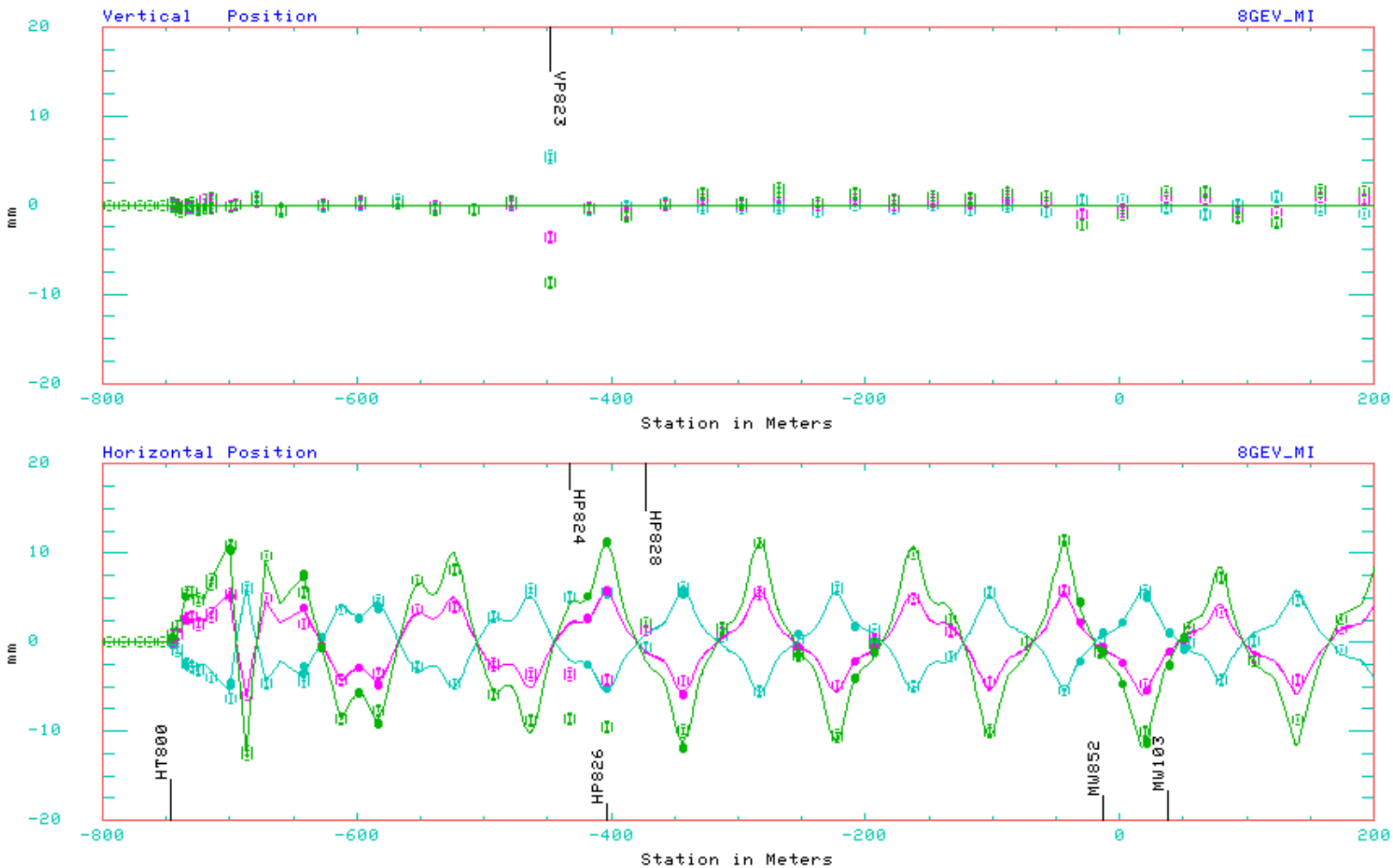
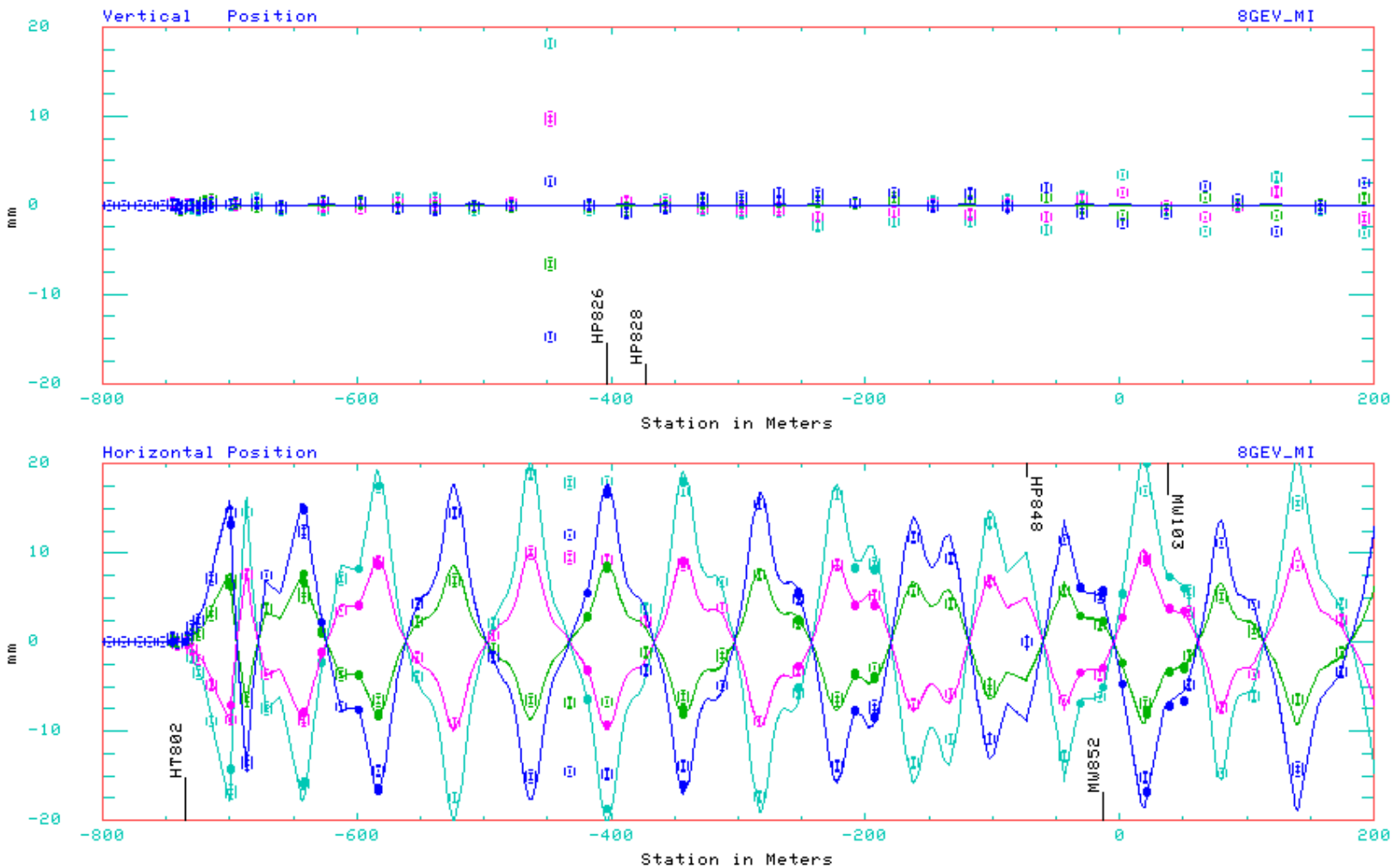
MI8 line optics study

- Orbits
  - Horizontal
  - Vertical
    - ✓ MPØ2
- Dispersion function
  - Horizontal
  - Vertical
    - ✓ MPØ2
- Lattice function
  - Sigma
  - MI injection matching
  - σ_P/P

