

MI8 line lattice study

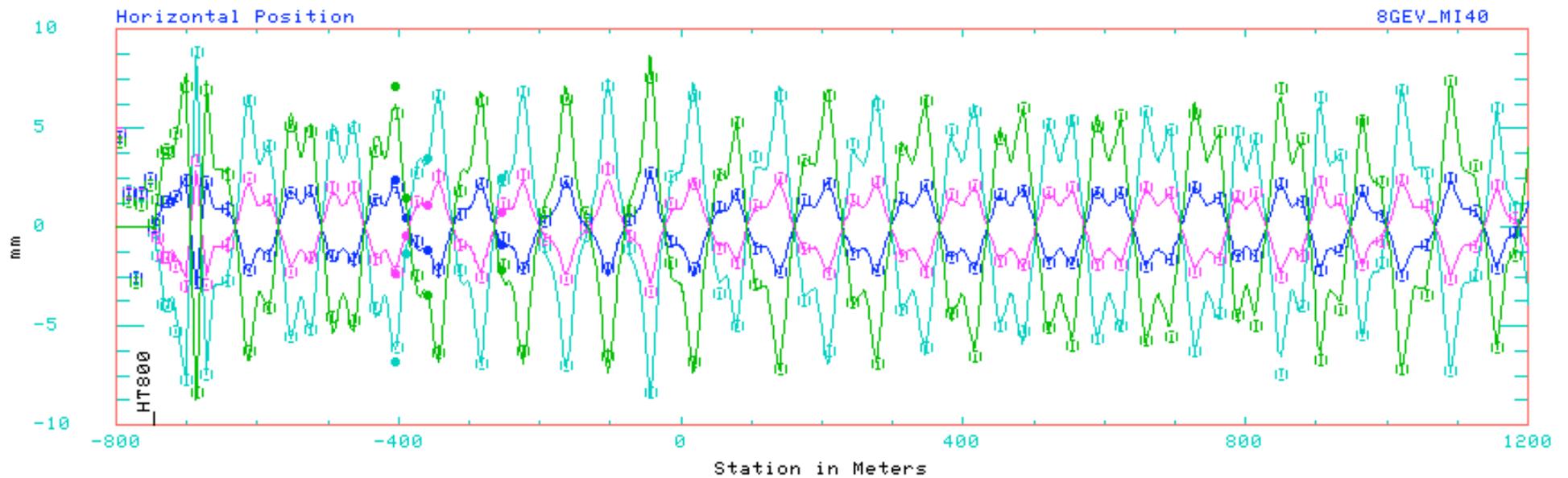
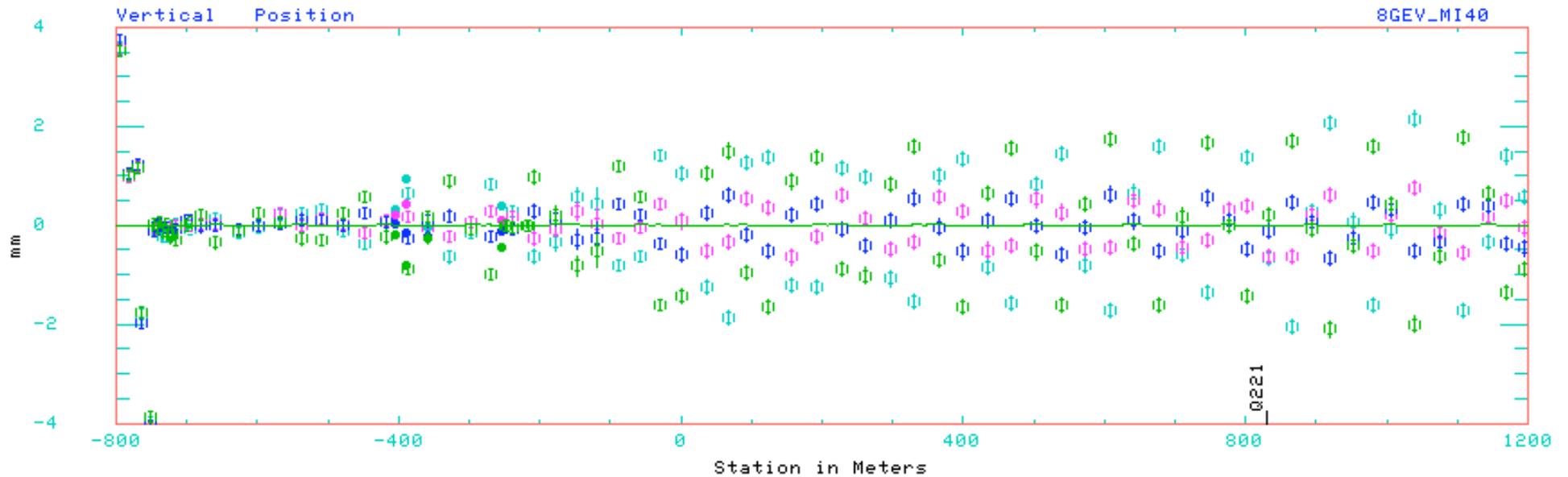
❖ Optics

- ▶ Horizontal 1-bump orbits
 - ht800, ht802, ht804.
- ▶ Vertical plane 1-bump orbits
 - Closed MP02/vt819/vt821 bump.
 - Adjust up-stream quad currents.
 - Vertical plane: vt805 & vt807.
 - Adjust down-stream quad currents.

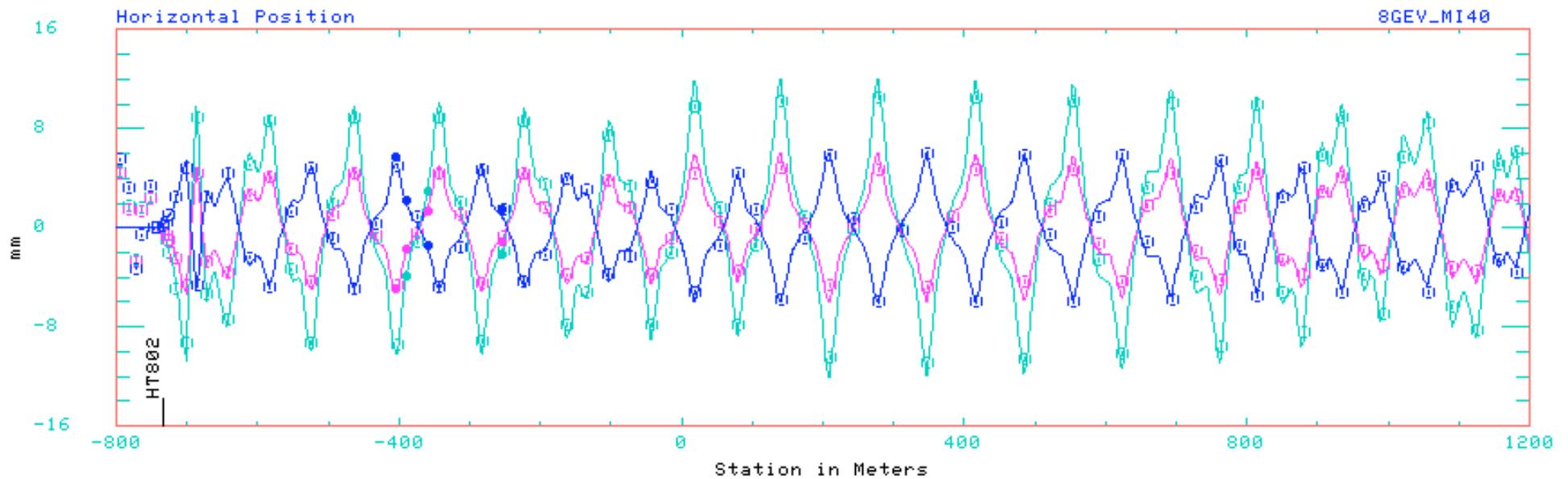
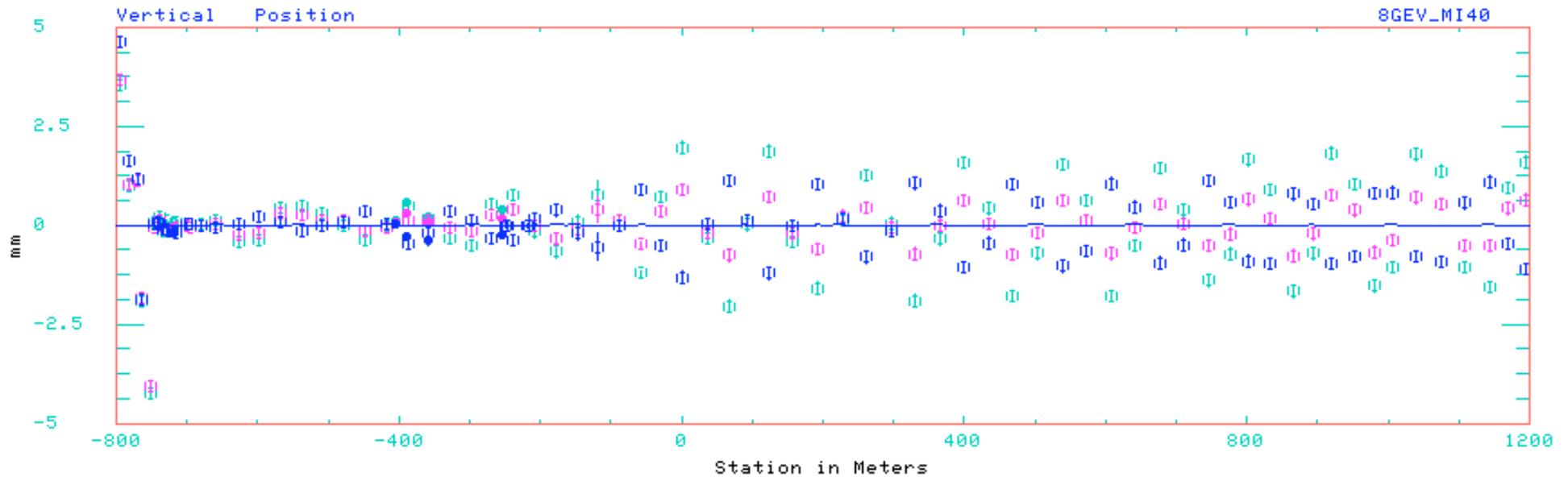
❖ Profile sigma data

- ▶ From Booster cycle \$14.

