



**R20 Transfer Line
Pbar orbit
and
Tracking Simulation**

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Pbar orbit study, MI to RR

❖ Agenda

- ▶ Follow up of previous RR20 line study with proton.
- ▶ Consistency check for R22 beamline optics
 - Including coupling field errors.
- ▶ Simulation of pbar beam sigma propagation.

❖ Data

- ▶ Take data during regular pbar transfer to RR.
 - Built closed long bump across Lam222 in MI.
 - 1-bump for pbar beam to RR.
- ▶ Horizontal data
 - with MI H230 & H228 at ± 0.2 amps.
- ▶ Vertical data
 - with MI V229 & V227 at ± 0.3 amps.

Setting used in R90 program

Z1 Beam line analysis--Recycler Ring 21-DEC-06 16:34:51 *Pgm_Tools*

functions	setup	data	calculate	display	Misc
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Setup Lattice parameters Beam line display

```

*
<R *Device type: [Mult ] *Update: [Manual]
  *Attribute: [Special II ] *Find: [ ]
  *Mode: [Modify] *Add *Commands*
  Multipole Bend_Roll Quad_roll SXT_roll OCT_roll DECA_roll
  * ARCDM707B 0 0 0 0 0 0
  * ARCDM707A 0 0 0 0 0 0
  * ARCGF706B 0 0 0 0 0 0
  R GF706A 0 0 0
  GD705B 0 0 0
  *D GD705A 0 0 0
  *U GF704B 0 0 0
  GF704A 0 0 0
  B GD703B 0 0 0
  *C GD703A 0 0 0
  V GF702B 0 0 0
  S S227_MI 0 0 0
  S228_MI 0 0 0
  *A S313_MI 0 0 0
  *P S314_MI 0 0 0
  De LAM402FF 0 0 0
  LAM402SHM 0 0 0
  LAM328FF 0 0 0
  LAM328SHM 0 0 0
  LAM214FF 0 0 0
  LAM214SHM 0 0 0
  LAM214INJ 0 -35 0
  LAM321CIR 0 0 0
  LAM222EXT 0 40 0
  VDP A2 0 10 0
  <Exit>
  
```

402:426 of 427

DB device page

```

*Page length: [ 25] *History depth:[15]
DB_name Setting prev_set reading prev_read
R_S328PM KGMM 209.184 209.184
R_S329PM KGMM -312.486 -312.486
R_S213PM KGMM -311.507 -311.507
R_S214PM KGMM 199.607 199.607
R_S215PM KGMM -325.354 -325.354
R_S327PM KGMM -326.54 -326.54
LAM214K1 AMPS 0 1 .5
LAM214K2 Amps 0 0
B1VDP A2 KG/M 0 1 -2
B2VDP A2 KG/M 0 0 1
B1VDP A1 KG/M 0 1 0
B2VDP A1 KG/M 0 0
LAM222K1 Amps 0 .5 .3
LAM222K2 Amps 0 0
R22_QF AMPS 26.27059 26.27059
R22_QD AMPS -25.31878 -25.31878 -26.31878
R:SQ704 Amps 0 9.39 19.39
R:SQ703 Amps 0 8.71 6.71
  
