P150 line
Lattice function Study

Ming-Jen Yang
06/12/2009

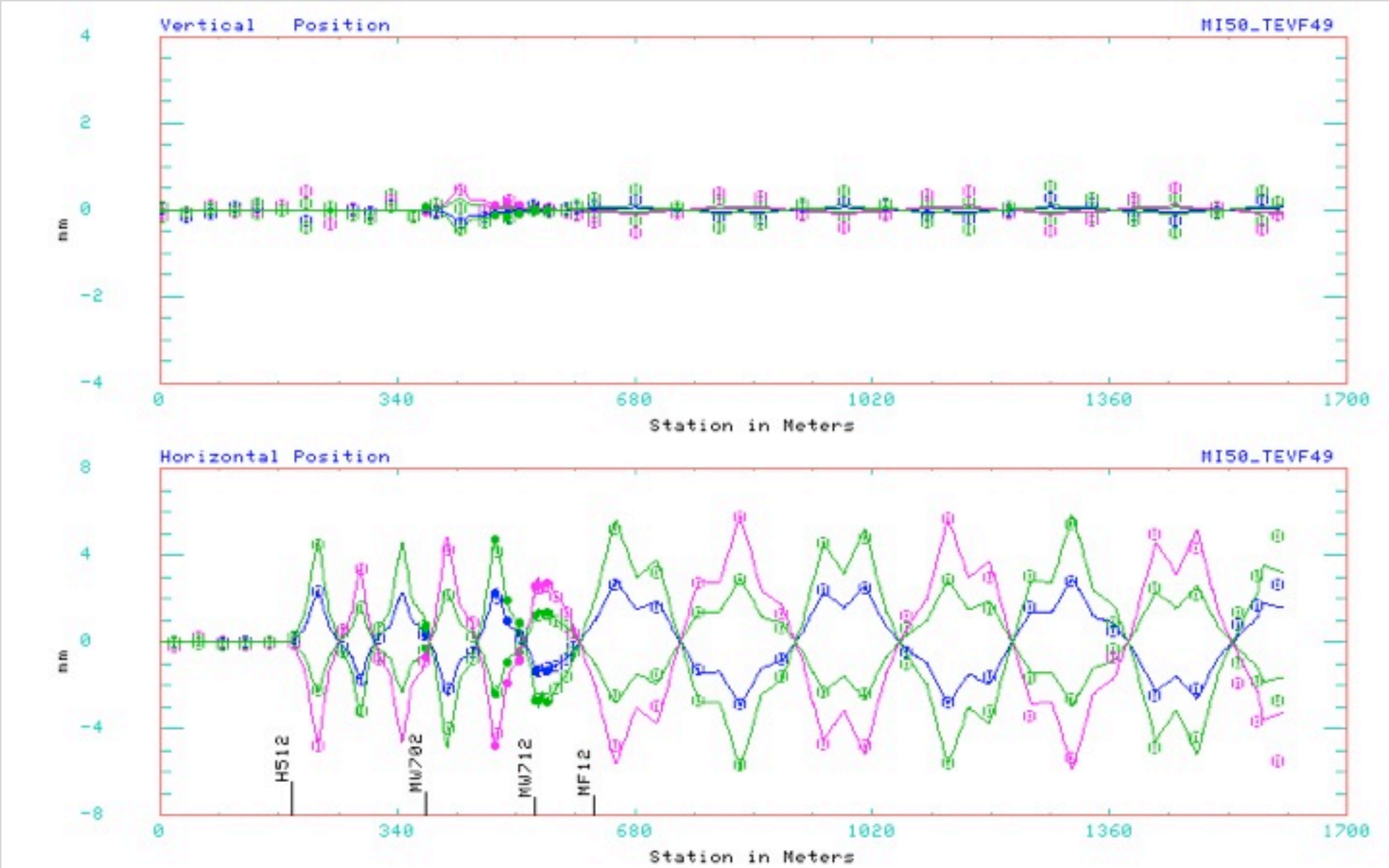
Study

- Beam
  - Uncoalesced proton.
  - 2 turn 30 bunches.
- 1-bump orbit
  - H512 & H514 for horizontal plane.
    - TEV BPM data upto F49.
  - V513 & V515 for vertical plane.
    - Without TEV BPM data.
- Dispersion data
  - ± 120 Hz