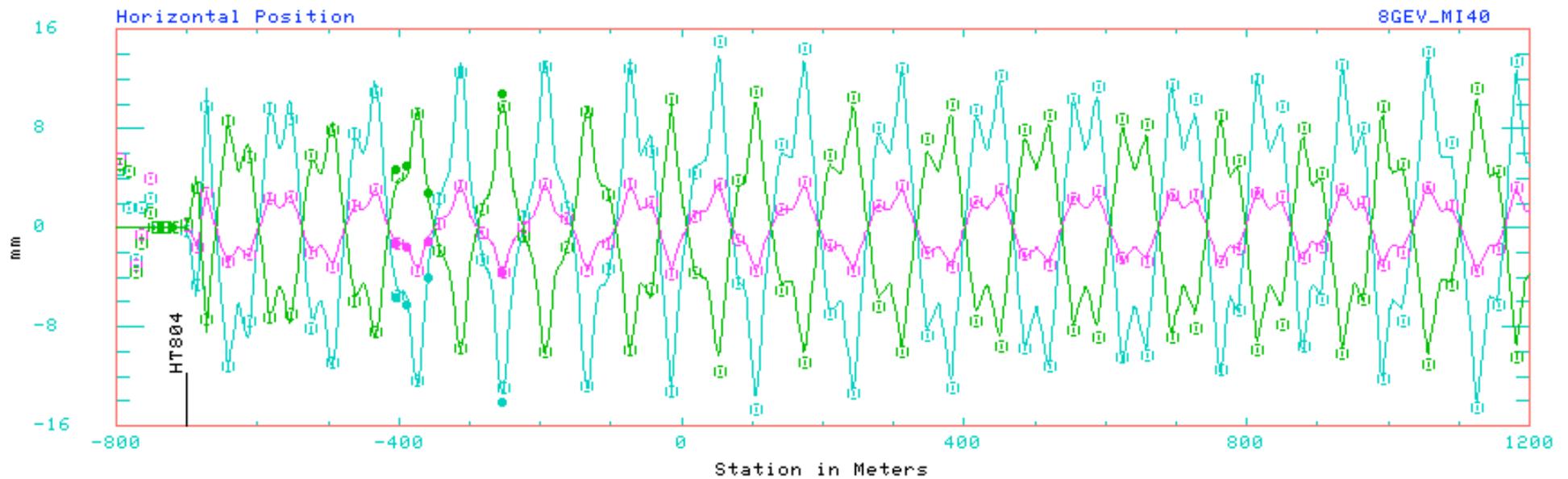
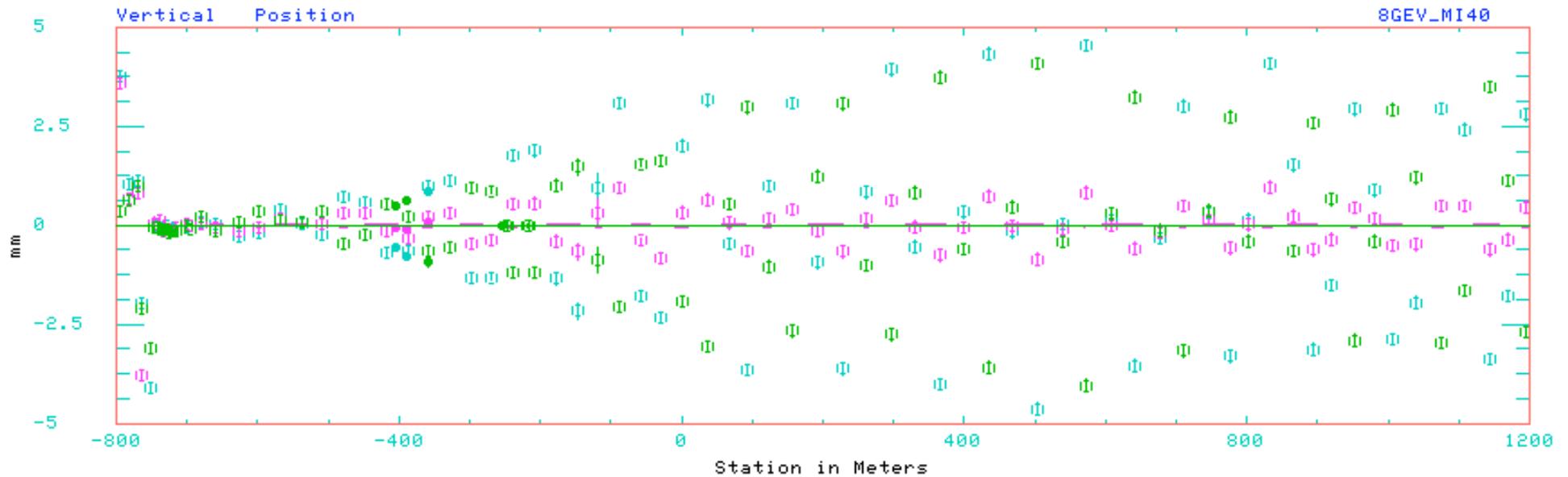
MI8 line 1-bump orbit, HT800



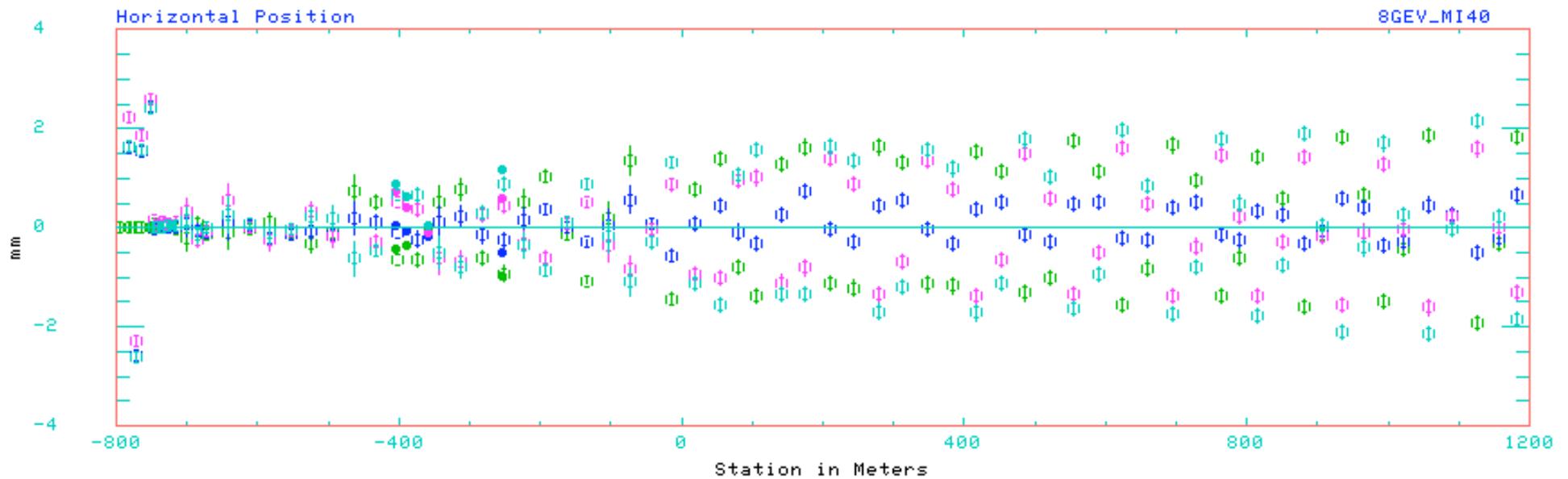
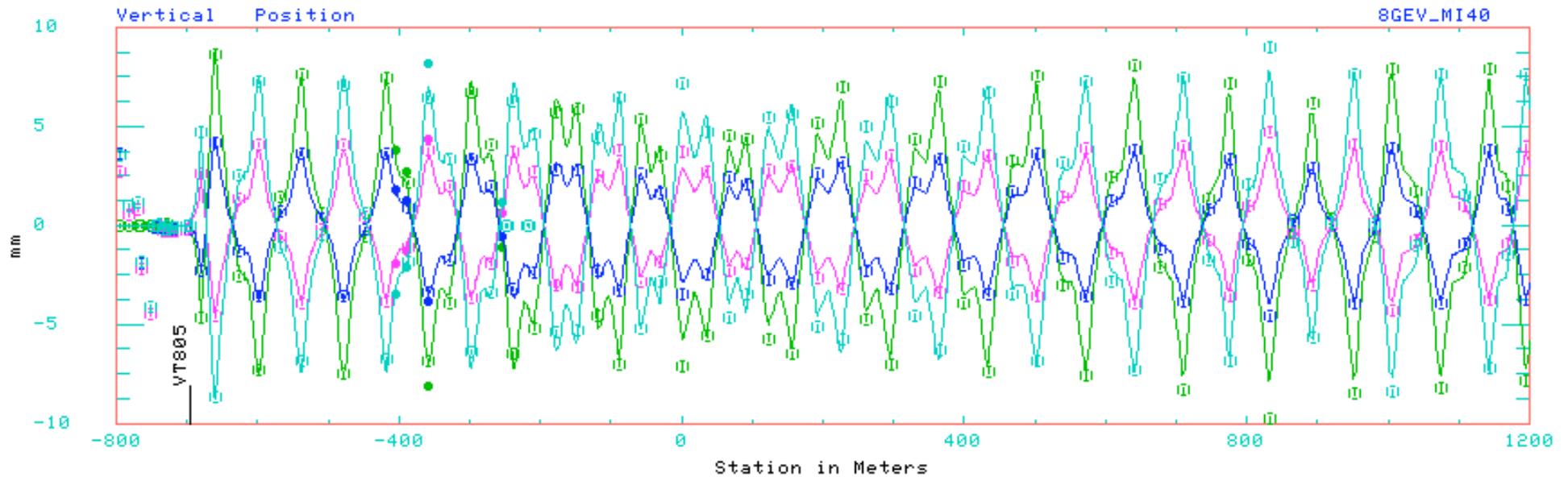
MI8 line 1-bump orbit, HT802



