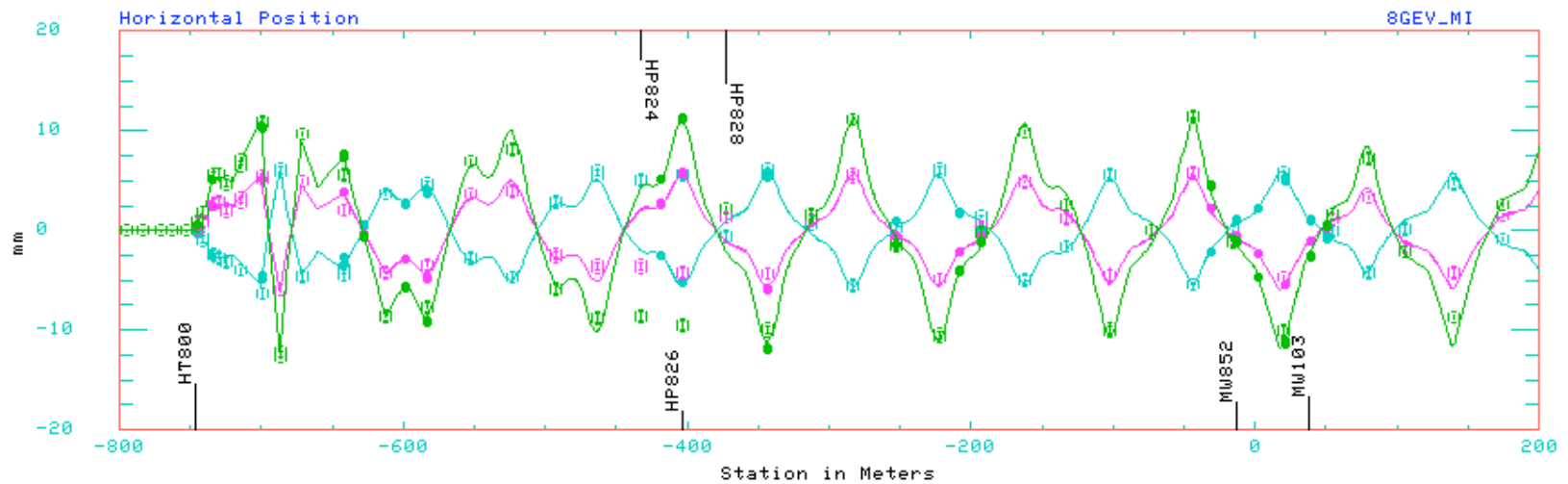
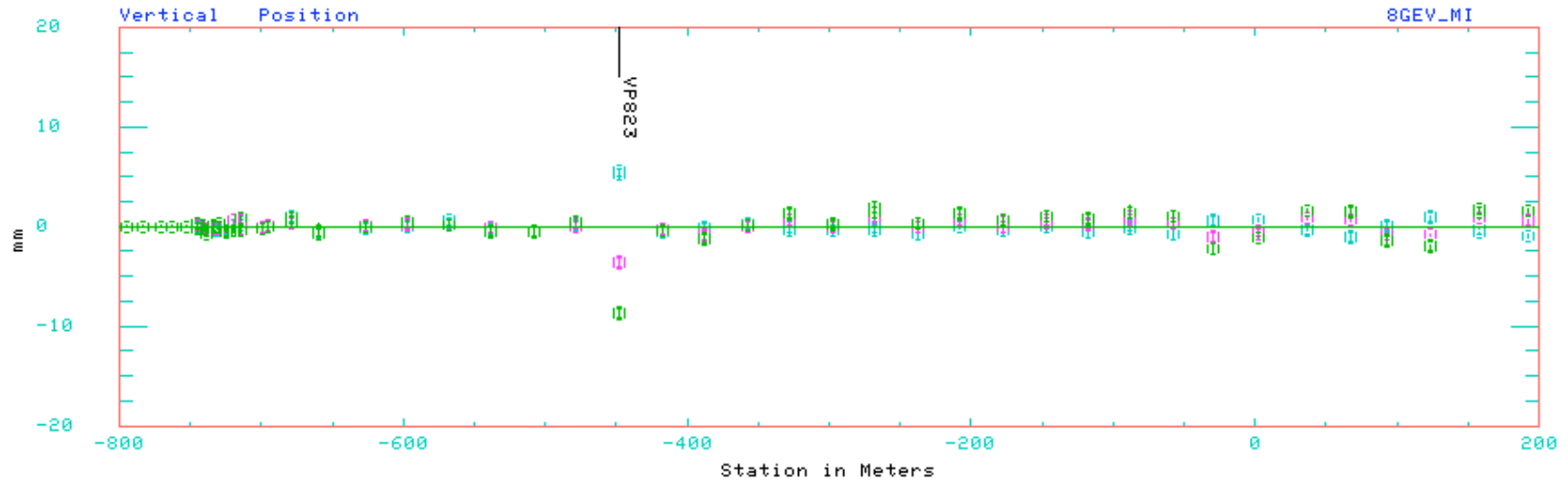


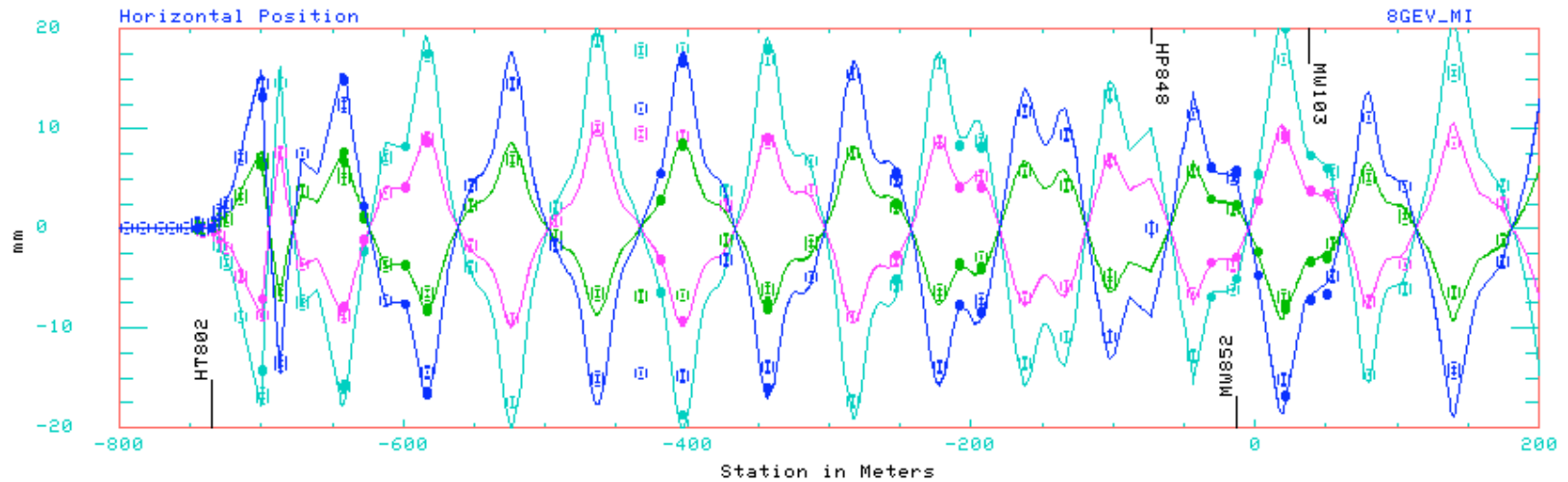
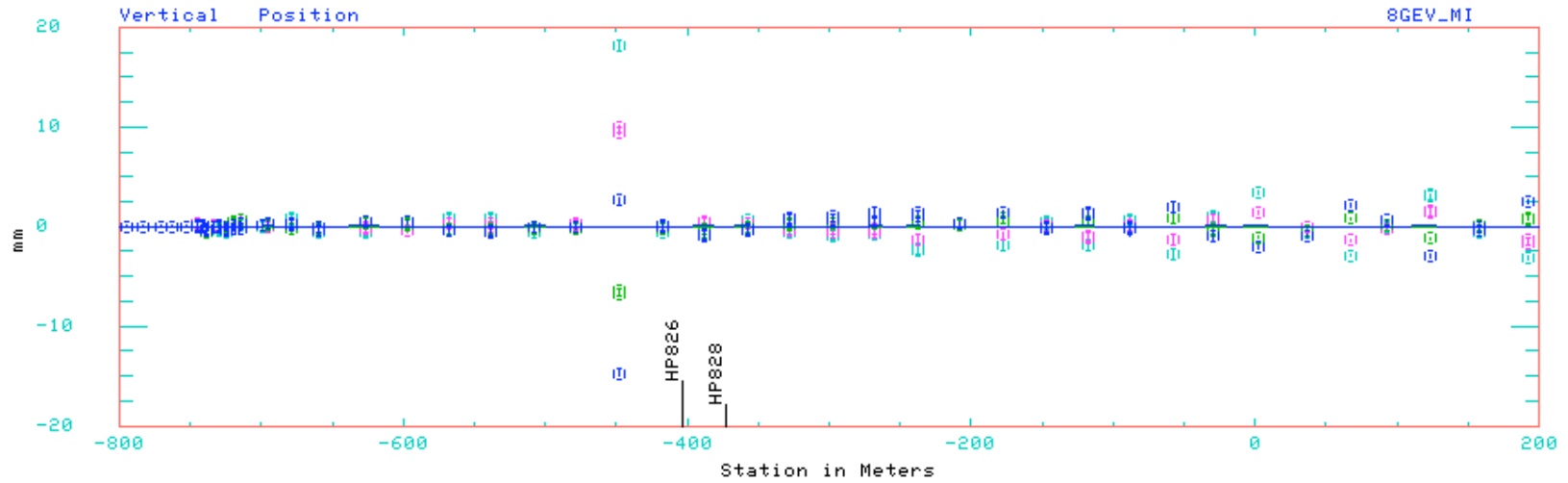
MI8 line optics study

- **Orbits**
 - Horizontal
 - Vertical
 - ✓ MPØ2
- **Dispersion function**
 - Horizontal
 - Vertical
 - ✓ MPØ2
- **Lattice function**
 - Beam size sigma & σ_p/P
 - MI injection matching
- **Transverse coupling**

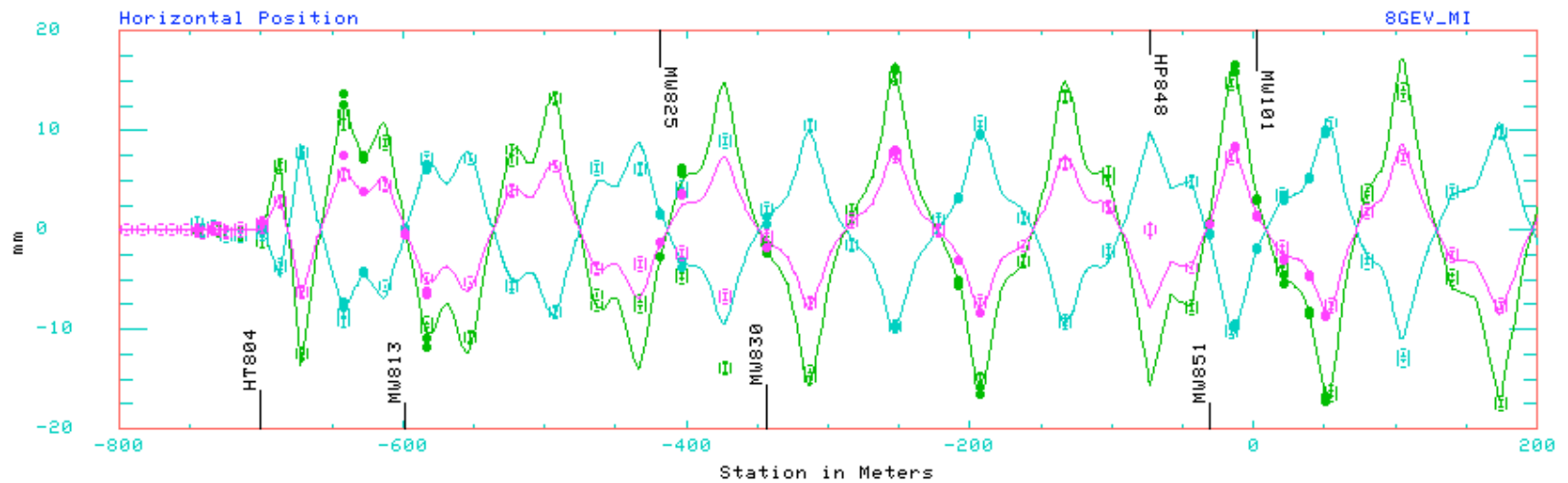
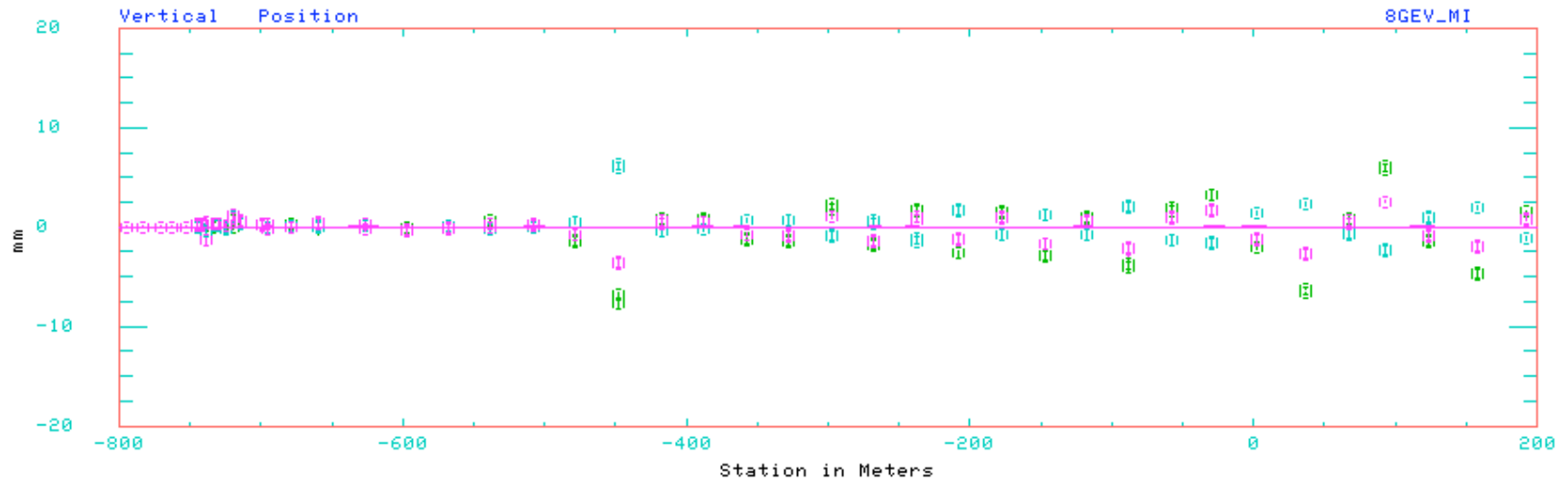
Orbits from HT800