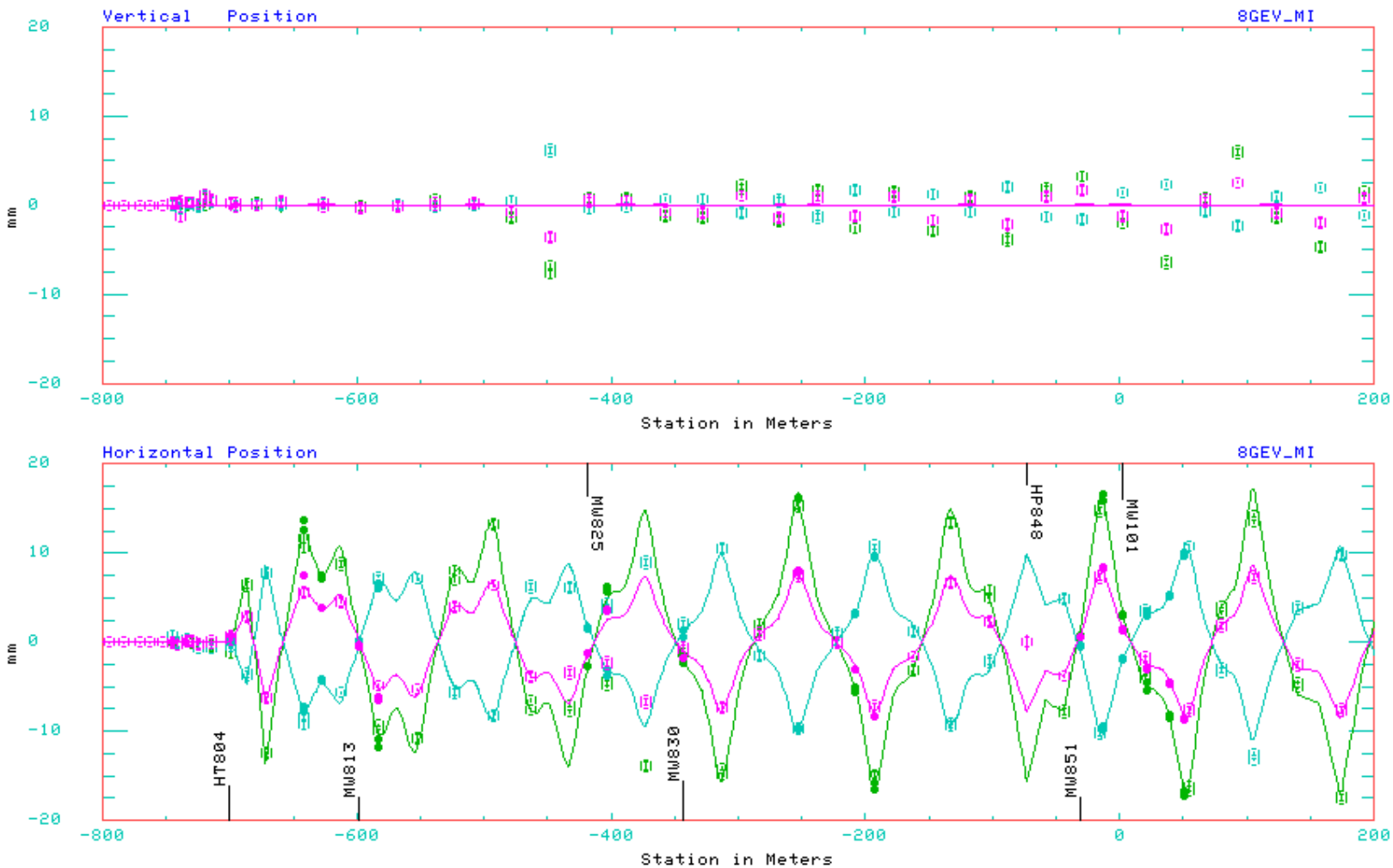
Orbits from HT800



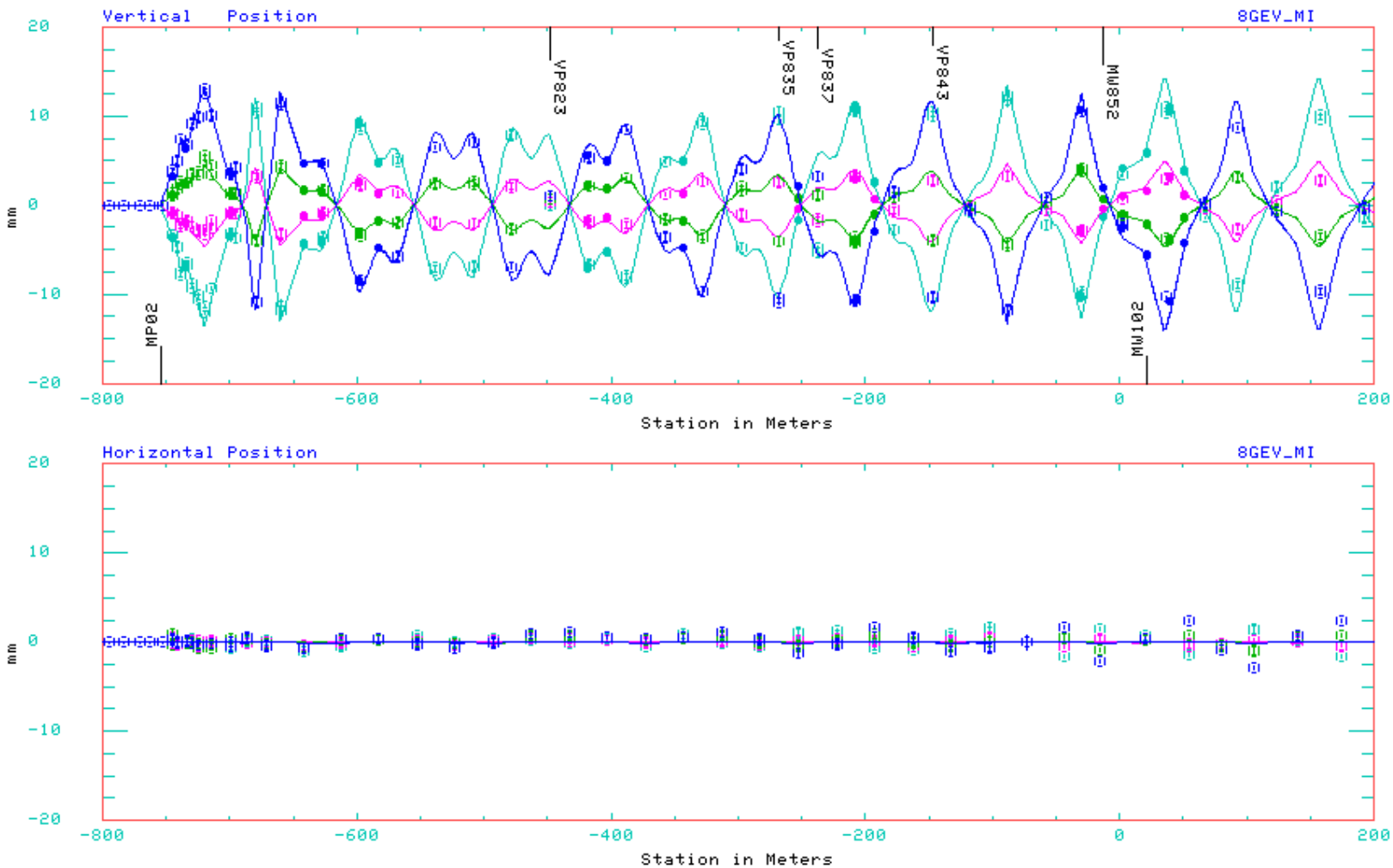
Orbits from HT802



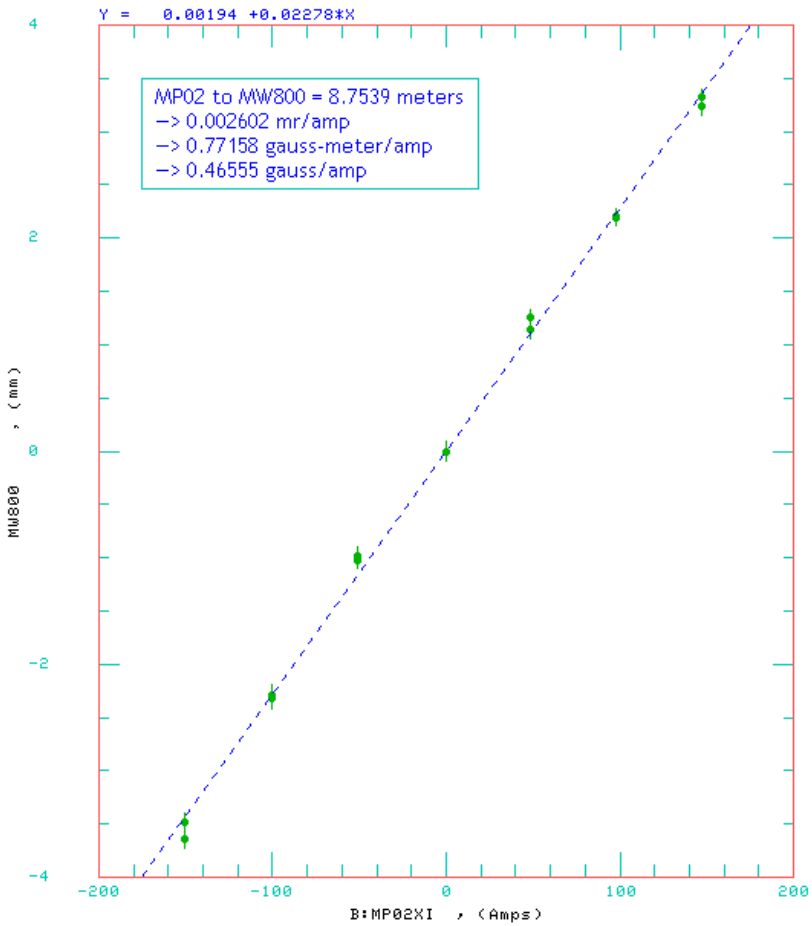
Orbits from HT804



Orbits from MPØ2

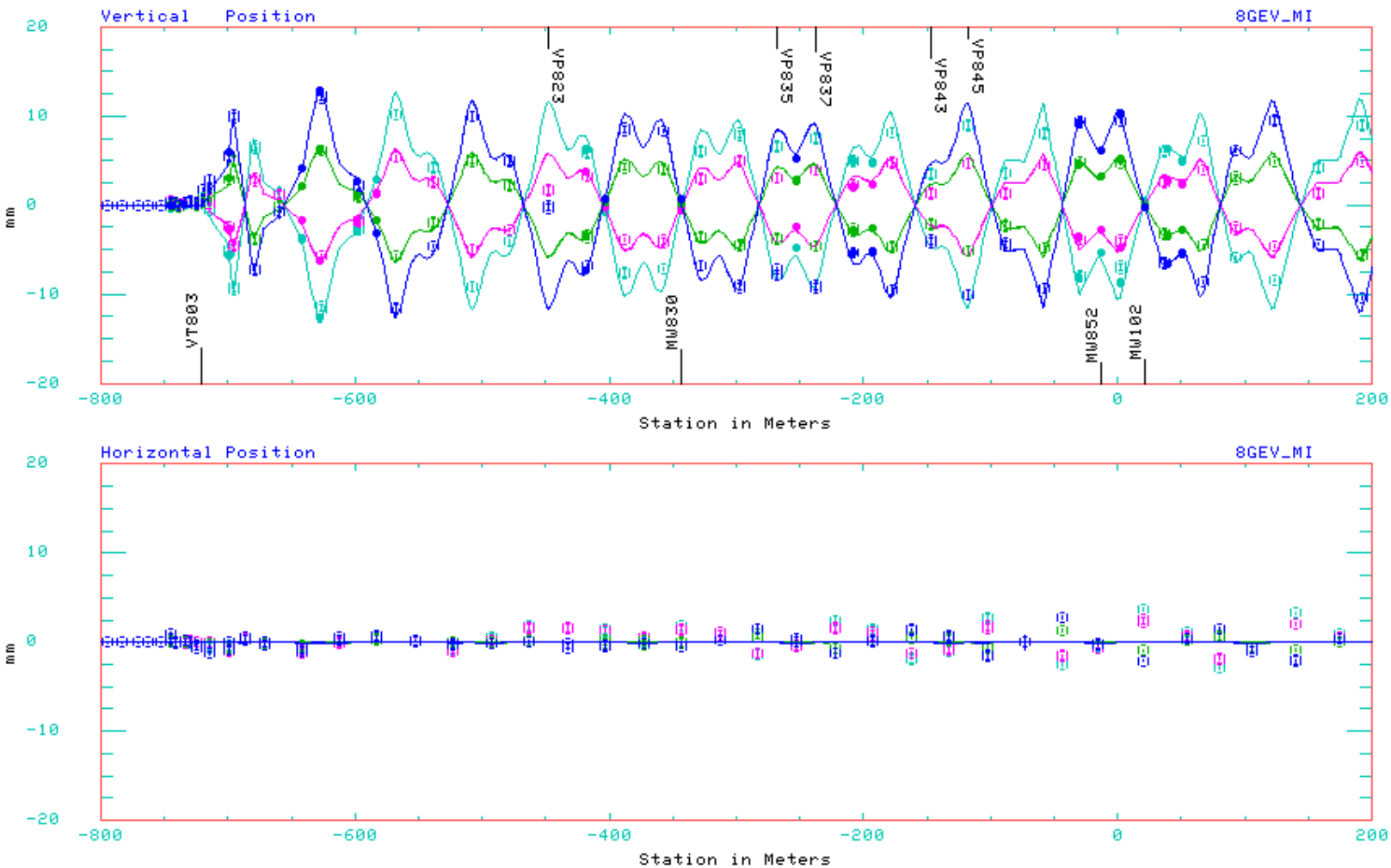


MPØ2 kick calibration