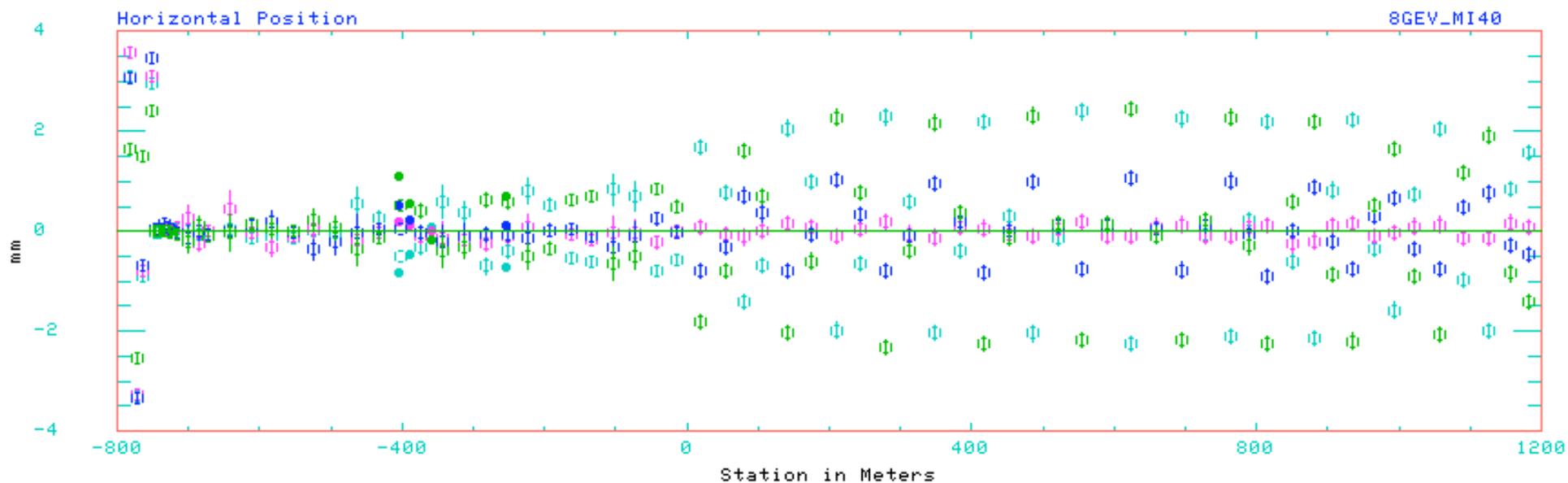
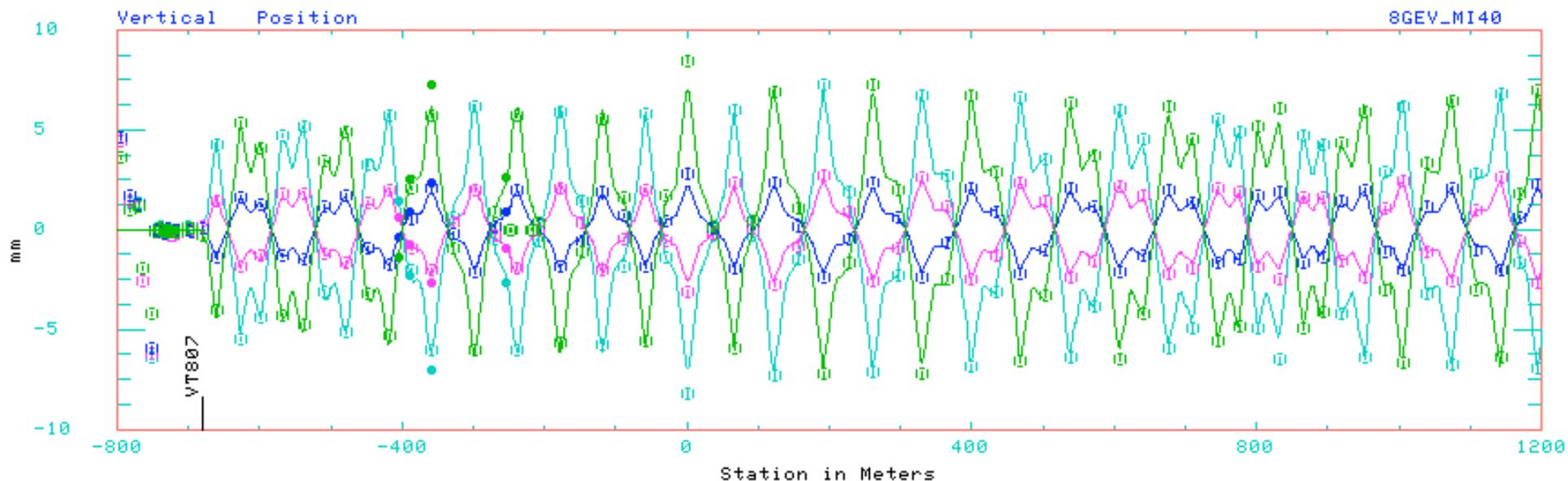
MI8 line 1-bump orbit, HT804