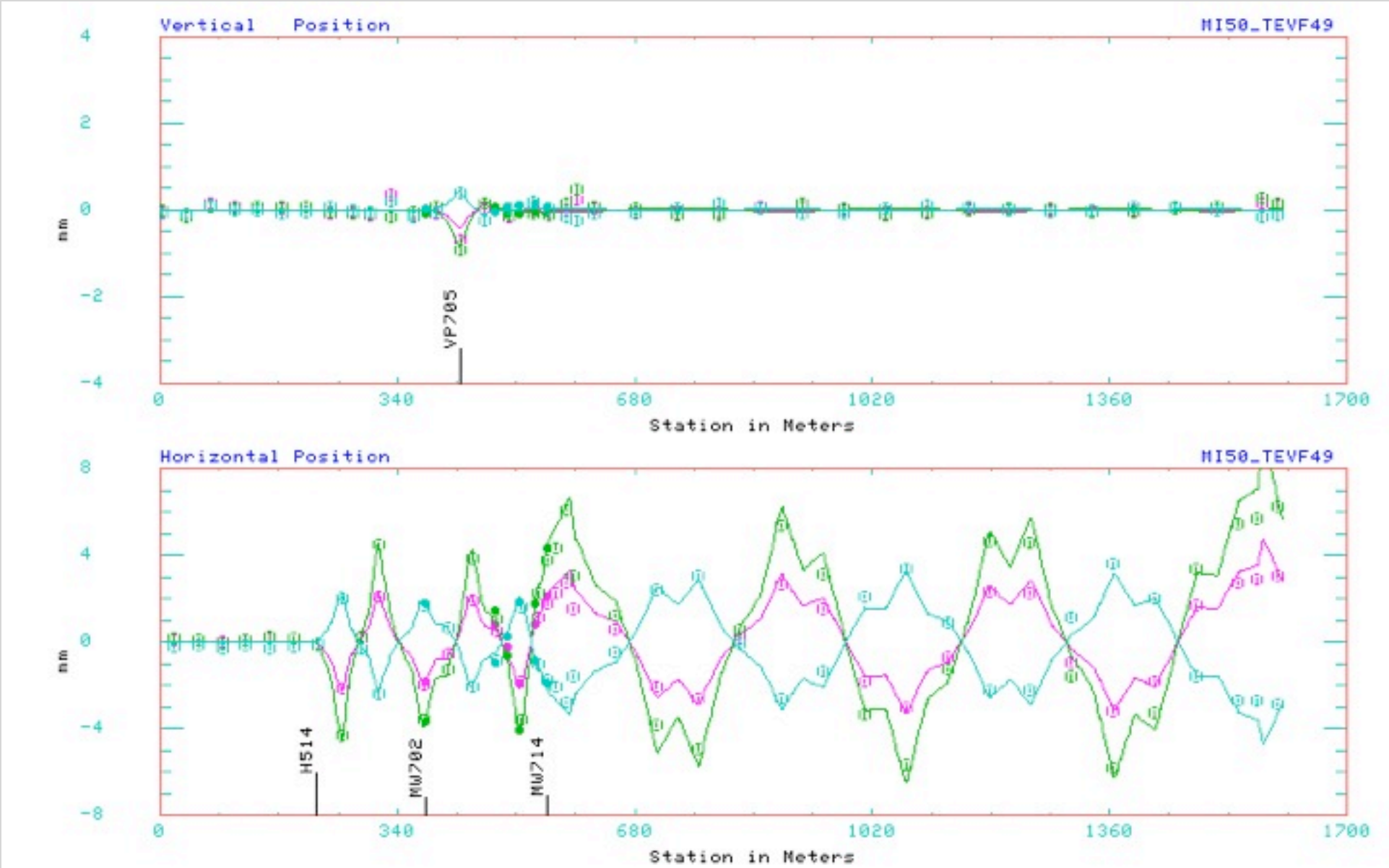
Bumps cross LAM52

```
 MULT     :3
-I:H512A [7]*.1  Horizontal Trim @Q512      7.054    -.068  Amps ..
-I:H526A [7]*-.01791izontal Trim @Q526     3.703    1.258  Amps ..
-I:H528A [7]*-.0658rizontal Trim @Q528    -10.09    -.184  Amps ..

 MULT     :3
-I:H514A [7]*.1  Horizontal Trim @Q514      3.961    -.446  Amps ..
-I:H526A [7]*.11737rizontal Trim @Q526     3.703    1.258  Amps ..
-I:H528A [7]*-.01336izontal Trim @Q528    -10.09    -.184  Amps ..

 MULT     :3
-I:V513A [7]*.1  Vertical Trim @Q513      -11.26   -1.008  Amps ..
-I:V523A [7]*-.03189tical Trim @Q523       4.699     .12   Amps ..
-I:V525A [7]*.13259rtical Trim @Q525      -4.149    -.905  Amps ..

 MULT     :3
-I:V515A [7]*.1  Vertical Trim @Q515      -3.958    -.901  Amps ..
-I:V523A [7]*-.0985rtical Trim @Q523       4.699     .12   Amps ..
-I:V525A [7]*-.02479tical Trim @Q525      -4.149    -.905  Amps ..
```