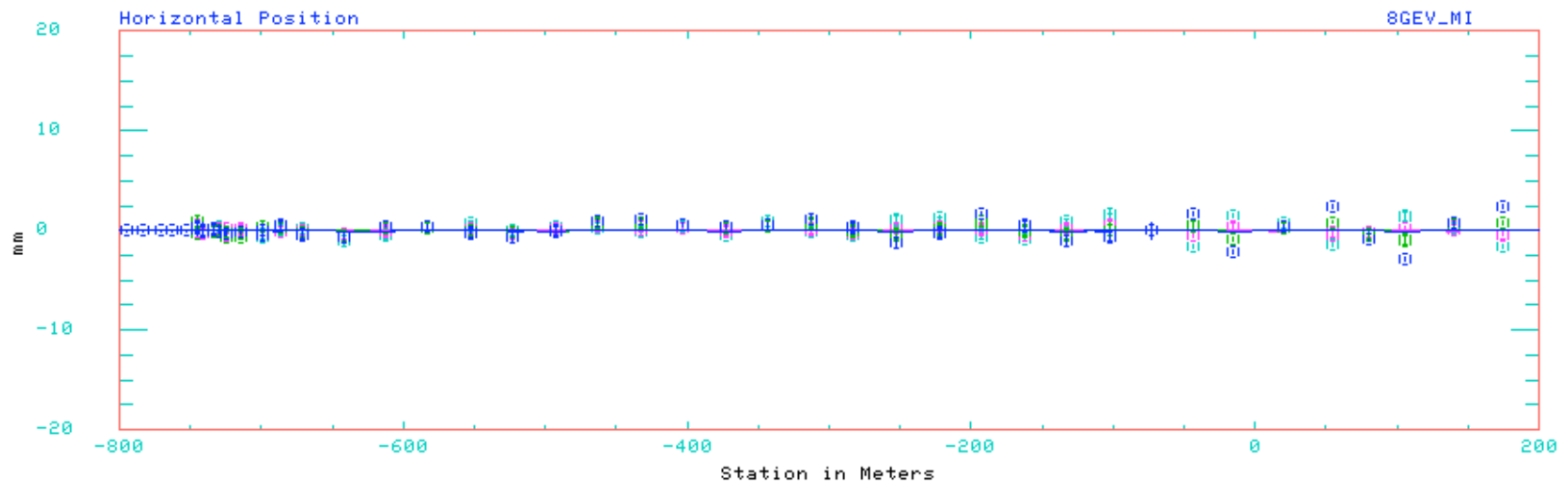
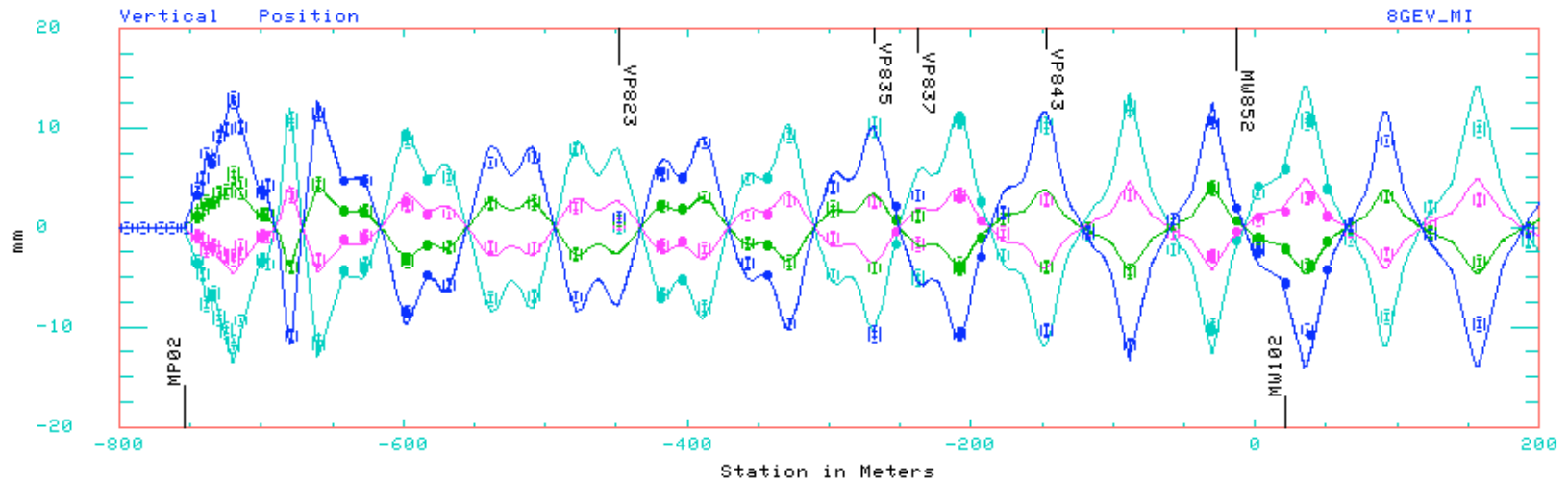
Orbits from HT802



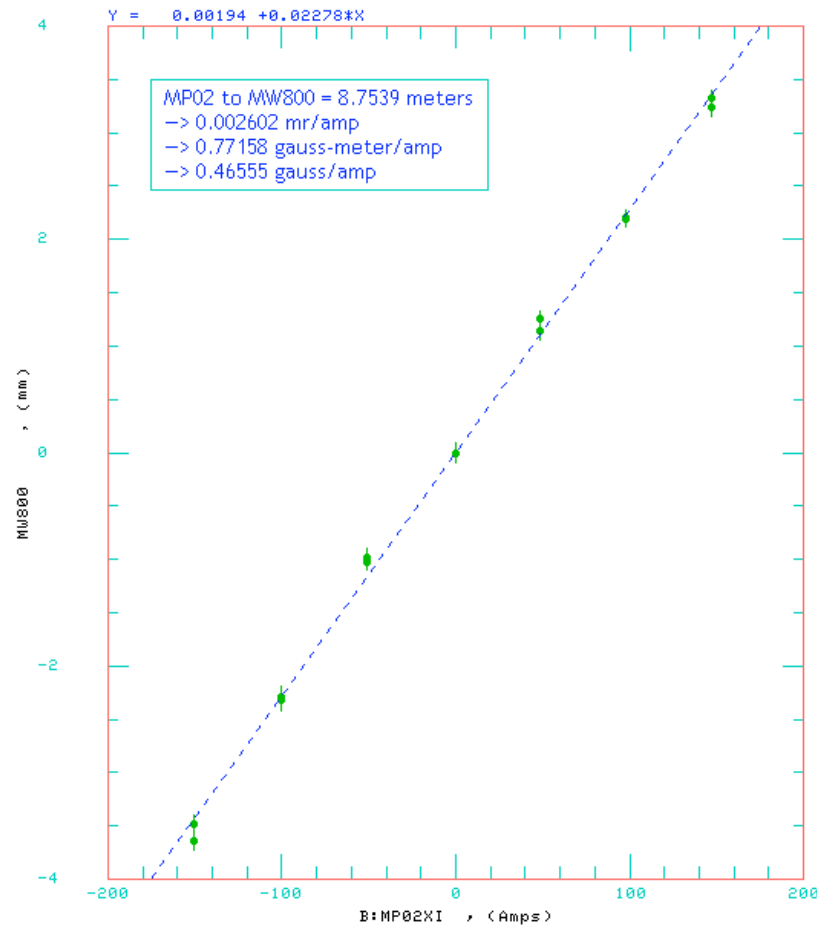
Orbits from HT804



Orbits from MPØ2

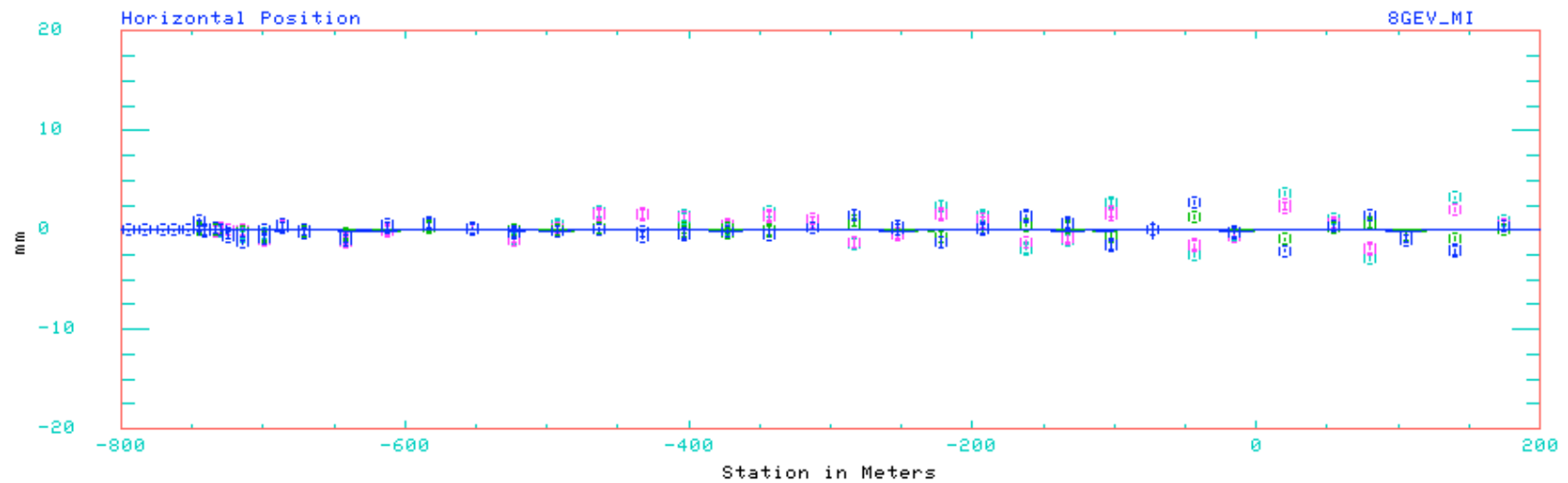
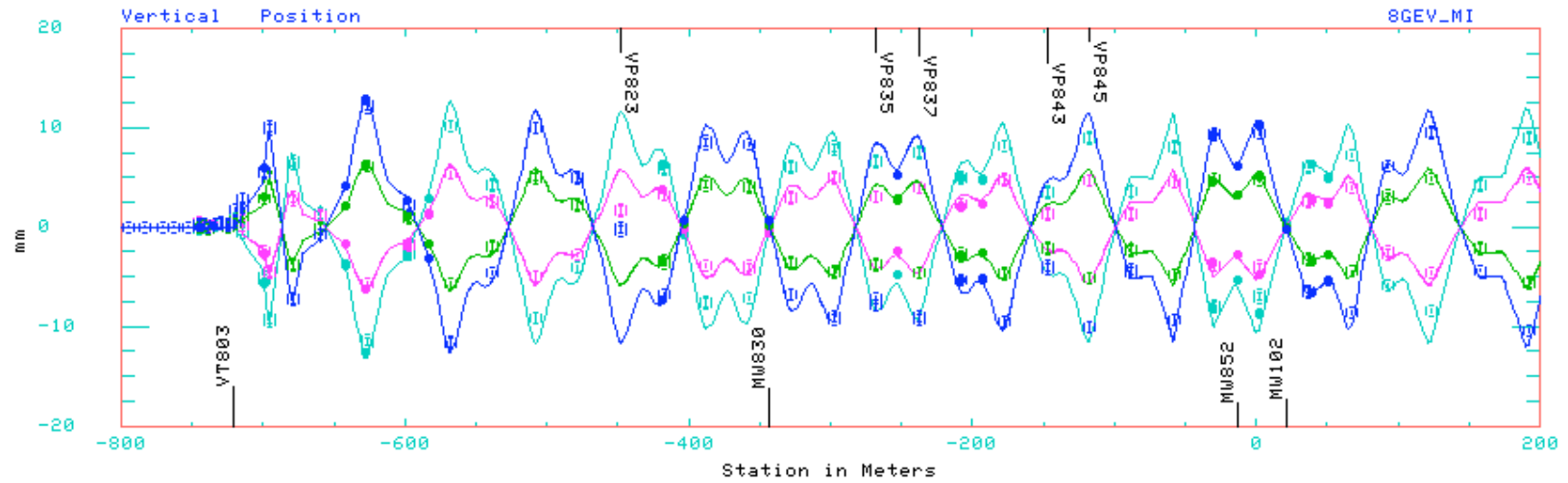