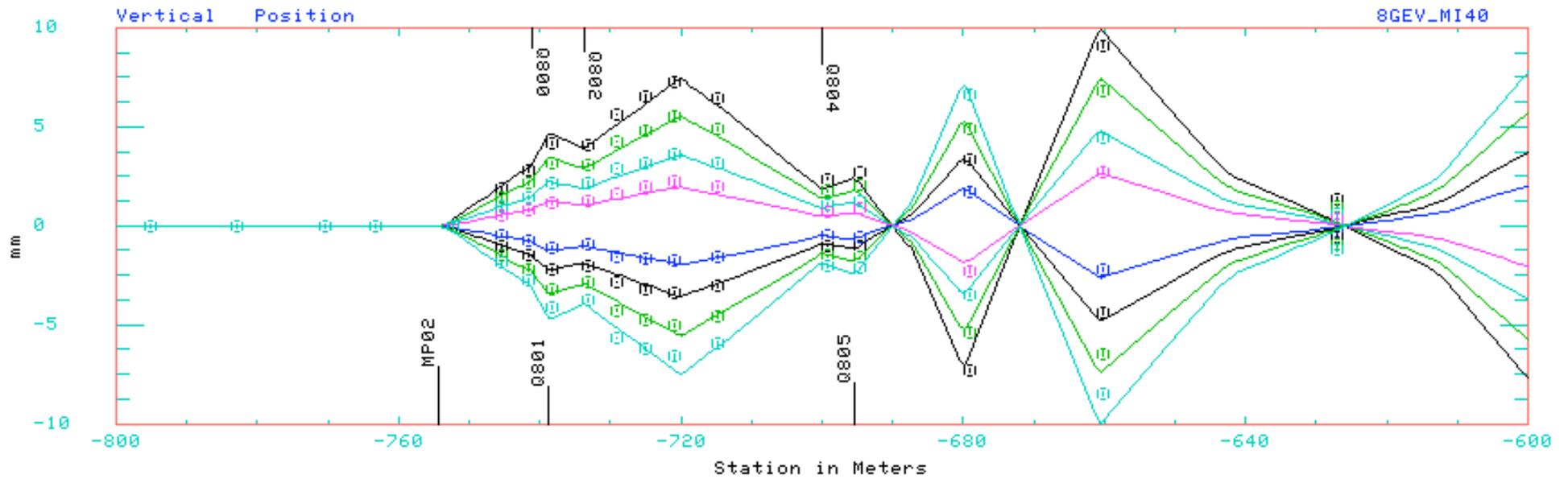
MI8 line 1-bump orbit, vt805



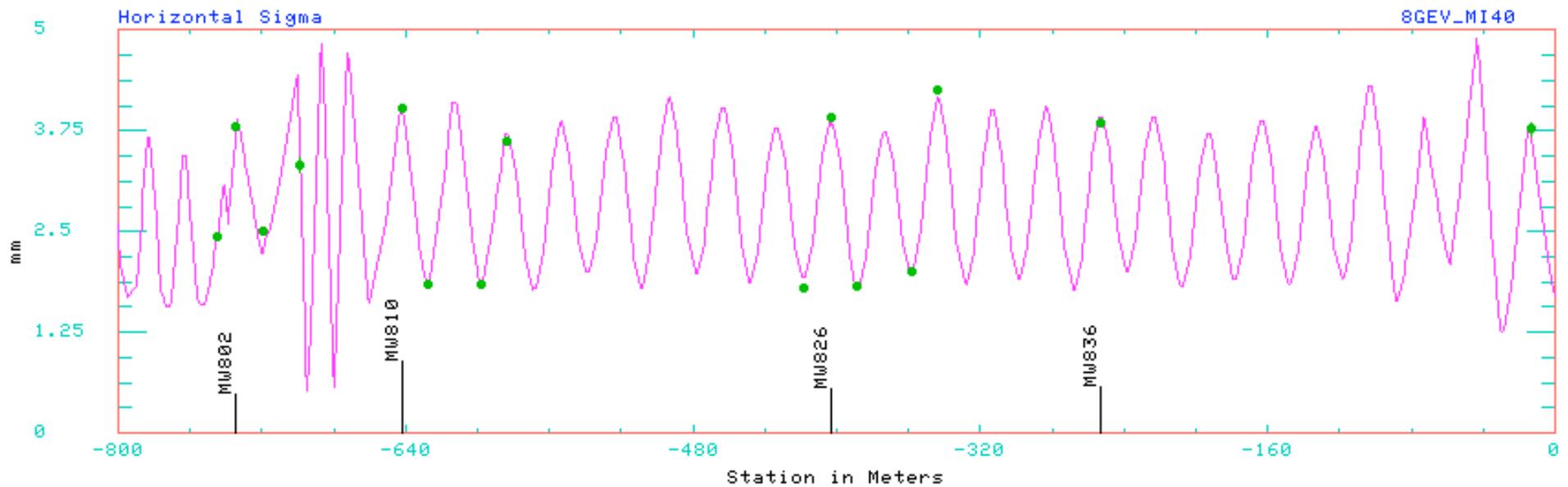
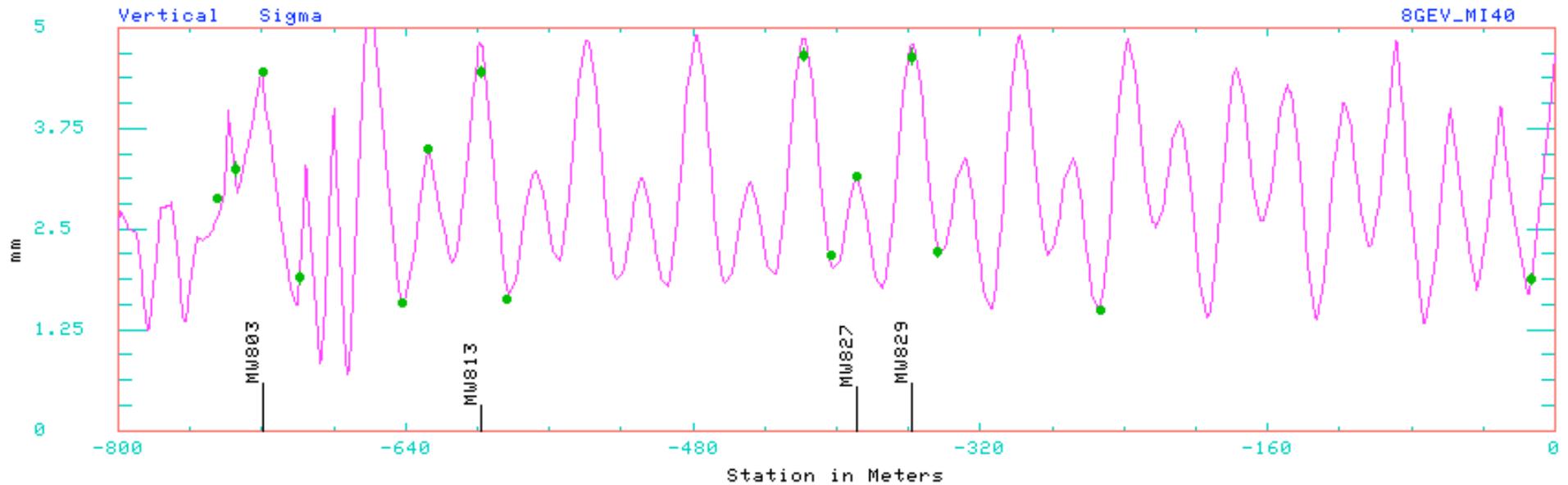
MI8 line 1-bump orbit, VT807



MI8 line orbit, MP02



MI8 line sigma on \$14s

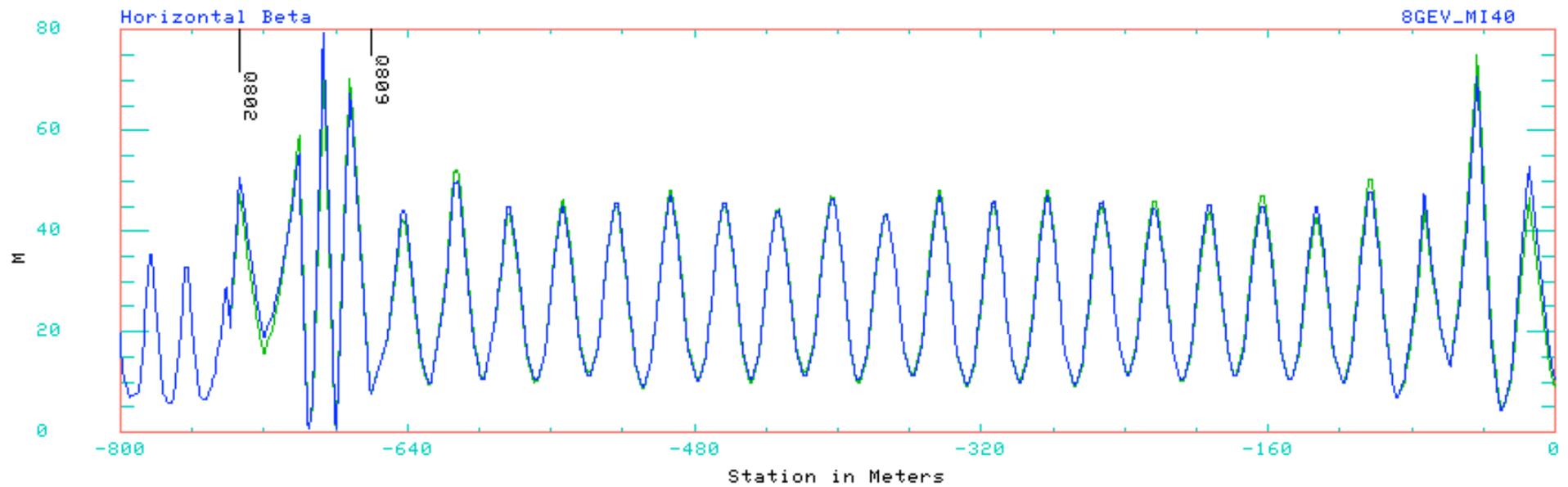
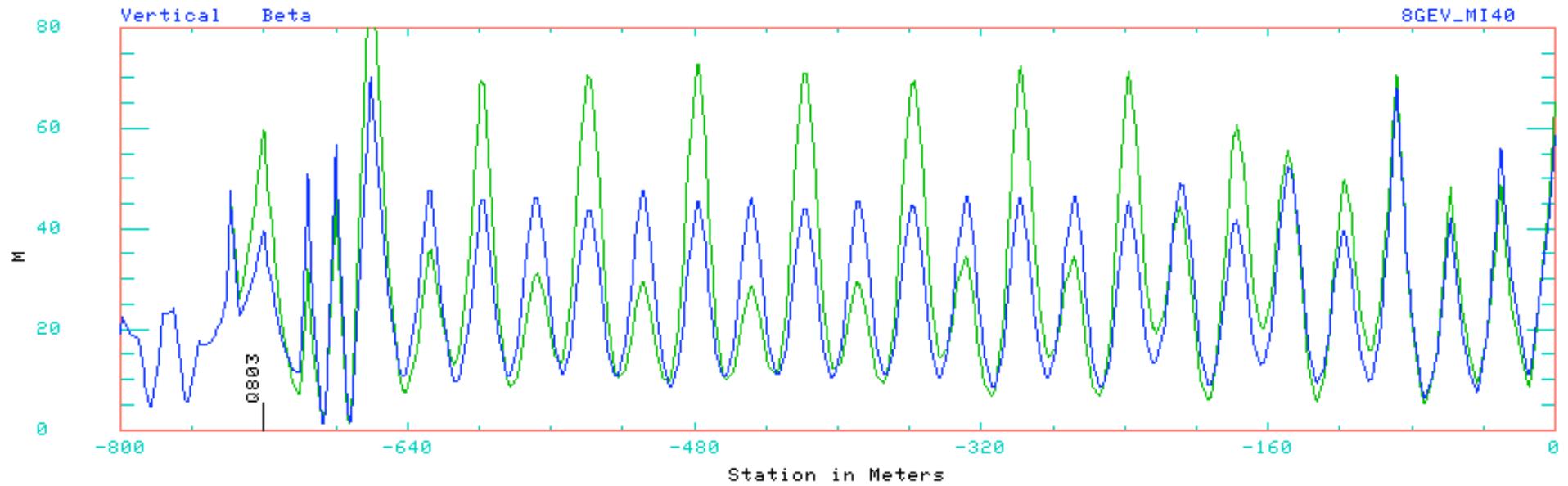


