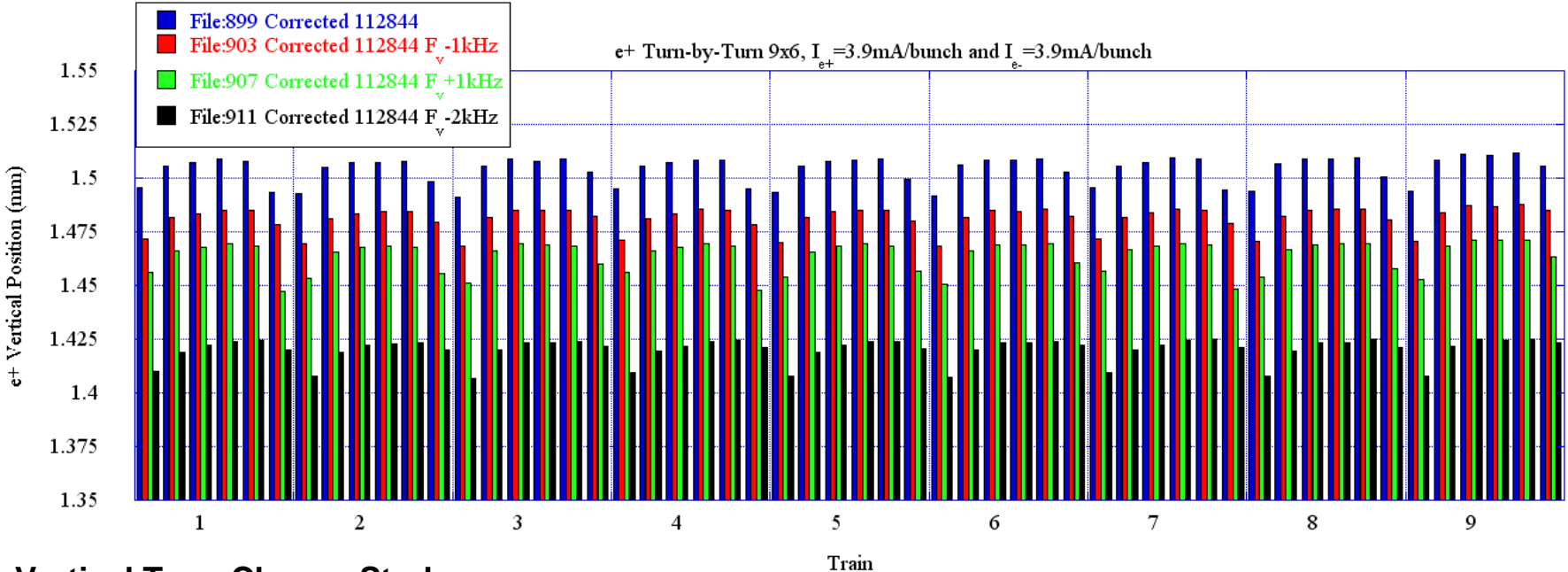
BSM23W898 results54
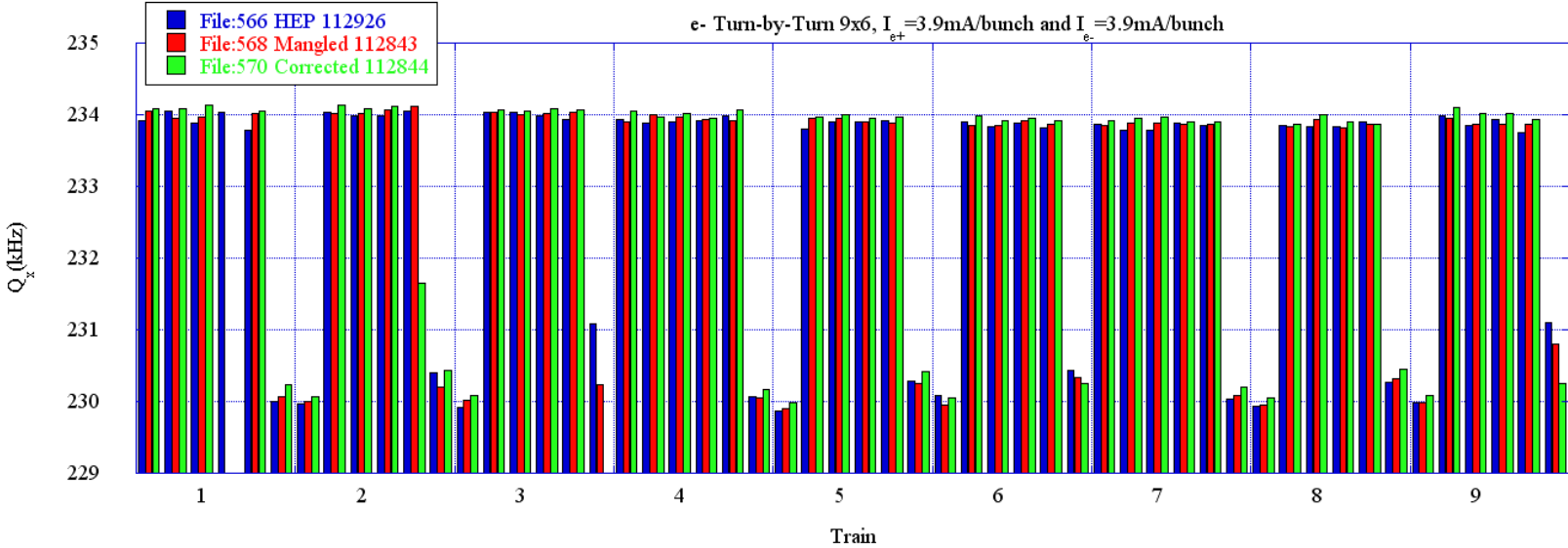
Coupling Test
e- Tunes
9x6 e+/e-
I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 566,568,570

e+ Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch

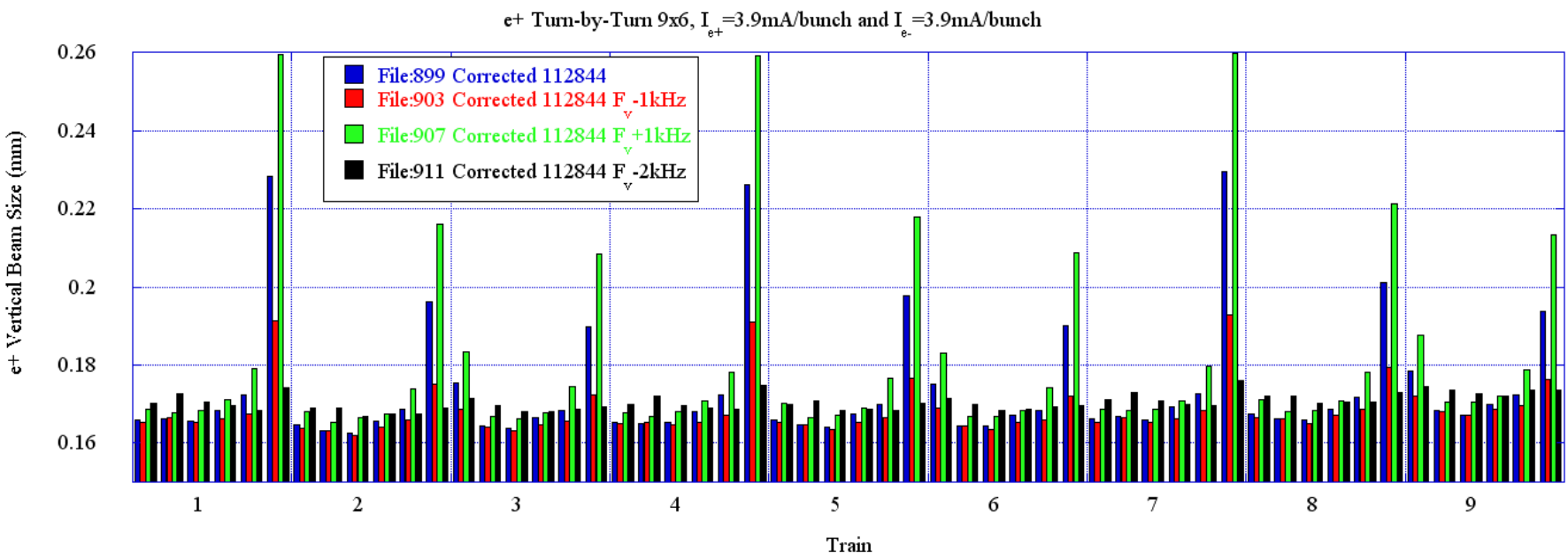**Vertical Tune Change Study**
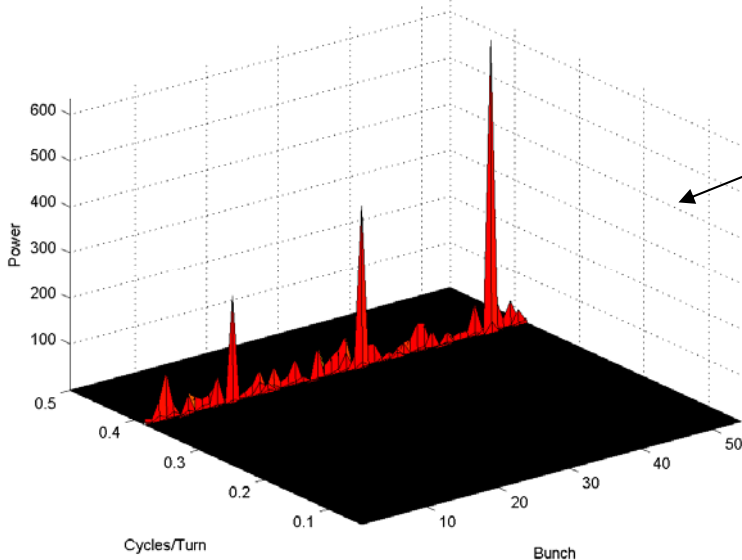
e+   9x6 e+/e-