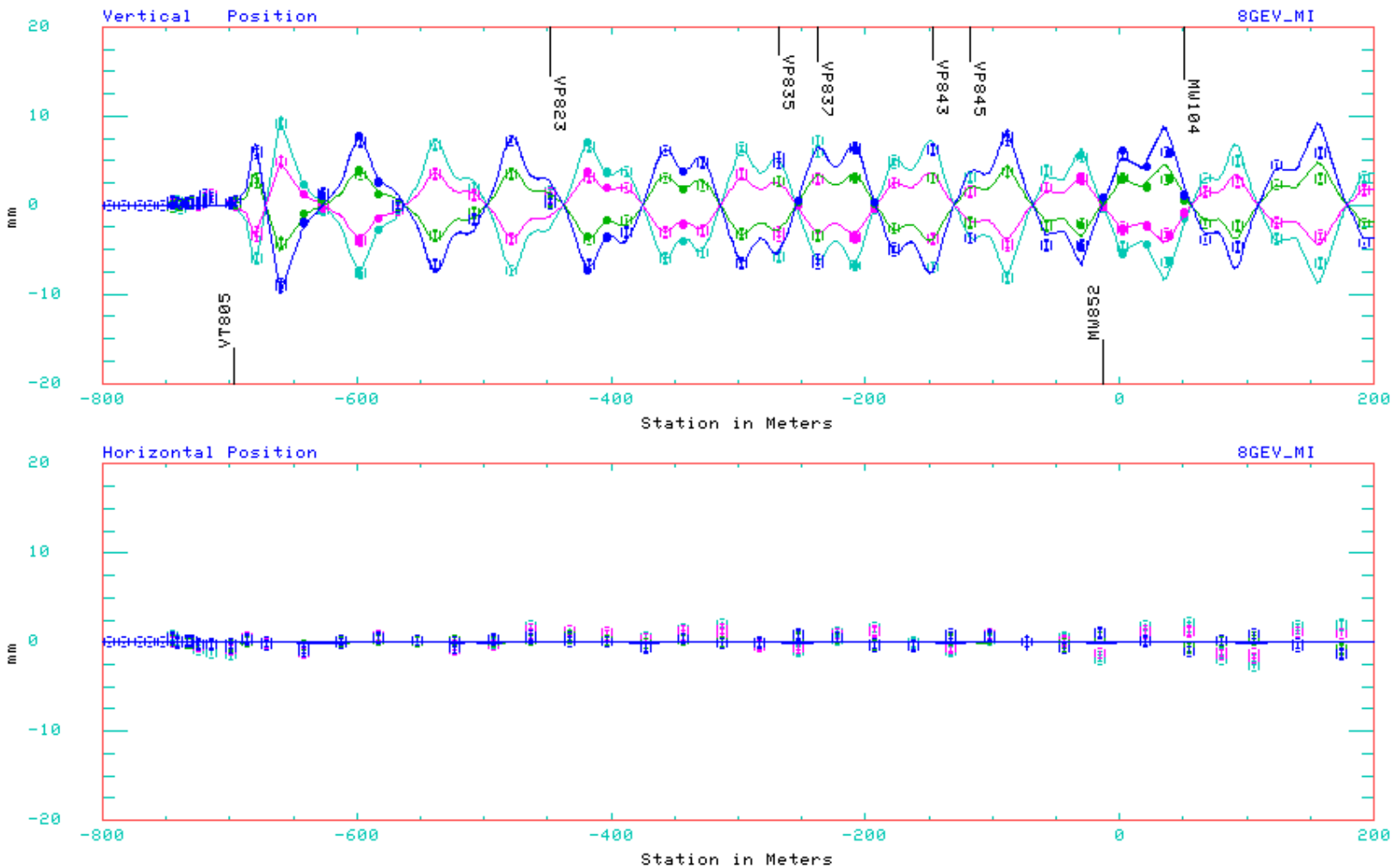


58.5 mr @ 22484 amps

Orbits from VT803



Orbit from VT805

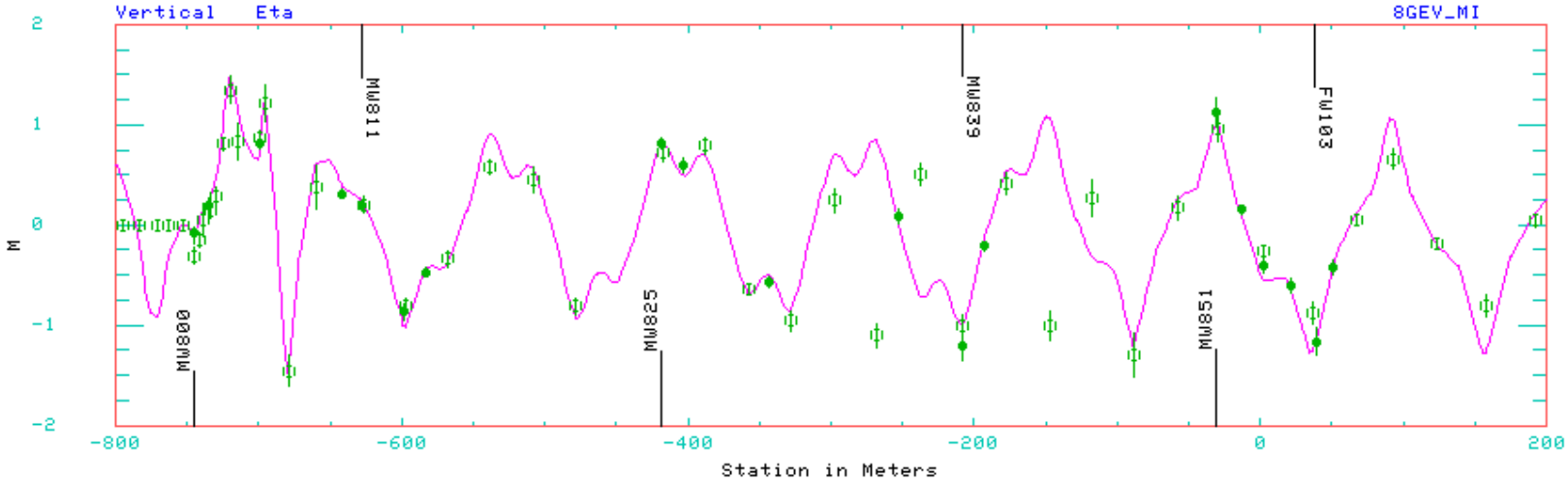


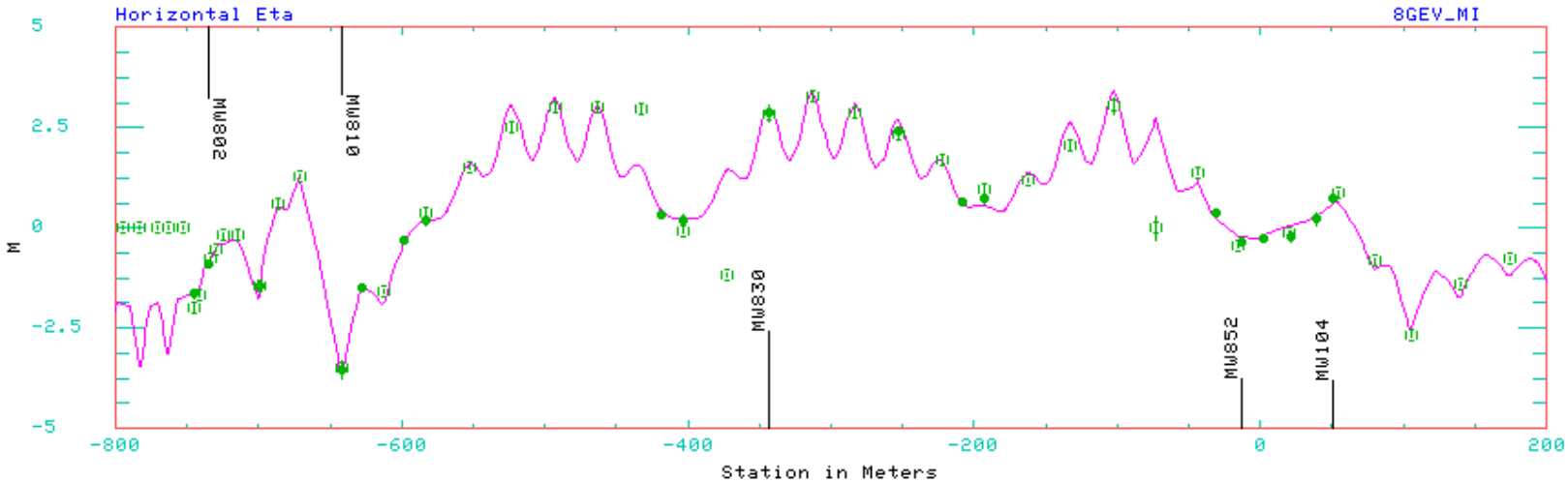
Quad current setting

DB_name		Setting	prev_set	reading	prev_read
B:MP02XI	Amps	22566.83		22484.06	
