

P3 to Switchyard dump beamline study

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The Study

❖ Data

- * I-bump orbit with HTFI3, HTFI5, VTFI4, and VTFI6.

❖ Analysis

- * Compare orbits from MWs and SWICs.
- * Look at the beam width sigma.

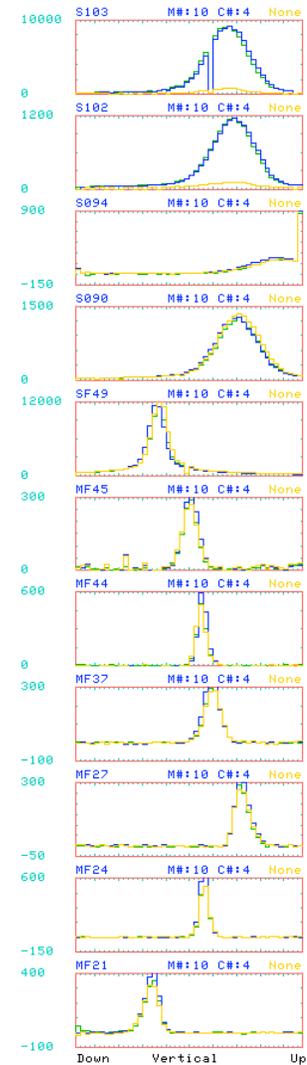
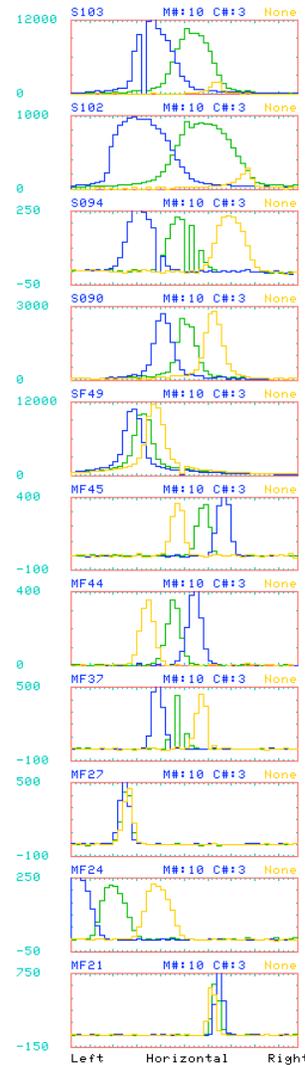
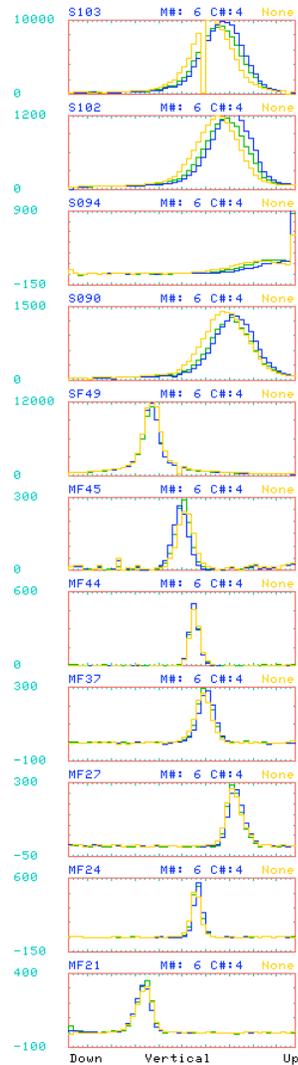
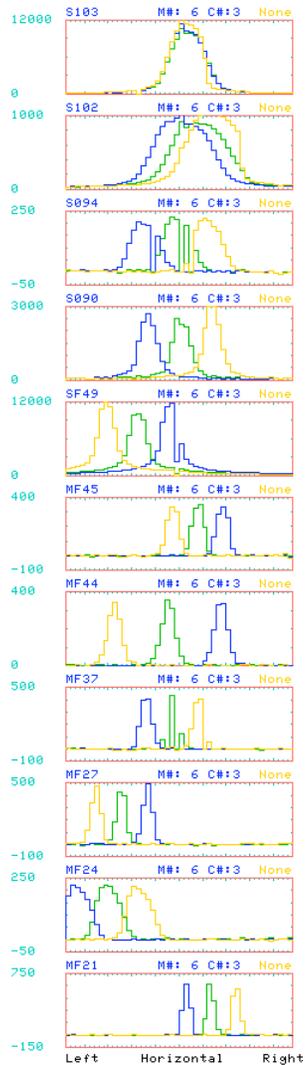
❖ Re-tune to minimize sigma