Fitted emittances & initial lattice

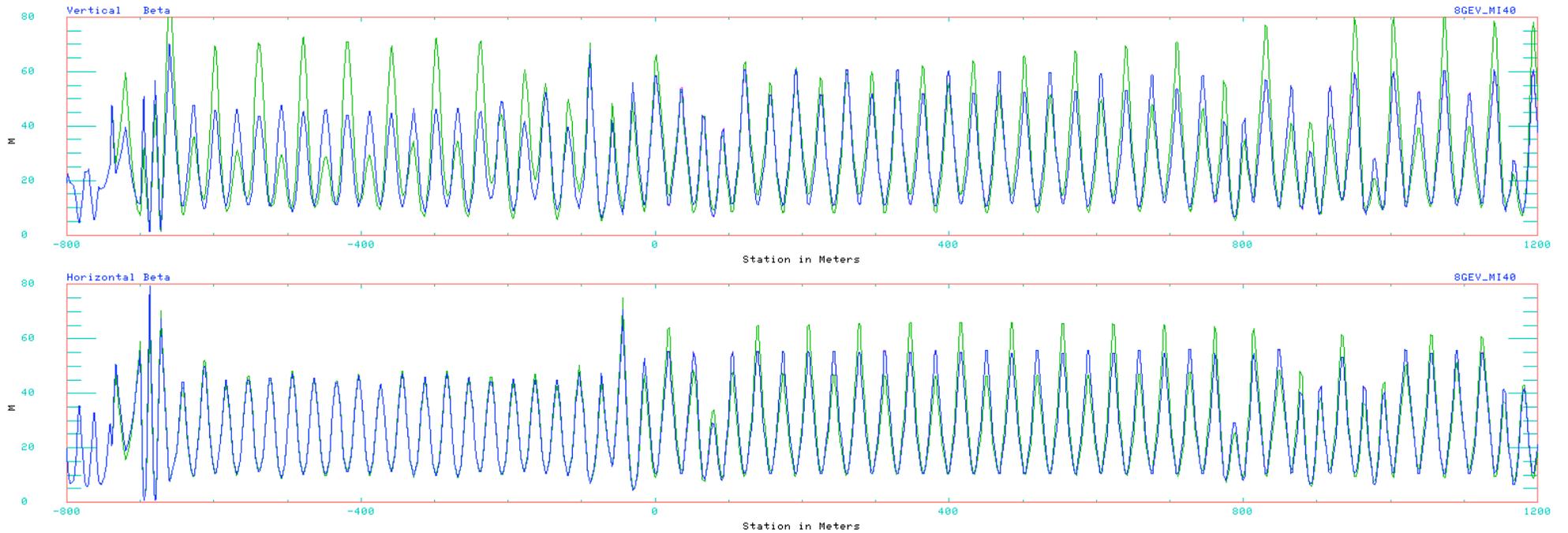
Z2 Beam line analysis--Main Injector 07-NOV-06 16:25:19 *Pgm_Tools*

functions	setup	data	calculate	display	misc		
<p>Cycle start <23</p> <p>*List [Twiss p</p> <p>*Device: [All</p> <p>* From <B00_CE</p> <p>* Name St</p> <p>VP423 20</p> <p>* S423 20</p> <p>* - 20</p> <p>IDA007 20</p> <p>- 20</p> <p>* IDB086 20</p> <p>* - 20</p> <p>* H424 20</p> <p>- 20</p> <p>F Q424 20</p> <p>- 20</p> <p>HP424 20</p> <p>S424 20</p> <p>- 20</p> <p>O424 20</p> <p>- 20</p> <p>IDA096 20</p> <p><Exit></p>		<p>Se</p> <p>Acqu</p> <p>P</p> <p>*Select: [8GEV_</p> <p>*Pick <MW803</p> <p>*Measurement# -</p> <p>*Calculation# -</p> <p>*Display mode:</p> <p>*Signal range:</p> <p>*Plot style: [S</p> <p>*Plot [Raw</p> <p>*Si</p> <p>Intensity: (3</p> <p>Mean: (2</p> <p>Sigma: (2</p> <p>Offset:</p> <p>*Save fit to bu</p> <p>*Fit Gaussian p</p> <p>Profile cut at</p> <p>*Edit wire: [ga</p> <p>*Use this profi</p> <p>Emulate on-lin</p> <p><Exit></p>		<p>Lattice parameters</p> <p>Select: [8GEV_MI40] as [Transfer line]</p> <p>Start at element: [B00_CELL01] for [Proton]]</p> <p>*Track: [Lattice function] at (8) GeV]</p> <p>Lattice Horiz Vert</p> <p>Phase: (24.5431) (23.639) 2π</p> <p>Beta: (52.55) (7.4) M</p> <p>Alpha: (-.243) (-.09)</p> <p>eta: (-3.189) (.065) M</p> <p>etap: (-.011) (-.013)</p> <p>Beam</p> <p>Position: (0) (0) mm</p> <p>Angle: (0) (0) mr</p> <p>Emittance: (2.99296) (3.14603) π-mm-mr</p> <p>± .074947 ± .287053</p> <p>ΣP/P: (.410878) ± .06867 E-3</p> <p>ΔP/P: (0) E-3</p> <p>*Fit emittance: [Emitt & sig_p/p]</p> <p>Momentum sigma from [Horizontal] plane</p> <p>*Update [reference orbit]</p> <p>Graphic window link: [GxPB 2]</p> <p>*Set lattice to [Linear] order and with [Matrix]</p> <p><Exit></p>		<p>ters</p> <p>n</p> <p>+</p> <p>n</p> <p>+</p> <p>n</p> <p>+</p> <p>n</p> <p>+</p> <p>n</p>	
<p>Mult: A0LAMB is associ</p> <p>DBDEV: K1A0Lamb is assoc</p> <p>DBDEV: Number of active database devices: 710</p>		<p>B:Q802S Amps 15.6</p> <p>B:Q804S Amps 29.44</p> <p><Exit></p>		<p>33.7225</p> <p>18.8425</p> <p>29.2425</p> <p>1:24 of 57</p>			
<p>1: 3 of 51</p>							

MI8 line beta



MI injection beta



Settings of MI8 line quads

DB_name		Setting	Reading		Used	Matched	delta	New setting	
Q800	AMP	211.2496	211.915		211.6619	211.6619	0	211.2496	211.2496
Q801	AMP	173.3199	172.265		180.2619	190.2619	10	183.3199	183.3199
Q802	AMP	167.6053	168.7213		163.9559	163.9559	0	167.6053	167.6053
Q803	AMPS	101.001	102.2875		116.2937	100.3875	-15.9062	85.0948	85.0948
Q804	Amps	225.5496	226.155		225.7419	225.7419	0	225.5496	225.5496
Q805	Amps	245.6096	245.755		245.5819	245.5819	0	245.6096	245.6096
Q806	Amps	164.5053	165.7613		166.9559	164.1559	-2.8	161.7053	161.7053
Q807	Amps	149.7053	151.1613		150.3959	150.3959	0	149.7053	149.7053
Q808	Amps	201.6199	199.985		200.1019	203.0019	2.9	204.5199	204.5199
Q809	Amps	203.6199	201.985		204.1419	204.1419	0	203.6199	203.6199
Q847	Amps	160.5827	159.0162		158.9113	165.4113	6.5	167.0827	167.0827
Q848	Amps	145.5427	143.9862		145.9113	145.9113	0	145.5427	145.5427
Q849	Amps	171.5027	169.7262		169.6613	172.0613	2.4	173.9027	173.9027
Q850	Amps	162.9827	161.3962		165.3213	167.7213	2.4	165.3827	165.3827
Q851	Amps	149.1027	147.5262		164.0513	163.5513	-0.5	148.6027	148.6027
Q852	Amps	164.5227	162.8862		171.8013	166.8013	-5	159.5227	159.5227
B:Q800S	Amps	43.74	43.085		43.3225	43.3225	0	43.74	43.74
B:Q801S	Amps	42.18	41.485		33.7225	23.7225	-10	32.18	32.18
B:Q802S	Amps	15.6	15.685		18.8425	18.8425	0	15.6	15.6
B:Q804S	Amps	29.44	28.845		29.2425	29.2425	0	29.44	29.44
B:Q805S	Amps	9.38	9.245		9.4025	9.4025	0	9.38	9.38
B:Q806S	Amps	18.7	18.645		15.8425	18.6425	2.8	21.5	21.5
B:Q807S	Amps	33.5	33.245		32.4025	32.4025	0	33.5	33.5
B:Q808S	Amps	13.88	13.765		13.8825	10.9825	-2.9	10.98	10.98
B:Q809S	Amps	11.88	11.765		9.8425	9.8425	0	11.88	11.88
I:Q847S	Amps	10.92	10.9025		15.9325	9.4325	-6.5	4.42	6.82
I:Q848S	Amps	25.96	25.9325		28.9325	28.9325	0	25.96	28.36
I:Q849S	Amps	0	0.1925		5.1825	2.7825	-2.4	-2.4	0
I:Q850S	Amps	8.52	8.5225		9.5225	7.1225	-2.4	6.12	8.52
I:Q851S	Amps	22.4	22.3925		10.7925	11.2925	0.5	22.9	25.3
I:Q852S	Amps	6.98	7.0325		3.0425	8.0425	5	11.98	14.38
B:Q800	AMP	254.9896	255		254.9844	254.9844	0	254.9896	254.9896
B:Q801	AMP	215.4999	213.75		213.9844	213.9844	0	215.4999	215.4999
B:Q802	AMP	183.2053	184.4063		182.7984	182.7984	0	183.2053	183.2053
B:Q803	AMPS	101.001	102.2875		116.2937	100.3875	-15.9062	85.0948	85.0948
I:Q847	AMP	171.5027	169.9187		174.8438	174.8438	0	171.5027	173.9027

K1_HB851 KG/M
K1A0Lamb KG/M

0.7 0.7
-0.3 -0.3

Disclaimers

❖ Optics study without multiwire

- ▶ BPM calibration
 - Up-stream MI8 line.
 - Between MI8 line and MI.