I_{e+}=3.9mA/bunch

I_{e-}=3.9mA/bunch

SL σ_v=180mm (899)
SL σ_v=???mm (903)
SL σ_v=190mm (907)
SL σ_v=180mm (911)

Files: 899,903,907,911

BSM23E903 results54

Vertical Tune Change Study
FFT of e+ vertical position
9x6 e-/e+
I_{e-}=3.9mA/bunch
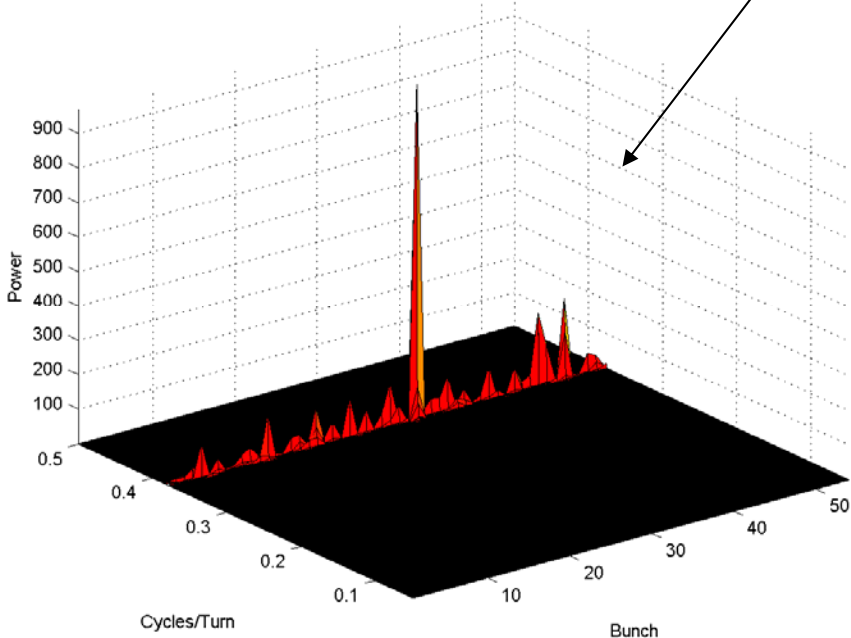I_{e+}=3.9mA/bunch
Files: 903, 907, 911

Corrected 112844 f_v-1kHz
File:903
Peak@~240kHz
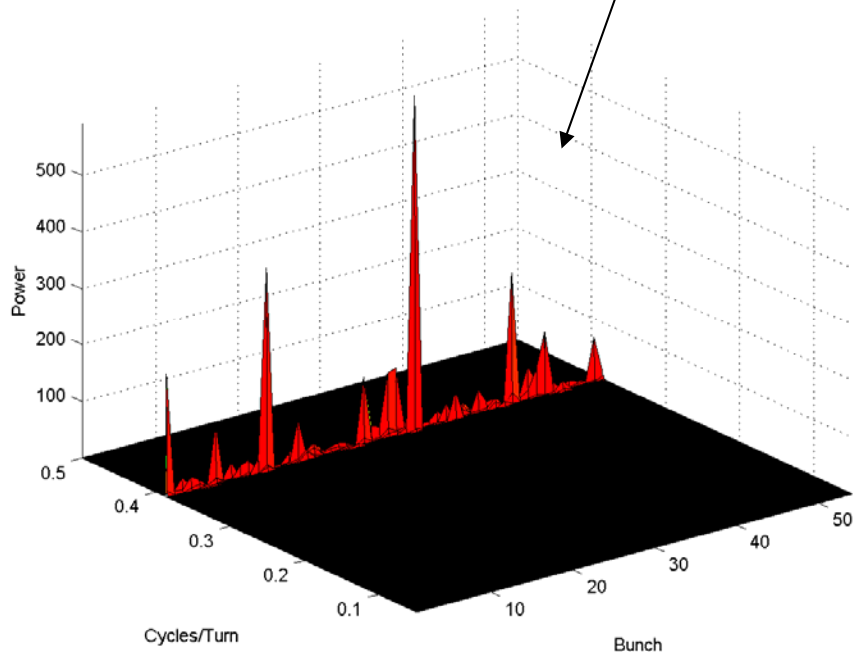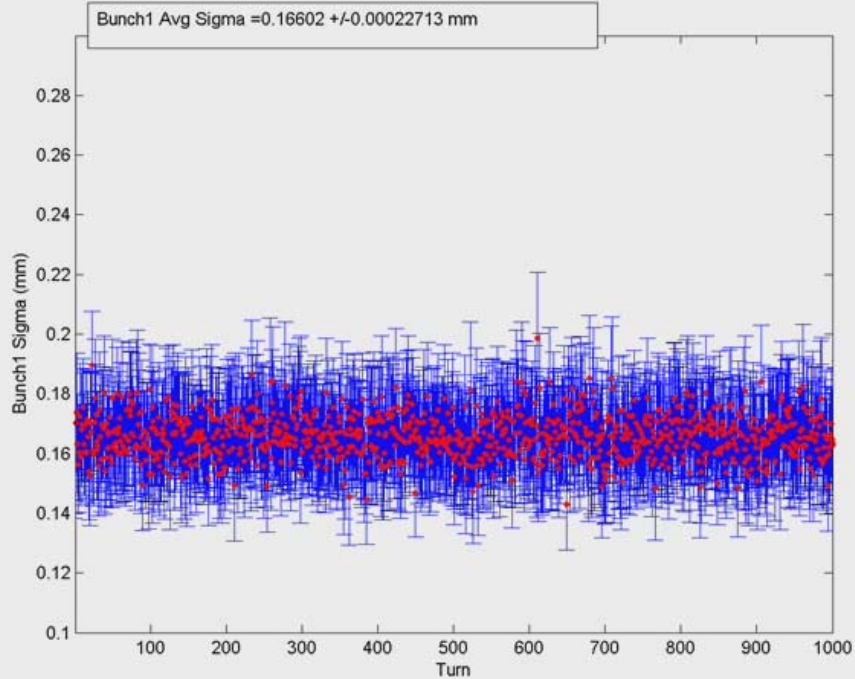
Corrected 112844 f_v+1kHz
File: 907
Peak@~242kHz

Corrected 112844 f_v-2kHz
File: 911
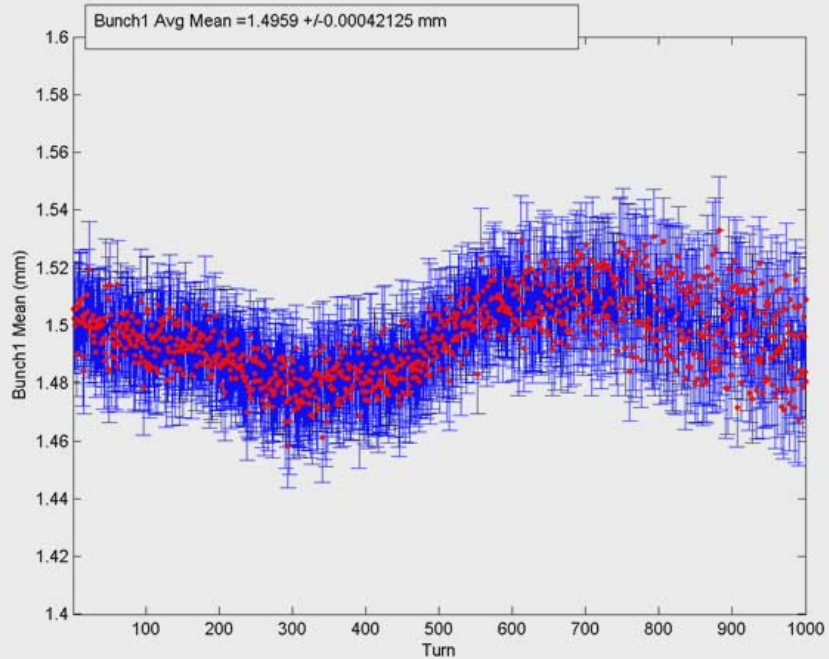Peak@~239kHz

BSM23E907 results54

BSM23E911 results54

Turn-by-turn σ_v
e+ vertical beam size
9x6 e-/e+
I_{e-}=3.9mA/bunch
I_{e+}=3.9mA/bunch
Files: 899, 911