- * Vertical beta still about 300 meter.
- * Horizontal beta dropped from 2660 to 300 meters

Profiles with horizontal orbits

HTFI3: from -6 to +6 amps

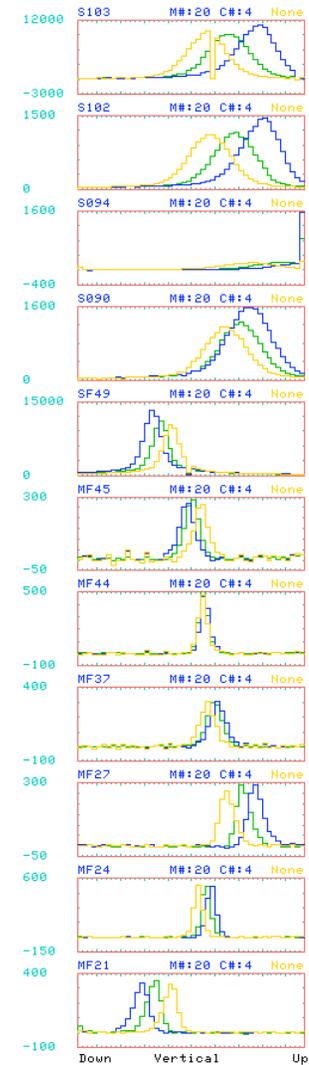
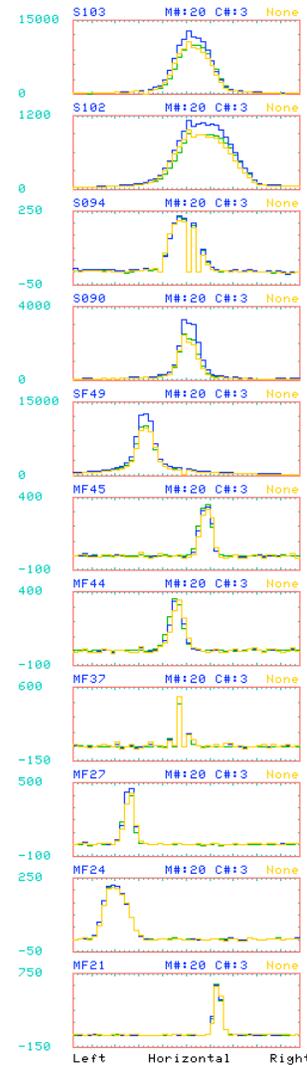
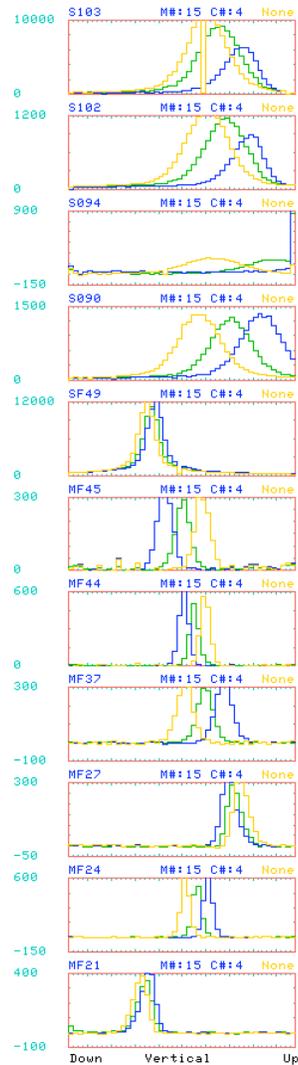
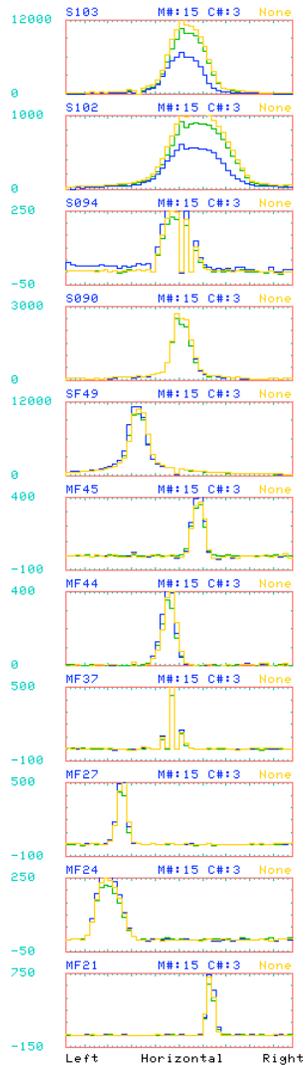
HTFI5: from -5 to +6 amps