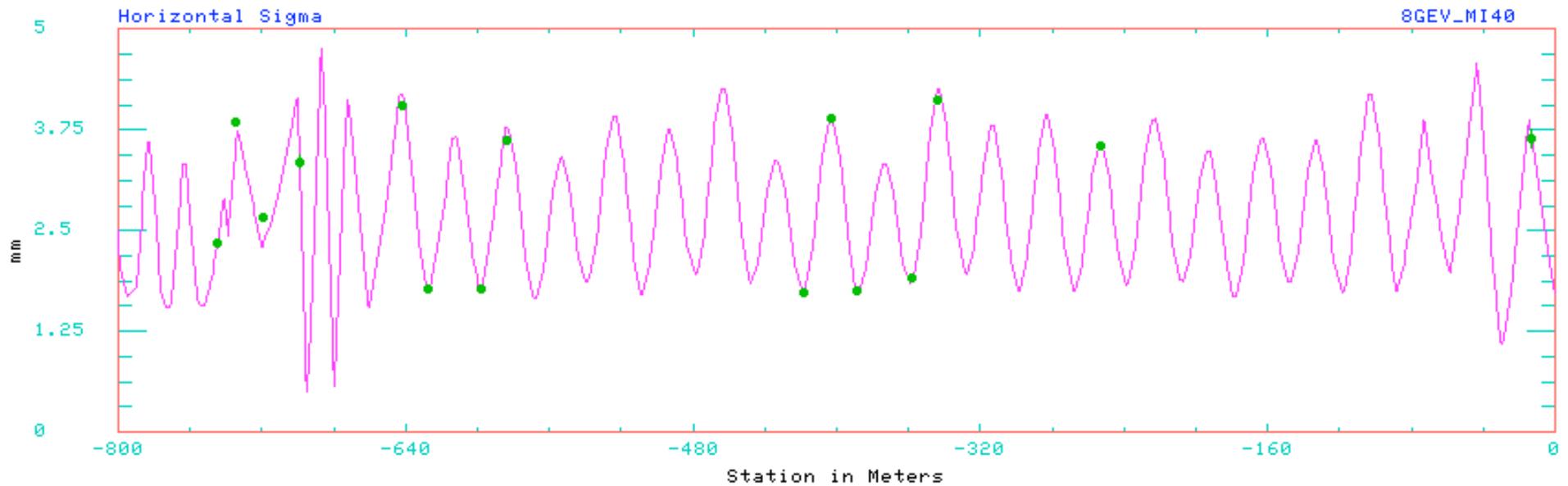
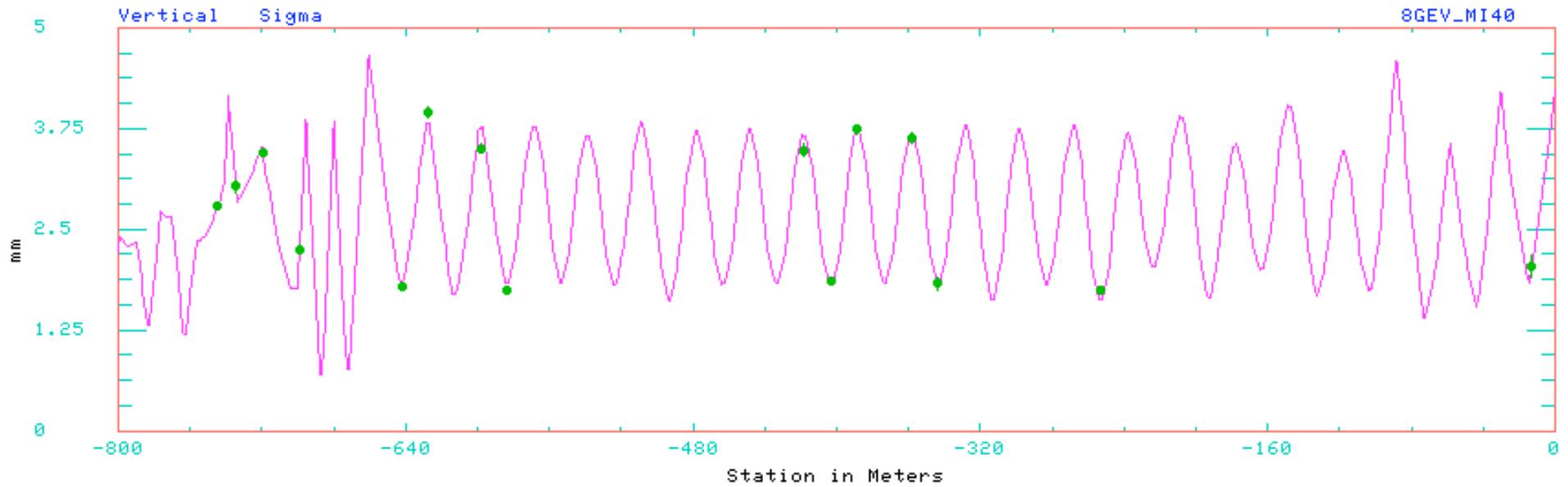
❖ MI8 line stabilities

- ▶ Orbit
 - B:Q801 has Booster RF feed-thru problem.
- ▶ Optics
 - Profile sigma between MW826 and MW836 has changed.
- ▶ Vertical dispersion function

❖ Coupling

- ▶ May affect sigma.

After new setting was installed

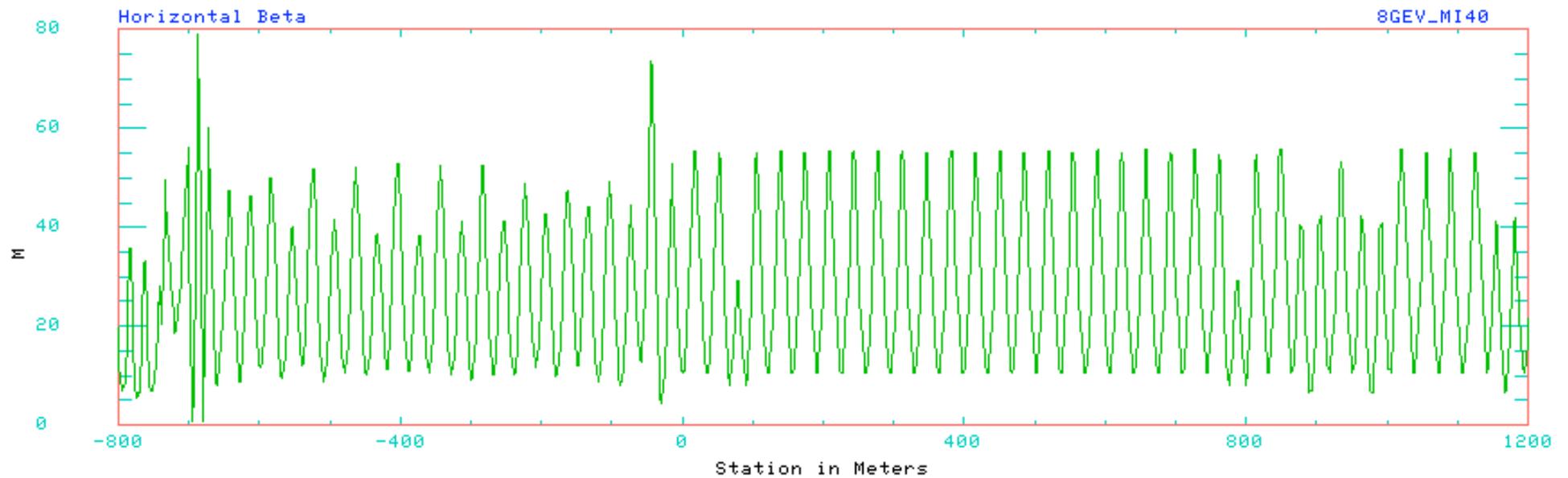
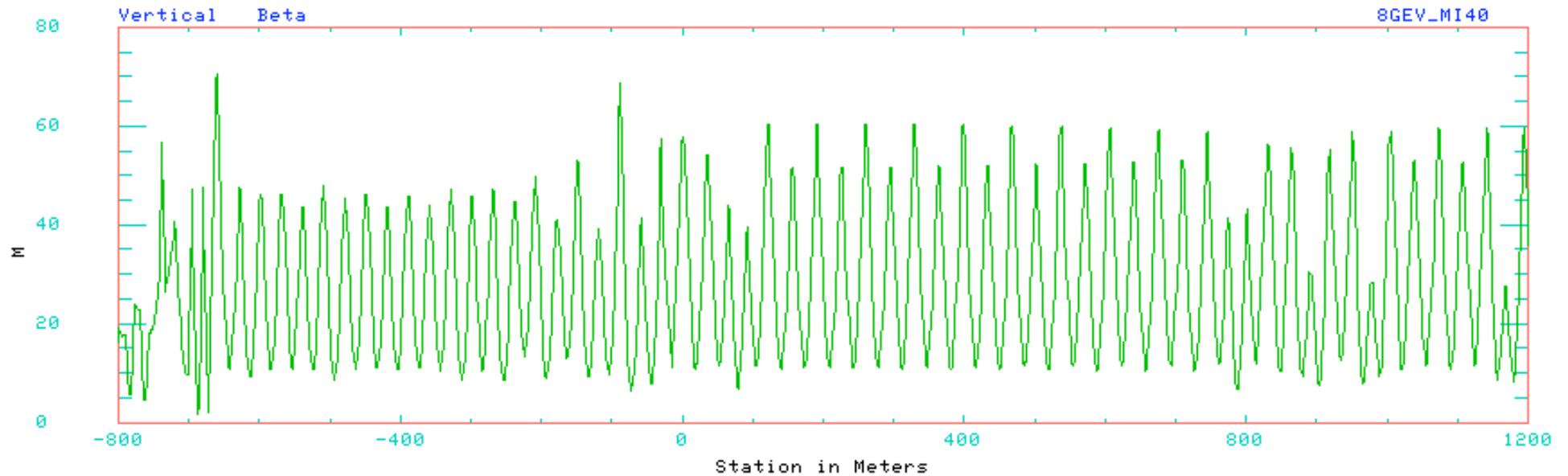