Corrected 112844
File:899
Movie
~30% increase in σ_v for bunch 6

Corrected 112844 f_v-2kHz
File: 911   Movie
No significant σ_v growth along the train
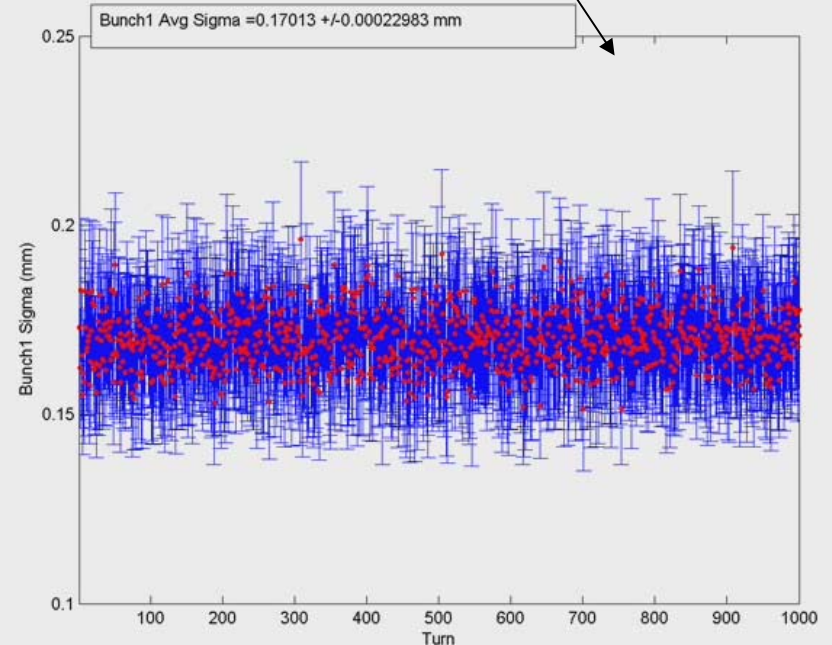
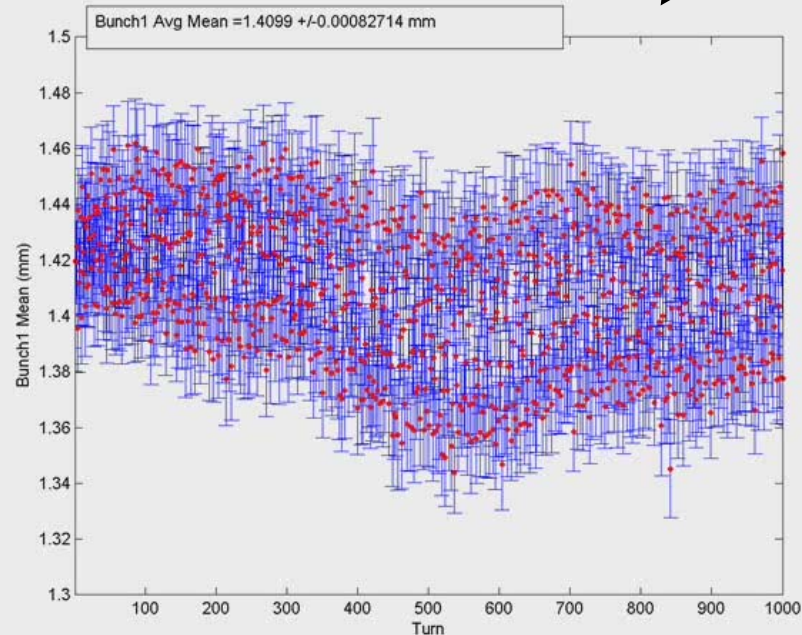**Turn-by-turn Vertical Position**
e+ vertical position
9x6 e-/e+
I_{e-}=3.9mA/bunch
I_{e+}=3.9mA/bunch
Files: 899, 911

Corrected 112844
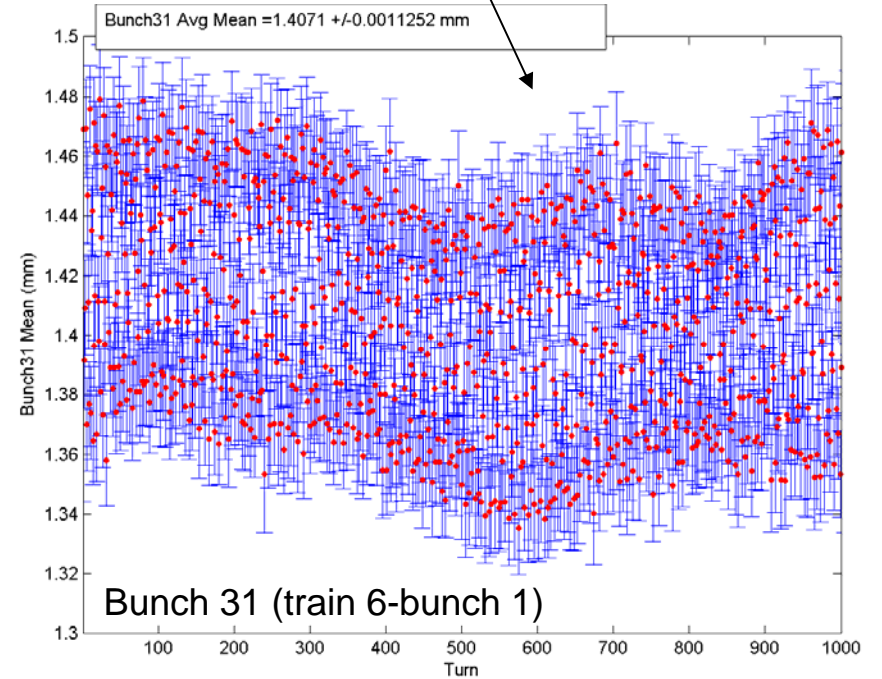File:899
Movie

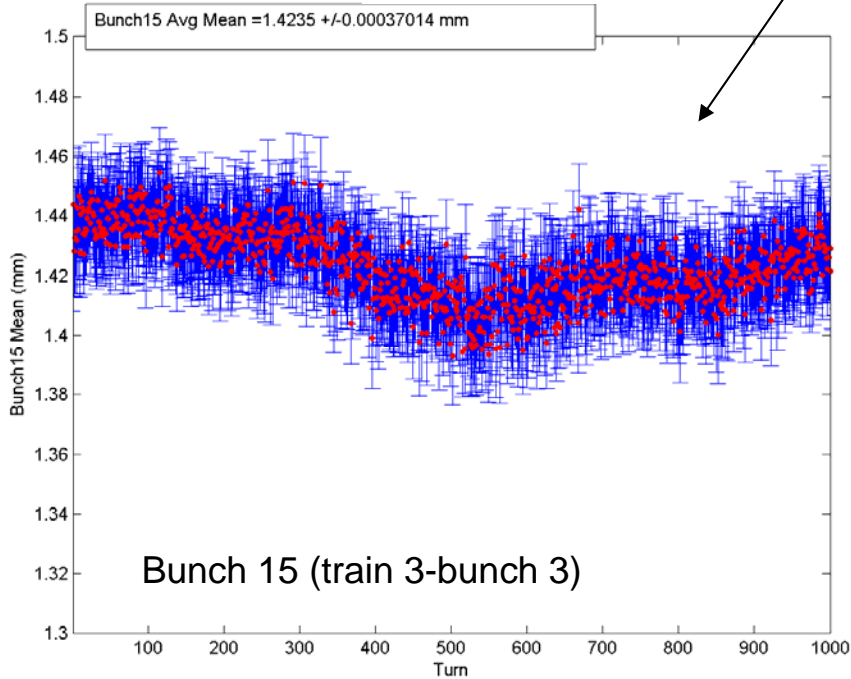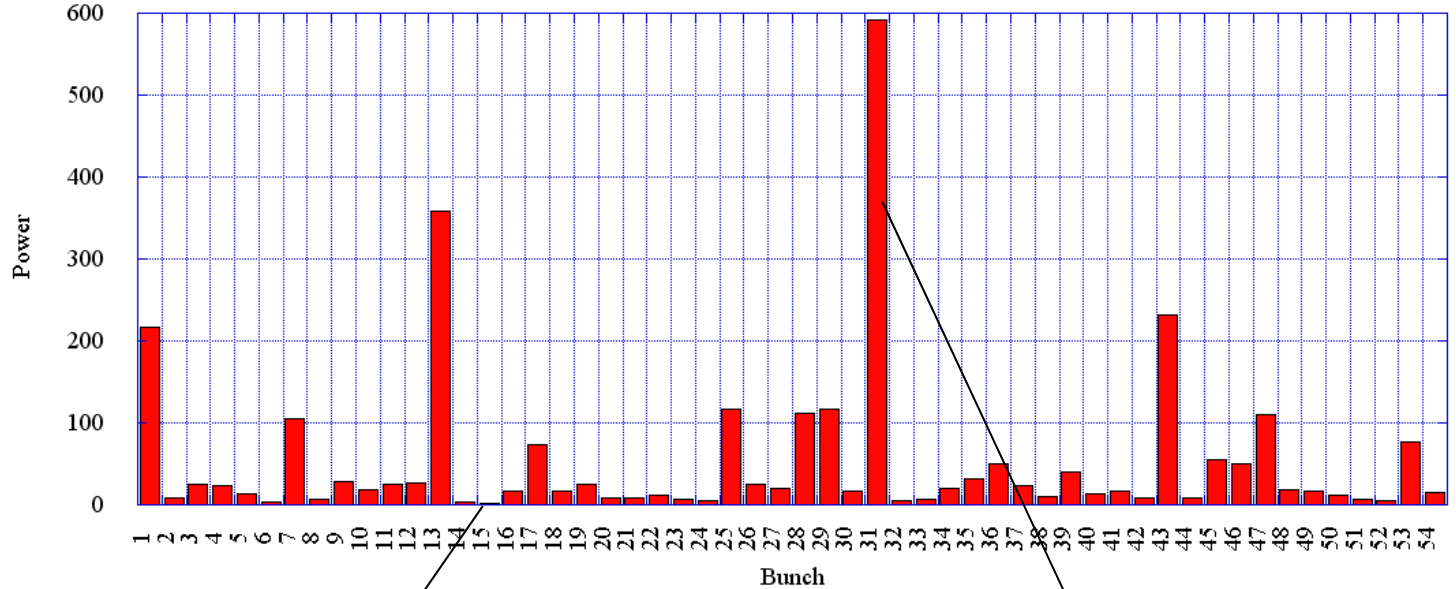Corrected 112844 f_v-2kHz
File: 911   Movie