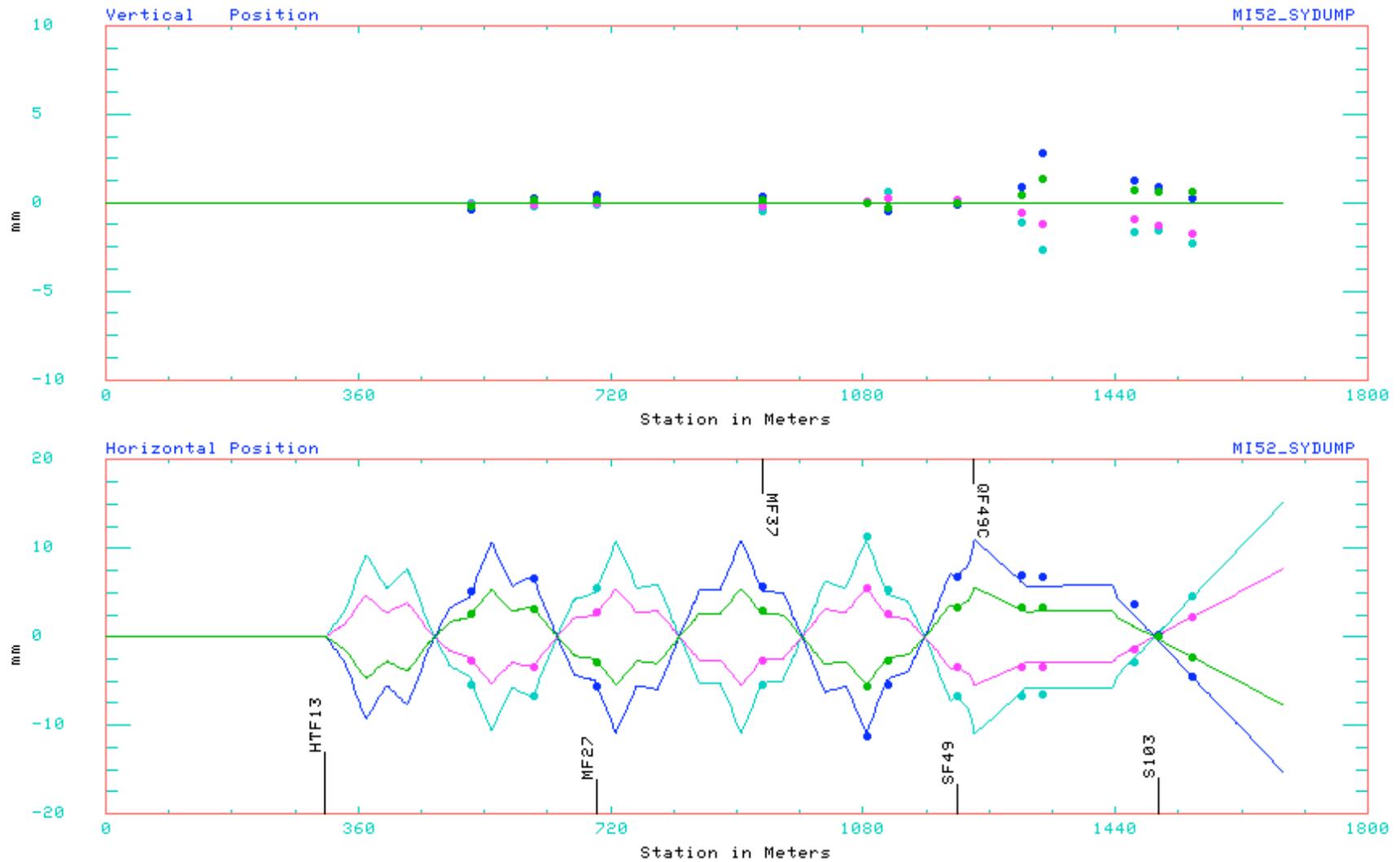
Profiles with vertical orbits

VTFI4: from -6 to +6 amps