Calibrating MPØ2 kick with MW800 multiwire data

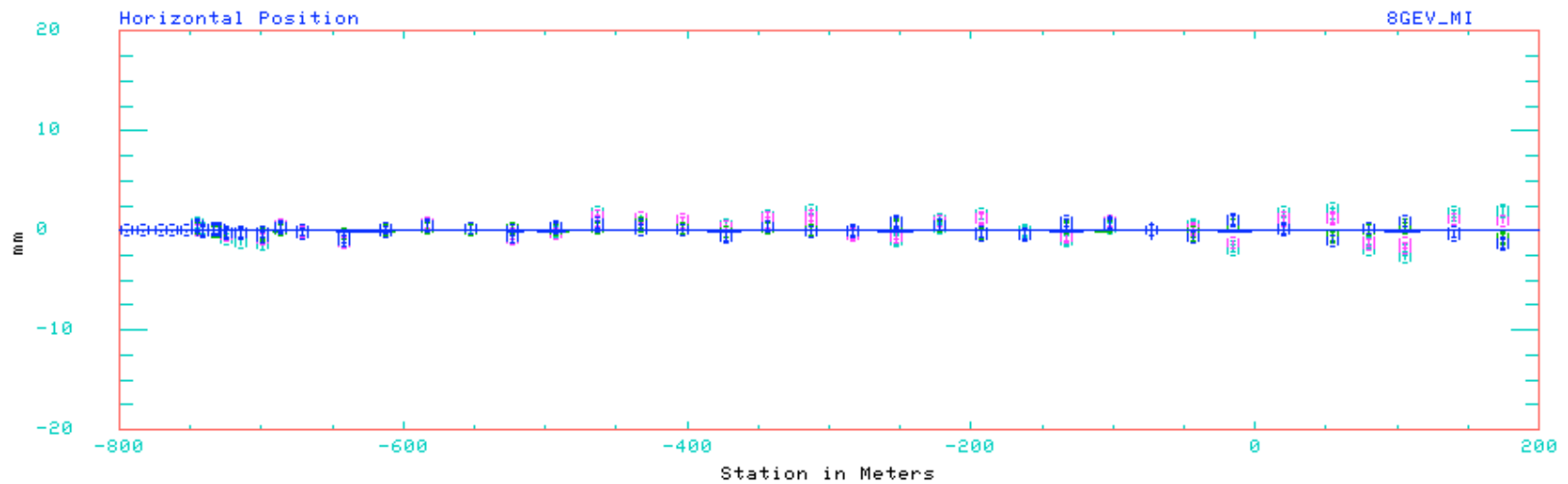
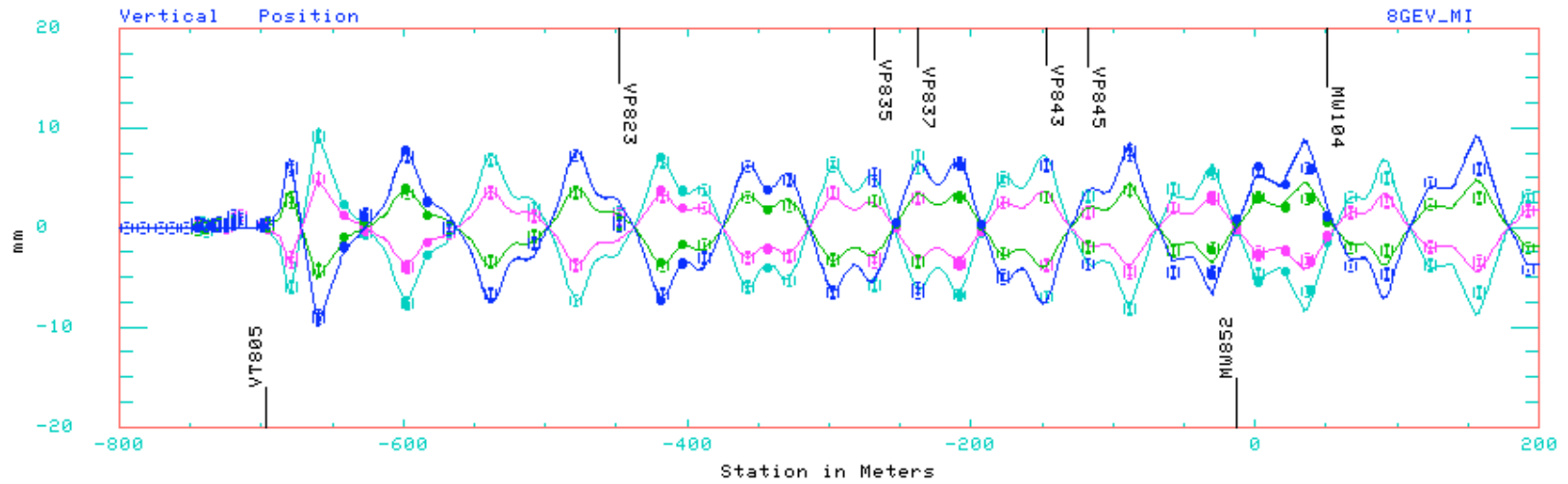


58.5 mr @ 22484 amps

Orbits from VT803



Orbit from VT805



Quad current setting

DB_name		Setting	prev_set	reading	prev_read
B:MP02XI	Amps	22566.83		22484.06	
MP02T	AMPS	0		0	
B:MISBND	AMP	1799.393		799.9719	799.5219
Q800	AMP	0		211.6619	
Q801	AMP	0		172.2619	
Q802	AMP	0		166.9559	
Q803	AMPS	0		122.2937	104.2937
Q804	Amps	0		225.7419	
Q805	Amps	0		245.5819	
Q806	Amps	0		163.9559	
Q807	Amps	0		143.3959	149.3959
Q808	Amps	0		200.1019	
Q809	Amps	0		206.1419	202.1419
Q847	Amps	0		158.9113	
Q848	Amps	0		143.9113	
Q849	Amps	0		169.6613	
Q850	Amps	0		161.3212	
Q851	Amps	0		160.0513	153.0513
Q852	Amps	0		162.8013	
B:Q800S	Amps	43.74		43.3225	
B:Q801S	Amps	42.18		41.7225	
B:Q802S	Amps	15.6		15.8425	
B:Q804S	Amps	29.44		29.2425	
B:Q805S	Amps	9.38		9.4025	
B:Q806S	Amps	18.7		18.8425	
B:Q807S	Amps	33.5		39.4025	33.4025
B:Q808S	Amps	13.88		13.8825	
B:Q809S	Amps	11.88		7.8425	11.8425
I:Q847S	Amps	10.92		10.9325	
I:Q848S	Amps	25.96		25.9325	
I:Q849S	Amps	0		0.1825	
I:Q850S	Amps	8.52		8.5225	
I:Q851S	Amps	16.8		9.7925	16.7925
I:Q852S	Amps	6.98		7.0425	
B:Q800	AMP	254.9896		254.9844	
B:Q801	AMP	215.4999		213.9844	
B:Q802	AMP	183.0963		182.7984	
B:Q803	AMPS	117.9993		122.2937	104.2937
I:Q847	AMP	171.4966		169.8438	
I:IQD	Amps			205.9111	
I:IQF	Amps			210.4282	
K1PGD_F		4.656277		4.646277	
K1PGD_D		-4.656277		-4.646277	

➤ B:Q803

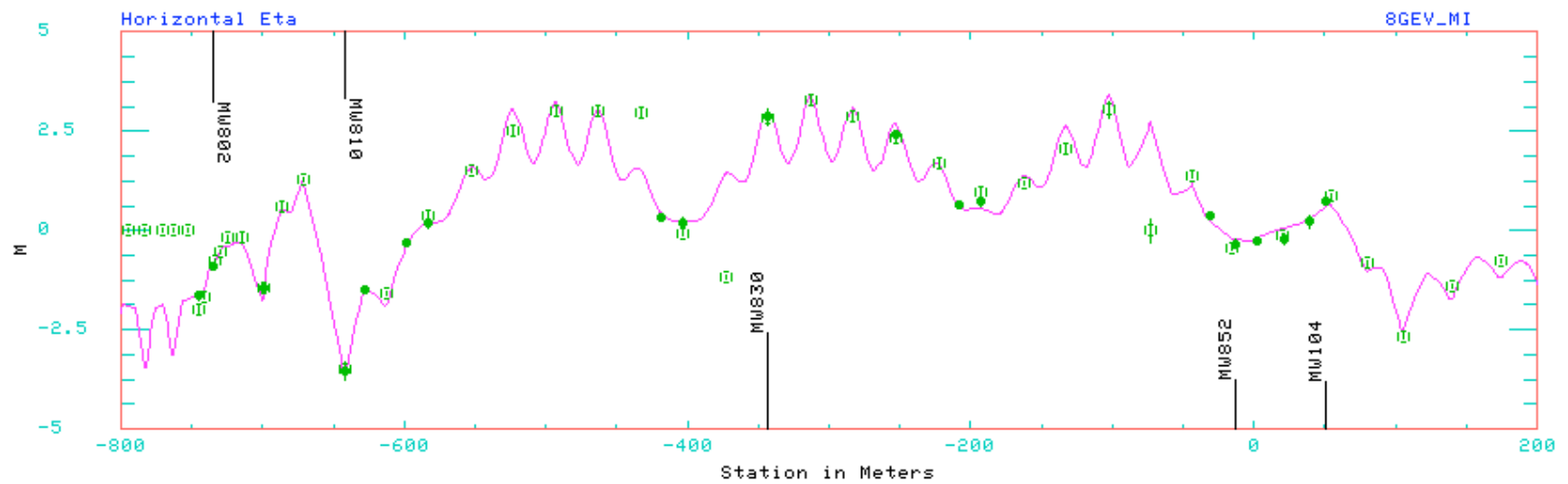
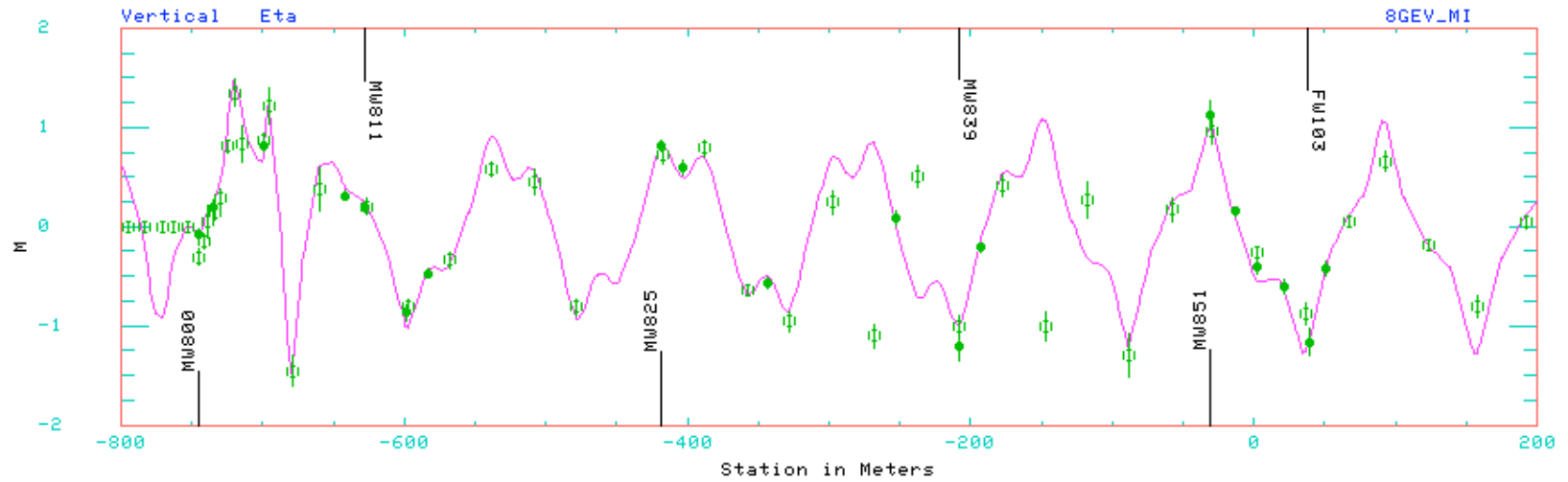
Value closer to the setting.

➤ Shunt current I:Q851S

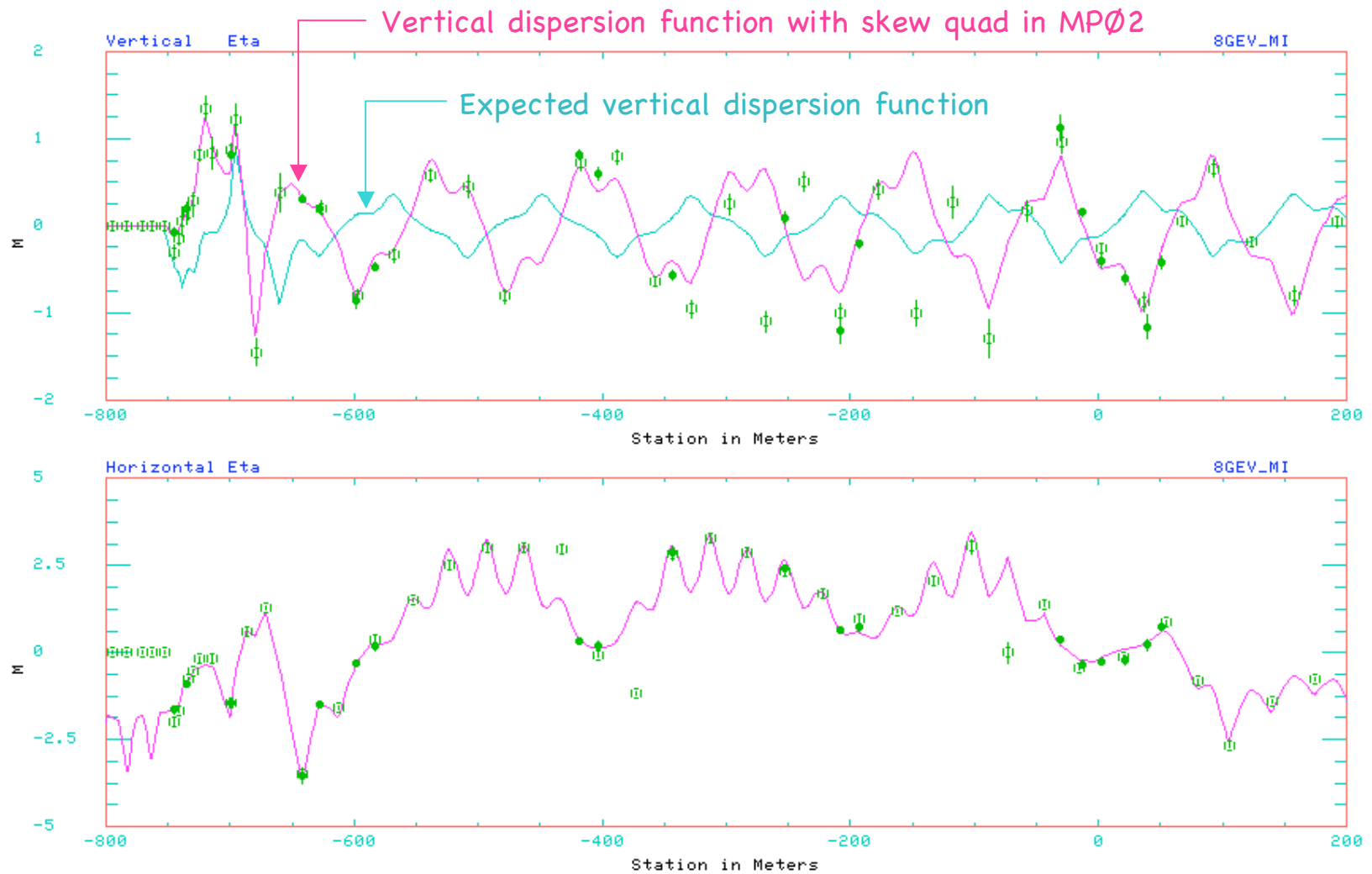
A troubled location to negotiate.