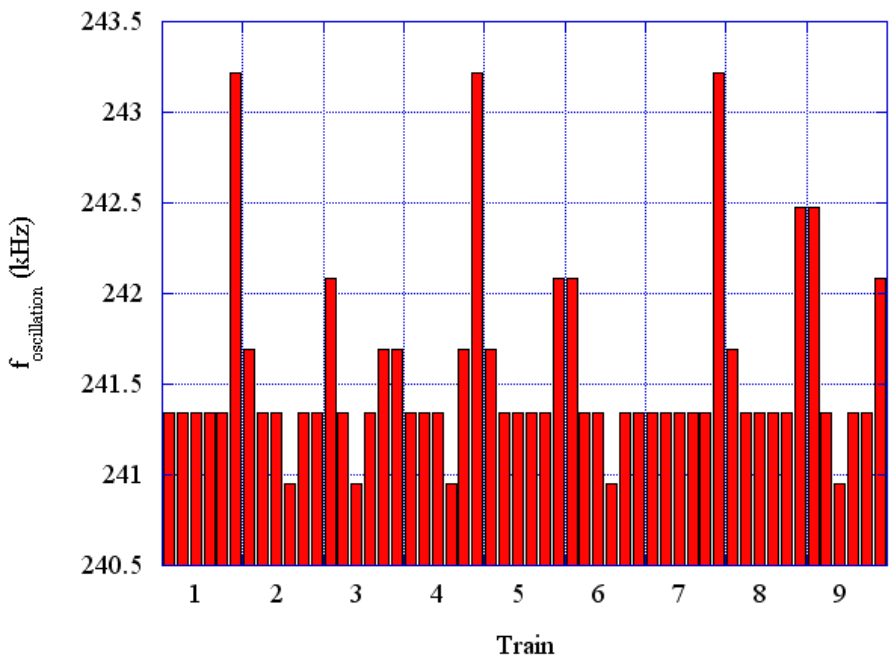e+ high and low frequency oscillations are
detected in the vertical position.

e+ High Frequency Oscillation
Corrected 112844 f_v-2kHz
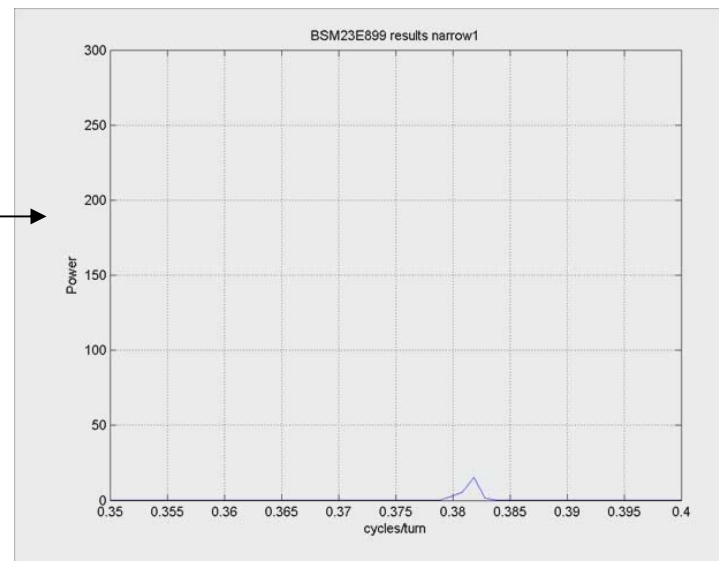File:911

FFT e+ File:911

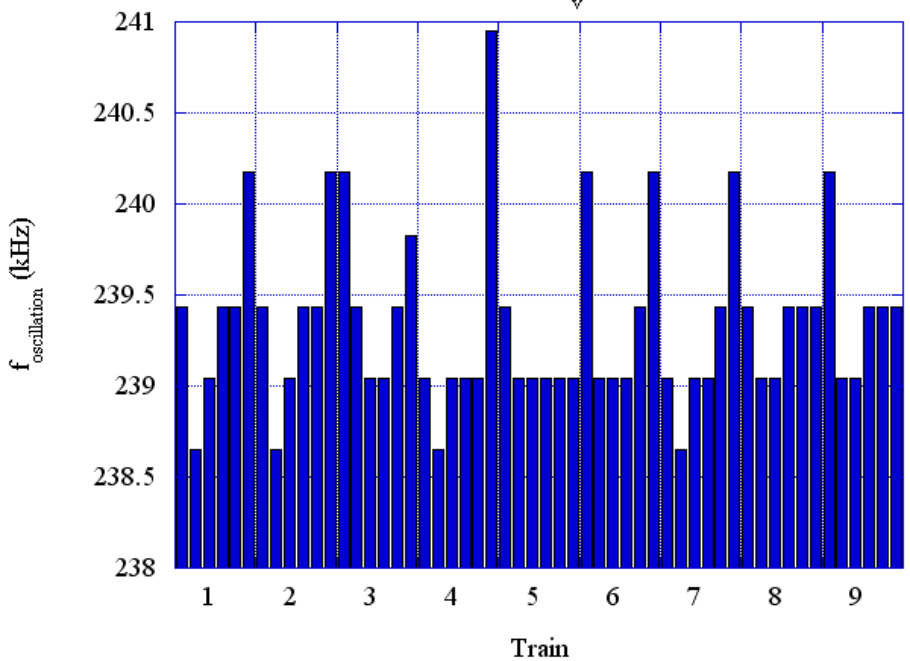Bunch 15 (train 3-bunch 3)

Bunch 31 (train 6-bunch 1)

e+ Corrected 112844 File:899

e+ High Frequency Oscillation at vertical tune f_v
- oscillation shifts along the train similar to f_v
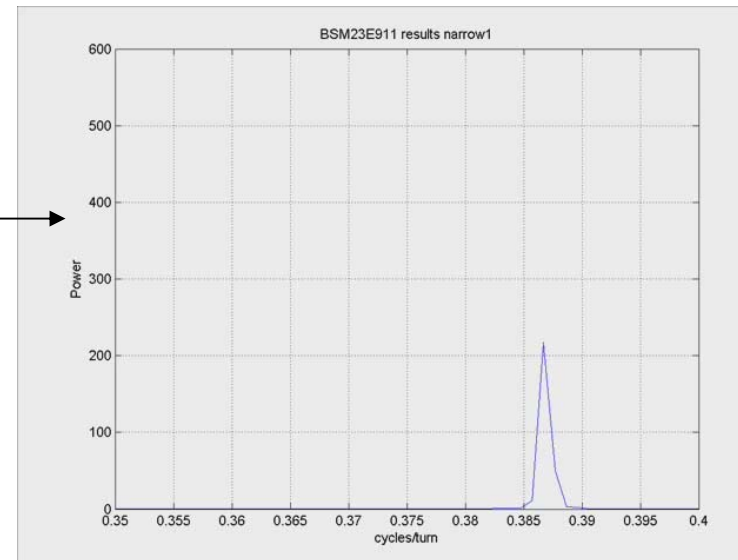
FFT file:899 movie →

BSM23E899 results narrow1

Need better resolution-More turns!

e+ Corrected 112844 f_v -2kHz File:911

FFT file:911 movie →

BSM23E911 results narrow1

BSM23E903 results54

Vertical Tune Change Study
FFT of e+ σ_v
9x6 e-/e+
I_{e-}=3.9mA/bunch
I_{e+}=3.9mA/bunch
Files: 903, 907, 911