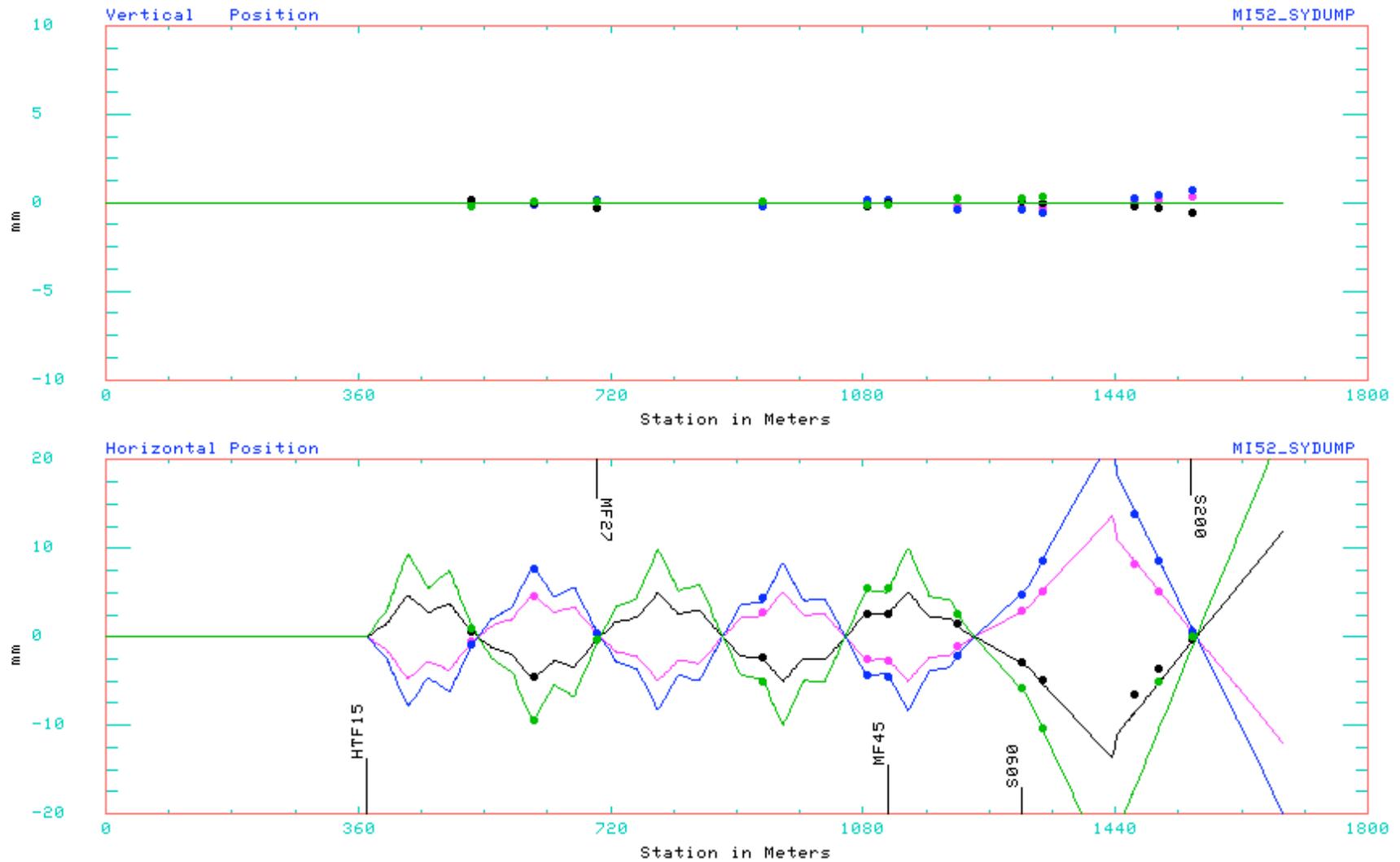
HTFI5: from -4 to +6 amps