Close to MiniBoone switch magnet.

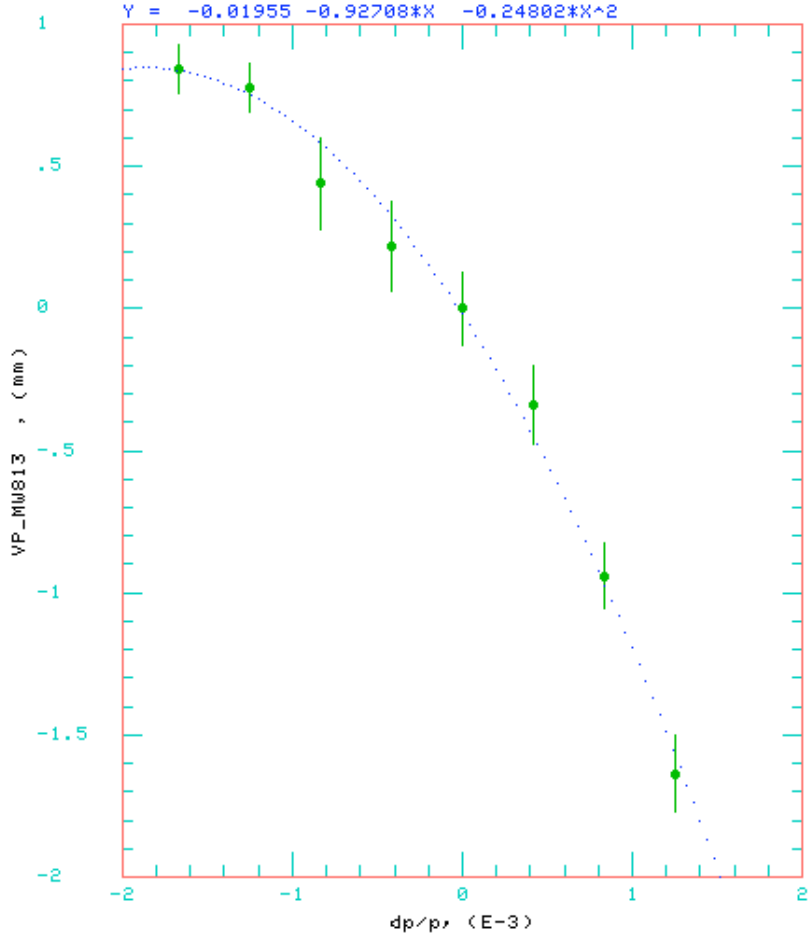
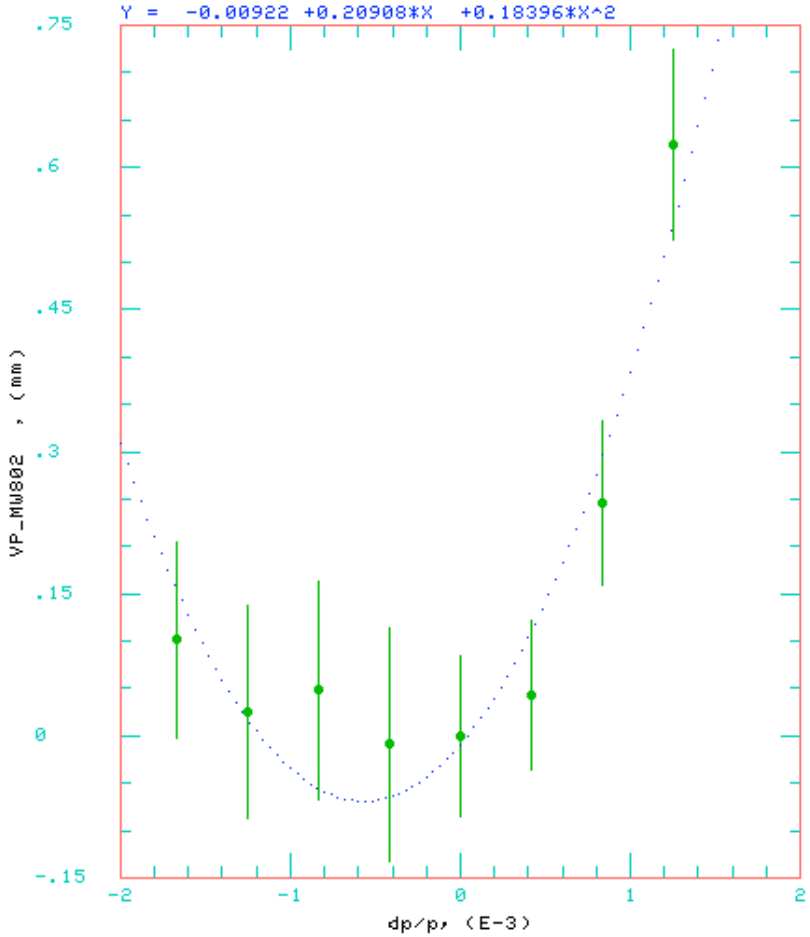
MI8 line dispersion function



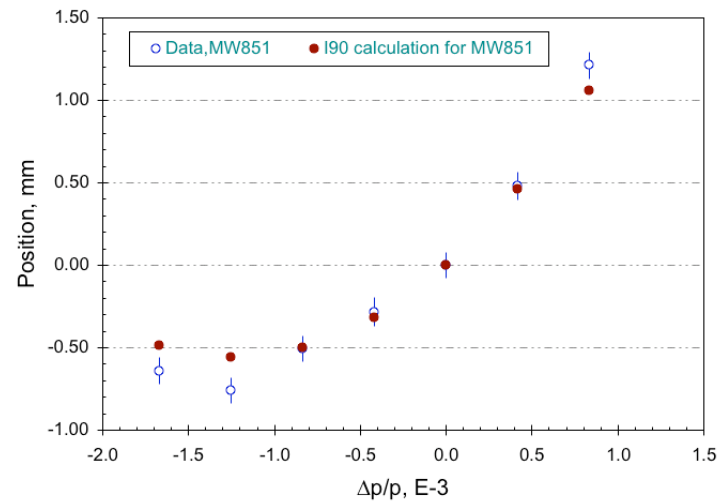
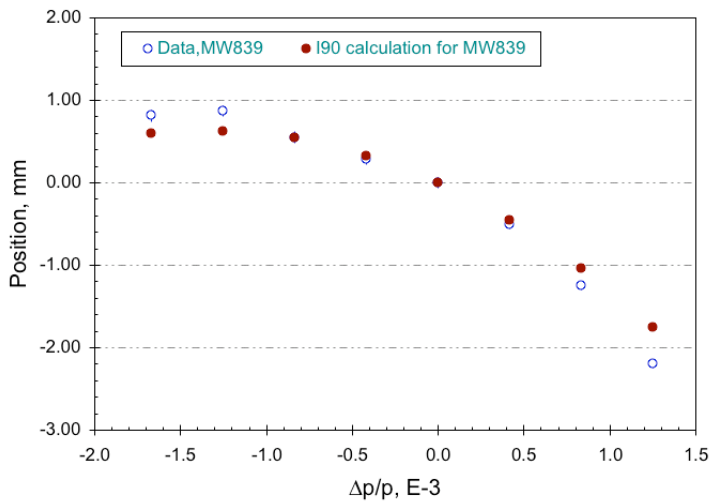
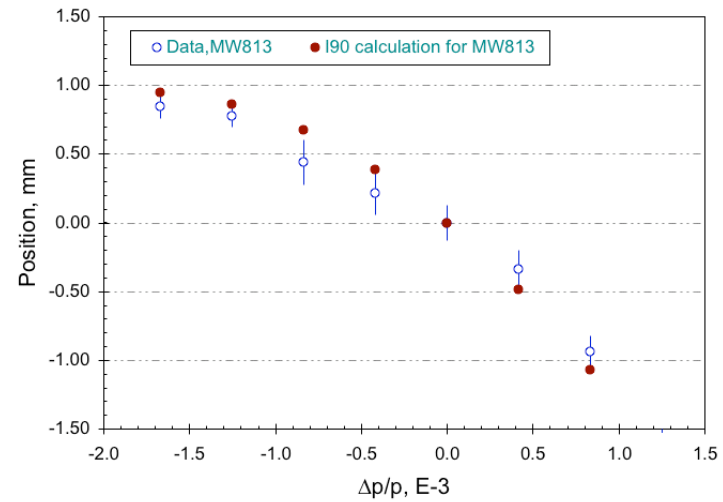
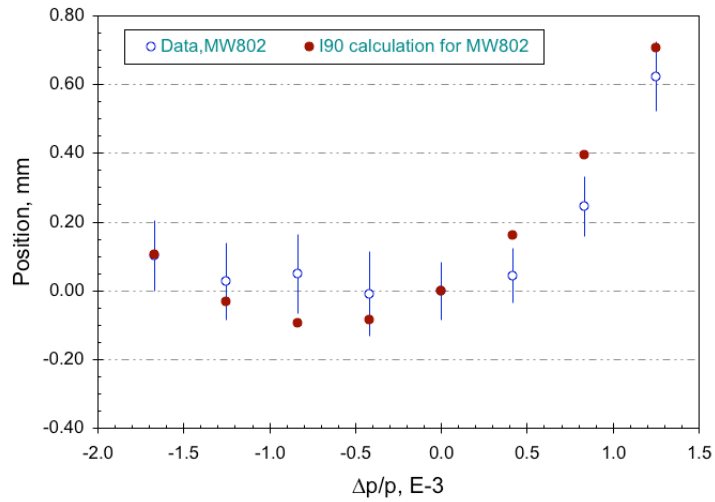
MI8 line eta, skew quad in MPØ2 at 4KG/m



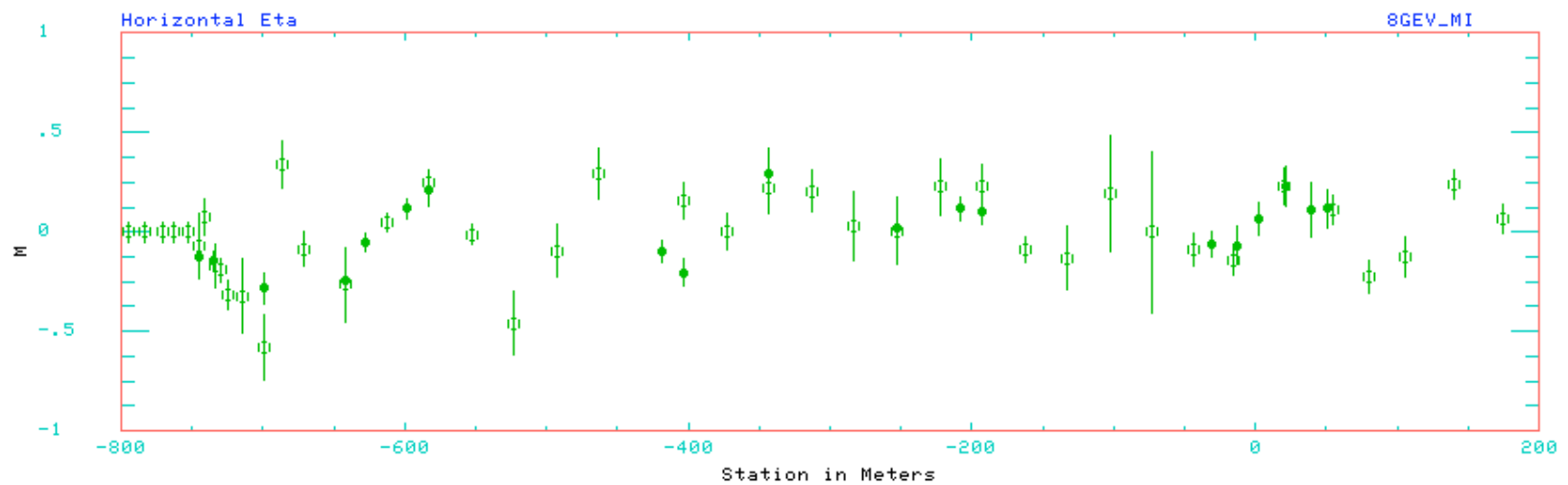
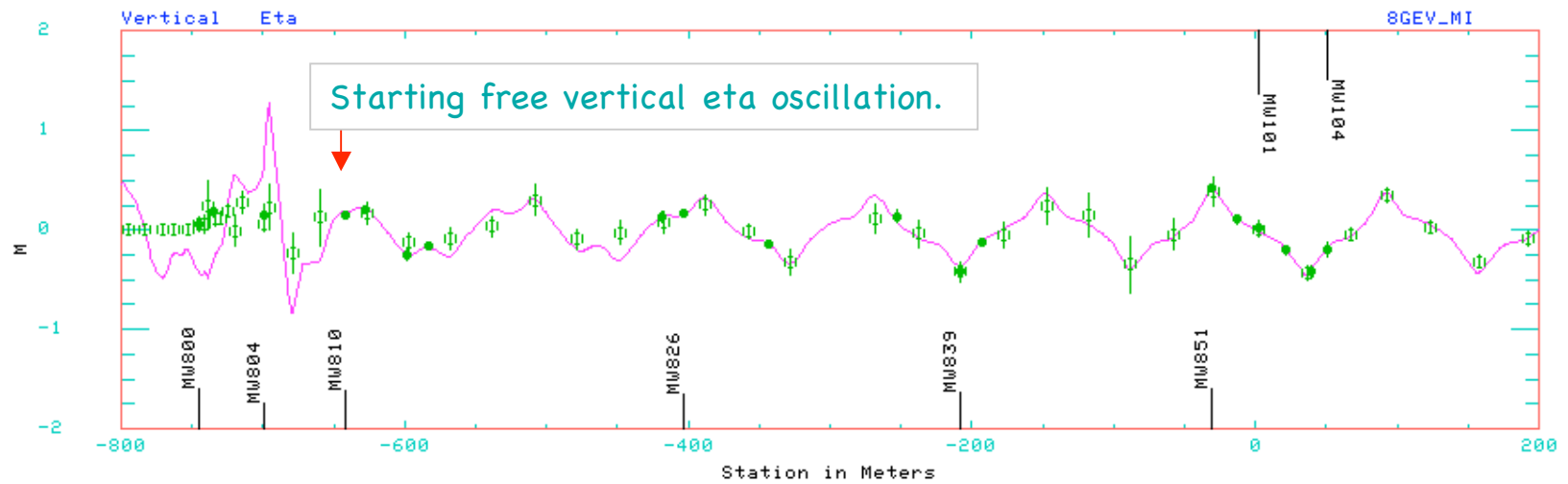
Vetical plane position vs $\Delta p/p$