Corrected 112844 f_v-1kHz
File:903

Corrected 112844 f_v+1kHz
File: 907

Corrected 112844 f_v+2kHz
File: 911

BSM23E907 results54

BSM23E911 results54
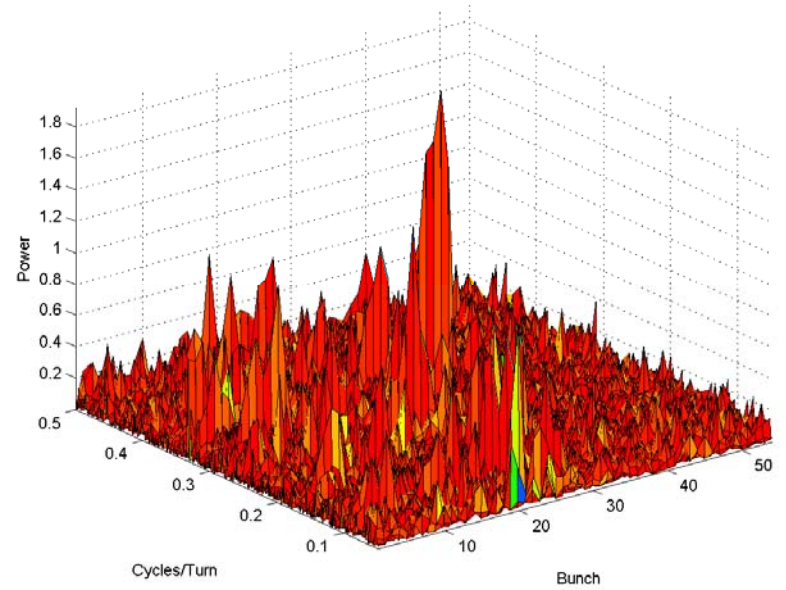
Vertical Tune Study
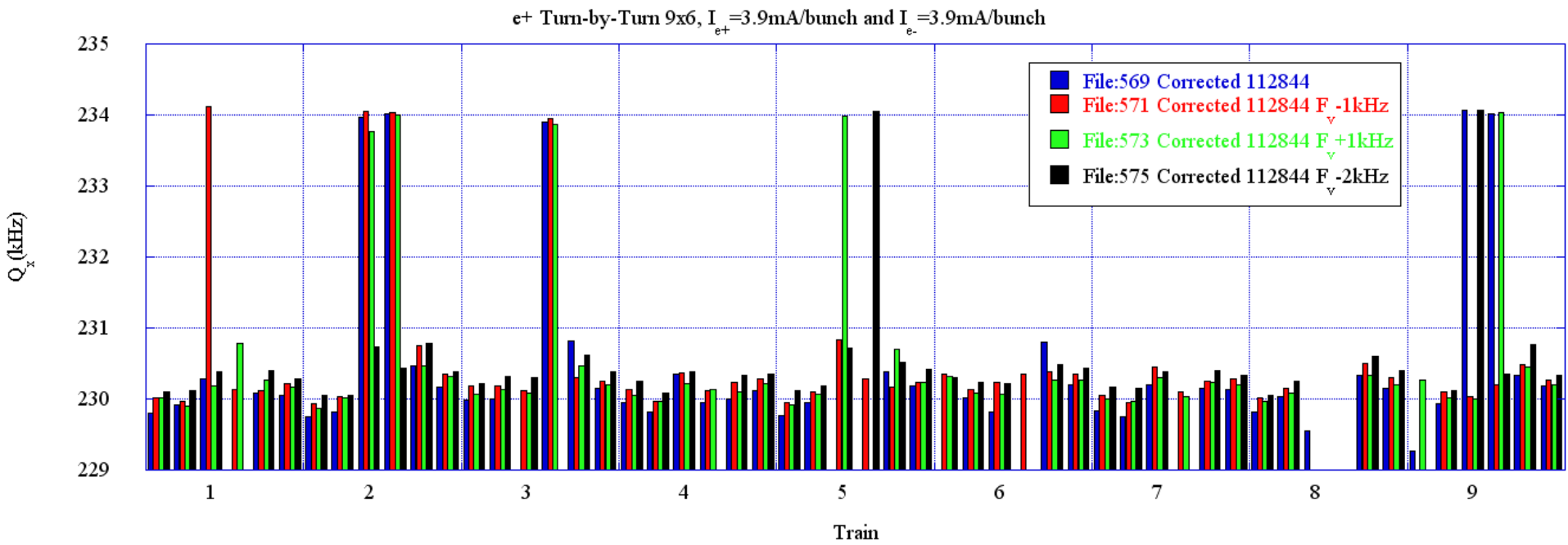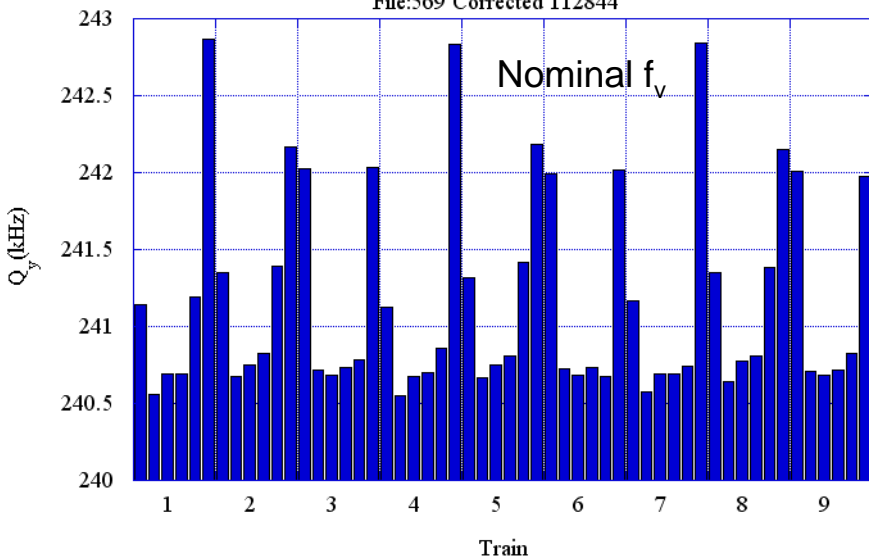e+ Tunes
9x6 e+/e-
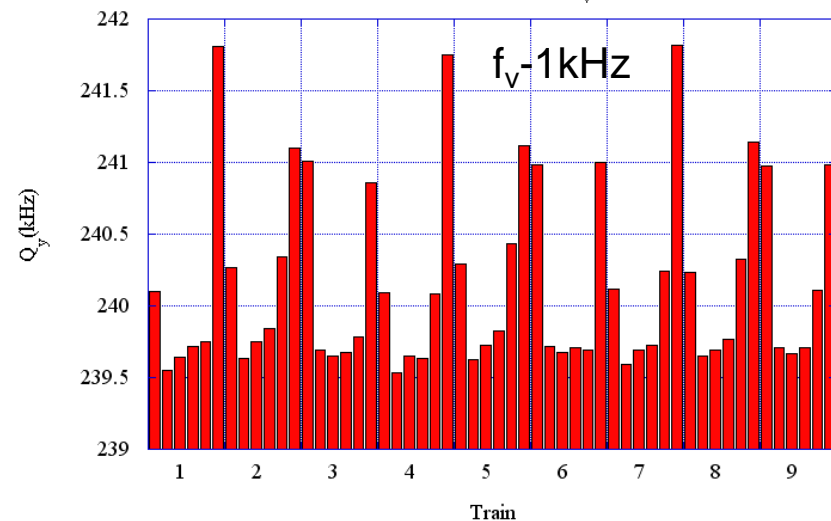I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 569,571,573,575

e+ Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch

File:569 Corrected 112844
File:571 Corrected 112844 F_v-1kHz
File:573 Corrected 112844 F_v+1kHz
File:575 Corrected 112844 F_v-2kHz
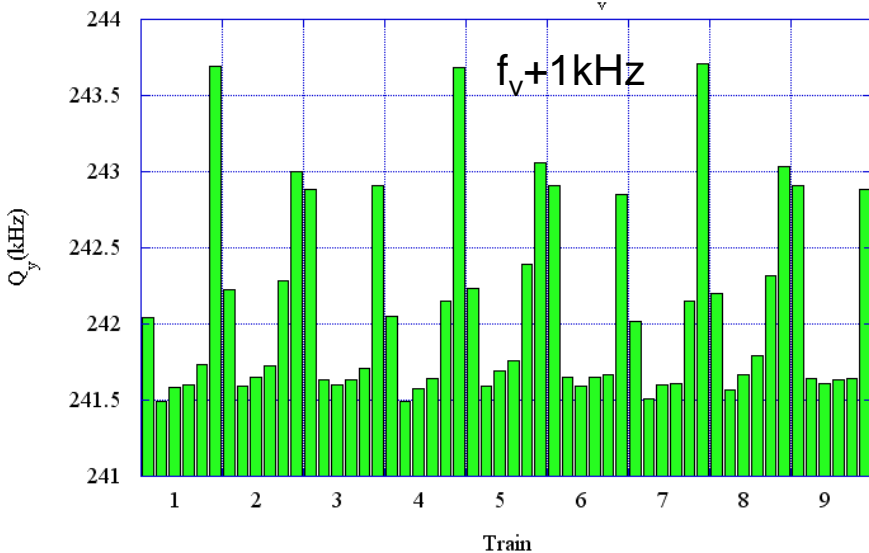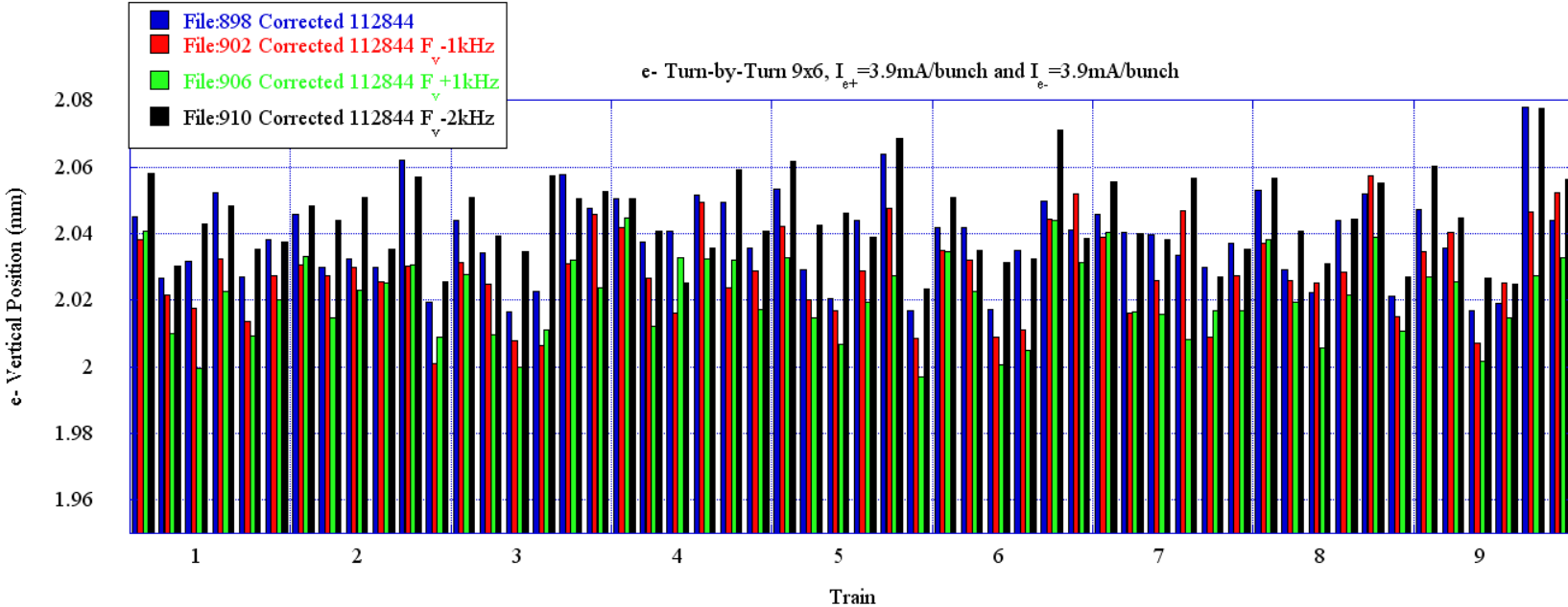
Vertical Tune Study
e+ Tunes
9x6 e+/e