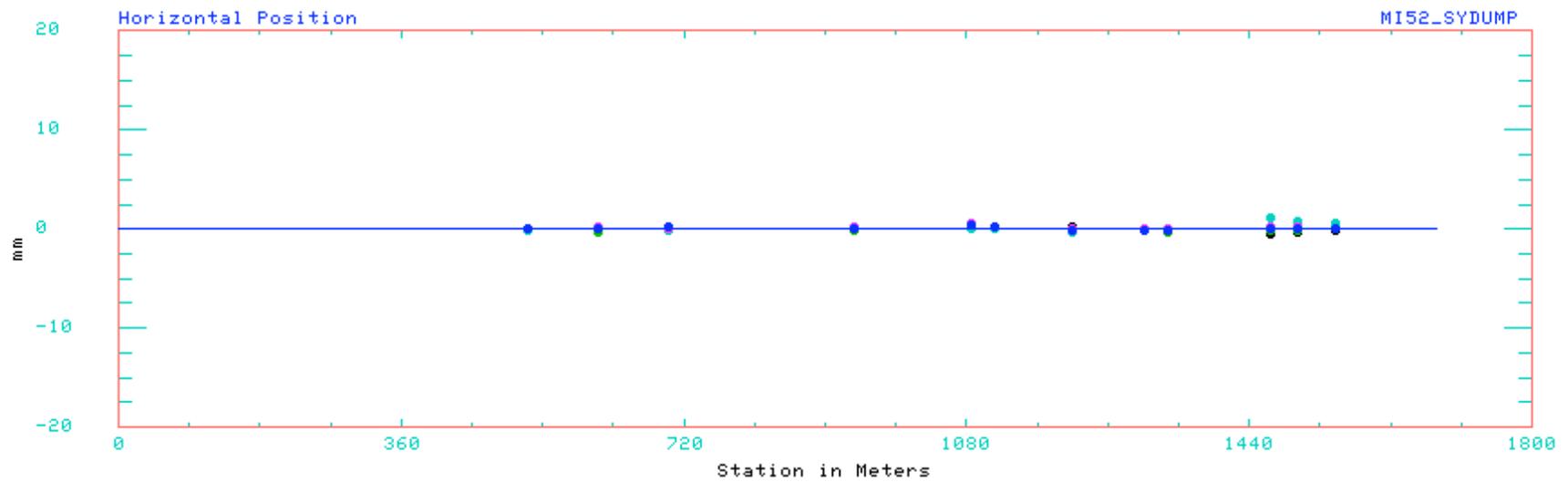
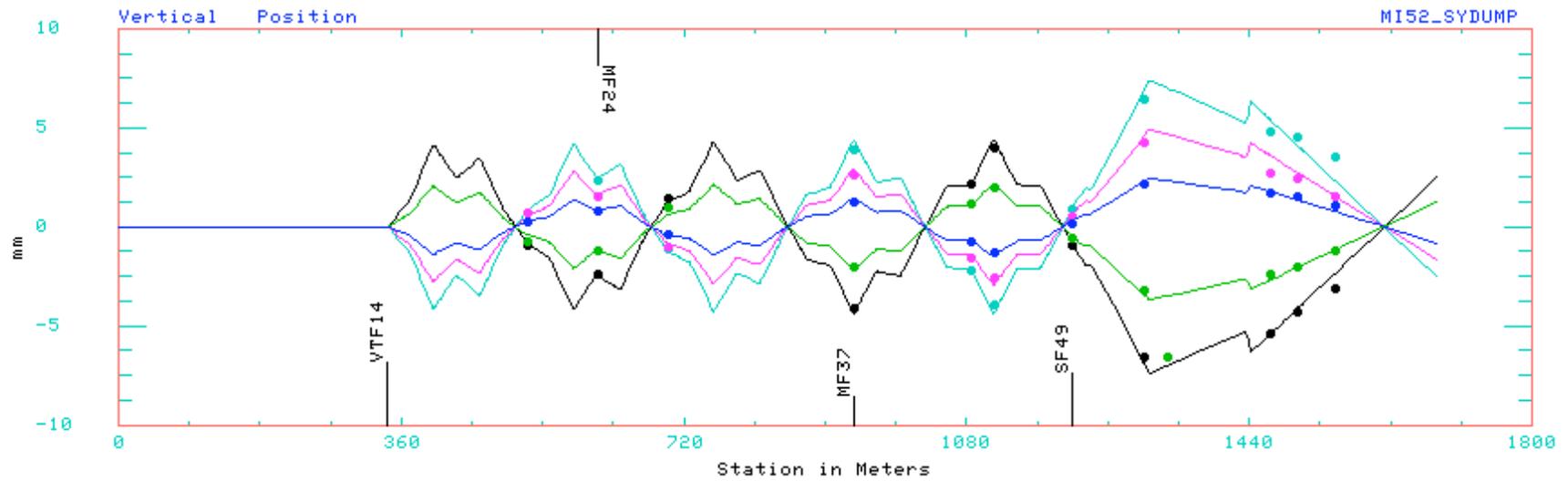
Orbit due to HTF13