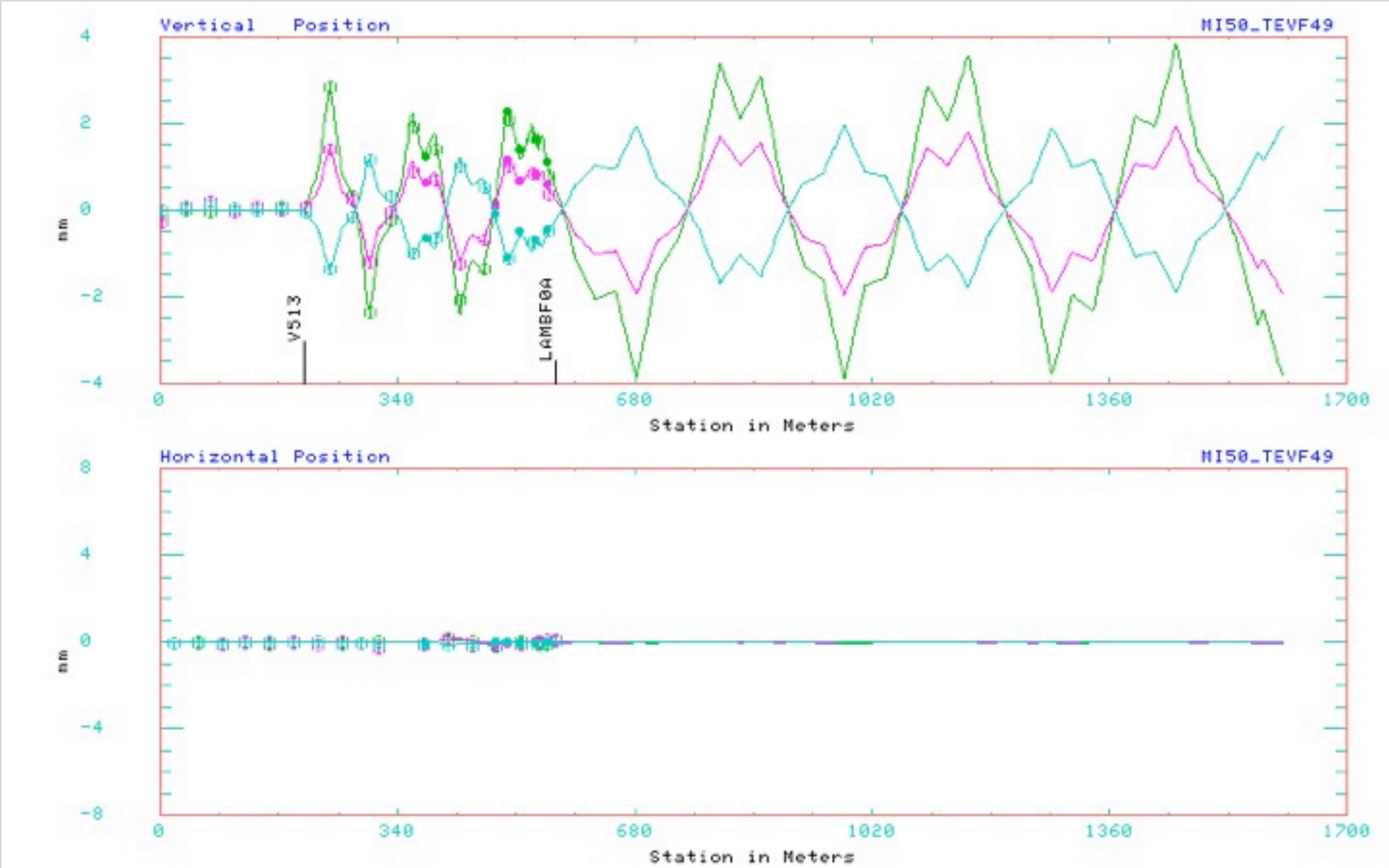
Orbit with H512



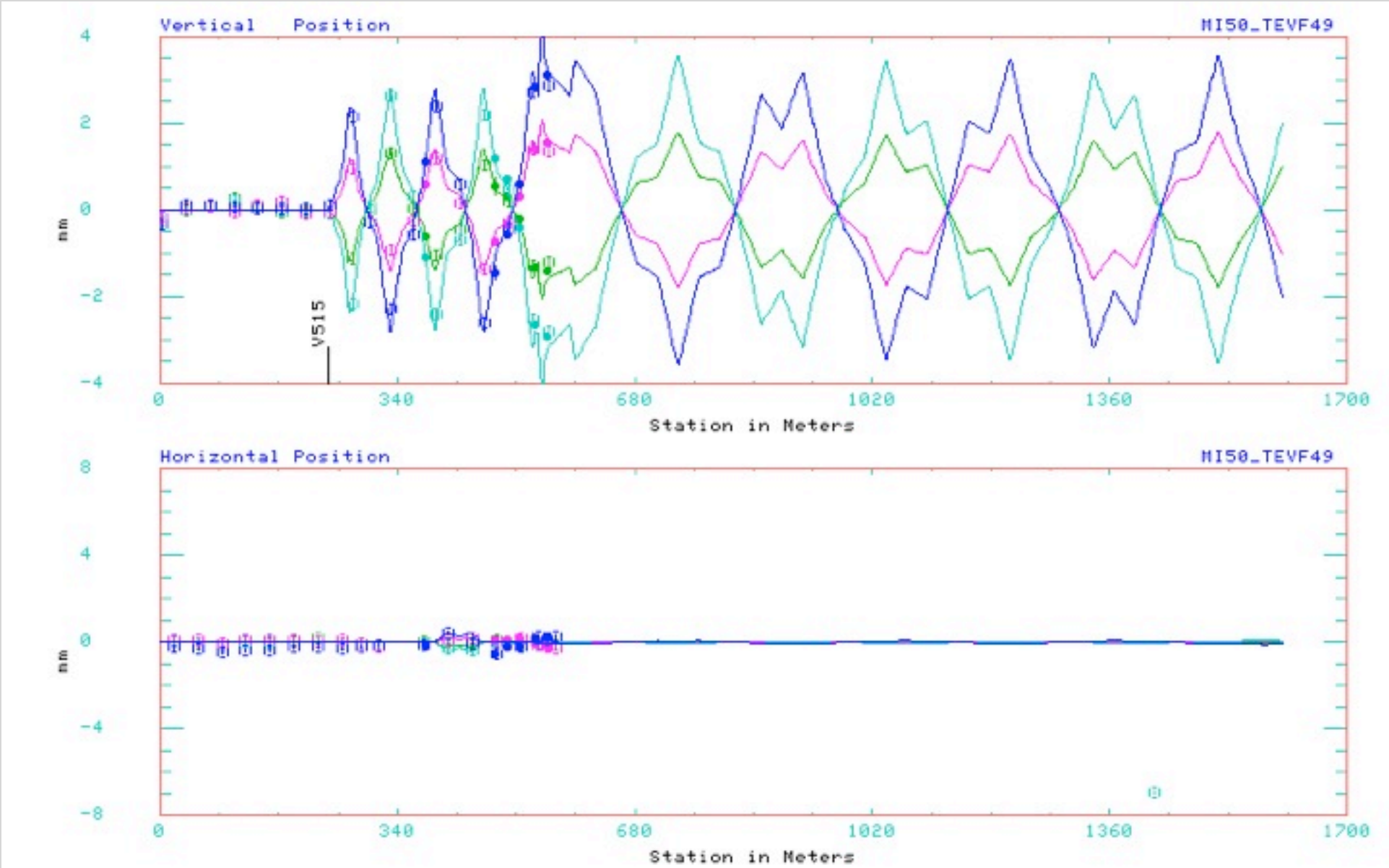
Orbit with H514



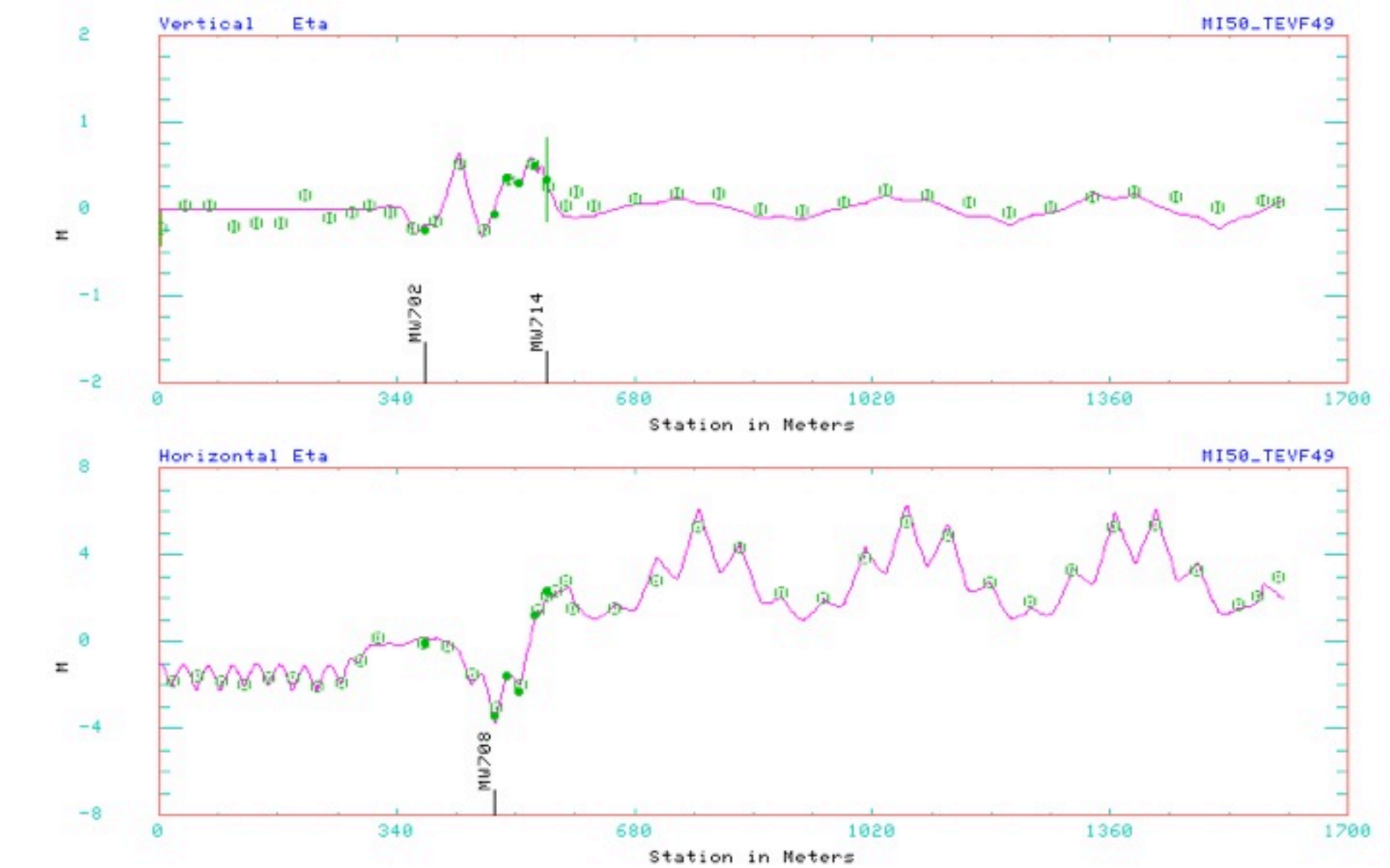
Orbit with V513



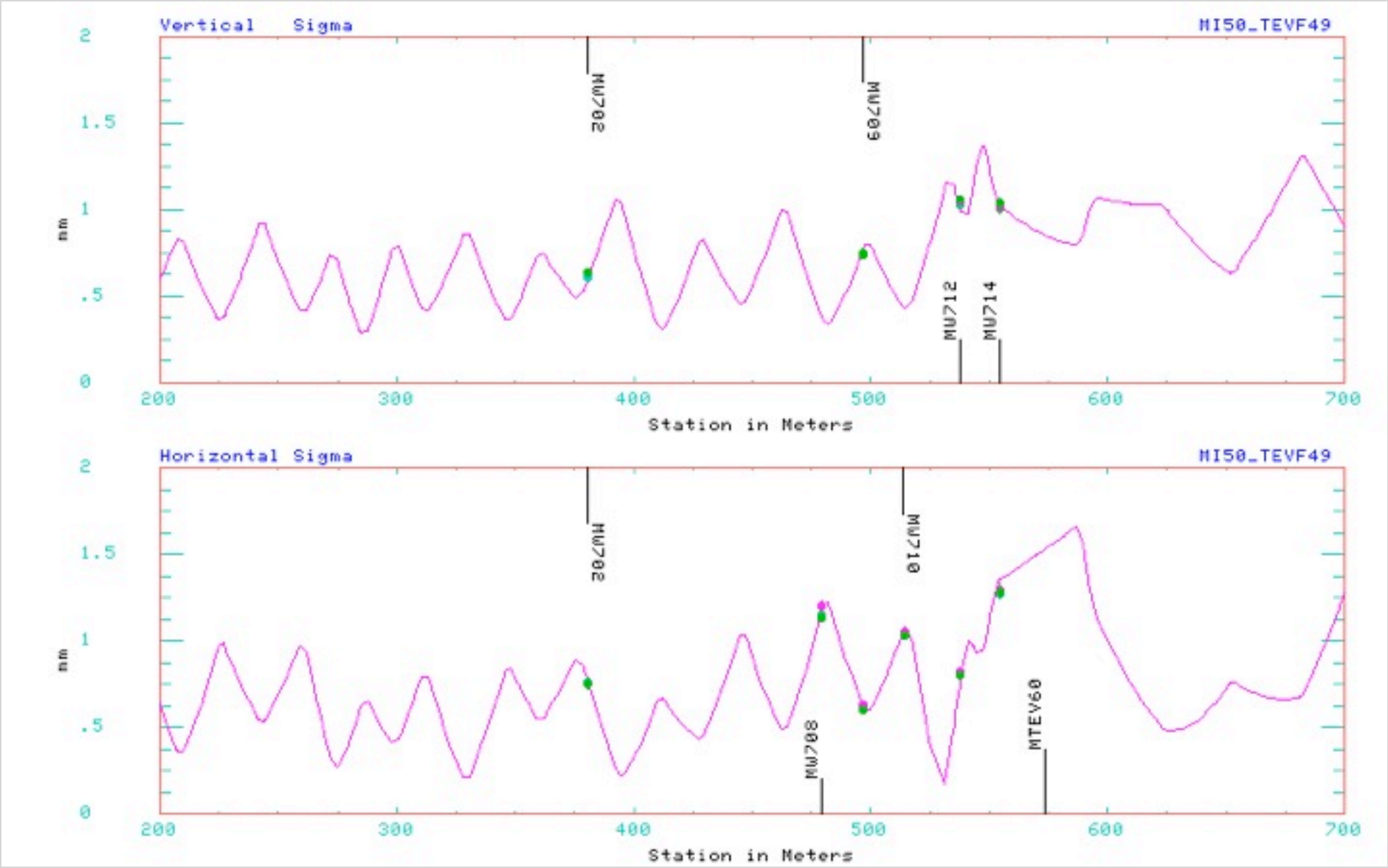
Orbit with V515



Dispersion function



Beam width sigma at P150 line