I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 569,571,573,575

Vertical Tune Change Study
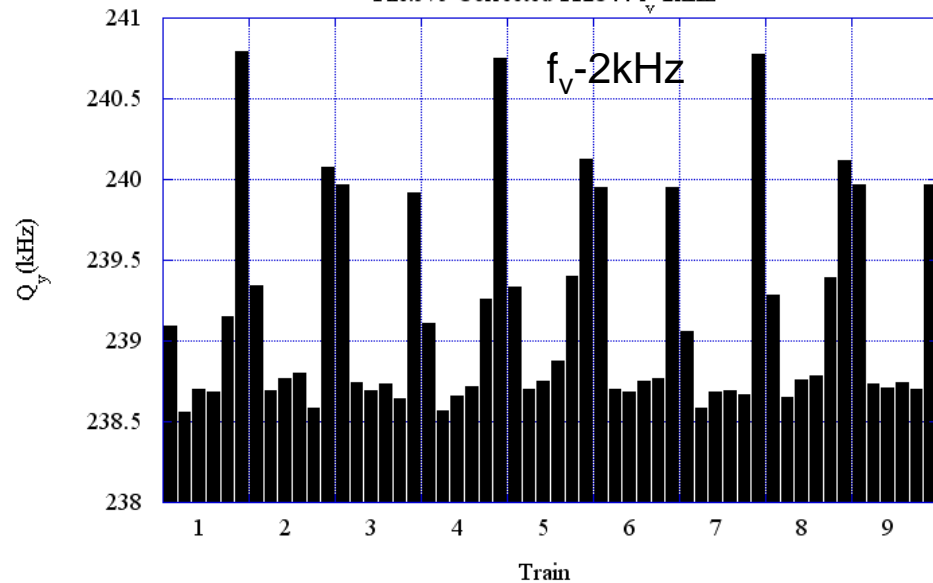
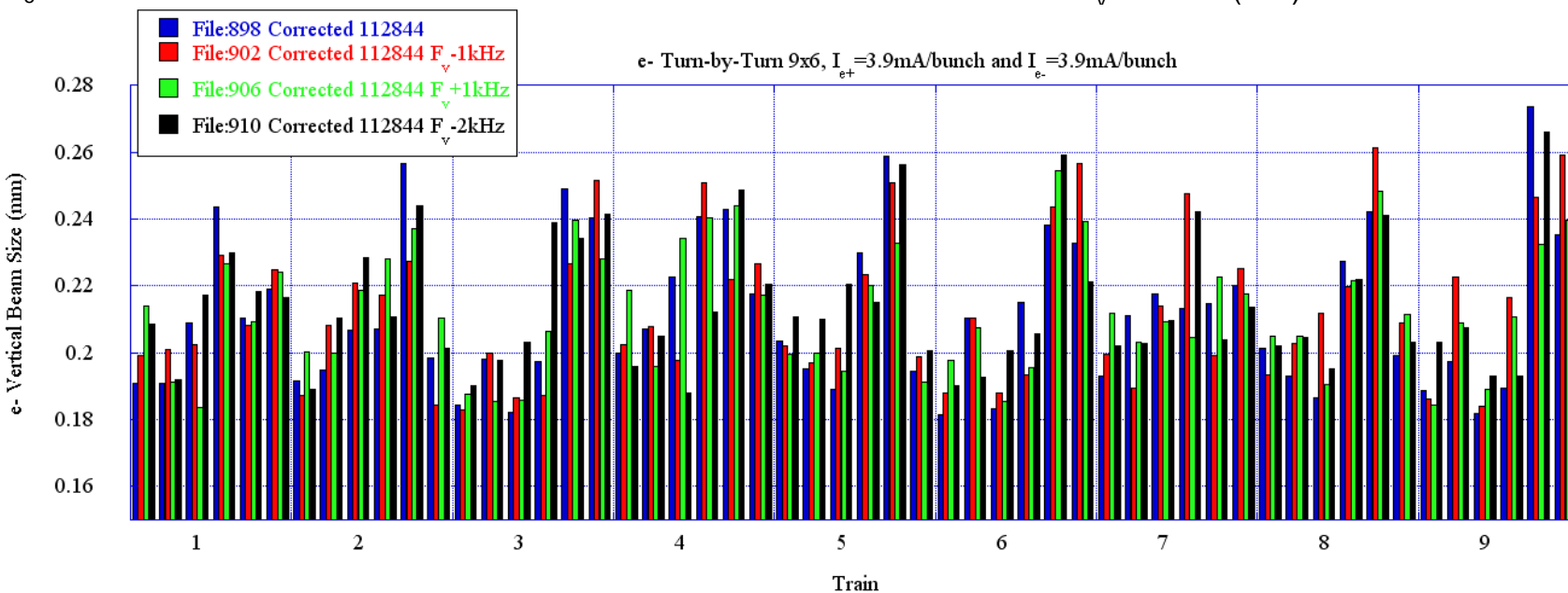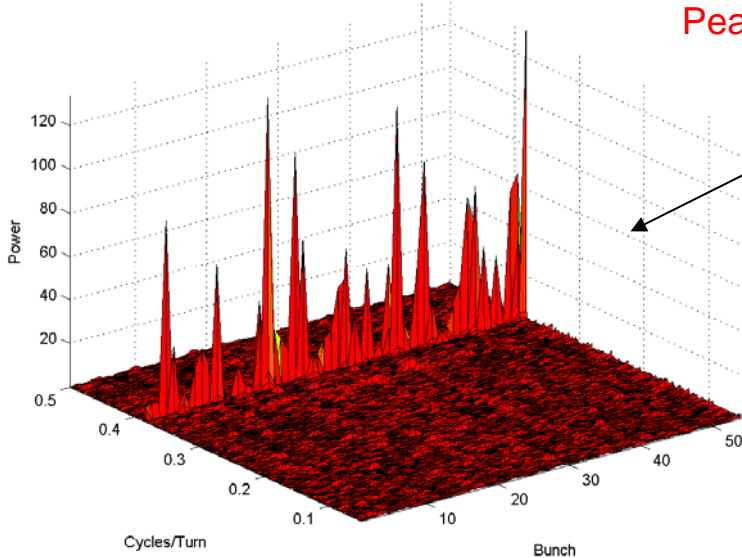e-   9x6 e+/e-
I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch

SL σ_v=174mm (898)
SL σ_v=???mm (902)
SL σ_v=173mm (906)
SL σ_v=190mm (910)

Files: 898,902,906,910

BSM23W902 results54

Vertical Tune Change Study
FFT of e- vertical position
9x6 e-/e+
I_{e-}=3.9mA/bunch
I_{e+}=3.9mA/bunch
Files: 902,906,910

Corrected 112844 f_v-1kHz
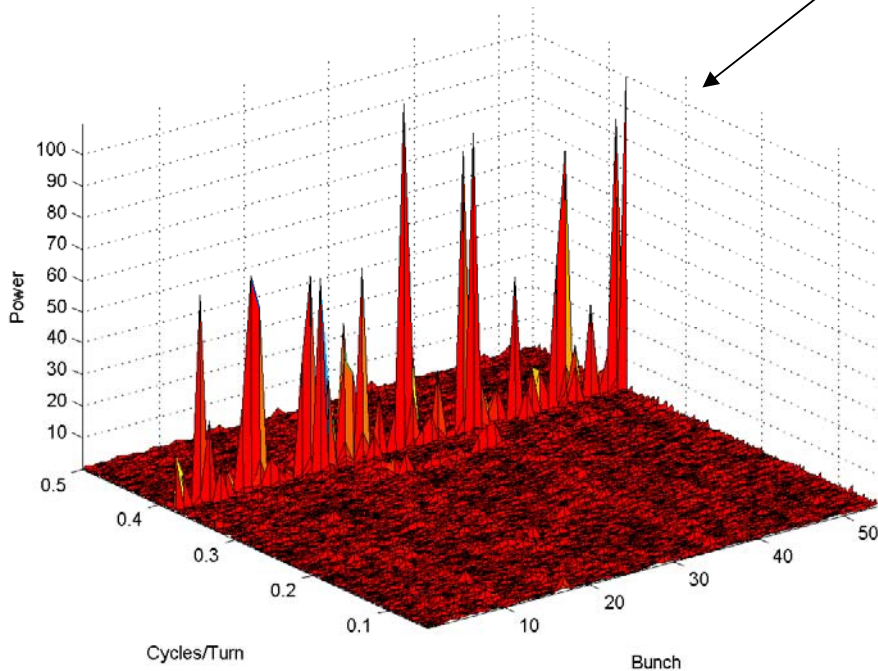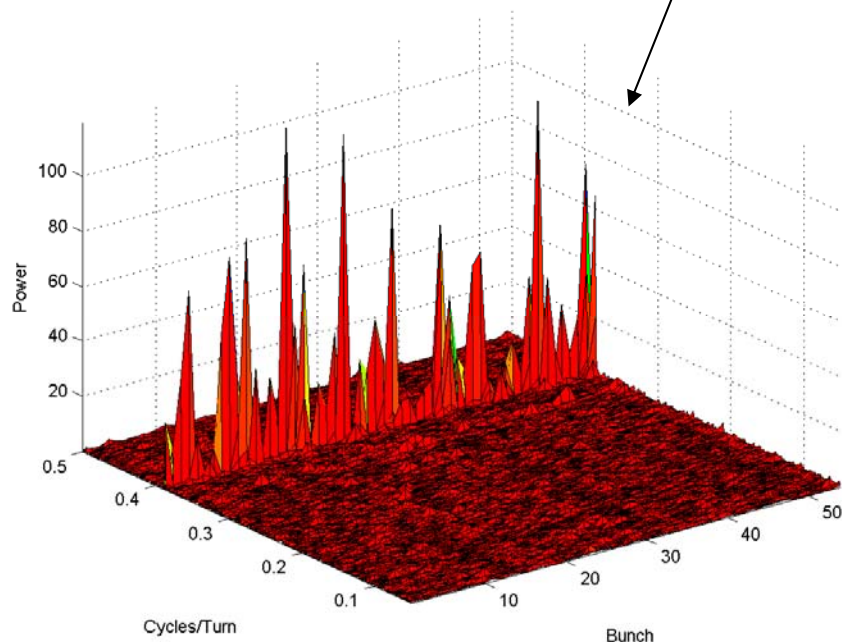File:902
Peak@~240kHz