MP02T	AMPS	0		0	
B:MI8BND	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	

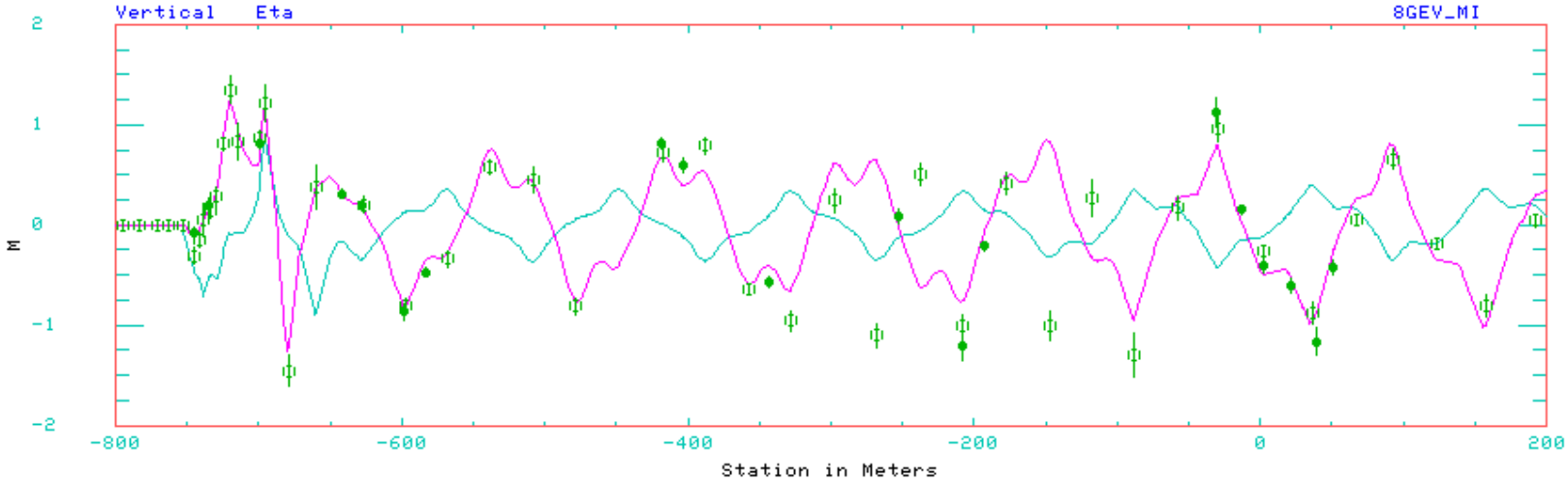
- B:Q803
  - Value closer to the setting.
- Shunt current I:Q851S
  - A troubled location to negotiate.
  - Close to MiniBoone switch magnet.