```

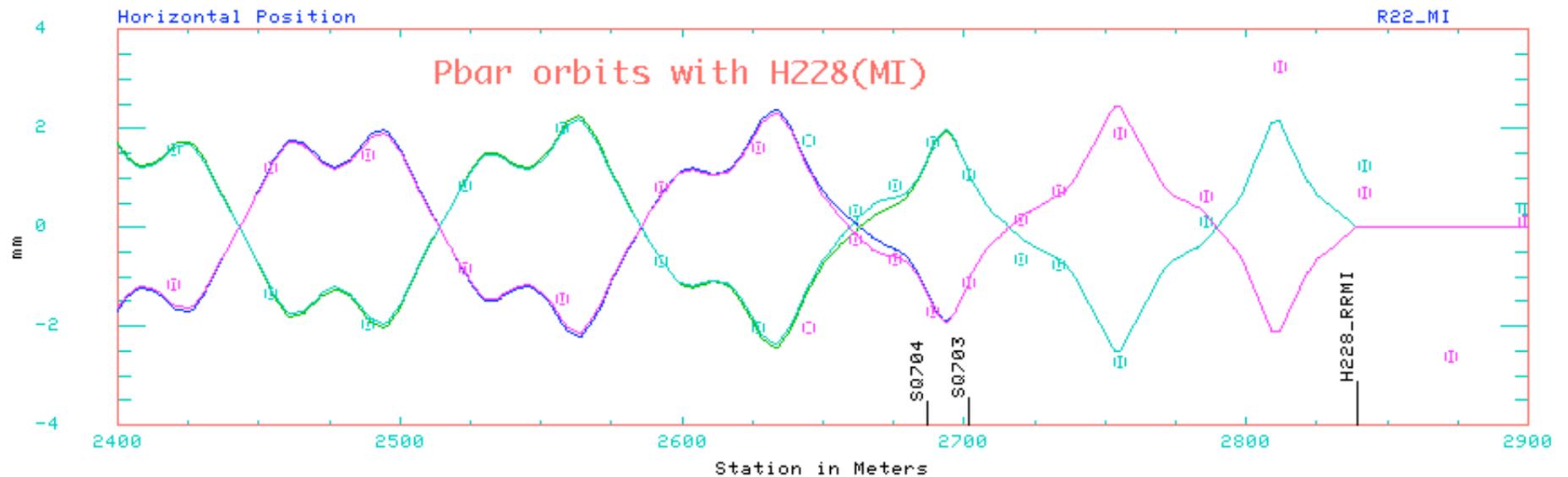
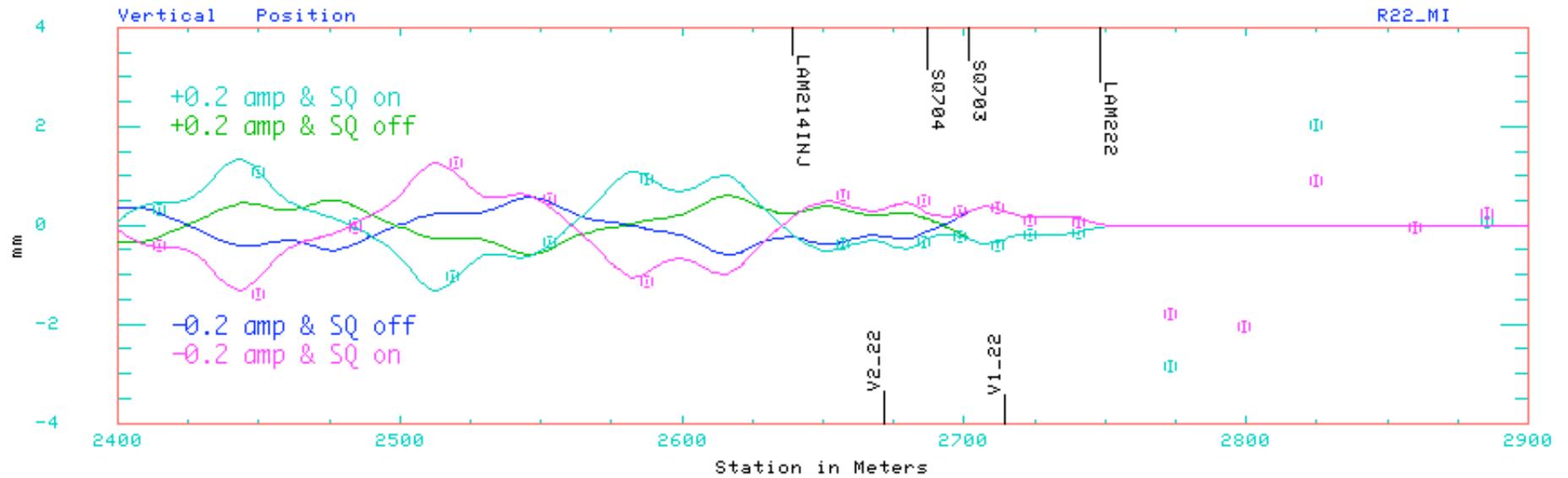
1:22 of 25

```

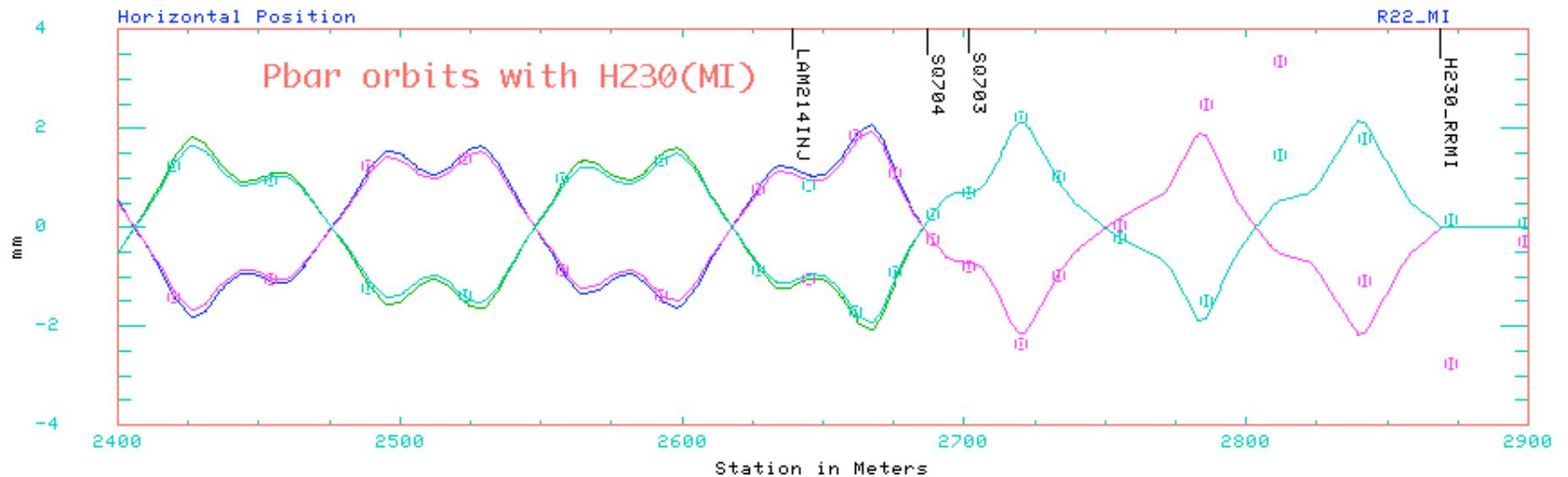