Analysis basis solely on profile sigma

```

Z2 Beam line analysis--Main Injector 09-NOV-06 14:14:21 *Pgm_Tools*
  functions      setup      data      calculate      display      misc
-----
                Se
                Acqu
Cycle start <23> P
  *List [Twiss parameters] *Page
  * *Device: [All elements] DB_na
  * From -<B00_CELL01>+ to B:Q80
  *
  * Na Restore option: *Device a
  * - *Data fra
  * VT *Display data frame: -<005
  * MW *Use data frame [000] as re
  VP
  PG Beamline: 8GEV_MI40
  * - *Calculate: [Position coeff
  * PG Variable data from: [readi
  * - Swic calculation#: [None]
  HT
  F HP *Apply fitted result: [1st
  PG *Plot -<VP01L +> in [Gx
  -
  PG Device chisq C0
  -
  VT
  MW
  VP
  <Exit>
  *Lattice parameters
  Select: [8GEV_MI40 ] as [Transfer line]
  Start at element: [B00_CELL01] for [Proton ] ]
  *Track: [Lattice function] at ( 8 ) GeV ]
  ]
  Lattice
  Horiz Vert
  Phase: ( 24.5091 ) ( 23.6543 ) 2π
  Beta: ( 51.55 ) ( 6.4 ) M
  Alpha: ( -.253 ) ( .02 )
  eta: ( -3.189 ) ( .065 ) M
  etap: ( -.011 ) ( -.013 )
  Beam
  Position: ( 0 ) ( 0 ) mm
  Angle: ( 0 ) ( 0 ) mr
  Emittance: ( 2.64935 ) ( 2.89949 ) π-mm-mr
             ± .042888 ± .137801
  ΣP/P: ( .4658 ) ± .04712 E-3
  ΔP/P: ( 0 ) E-3
  *Fit emittance: [None ]
  Momentum sigma from [Horizontal] plane
  *Update [reference orbit]
  Graphic window link: [GxPB 2]
  *Set lattice to [Linear] order and with [Matrix]
  <Exit>
  ters
  C
  n
  +
  Non-physical sigma_p/p in K1A0Lamb KG/M 0 - .3 n
  Non-physical sigma_p/p in <Exit> 21:44 of 57 +
  Non-physical sigma_p/p in emittance fit result
  n
  1: 3 of 51
  
```

New beta function, (matched into MI)



Setting to be modified

Used		New setting	
211.6619		211.2496	211.2496
190.2619		183.3199	183.3199
163.9559		167.6053	167.6053
100.3875		85.0948	85.0948
225.7419		225.5496	225.5496
245.5819		245.6096	245.6096
163.1559	-1	160.7053	160.7053
150.7959	0.4	150.1053	150.1053
203.0019		204.5199	204.5199
199.6419	-4.5	199.1199	199.1199
165.4113		167.0827	167.0827
141.9113	-4	141.5427	141.5427
171.5613	-0.5	173.4027	173.4027
168.9213	1.2	166.5827	166.5827
162.5513	-1	147.6027	147.6027
168.3013	1.5	161.0227	161.0227
43.3225		43.74	43.74
23.7225		32.18	32.18
18.8425		15.6	15.6
		0	
29.2425		29.44	29.44
9.4025		9.38	9.38
19.6425	1	22.5	22.5
32.0025	-0.4	33.1	33.1
10.9825		10.98	10.98
14.3425	4.5	16.38	16.38
9.4325		6.82	6.32
32.9325	4	32.36	31.86
3.2825	0.5	0.5	0
5.9225	-1.2	7.32	6.82
12.2925	1	26.3	25.8
6.5425	-1.5	12.88	12.38
254.9844		254.9896	254.9896
213.9844		215.4999	215.4999
182.7984		183.2053	183.2053
100.3875		85.0948	85.0948
174.8438		173.9027	173.4027