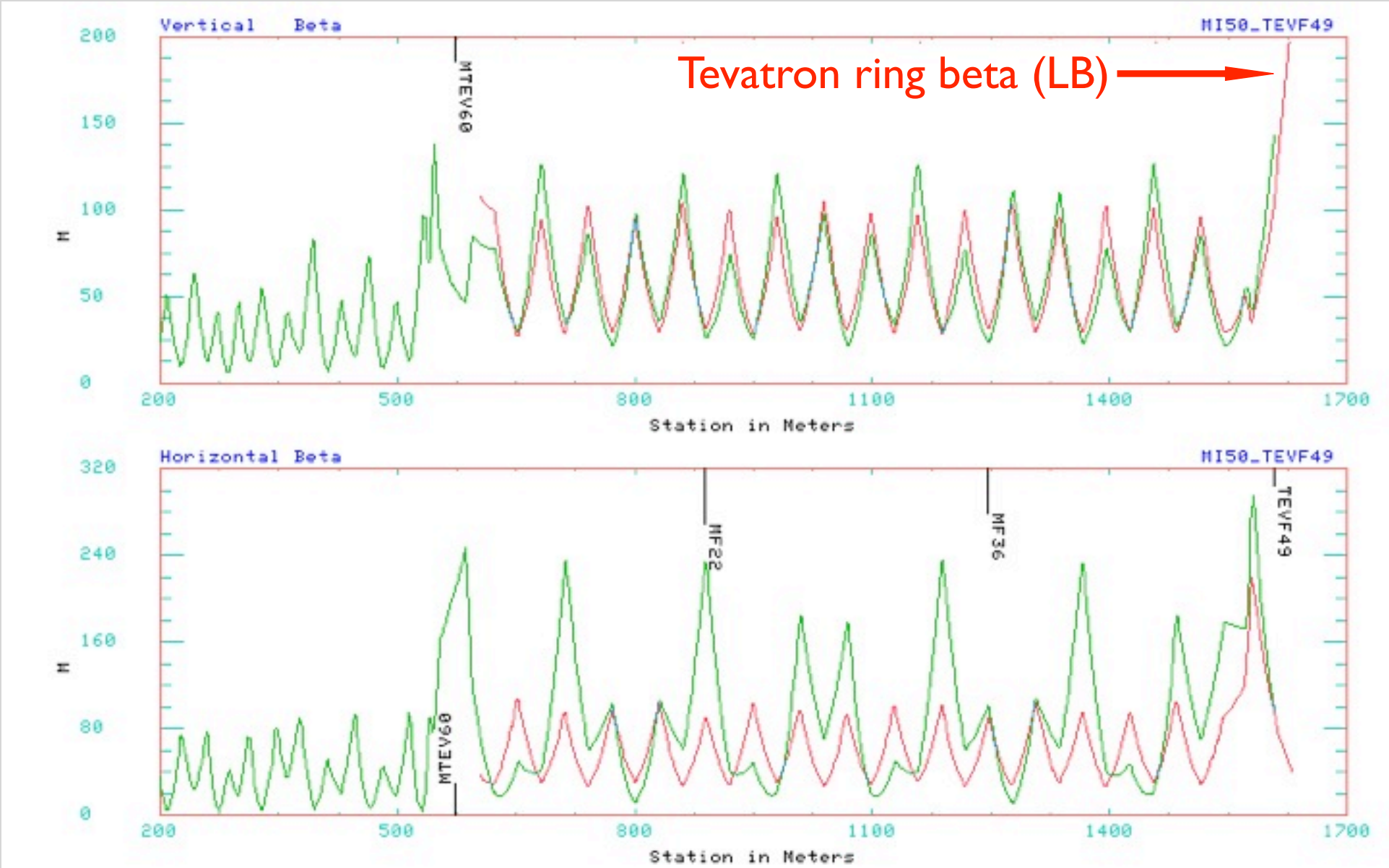
Initial lattice function used

```
                    Lattice parameters
 Select: [MI50_TEVF49 ] as [Transfer line]
 Start at element: [MI50Start ] for [Proton     ]
*Track: [Lattice function] at ( 149.065) GeV

Lattice        Horz          Vert
     Phase: ( 7.46264)   ( 7.3029 ) 2π