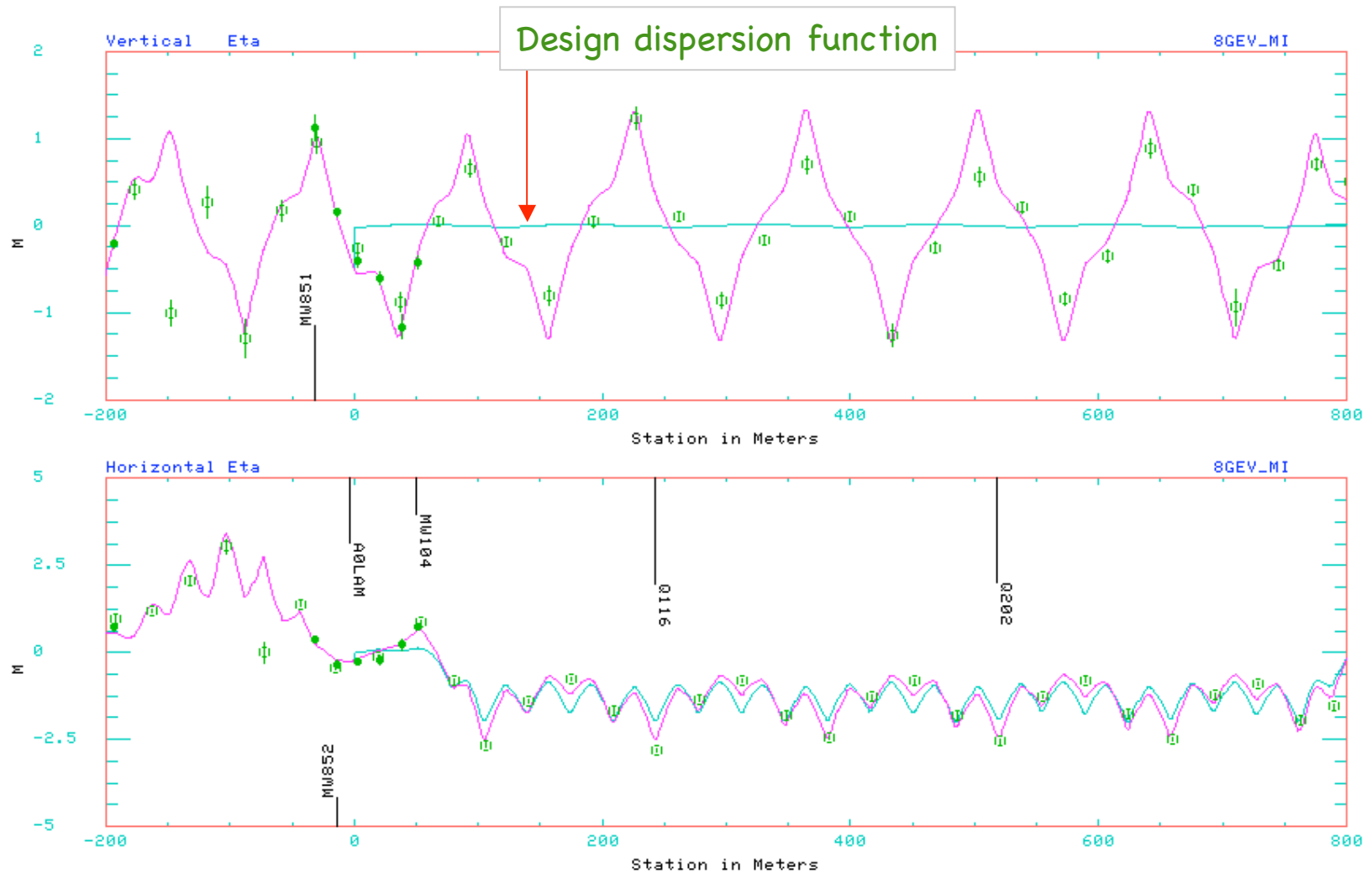
Vert position vs. $\Delta p/p$, data & simulation



Dispersion function in 2nd order terms. It's from up-stream !!!



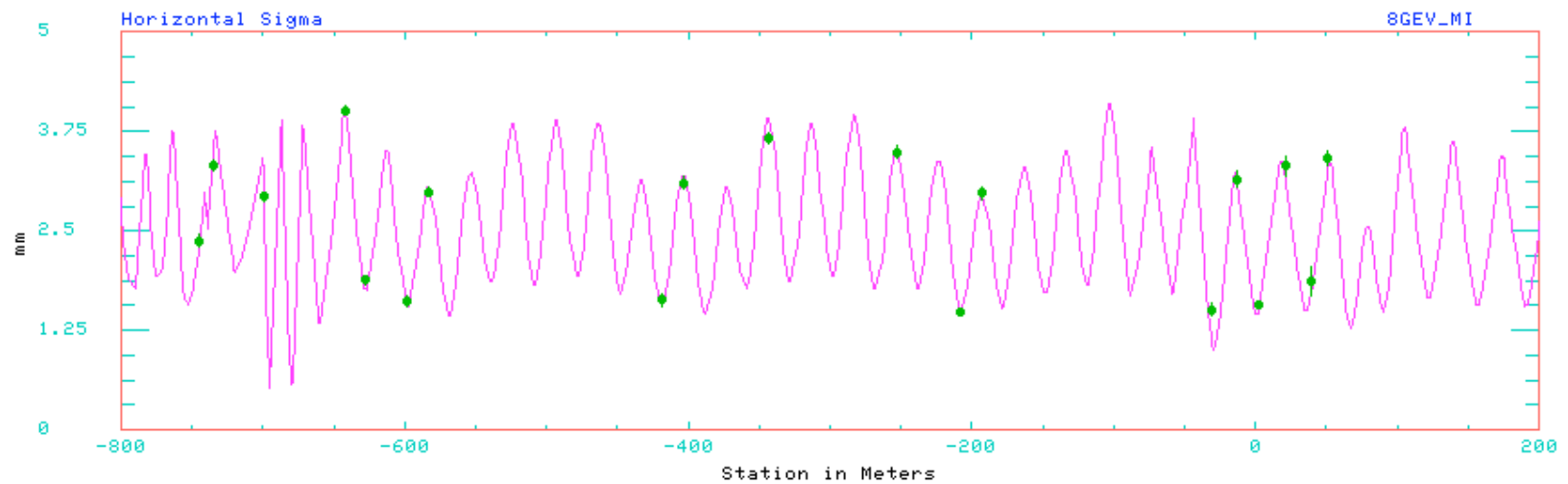
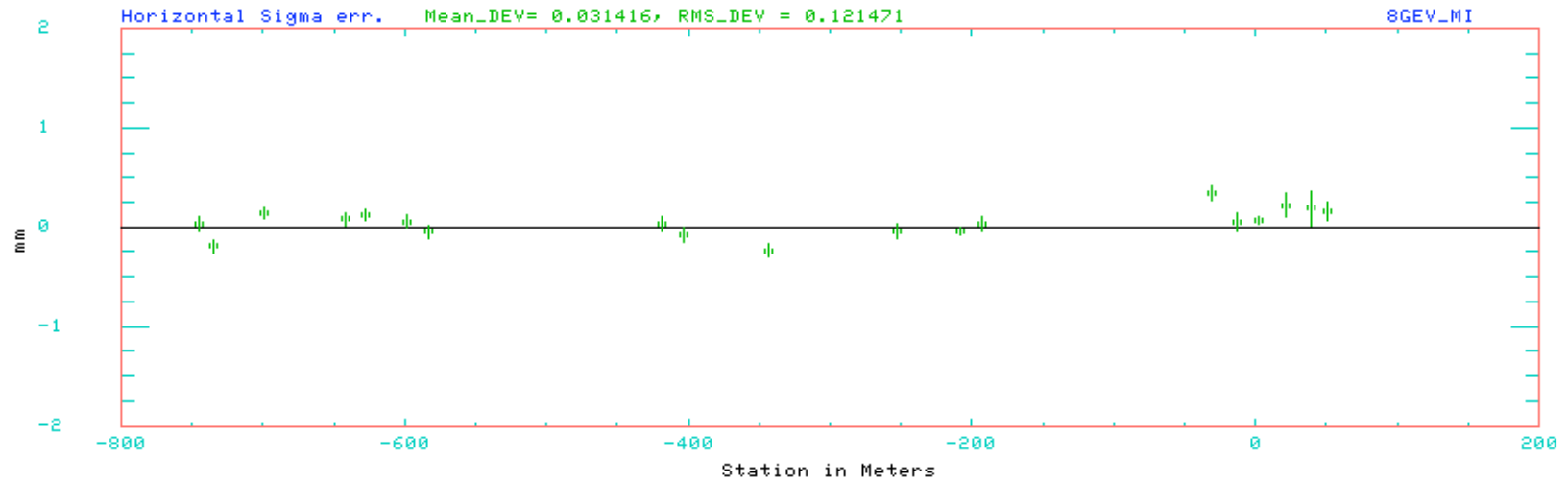
MI injection matching, dispersion function



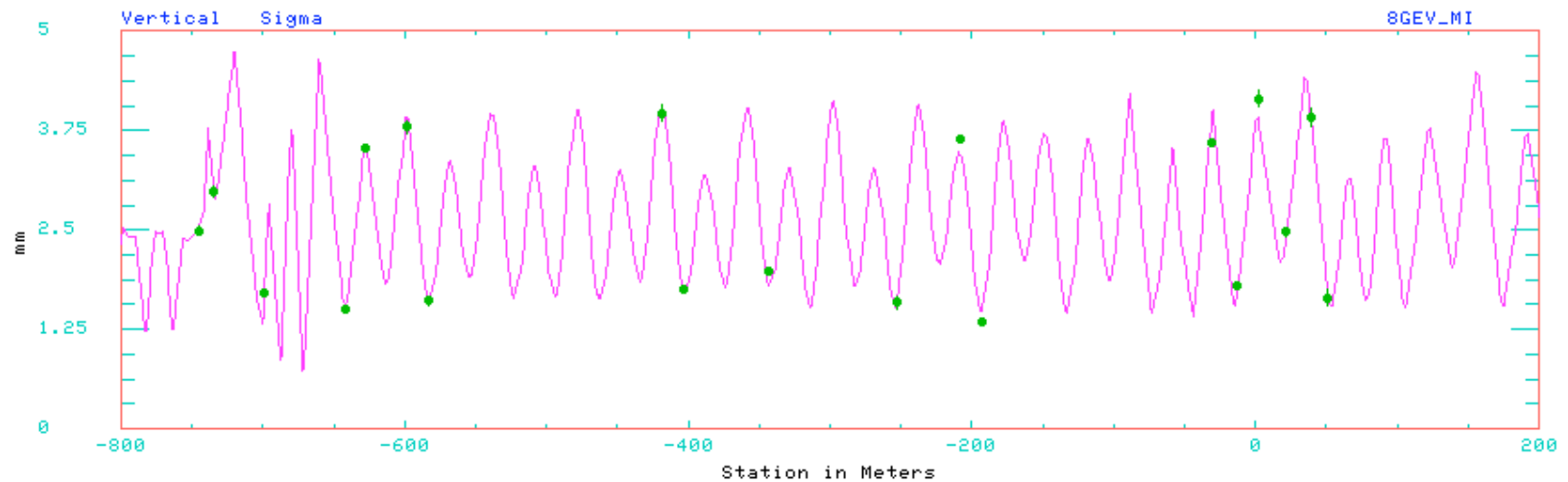
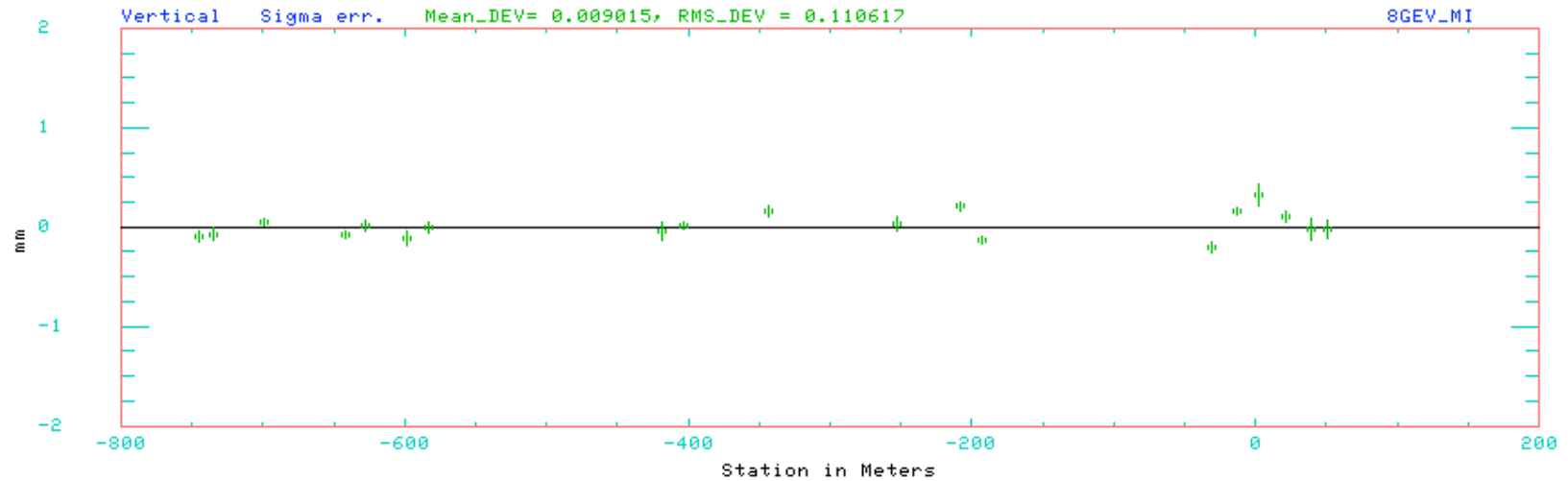
Issues on vertical dispersion function

- **Skew quad component in MPØ2**
 - 4 KG/meter appears to fit the data well.
 - What is the result of field measurement?
 - Need another dedicated study, just for MPØ2.
- **Skew sextupole contribution**
 - Signature of skew sextupole effect.
 - 1500 KG/(m²), if only from MPØ2
 - Is there other scenario?