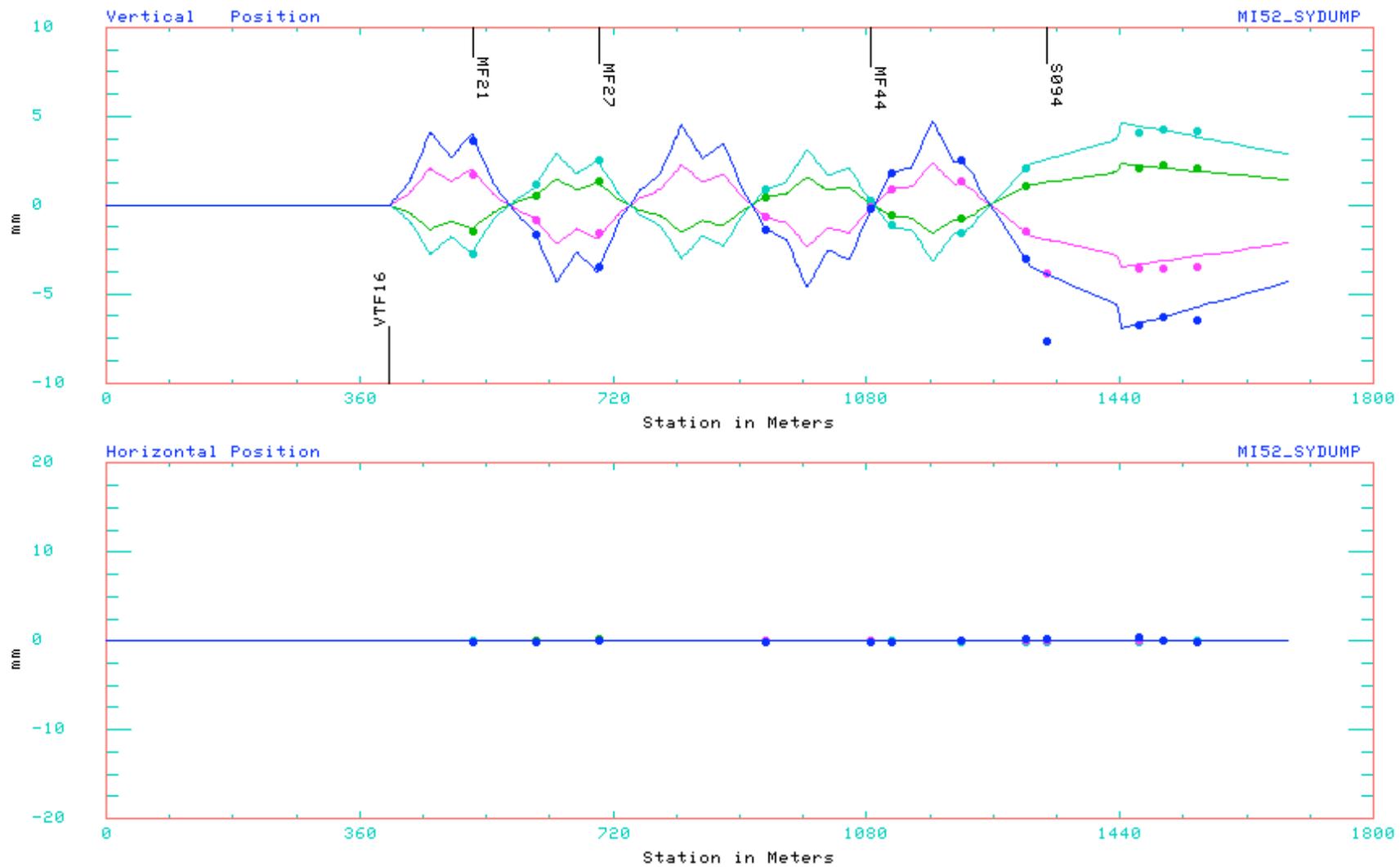
Orbit due to HTF15



Orbit due to VTF14