e- oscillate at e+ vertical tune

Corrected 112844 f_v+1kHz
File: 906
Peak@~242kHz

Corrected 112844 f_v+2kHz
File: 910
Peak@~239kHz

BSM23W906 results54

BSM23W910 results54
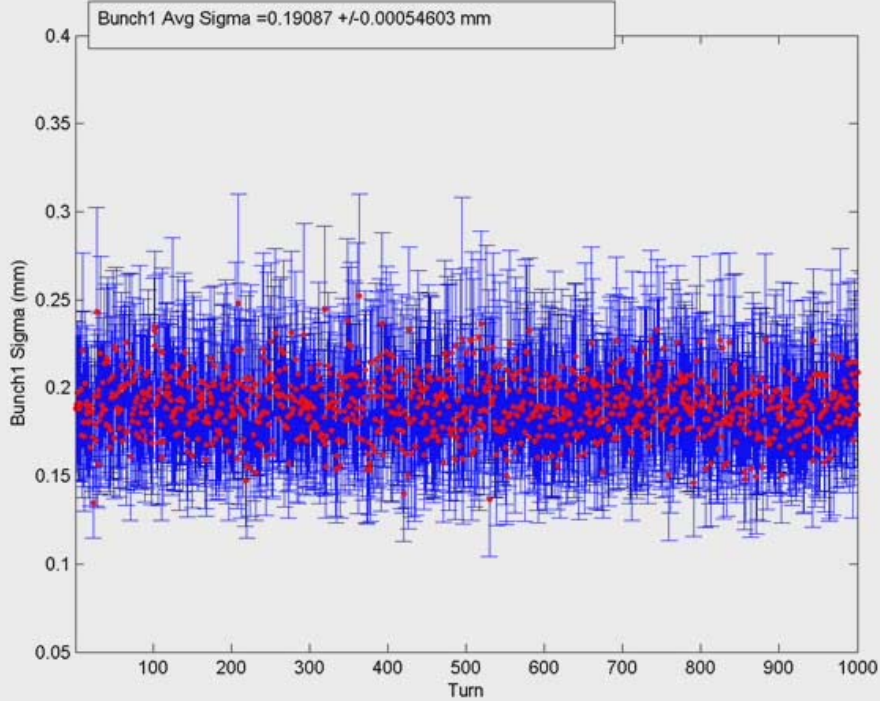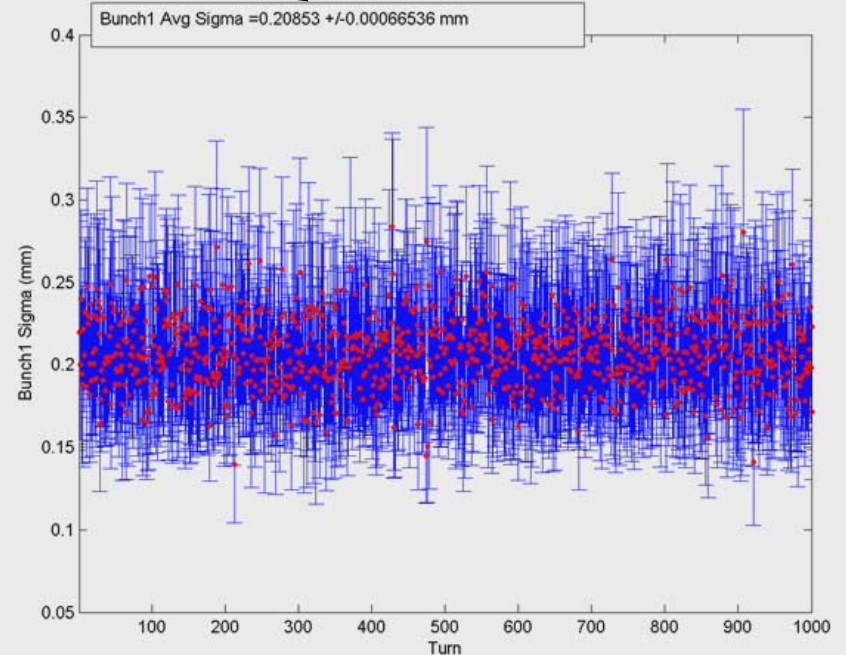
Turn-by-turn σ_v
e- vertical beam size
9x6 e-/e+
I_{e-}=3.9mA/bunch
I_{e+}=3.9mA/bunch
Files: 898, 910

Corrected 112844
File:898
Movie
σ_v growth along the train

Corrected 112844 f_v-2kHz
File: 910   Movie
σ_v growth along the train

σ_v growth along the train and large turn-by-turn σ_v variation.
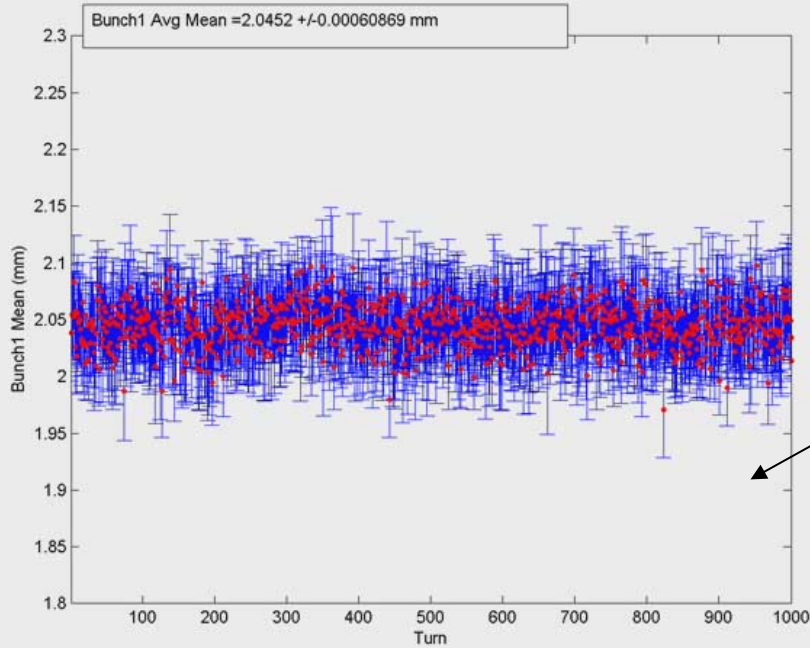
Turn-by-turn Vertical Position
e- vertical position
9x6 e-/e+
I_{e-}=3.9mA/bunch
I_{e+}=3.9mA/bunch
Files: 898, 910

Corrected 112844
File:898
Movie

Corrected 112844 f_v-2kHz
File: 910   Movie

e- high frequency vertical position oscillation is evident.