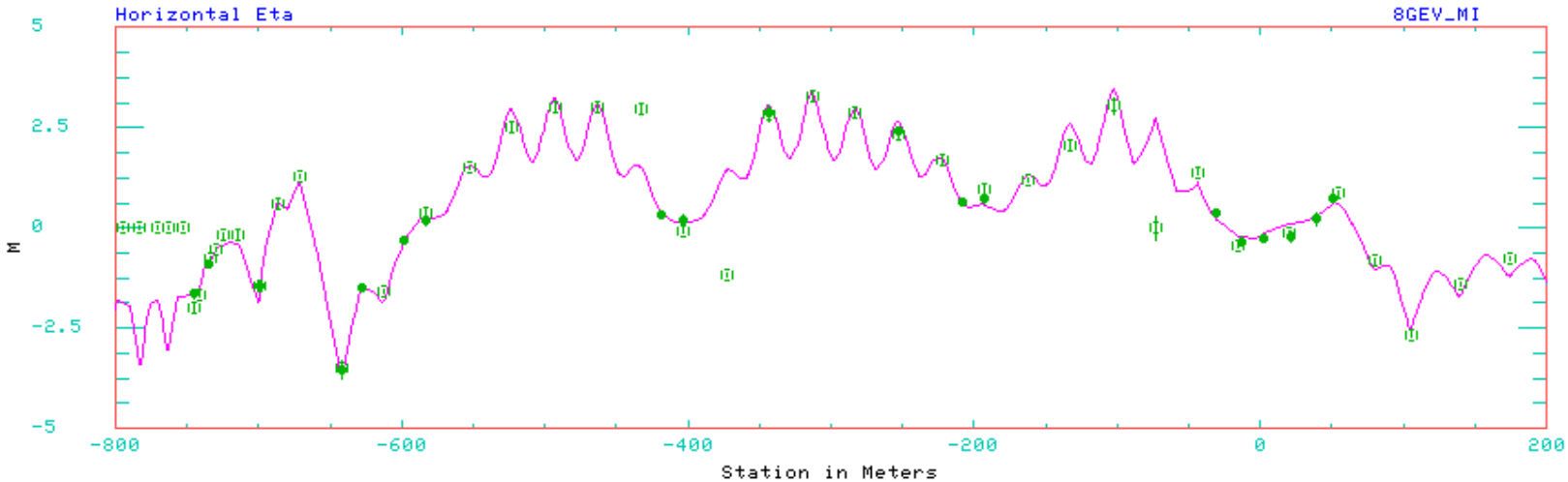
MI8 line dispersion function



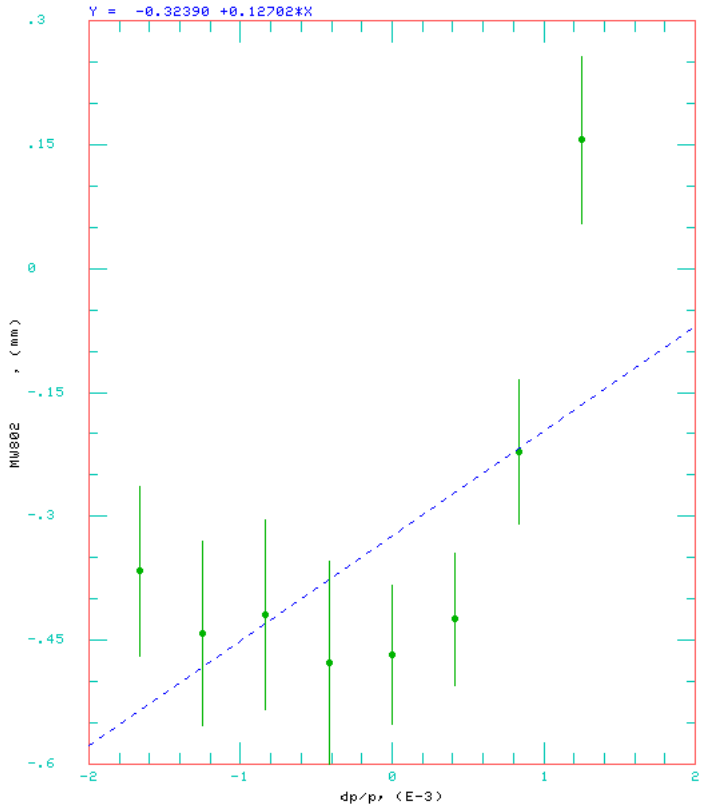


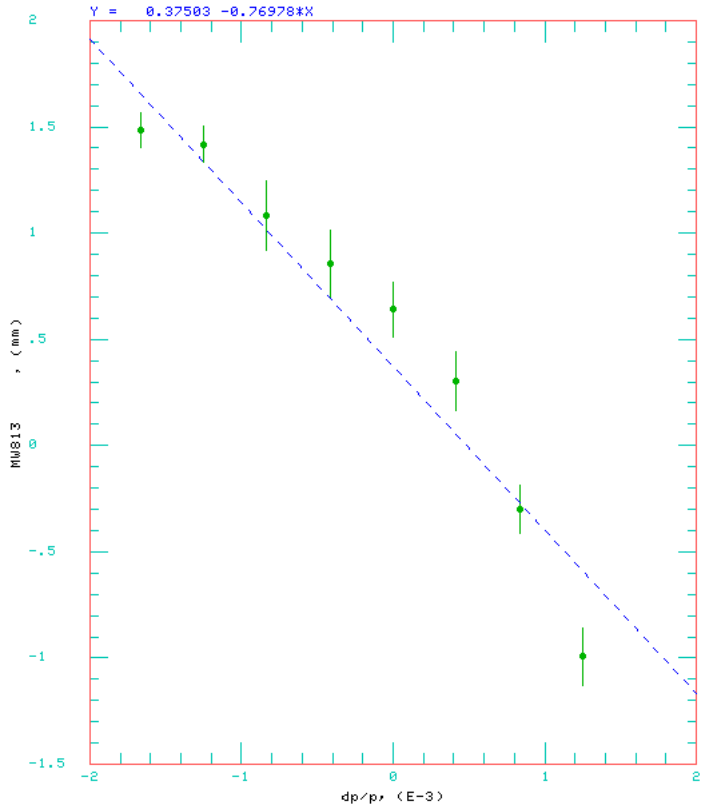
MI8 line eta, skew quad in MPØ2 at 4KG/m