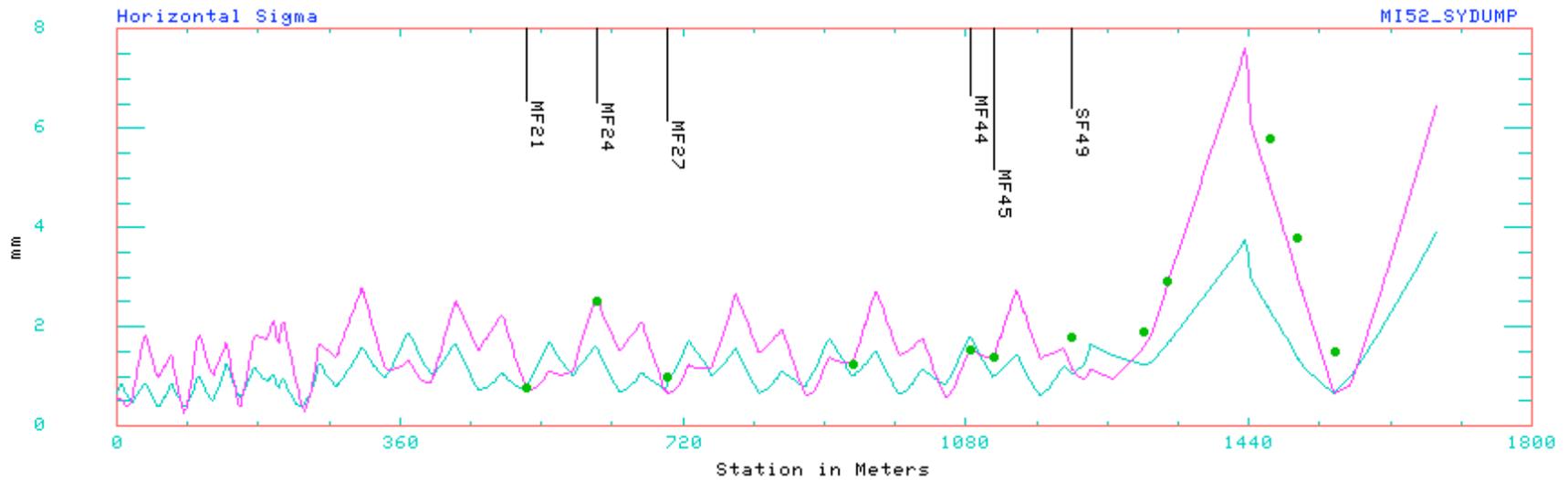
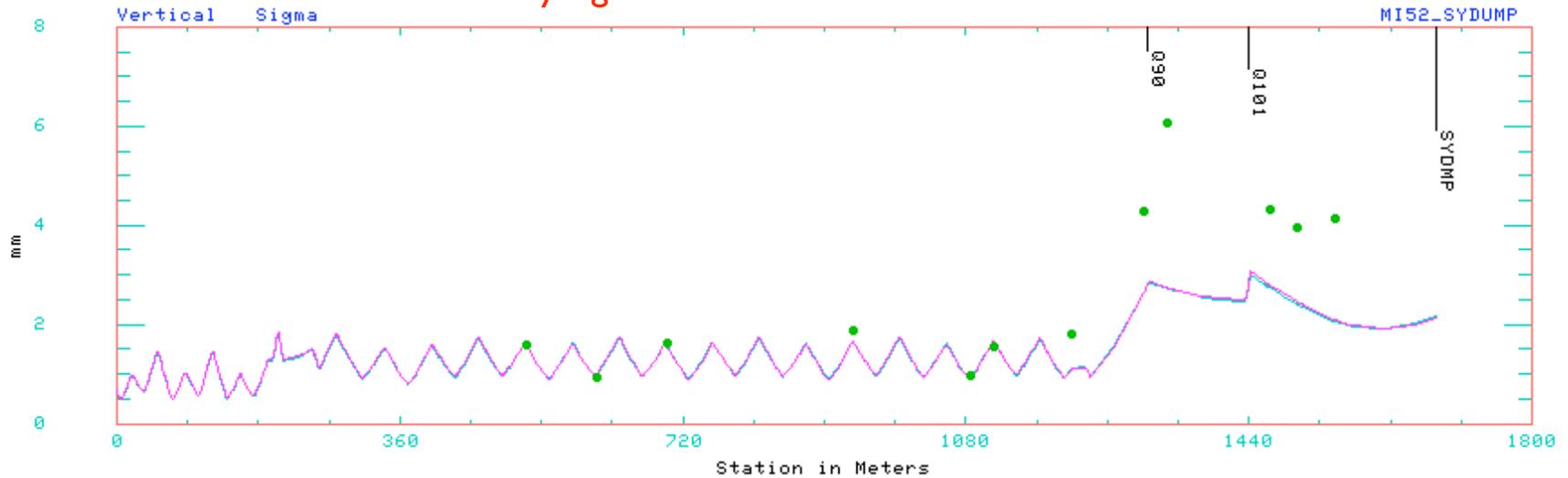