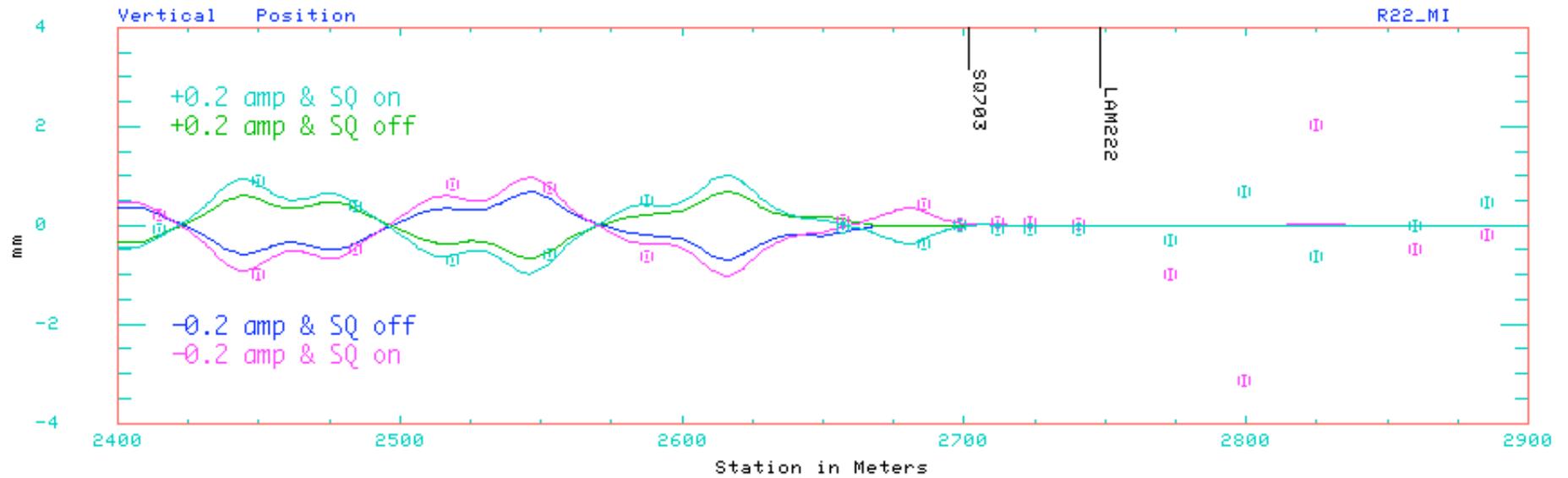
DBDEV: R_S214PM is associated with 3 devices
DBDEV: R_S213PM is associated with 3 devices
DBDEV: Number of active database devices: 588
  