setup for emittance monitors

```

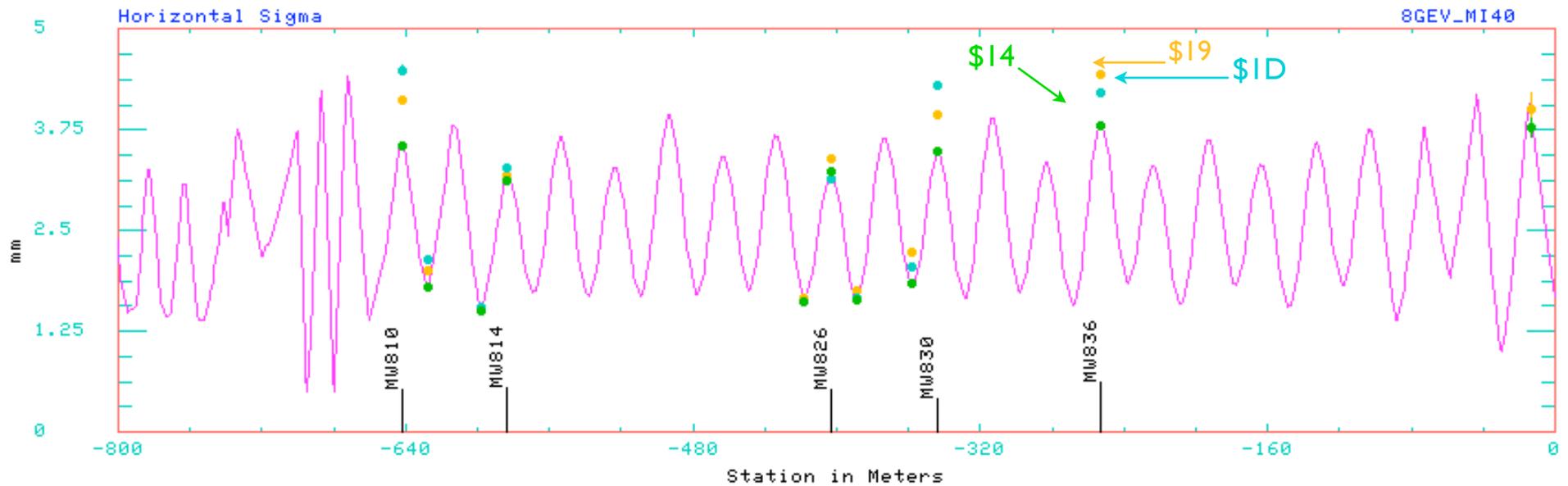
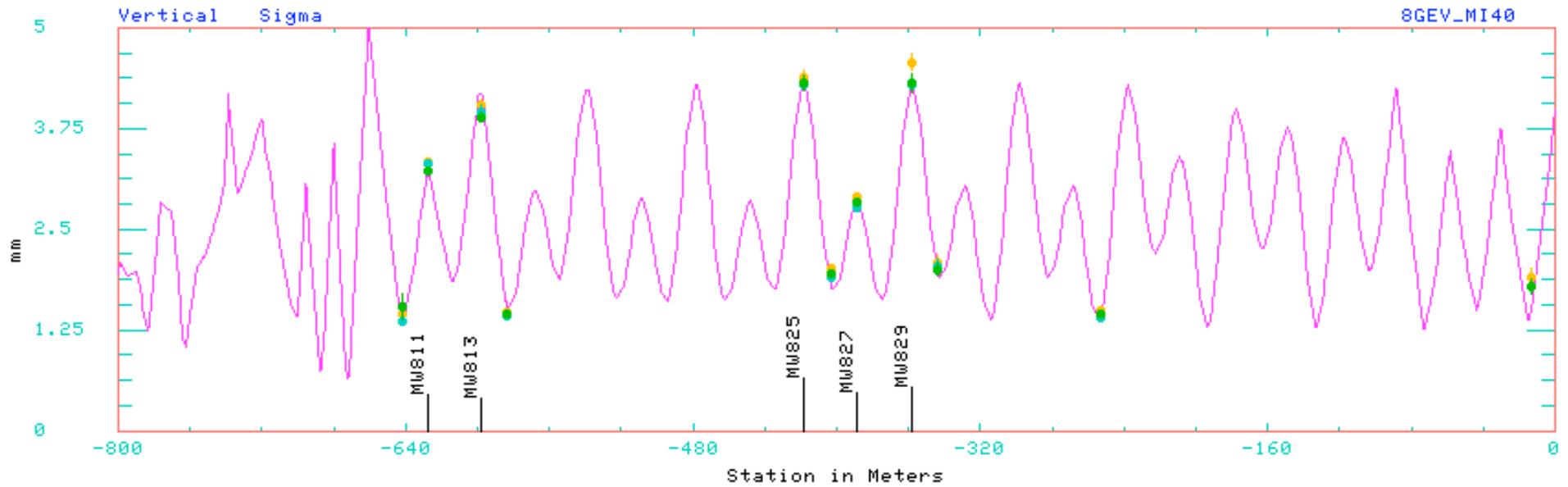
I63    MI-8 EMIT MON (TEXAS WIRES) SET      D/A  A/D  Com-U  *PTools*
-<FTP>+ *SA+ X-A/D  X=TIME      Y=I:BEAM  ,B:CHG0  ,I TOR806,I TOR852
COMMAND ---- Eng-U  I= 0      I= 0      , 0      , 0      , 0
-<32>+  s_MI AUTO  F= 2      F= 40    , 6      , 6      , 6
-I:8GIDX1  MI8L emit: hor MW 1st  5      5      node
-I:8GIDX2  MI8L emit: hor MW 2nd  2      2      node
-I:8GIDY   MI8L emit: ver MW      7      7      node
-I:8GX1N   MI8L emit: sigma x1 m 1500    1500    (M)
-I:8GX1X   MI8L emit: sigma x1 m  0      0      (M)
! LATTICE FUNCTION AT THE SCANNERS USED
-I:8GBEX1  MI8L emit:  51.200005  52.728001  52.728001 (M)
-I:8GBEX2  MI8L emit:  40.119999  41.096001  41.096001 (M)
-I:8GBEY   MI8L emit:  42.542999  44.022999  44.022999 (M)
-I:8GETX1  MI8L emit:  -.78275001 -.85460001 -.85460001 (M)
-I:8GETX2  MI8L emit:   2.4317    2.34284   2.34284   (M)
-I:8GETY   MI8L emit:  -.47139999 -.54887998 -.54887998 (M)

! EMITTANCES
I:8GHE14  MI8L hor emit on #14      16.890266 pmmr
I:8GVE14  MI8L ver emit on #14     16.781778 pmmr
I:8GDP14  MI8L dp/p on #14         .58190662 E-3
I:8GHE19  MI8L hor emit on #19     17.435415 pmmr
I:8GVE19  MI8L ver emit on #19     17.266241 pmmr
I:8GDP19  MI8L dp/p on #19         .44907358 E-3
I:8GHE1D  MI8L hor emit on #1D     15.713193 pmmr
I:8GVE1D  MI8L ver emit on #1D     16.433765 pmmr
I:8GDP1D  MI8L dp/p on #1D         .77587444 E-3

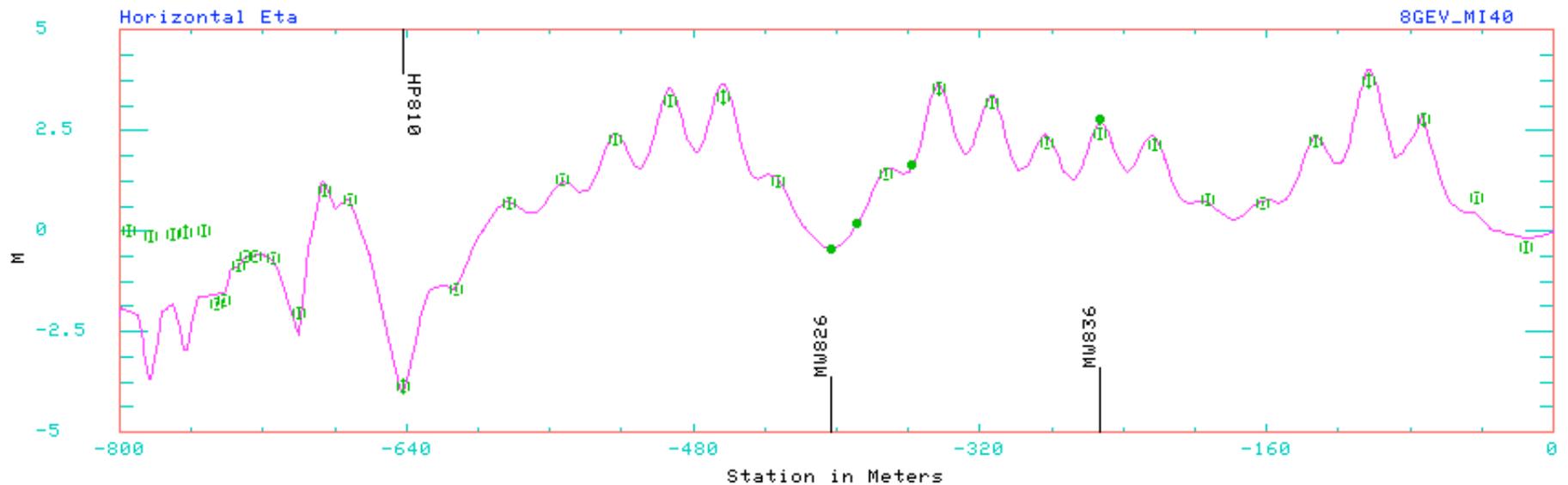
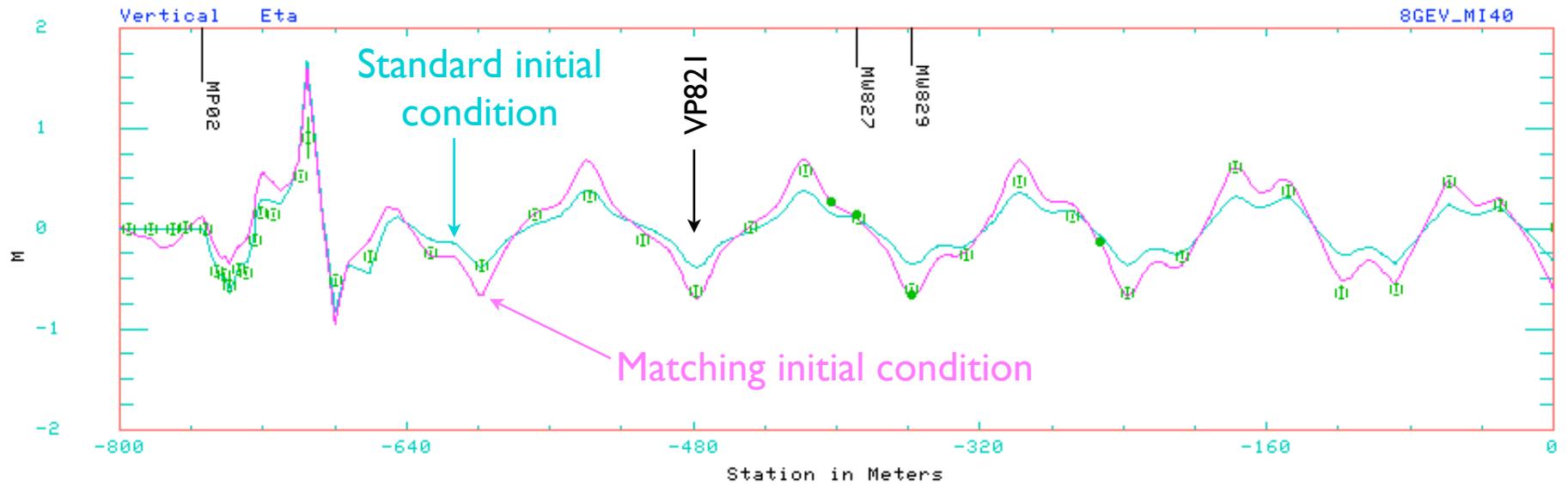
-I:PM826  MI8CL1 MOTOR 8           < > 0      mils IU.I
-I:PM827  MI8CL1 MOTOR 9           < > 0      mils IU.I
-I:PM829  MI8CL1 MOTOR 10          < > 0      mils IU.I
-I:PM836  MI8CL1 MOTOR 11          < > 0      mils IU.I
I:M826DG  NM  M826 Digital Status   ...I
I:M827DG  NM  M827 Digital Status   ...I
I:M829DG  NM  M829 Digital Status   ...I
I:M836DG  MWire 836 Digital Status  ..

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Profile sigma, from Sept. 08



Measured dispersion function



MI8 line dispersion at June start-up