Orbit due to VTF16



Fitting beam profile sigma

Use only sigma from MWs to fit



Initial lattice parameters

```
----- Lattice parameters -----
Select: [MI52_SYDUMP ] as [Transfer line]
Start at element: [P150_START] for [Proton      ]
*Track: [Lattice function] at ( 120      ) GeV

Lattice      Horz      Vert
Phase: ( 5.34784 ) ( 4.82183 ) 2 $\pi$ 
Beta: ( 13.96   ) ( 17.59   ) M
Alpha: ( .0844   ) ( 1.183   )
eta: ( -.0007   ) ( 0       ) M
etap: ( -.005   ) ( 0       )

Beam
Position: ( 0       ) ( 0       ) mm
Angle: ( 0       ) ( 0       ) mrad
Emittance: ( 2.68121 ) ( 3.30949 )  $\pi$ -mm-mrad
            $\pm$  .343231  $\pm$  .444794
SigmaP/P: ( .18075 )  $\pm$  .0799      E-3
DeltaP/P: ( 0       )              E-3

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

*Update [reference orbit]
Graphic window link: [GxPA 2]
*Set lattice to [Linear] order and with [Matrix]

<Exit>
```

Quad currents

| | | Used in calculation | | Proposed new setting | |
|---------|------|---------------------|-----------|----------------------|-----------|
| DB_name | | reading | prev_read | reading | prev_read |
| I:Q701 | Amps | 235.79 | | 235.79 | |
| I:Q702 | Amps | 216.28 | | 216.28 | |
| I:Q703 | Amps | 2731.21 | | 2731.21 | |
| I:Q710 | Amps | 160.98 | | 160.98 | |
| I:Q711 | Amps | 126.04 | | 106.04 | 126.04 |
| I:Q712 | Amps | 167.36 | | 163.36 | 167.36 |
| I:Q713 | Amps | 255.8 | | 253.8 | 255.8 |
| I:Q714 | Amps | 267.04 | | 254.04 | 267.04 |
| I:QF11A | Amps | 289 | | 289 | |
| I:QF11B | Amps | 229.25 | | 229.25 | |
| I:QF12 | Amps | 1244.5 | | 1258.5 | 1244.5 |
| | | | | | |
| S:QP3 | Amps | 1177 | | 1054 | 1177 |
| S:Q90D | Amps | 7.986 | | 7.986 | 8.986 |
| S:Q100 | AMPS | 42.63 | 40.63 | 42.63 | 40.63 |
| S:Q101 | AMPS | 39.39 | 38.39 | 39.39 | 38.39 |

Summary of study

- ❖ Data looks good
 - * Vertical orbit was changed after frame# 13.
- ❖ Orbits are consistent with expectation
 - * Bend & Quad currents from I68 are used in calculation.
 - * SWIC MF49: horizontal plane is backward.
- ❖ Fitting sigma for lattice function
 - * All profiles after MF45 were ignored.
- ❖ Beta function
 - * Horizontal beta at Q100 is 2660 meters.
 - * Proposed tune reduces beta to about 300 meters.
 - ▶ Result of a quick and limited search.
 - ▶ There may exist a better solution.