```

1:3 of 9

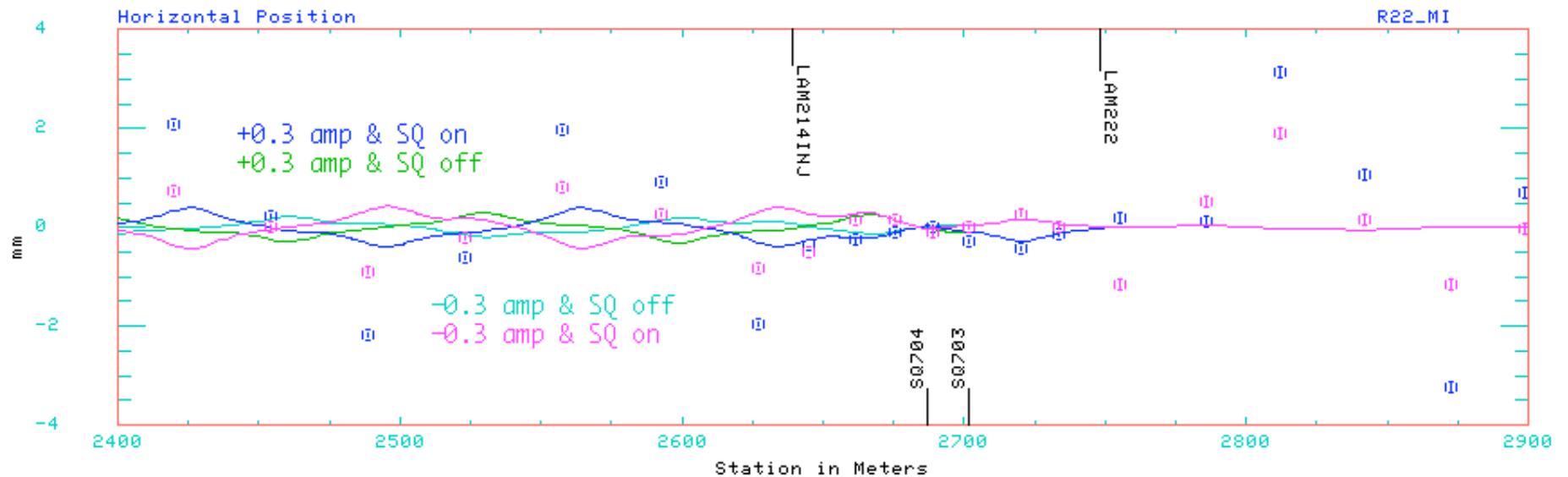
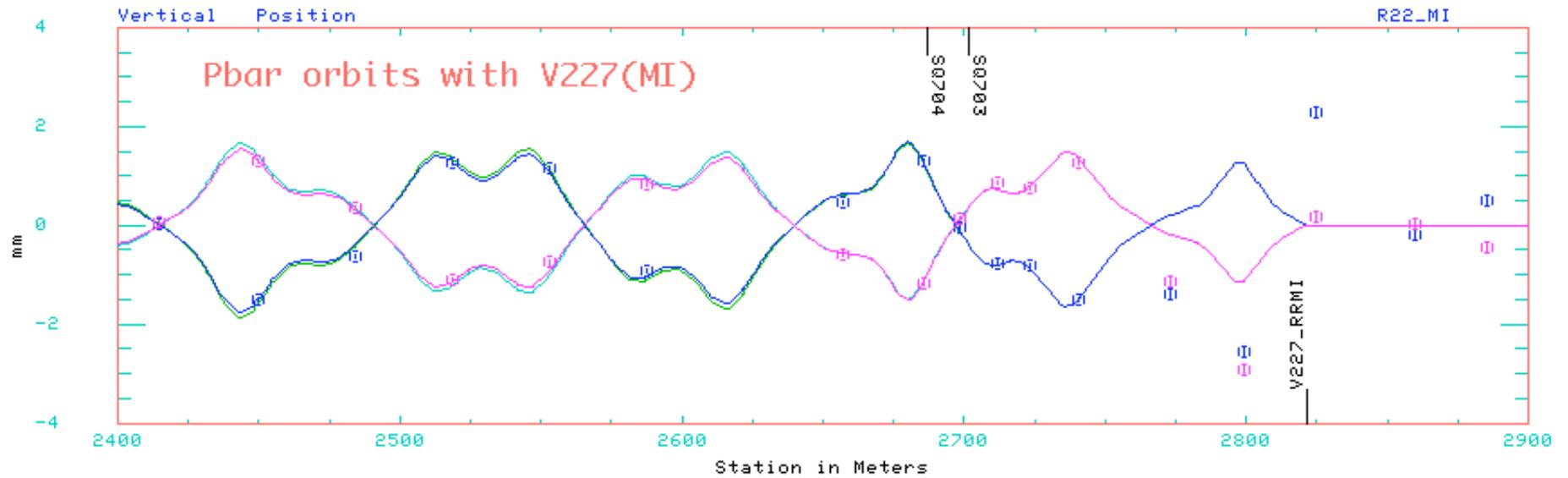
Pbar orbit, MI H228