      Beta: ( 6.5     )   ( 48.4806) M
     Alpha: ( .87     )   (-1.98606)
       eta: (-1.00715)   ( 0       ) M
      etap: ( .04343 )   ( 0       )
Beam
  Position: ( 0       )   ( 0       ) mm
     Angle: ( 0       )   ( 0       ) mr
 Emittance: ( 1.3822 )   ( 2.35369) π-mm-mr
            ± .063163    ± .15699
      ΣP/P: ( .245527) ±  .008617   E-3
      ΔP/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]
 Coupled machine: [    ]
 <Exit>
```

Designed initial lattice

```
            Horz          Vert
Phase: ( 7.49442)   ( 7.30132) 2π
 Beta: ( 10.4831)   ( 52.4806) M
Alpha: ( .531631)   (-2.18606)
  eta: (-1.00715)   ( 0       ) M
 etap: ( .04343 )   ( 0       )
```

Projected beta, from MI to TEV



Conclusion

- Data
  - Consistency - OK
  - Missing TEV BPM data in vertical 1-bump data.
- Calculation
  - Quad magnet current as read.
  - Quad roll angle included.
- Analysis
  - Quad strength - consistent with observed orbit
  - Dispersion function - good agreement with expectation.
  - Sigma fit
    - Large horizontal beta mis-match.
    - Vertical beta mis-match is not as severe.
    - Initial lattice function at MI501
      - ✓ Not consistent with TBT lattice measurement.
- More data