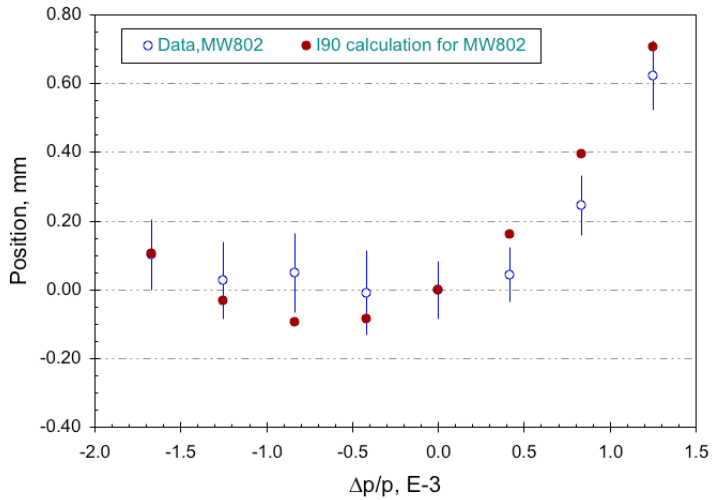


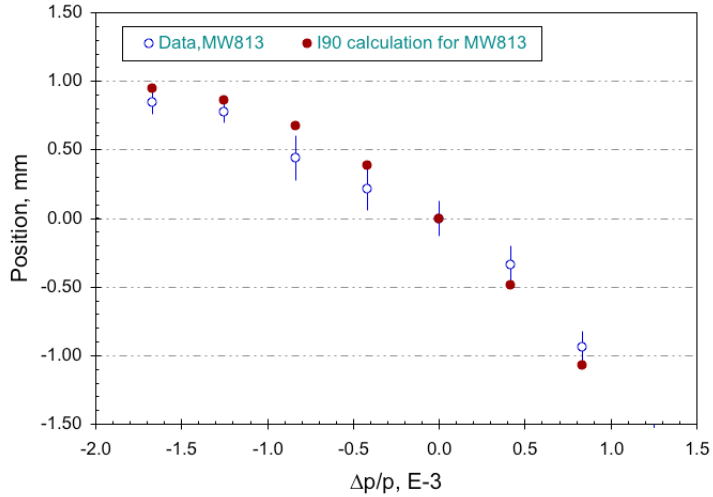
Vetical plane position vs Δp/p

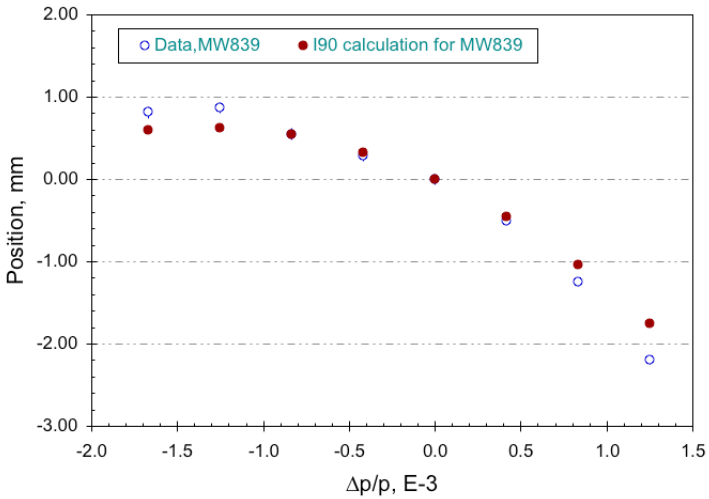


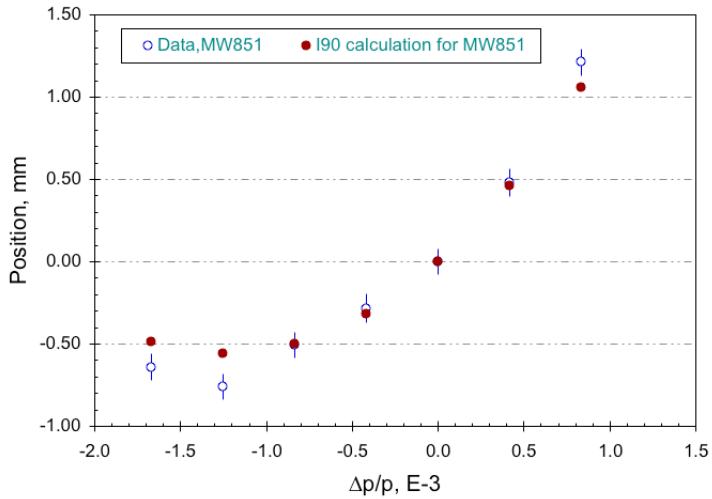


Vert position, data & calculation

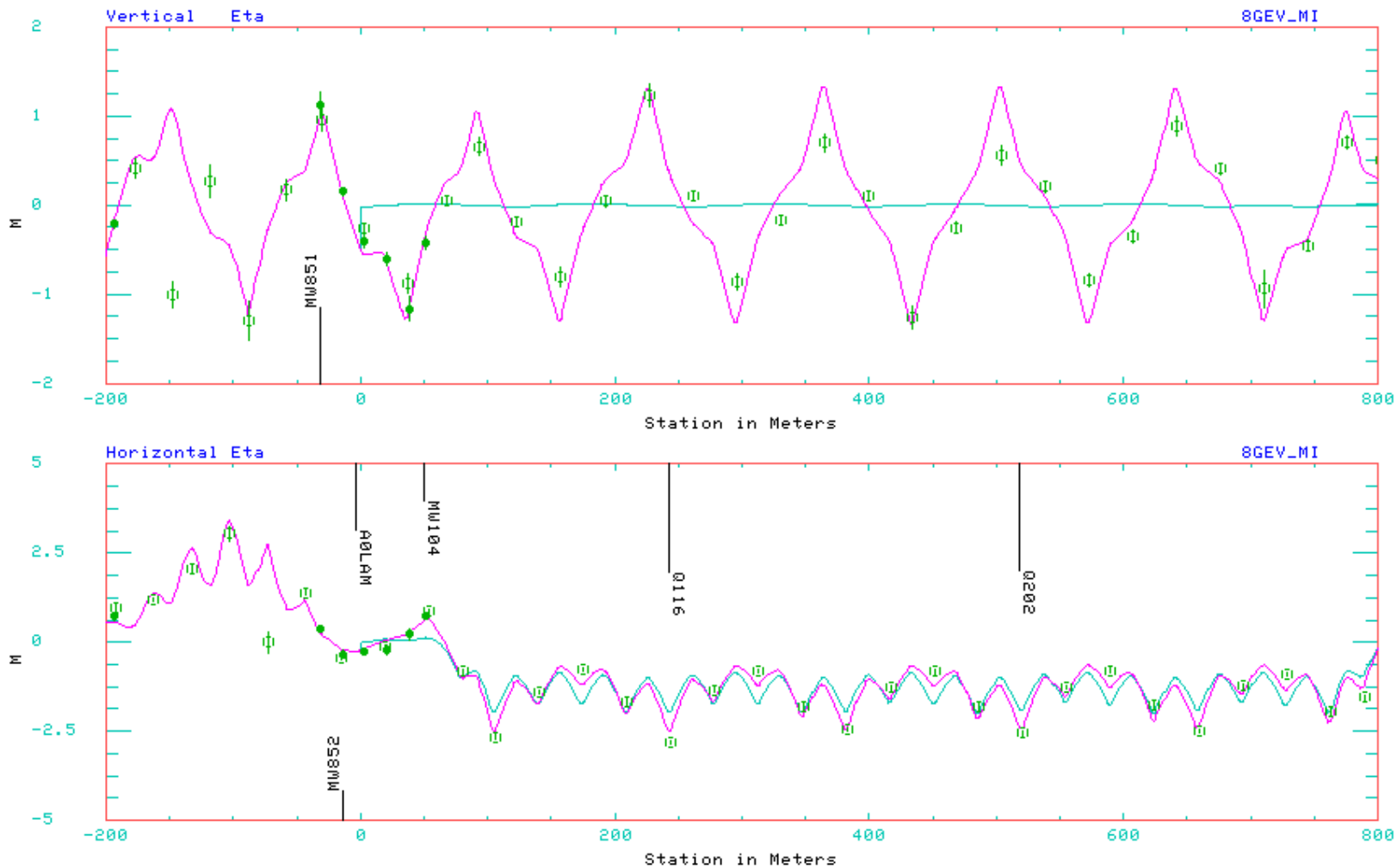








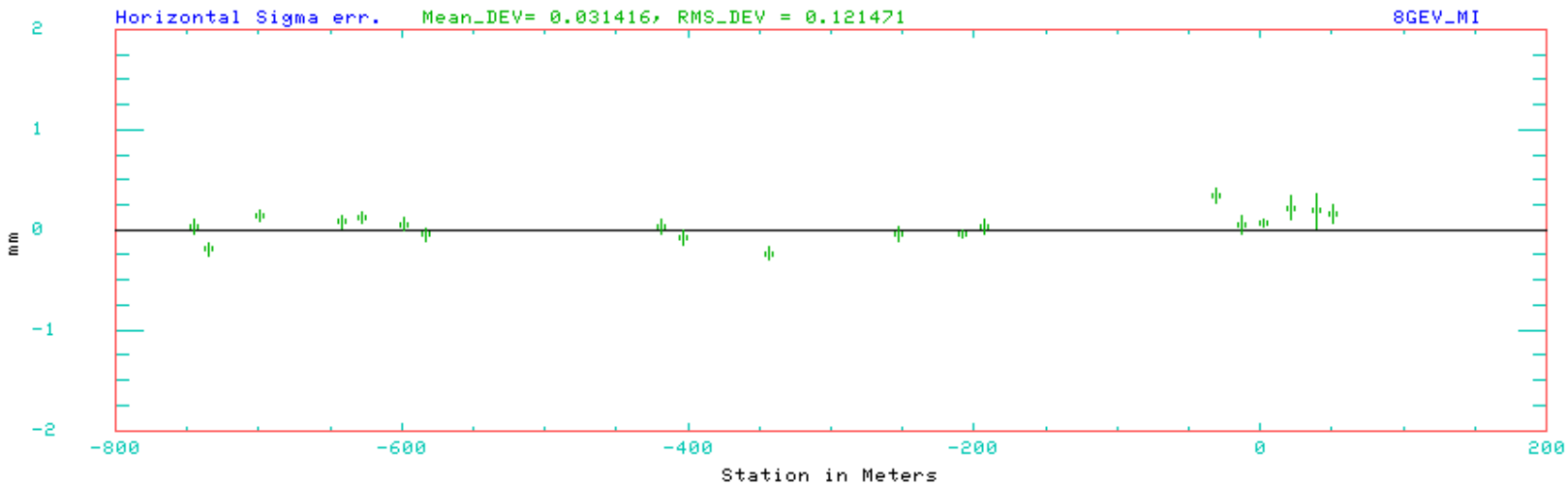
Injection matching, dispersion function

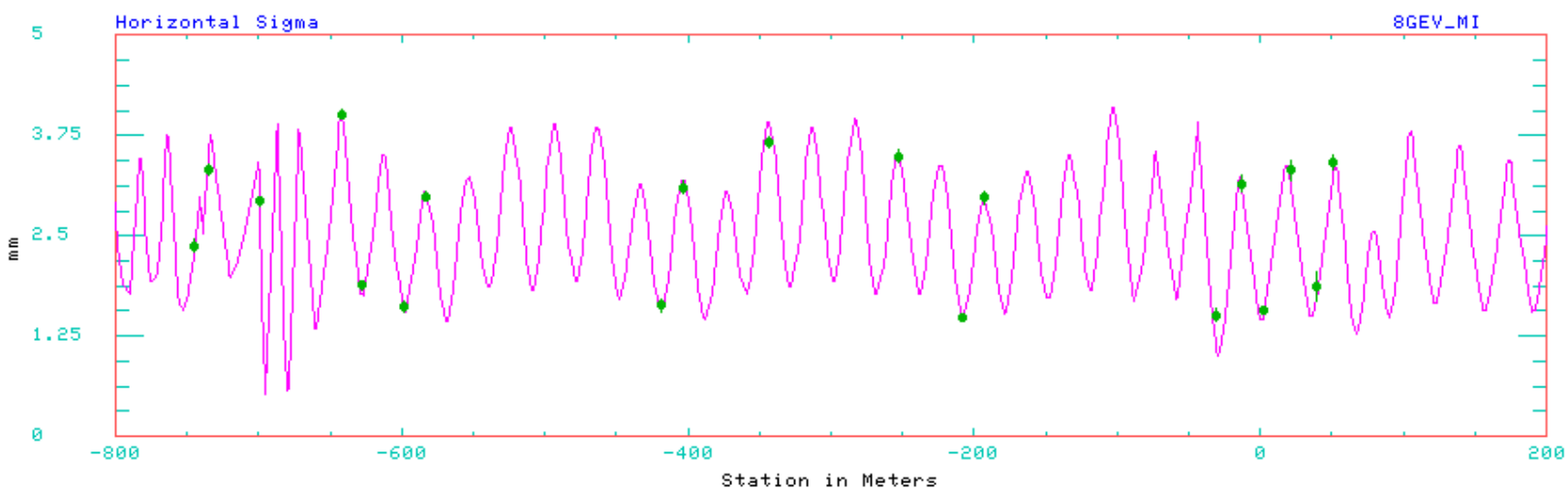


Issues on vertical dispersion function

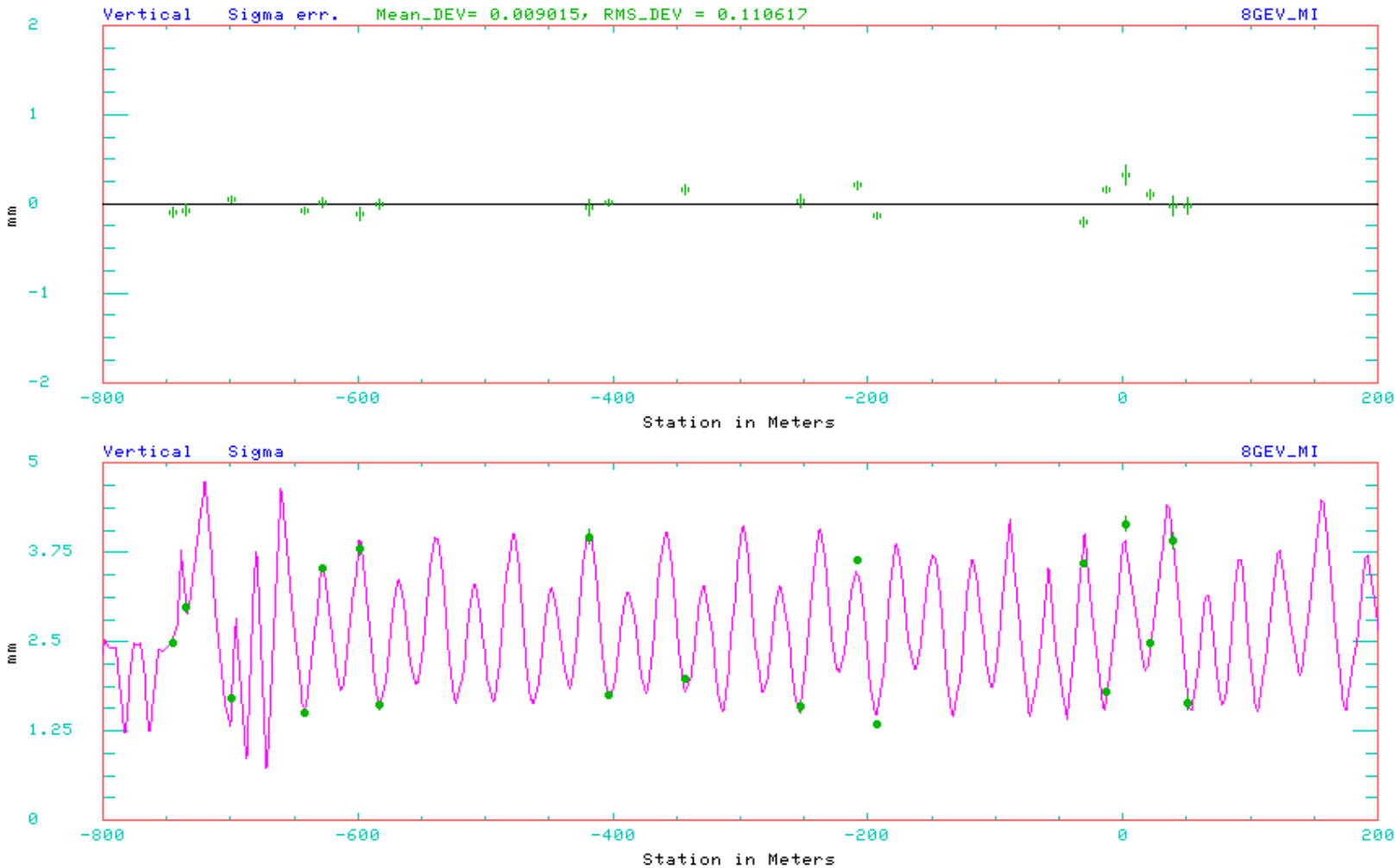
- Skew quad component in MPØ2
  - 4 KG/meter appears to fit the data well.
  - What is the result of field measurement?
  - Need another dedicated study, just for MPØ2.