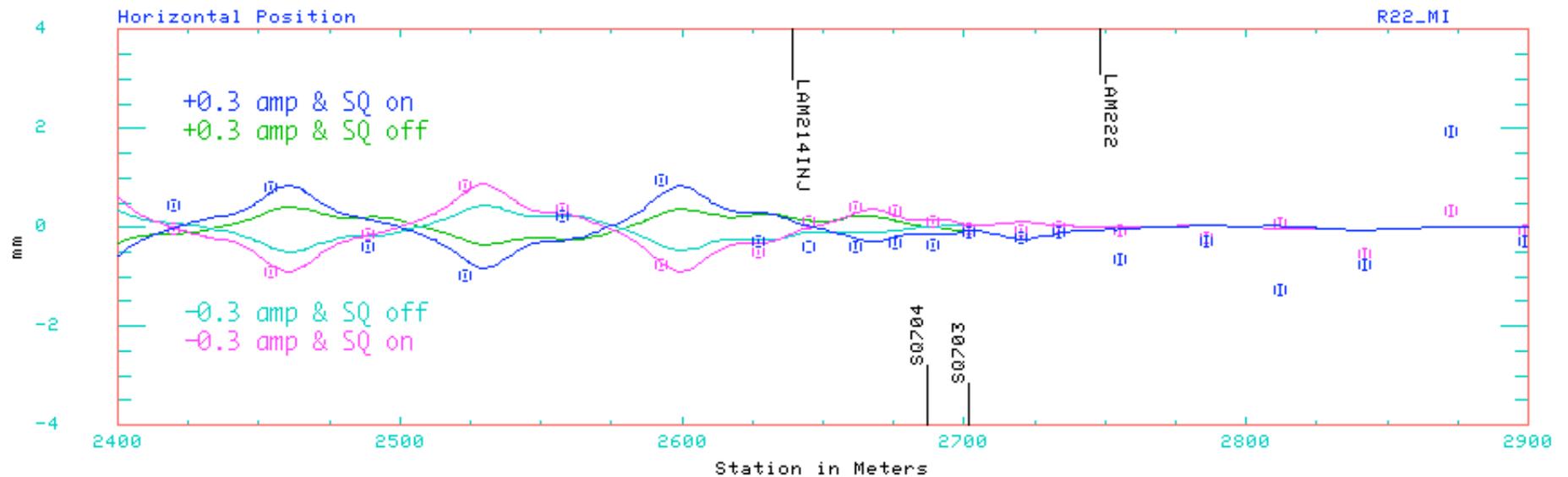
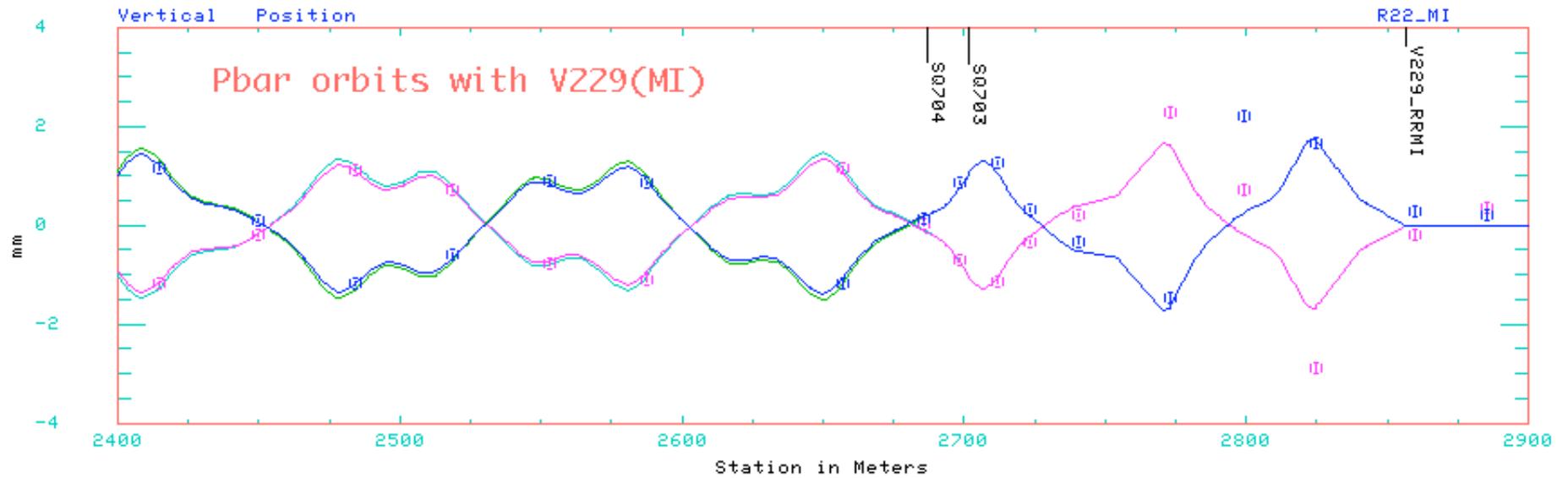
Pbra orbit, MI H230