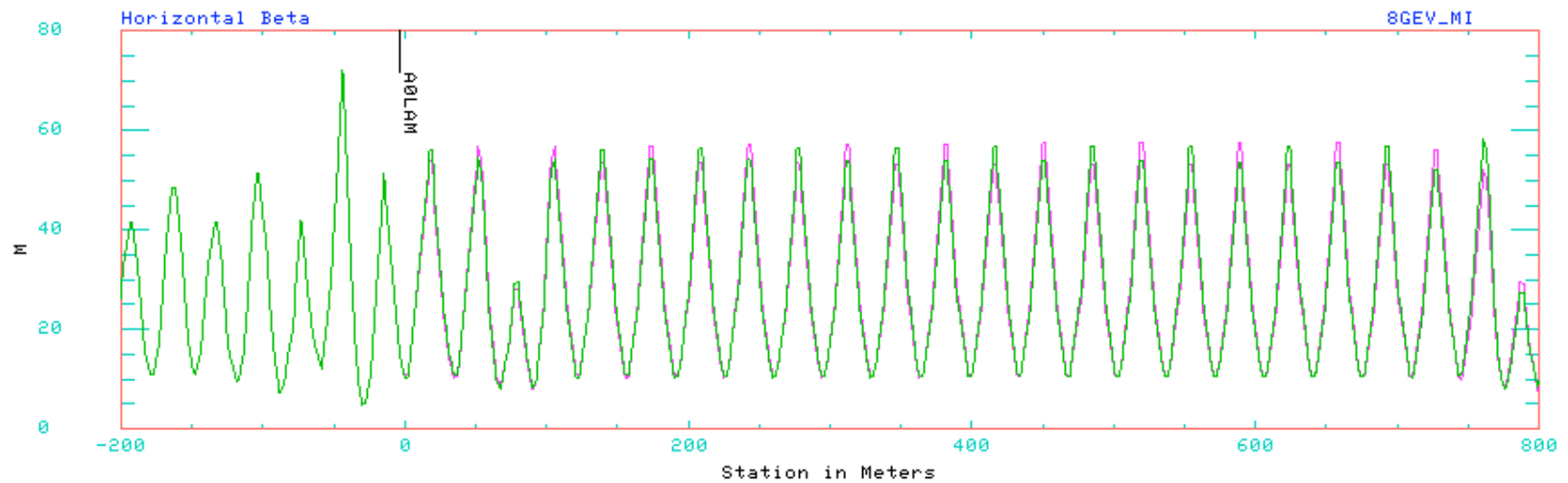
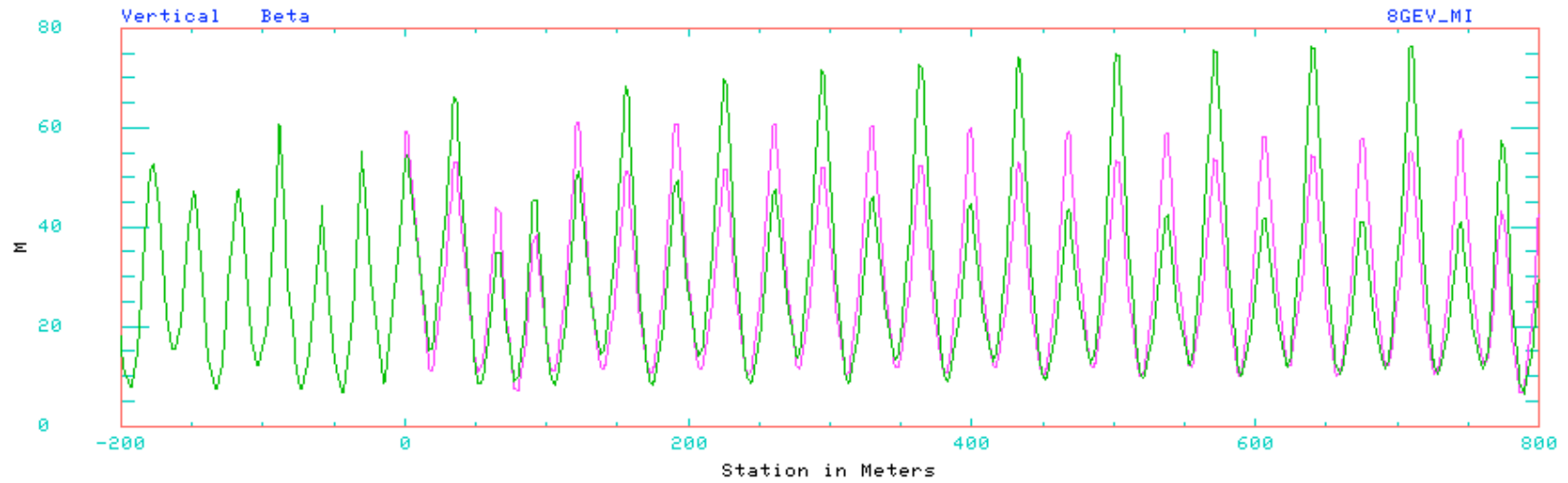
Fitting horizontal plane beam width sigma



Fitting vertical plane beam width sigma



MI injection matching, beta function



Lattice parameters and emittances

- Horizontal emittance
 $11.6 \pm 0.4 \text{ } \pi\text{-mm-mr}$
- Vertical emittance
 $15.9 \pm 1.7 \text{ } \pi\text{-mm-mr}$
- σ_p/p
 $- 0.74 \pm 0.04 \text{ E-3}$

```
Lattice parameters
Select: [8GEV_MI      ] as [Transfer line]
Start at element: [B00_CELL01] for [Proton      ]
*Track: [Lattice function] at ( 8      ) GeV

Lattice      Horz      Vert
Phase: ( 33.9457 ) ( 32.6266 ) 2π
Beta: ( 84.673 ) ( 6.321 ) M
Alpha: (-.353 ) (-.15 )
eta: (-3.089 ) (.48 ) M
etap: (-.005 ) (-.016 )

Beam
Position: ( 4.15294 ) ( 1.33111 ) mm
Angle: ( .017314 ) ( .031588 ) mr
Emittance: ( 1.92967 ) ( 2.65559 ) π-mm-mr
           ± .060438 ± .278517
ΣP/P: ( .740112 ) ± .04214 E-3
ΔP/P: ( 0 ) E-3

*Fit emittance: [Emitt & sig_p/p]
Momentum sigma from [Horizontal] plane

*Update reference orbit
Graphic window link: [None ]
Calculation in [Matrix] order
<Exit>
```

σ_p/p with bunch rotation

```

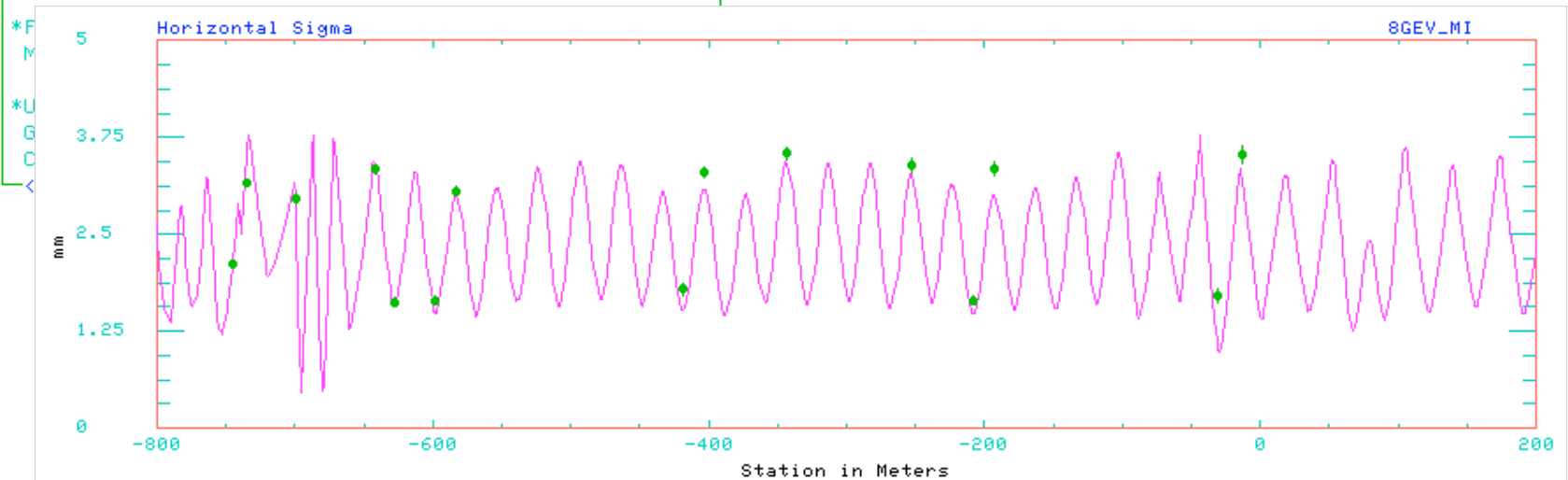
Lattice parameters
Select: [8GEV_MI] as [Transfer line]
Start at element: [B00_CELL01] for [Proton]
*Track: [Lattice function] at ( 8 ) GeV

Lattice      Horz      Vert
Phase: ( 33.9634) ( 32.6418) 2π
Beta: ( 84.673 ) ( 6.321 ) M
Alpha: (-.353 ) (-.15 )
eta: (-3.089 ) (.48 ) M
etap: (-.005 ) (-.016 )

Beam
Position: ( 5.15338) ( 0 ) mm
Angle: ( .008341) ( 0 ) mr
Emittance: ( 1.91825) ( 0 ) π-mm-mr
           ± .125985 ±
ΣP/P: ( .477125) ± .11657 E-3
ΔP/P: ( 0 ) E-3
    
```

σ_p/p in

Bunch Rotation	% σ_p/p		
	No	Yes	
MW profiles	.074	.048	1- σ
WCM data	.18	.12	95%



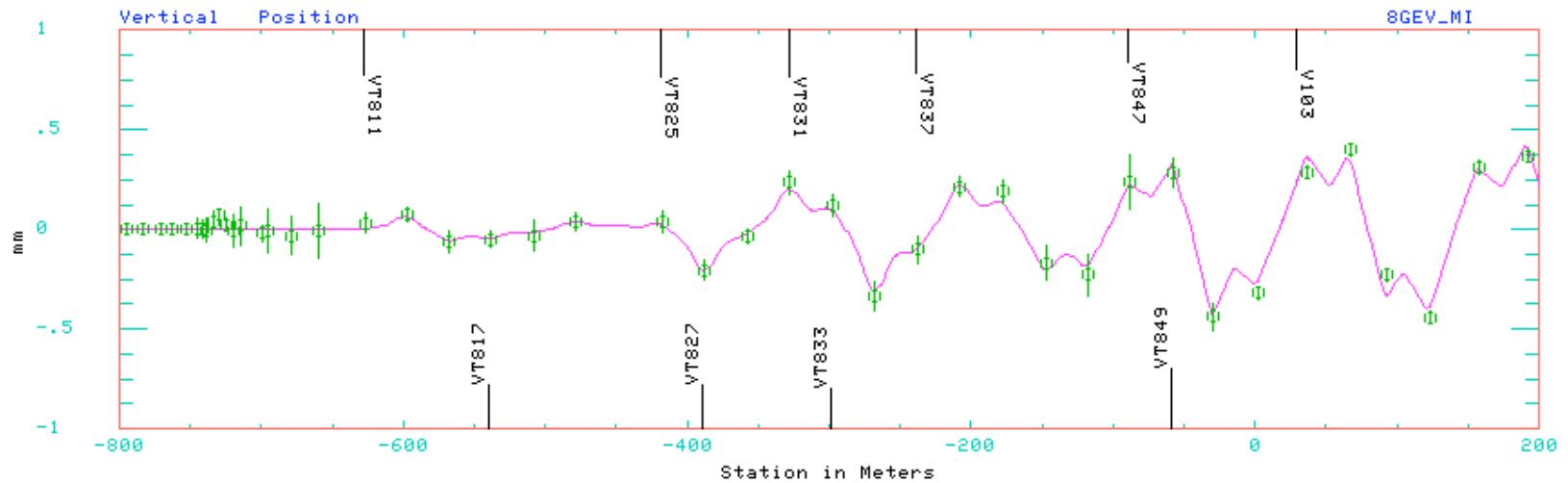
Vertical orbit from HT800

DB device page

```
*Page length: [ 81] *History depth:[15]
```

DB_name	Setting	prev_set	reading	prev_read
I:VT811D	Amps	0	.005	0
I:VT813D	Amps	0	-.005	0
I:VT815D	Amps	0	.003	0
I:VT817D	Amps	0	-.005	0
I:VT825D	Amps	0	-.015	0
I:VT827D	Amps	0	.003	0
I:VT831D	Amps	0	.006	0
I:VT833D	Amps	0	-.008	0
I:VT837D	Amps	0	-.005	0
I:VT847D	Amps	0	.01	0
I:VT849D	Amps	0	-.005	0
I:V103A	Amps	-.064998	.015	0
I:V101A	Amps	.163995	-.005	0
I:VT823D	Amps	0	.005	0