- Skew sextupole contribution
  - Signiture of skew sextupole effect.
  - 1500 KG/(m^2), if only from MPØ2
  - Is there other scenario?

Fitting horizontal plane beam width sigma

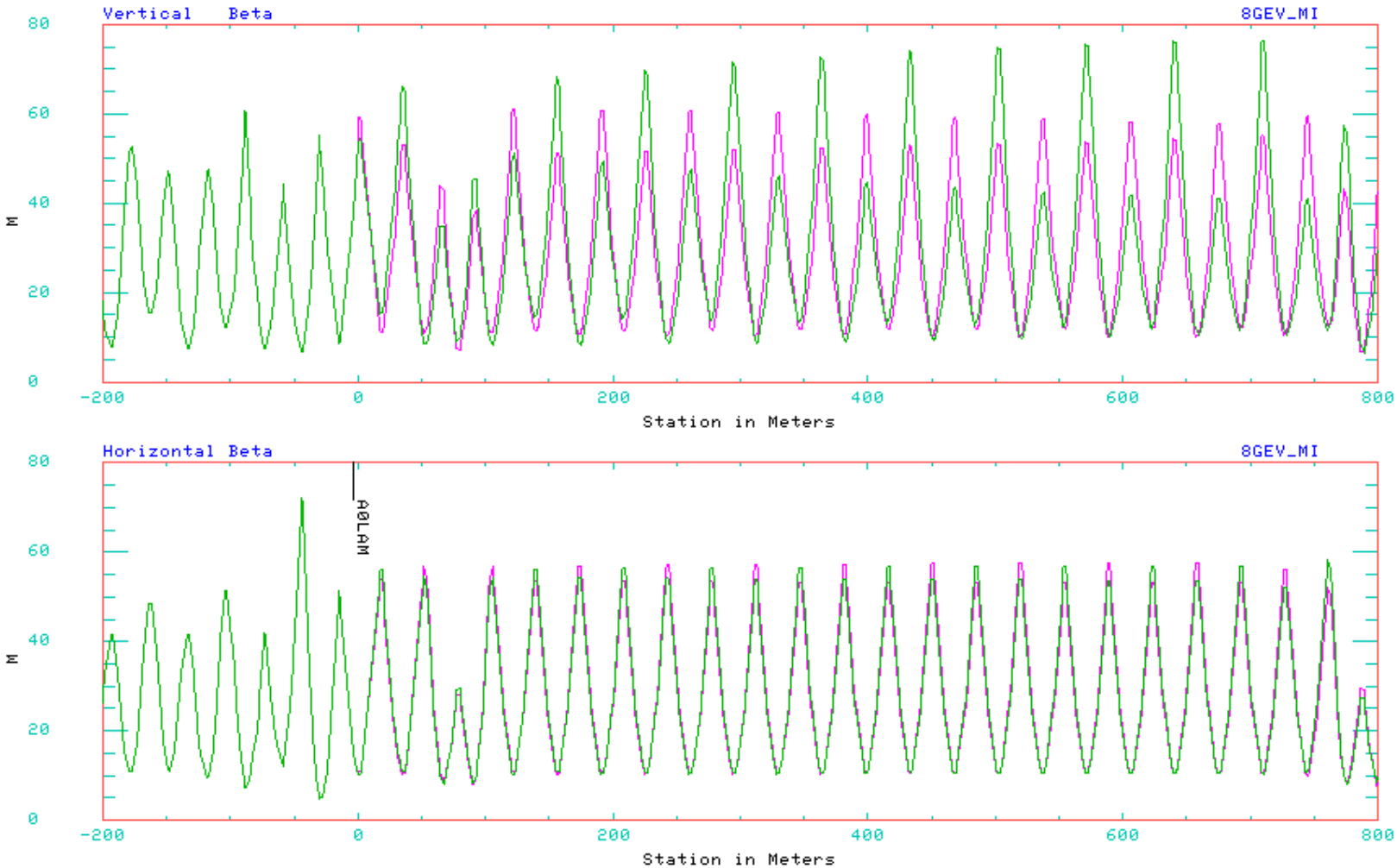




Fitting vertical plane beam width sigma



MI injection matching, beta function



Lattice parameters and emittances

- Horizontal emittance
  11.6 ± 0.4 π-mm-mr
- Vertical emittance
  15.9 ± 1.7 π-mm-mr
- σ_p/p
  - 0.74 ± 0.04 E-3

```
                    Lattice parameters
 Select: [8GEV_MI      ] as [Transfer line]
 Start at element: [BOO_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>
```