Vertical Tune Change Study
FFT of e- σ_v
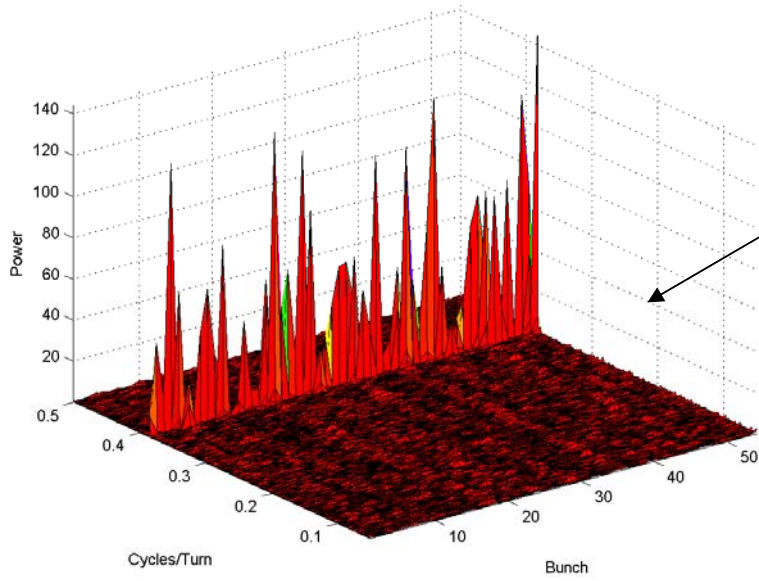9x6 e-/e+
I_{e-}=3.9mA/bunch
I_{e+}=3.9mA/bunch
Files: 902,906,910
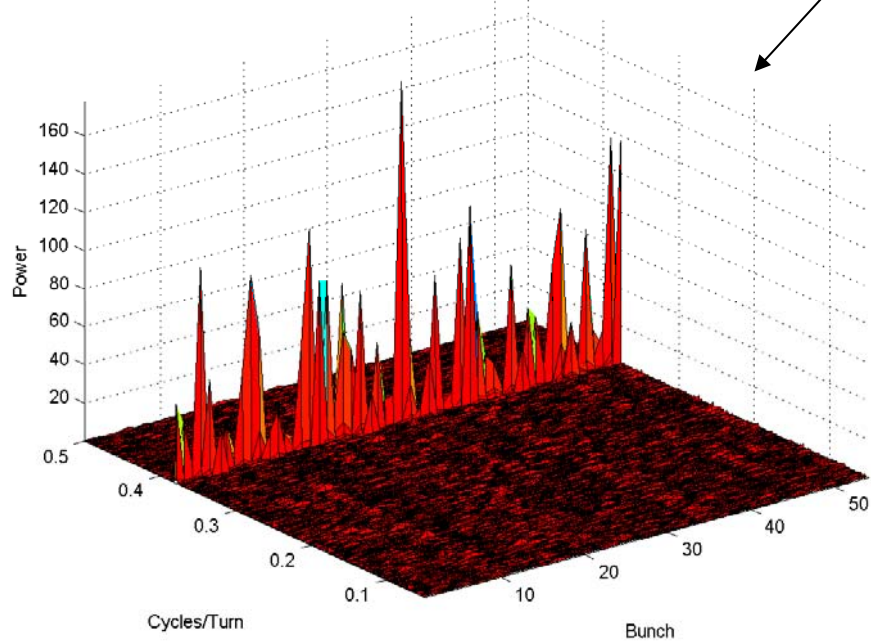
Corrected 112844 f_v-1kHz
File:902
Peak@~240kHz

Corrected 112844 f_v+1kHz
File: 906
Peak@~242kHz

Corrected 112844 f_v+2kHz
File: 910
Peak@~239kHz

Vertical Tune Study
e- Tunes
9x6 e+/e-
I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 570,572,574,576

e- Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch

File:570 Corrected 112844
File:572 Corrected 112844 f_v-1kHz
File:574 Corrected 112844 f_v+1kHz
File:576 Corrected 112844 f_v-2kHz

e- Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch
File:570 Corrected 112844
Nominal f_v

e- Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch
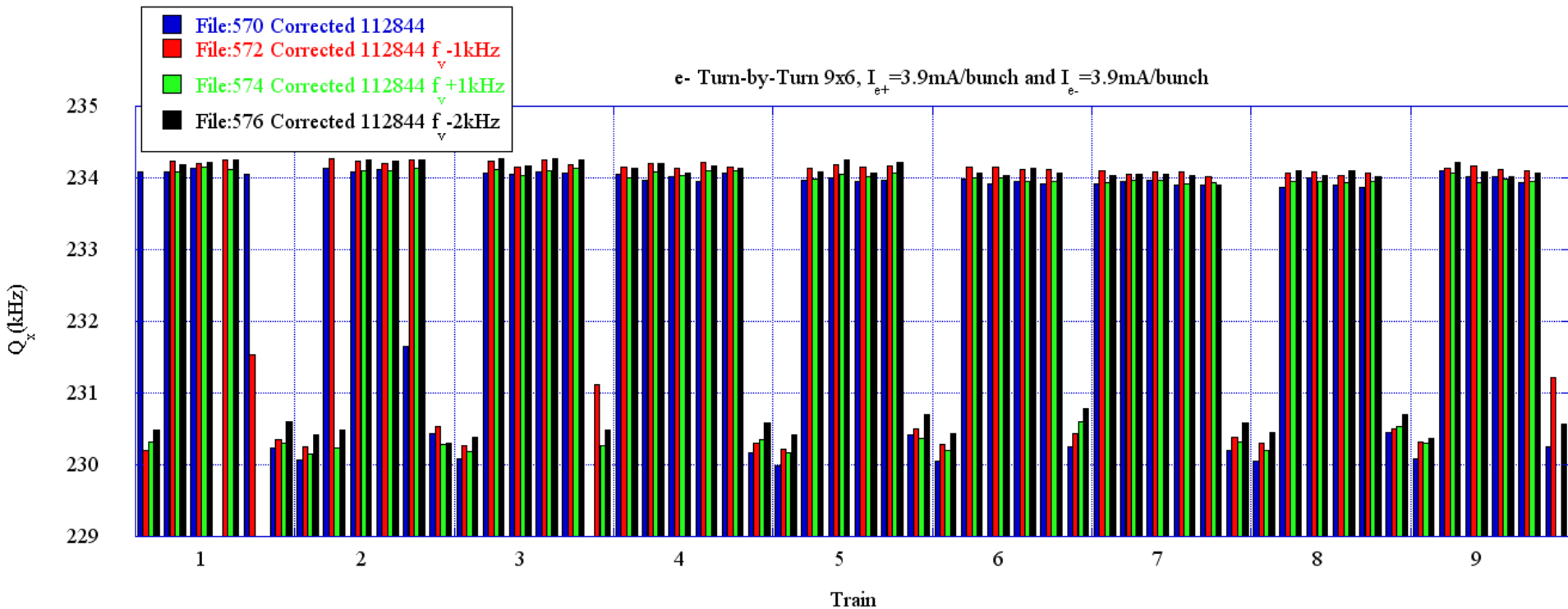File:572 Corrected 112844 f_v-1kHz
f_v-1kHz

Vertical Tune Study
e- Tunes
9x6 e+/e
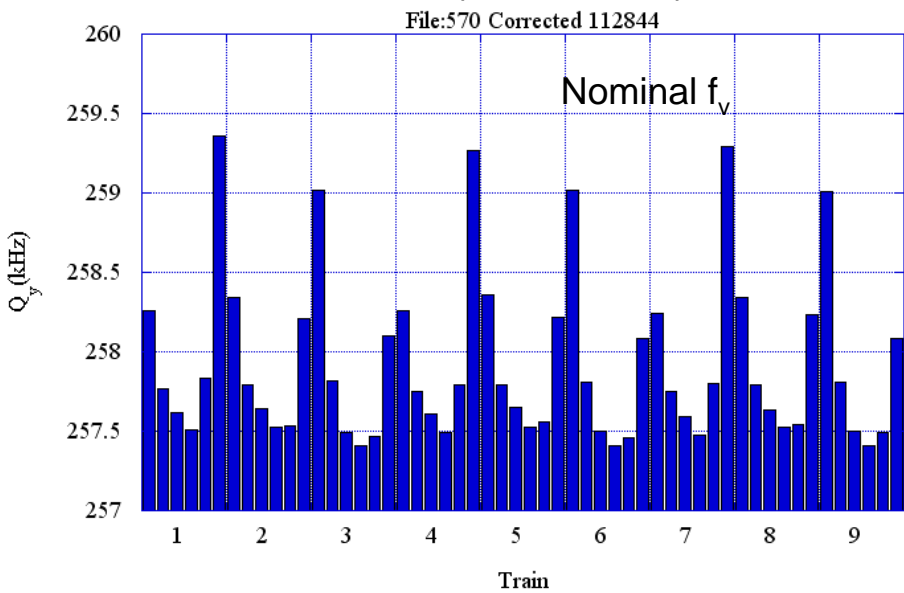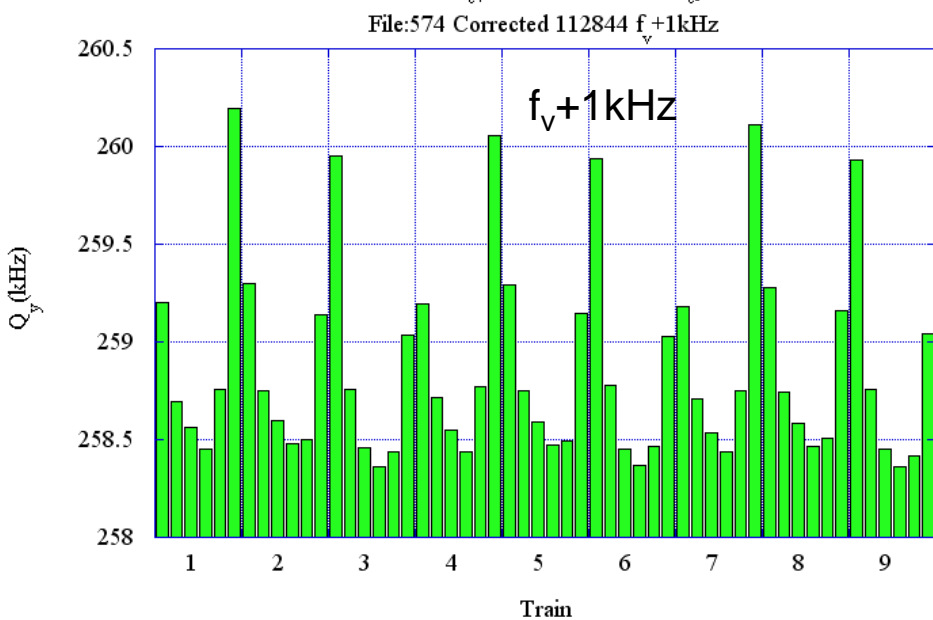
I_{e+}=3.9mA/bunch
I_{e-}=3.9mA/bunch
Files: 570, 572, 574, 576

e- Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch
File:574 Corrected 112844 f_v+1kHz
f_v+1kHz

e- Turn-by-Turn 9x6, I_{e+}=3.9mA/bunch and I_{e-}=3.9mA/bunch
File:576 Corrected 112844 f_v-2kHz
f_v-2kHz