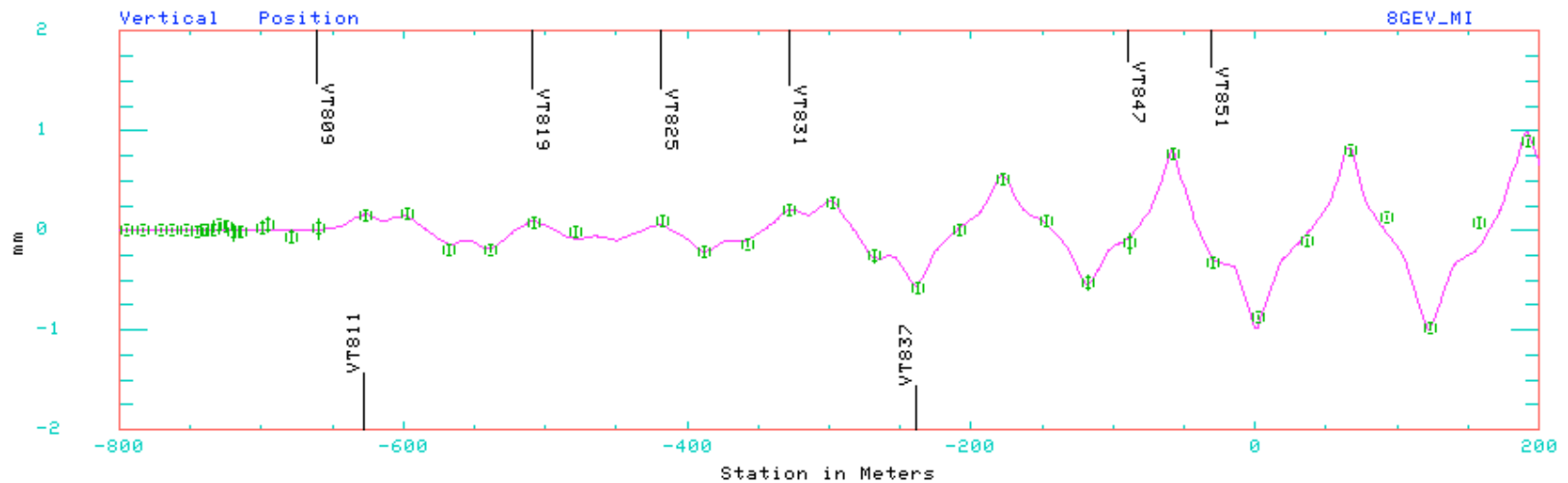
<Exit> 47:60 of 81



Vertical orbit with 1-bump kick from HT802

```
DB device page
*Page length: [ 81]          *History depth:[15]
DB_name      Setting  prev_set  reading  prev_read
I:VT809D Amps  0          0         .01      0
I:VT811D Amps  0          0         .01      0
I:VT819D Amps  0          0        -.02     0
I:VT825D Amps  0          0       -.025    0
I:VT831D Amps  0          0        .015    0
I:VT833D Amps  0          0       -.005    0
I:VT835D Amps  0          0       -.02     0
I:VT837D Amps  0          0       -.01     0
I:VT847D Amps  0          0        .02     0
I:VT851D Amps  0          0       -.008    0
<Exit>      46:55 of 81
```

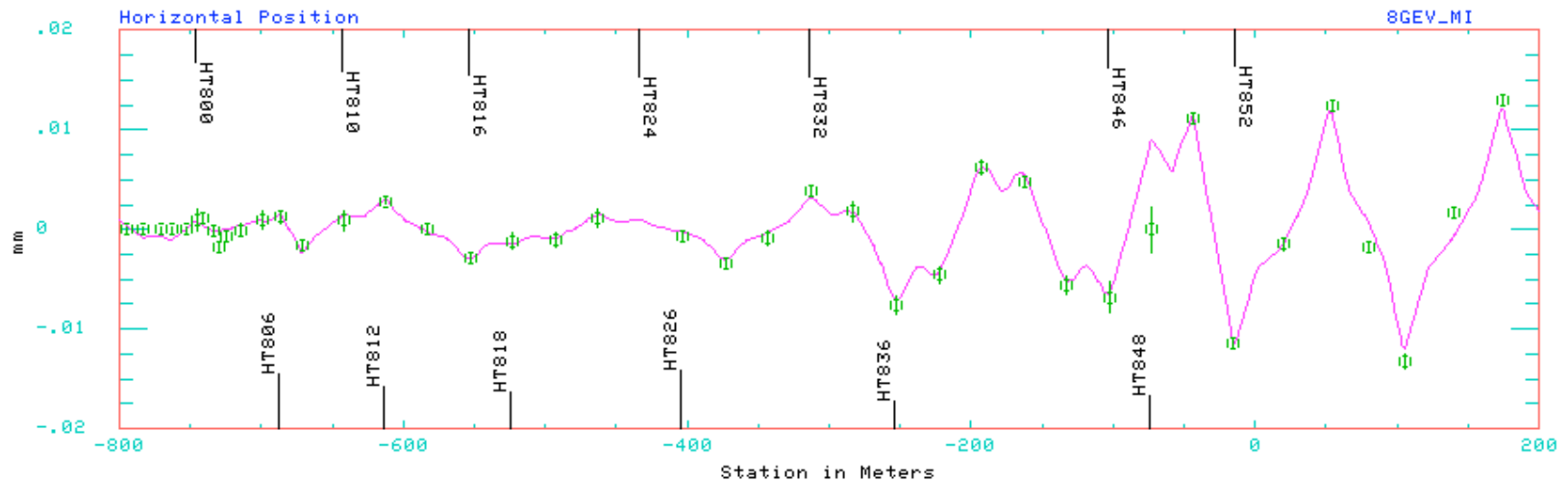
Kicks used to simulate the vertical orbit.



Horizontal orbit with 1-bump kick from MP02

```
DB device page
*Page length: [ 81]          *History depth:[15]
DB_name      Setting  prev_set  reading  prev_read
I:HT800D Amps  0          -0.0015  0
I:HT802D Amps  0          0.0008  0
I:HT804D Amps  0          0.00025 0
I:HT806D Amps  0          0.00025 0
I:HT810D Amps  0          0.00005 0
I:HT812D Amps  0          0.00003 0
I:HT816D Amps  0          -0.00005 0
I:HT818D Amps  0          -0.00018 0
I:HT824D Amps  0          0.00005 0
I:HT826D Amps  0          -0.0001 0
I:HT832D Amps  0          0.0001 0
I:HT834D Amps  0          -0.0003 0
I:HT836D Amps  0          -0.00015 0
I:HT846D Amps  0          0.0002 0
I:HT848D Amps  0          0.00015 0
I:HT852D Amps  0          0.0001 0
<Exit>                                     45:60 of 81
```

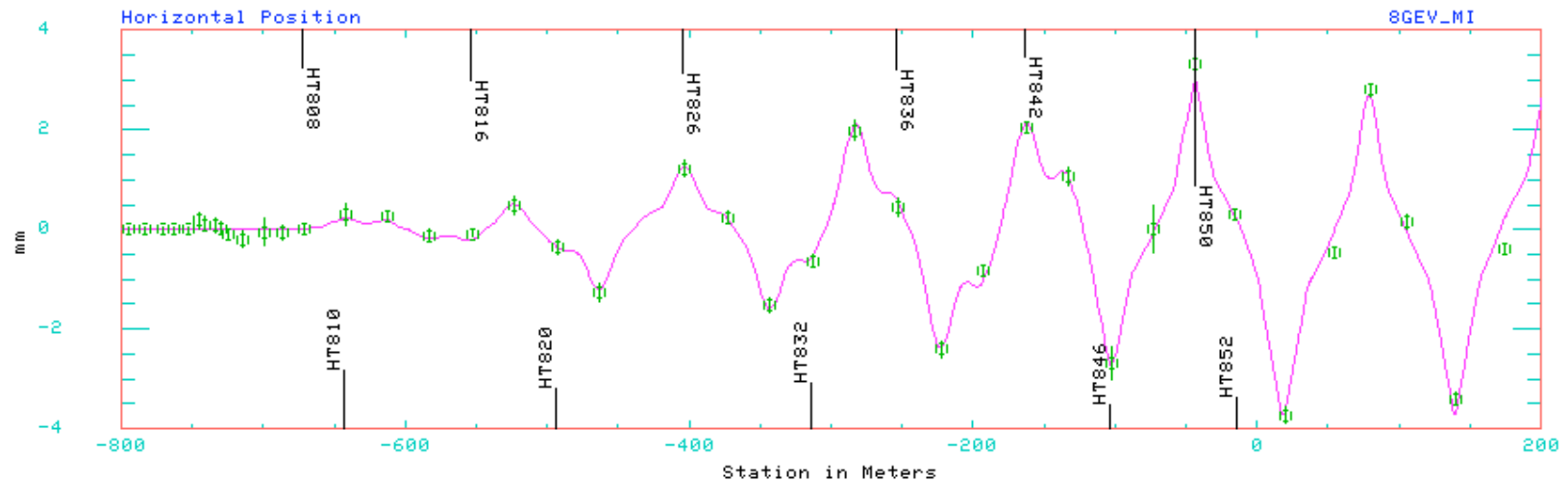
Kicks used to simulate
the horizontal orbit.



Horizontal orbit with 1-bump kick from VT803

```
DB device page
*Page length: [ 81]          *History depth:[15]
DB_name      Setting  prev_set  reading  prev_read
I:HT8080 Amps  0          .01       0
I:HT8100 Amps  0          .01       0
I:HT8160 Amps  0          .02       0
I:HT8180 Amps  0         -.03       0
I:HT8200 Amps  0         -.05       0
I:HT8260 Amps  0          .01       0
I:HT8280 Amps  0         -.02       0
I:HT8300 Amps  0         -.01       0
I:HT8320 Amps  0          .04       0
I:HT8360 Amps  0         -.03       0
I:HT8420 Amps  0         -.02       0
I:HT8440 Amps  0         -.03       0
I:HT8460 Amps  0          .03       0
I:HT8500 Amps  0          .04       0
I:HT8520 Amps  0         -.01       0
<Exit>                               49:63 of 81
```

Kicks used to simulate the horizontal orbit.