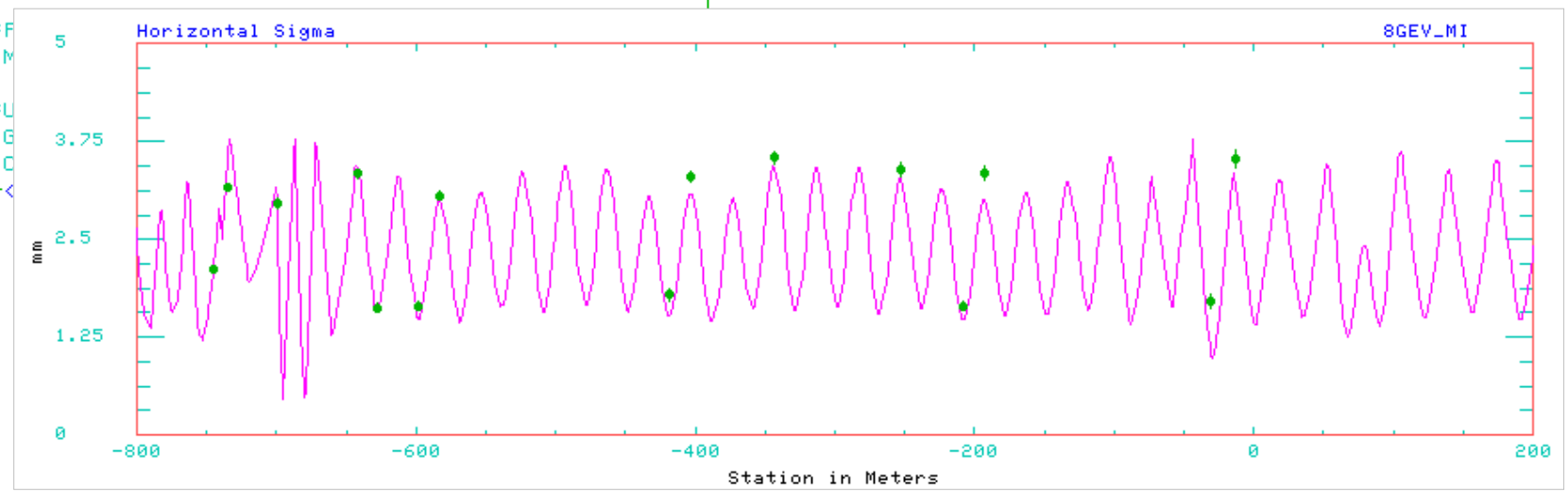
σ_p/p with bunch rotation

```
Lattice parameters
 Select: [8GEV_MI      ] as [Transfer line]
 Start at element: [BOO_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
```

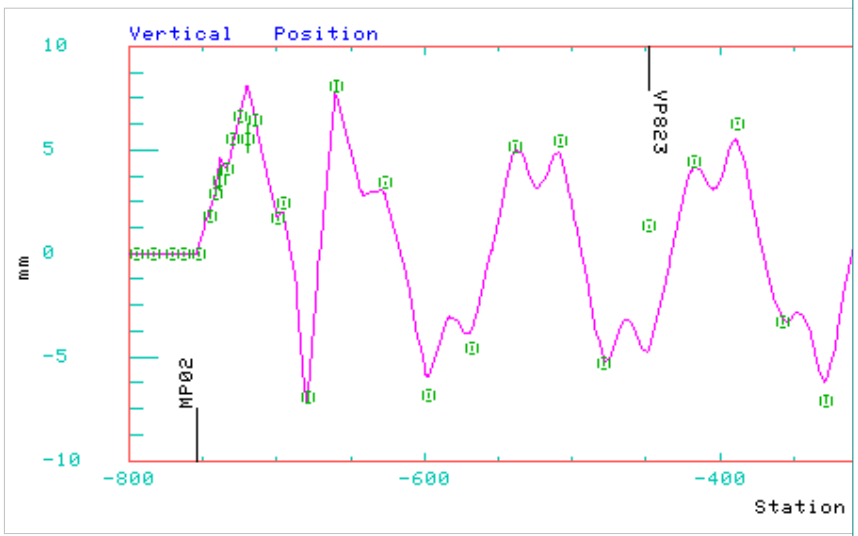
σ_p/p in %

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

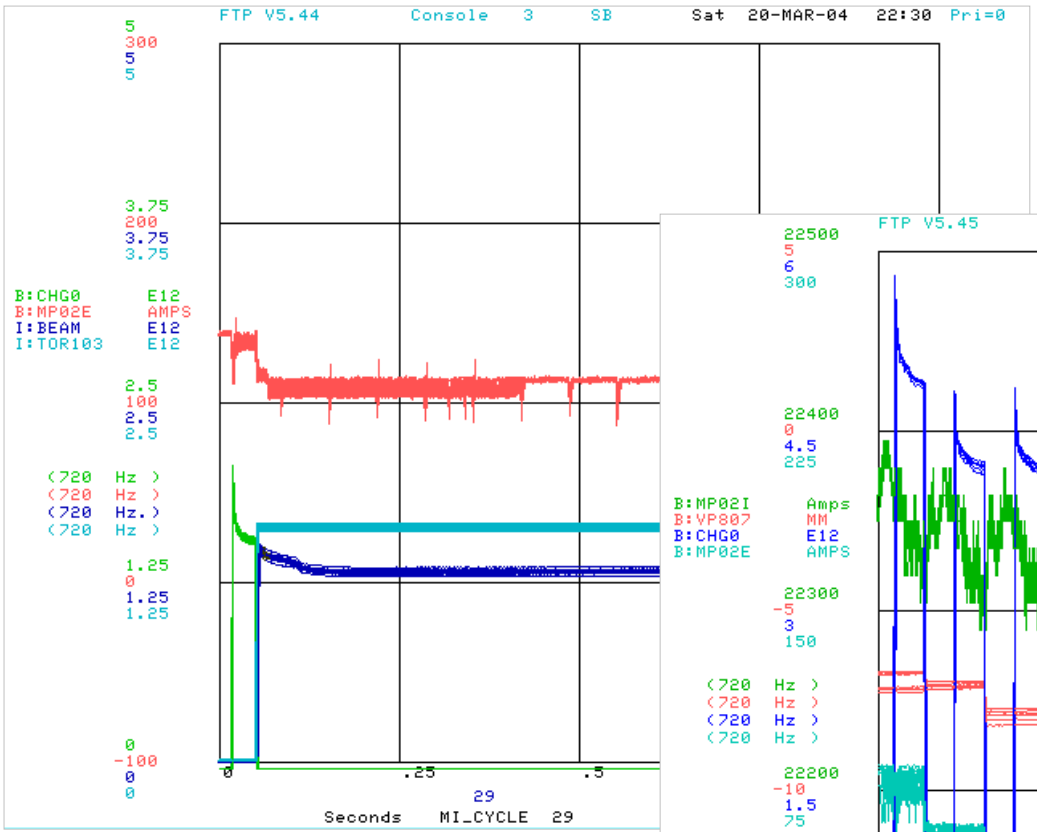


Stability with septum magnet MPØ2

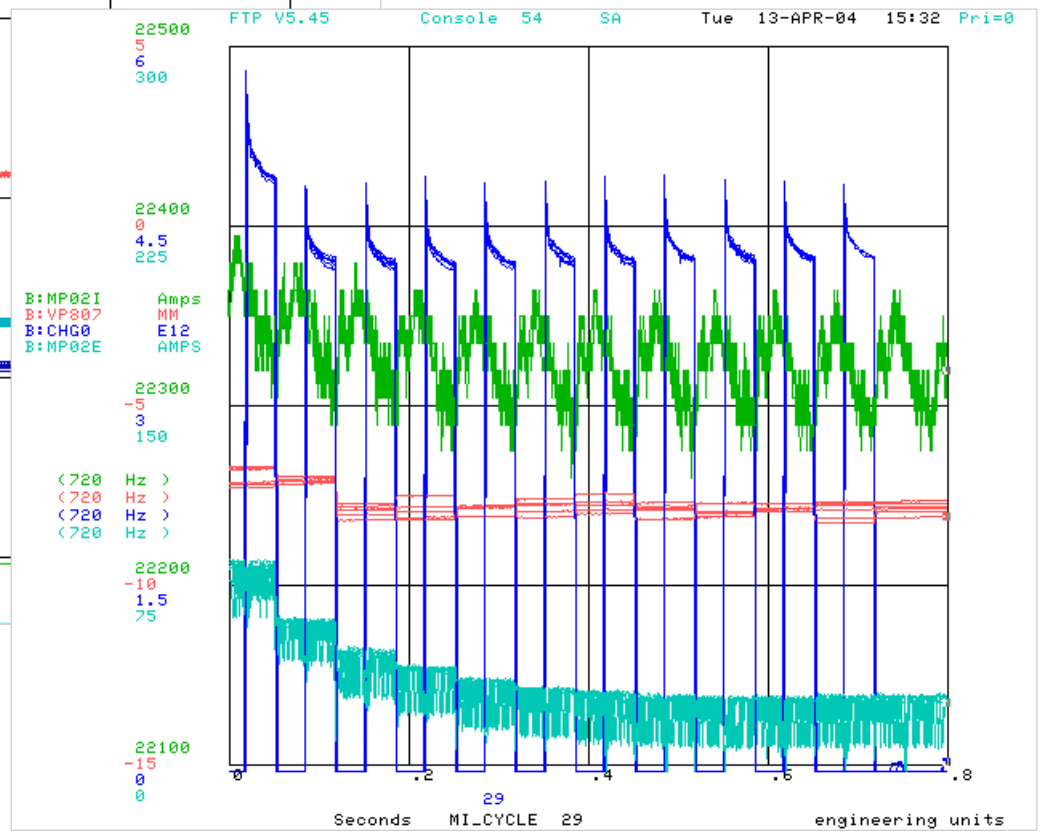
- MPØ2 setting not changed
- Orbit difference:
  4/12/04 - 4/06/04
- Calculation:
  +90 amps on MPØ2



MPØ2 error signal



Setting = 22411 amps
Error ~ 75 amp



Setting = 22567 amps
Error ~ 130 amps