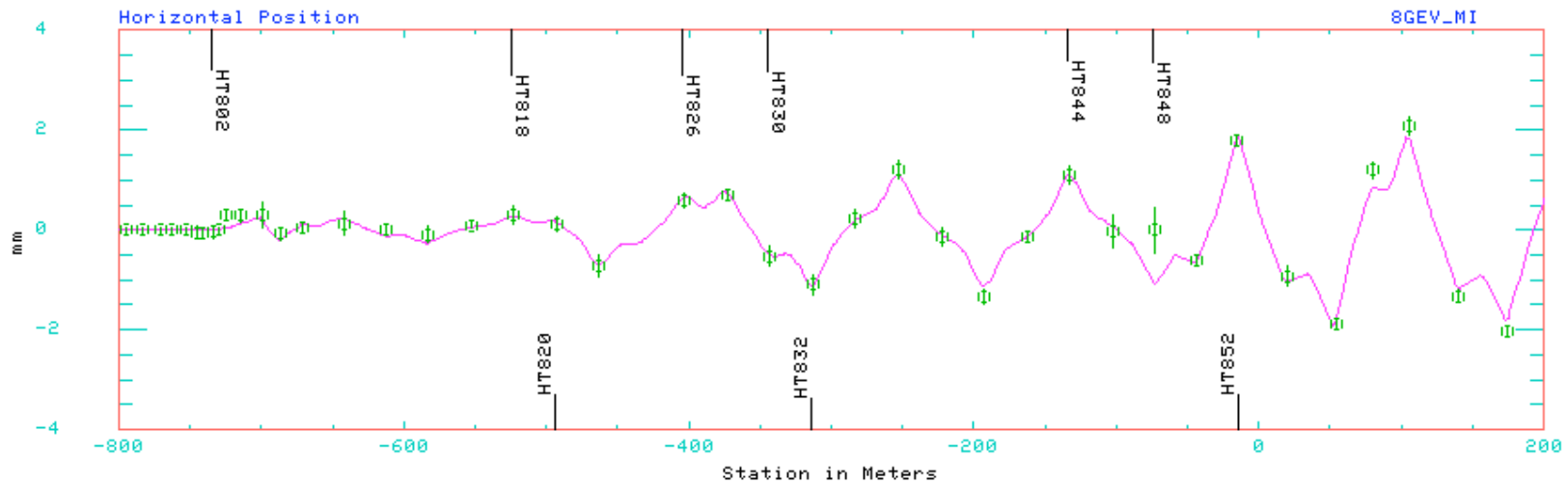
Horizontal orbit from VT805

DB device page

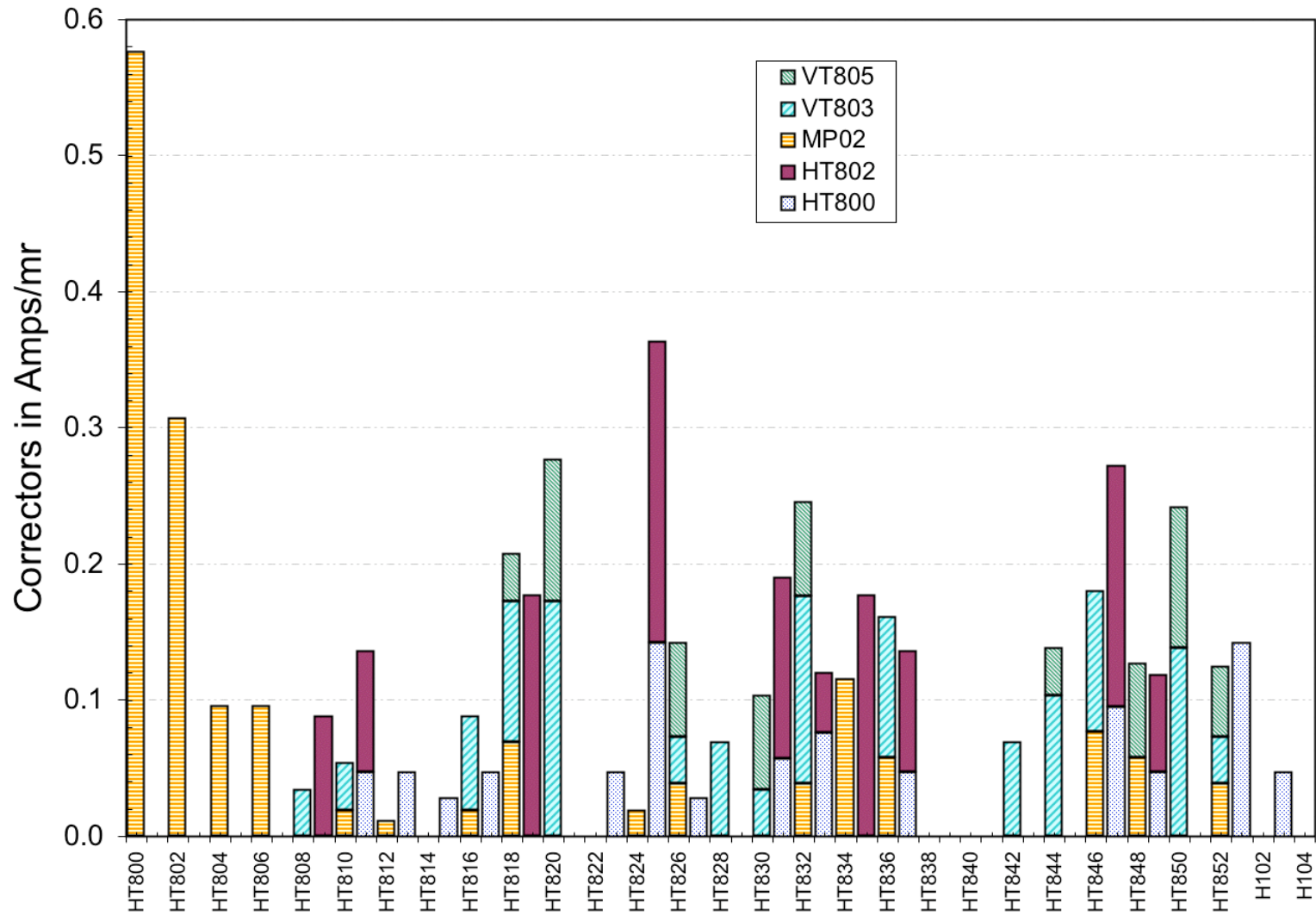
```
*Page length: [ 81] *History depth:[15]
DB_name      Setting  prev_set  reading  prev_read
I:HT802D Amps  0         .045     0
I:HT818D Amps  0         .01      0
I:HT820D Amps  0        -.03     0
I:HT826D Amps  0         .02      0
I:HT830D Amps  0        -.02     0
I:HT832D Amps  0        -.02     0
I:HT844D Amps  0        -.01     0
I:HT848D Amps  0        -.02     0
I:HT850D Amps  0         .03      0
I:HT852D Amps  0        -.015    0
<Exit>
```

46:55 of 81

Kicks used to simulate the horizontal orbit.

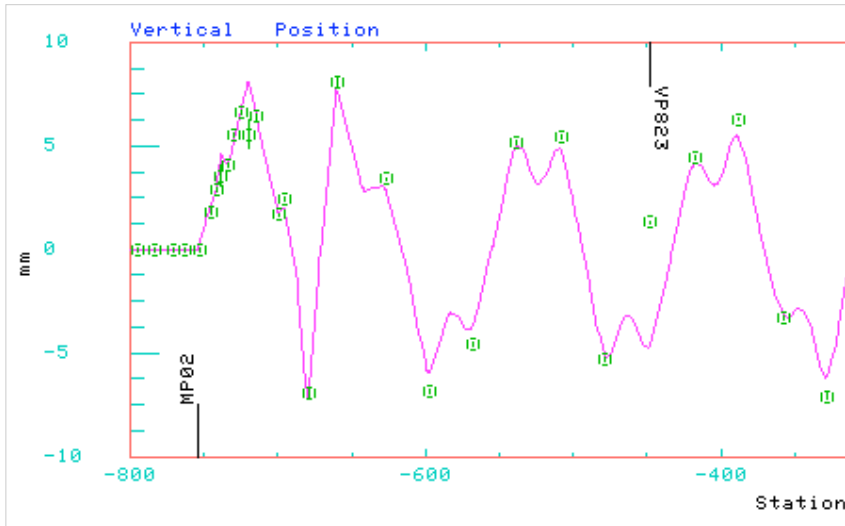


Currents per mr 1-bump kick, are they signs of coupling?



Stability with septum magnet MP02

- MP02 setting not changed
- Orbit difference:
4/12/04 - 4/06/04
- Calculation:
+90 amps on MP02



PB:163 8 GEV LINE PARAMS<NoSets>

```

I63 BOOSTER->MI8 MAGNETS:SET D/A A/D Com-U +PTools
-<FTP> *SA* X=A/D X=TIME Y=I:VP823 ,I:HP824 ,I:IBEAMM,I:TOR103
COMMAND --- Eng-U I= 0 I=-10 /-10 / 0 / 0
-< 1>+ s_MI AUTO F= 2 F= 10 / 10 / 6 / 6
-B:MP02I MP02 PS Peak Current 22411 22334 Amps .
-B:IMAX MAXIMUM MAGNET AMPS 9731 * 9718 .1A
-B:VBC0 NEW MAGNET INSTALLATION 168.2 167.5 AMPS ...
-B:VBC1 *.01 Vert Bend #1 PS MI-8 840.2 818.4 AMPS ...
-B:MI8BND H8021,V8022,V8023,H8031. 31 -20 /31 -20 31 -20
-B:MI8BD *.001MI8BND RAMP CARD NAME 1799.3927 798.67188 AMPS ...
    
```

GxPB 2: Storage Scope Emulation

```

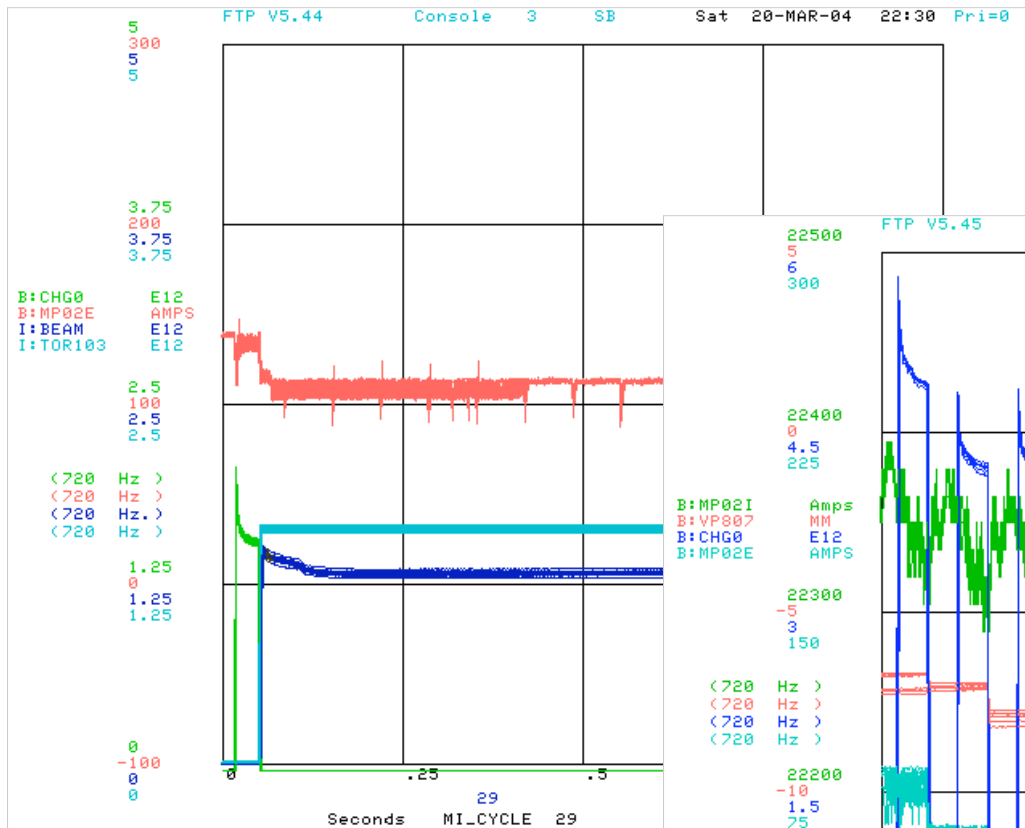
BOOSTER File Directory 13-Apr-04 1026 Tue
+ 200 10-Apr-04 0600 Sat save after tune
+ 223 05-Apr-04 2013 Mon correctors only
219 05-Apr-04 1552 Mon RAD save single orate #30
+ 246 04-Apr-04 1525 Sun #14=4.3e12, minibooone=3e16@10T
- 241 01-Apr-04 1328 Thu after ver ramp corrector setup
224 31-Mar-04 1315 Wed Sequencer Save - 400MeV Dip. (ver)
221 31-Mar-04 1314 Wed Sequencer Save - 400MeV Dip. (hor)
220 31-Mar-04 1312 Wed Sequencer Save - 400MeV Quad Settings
254 30-Mar-04 2223 Tue Tuning up, 4.7E12
242 30-Mar-04 0041 Tue getting ready to retreat maybe
+ 247 29-Mar-04 1236 Mon prior to restore of horizontals
228 28-Mar-04 1039 Sun running ok after tuning.
    
```

Utilities CNS54

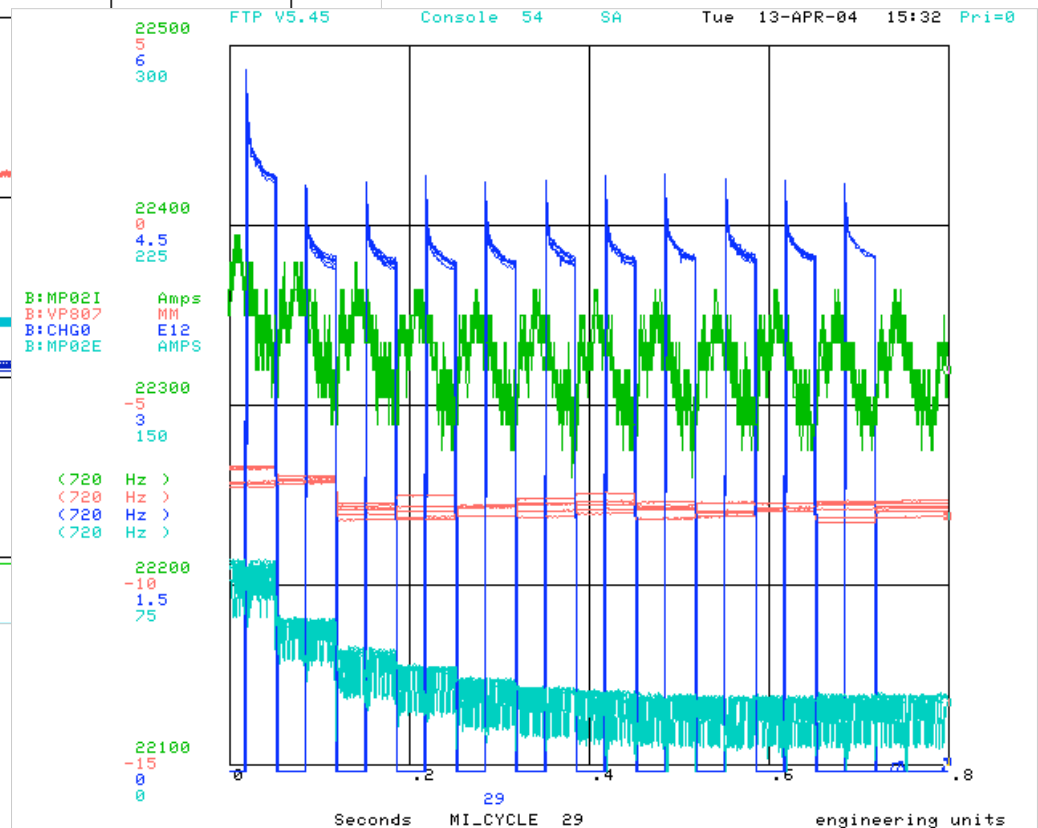
```

Utilities *FTP *SNP *COPIES *Pgm_Tools
Logger/Save-Restore/SDA Redirection
*Er < pa | PB | pc | sa | sb | sc | alrm | util >
*St Redirect *Set *Remove *Directory
>Use SR File -< 246>+
*Pr Use SDA Usage -<ColliderShot >+
*Sa Use SDA File *Directory
*Ra Use SDA Case -<Inject Protons >+
*Sa Use SDA Subcase -< 1>+
*DA Use Logger Node *CBSDA (DUE25 *
Use Logger Time *08-FEB-2004 08:22 *
Use Logger Accuracy *3600 * (Sec )
Error initializing SDA file field CBS_INVARG
    
```

MPØ2 error signal



Setting = 22411 amps
 Error ~ 75 amp



Setting = 22567 amps
 Error ~ 130 amps