Pbar orbit, MI V227

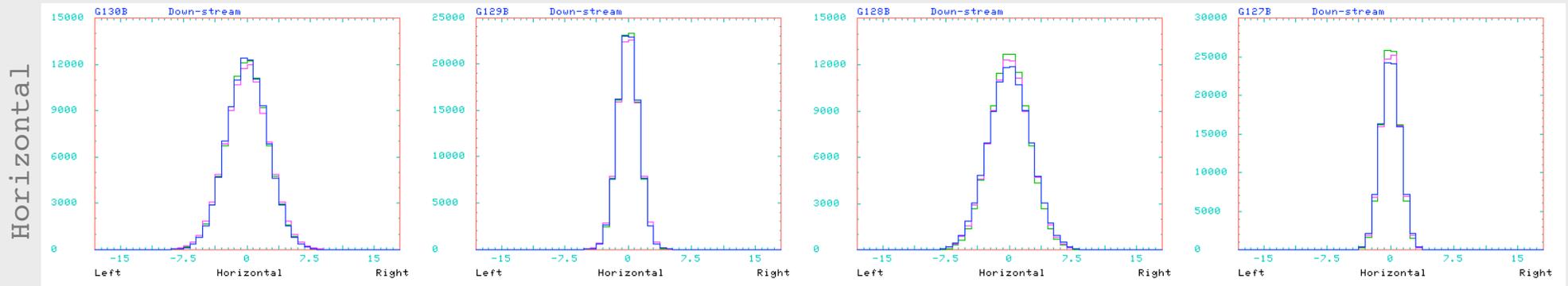


Pbar orbit, MI V229



Effect of coupling on injection profiles

Pbar from MI 

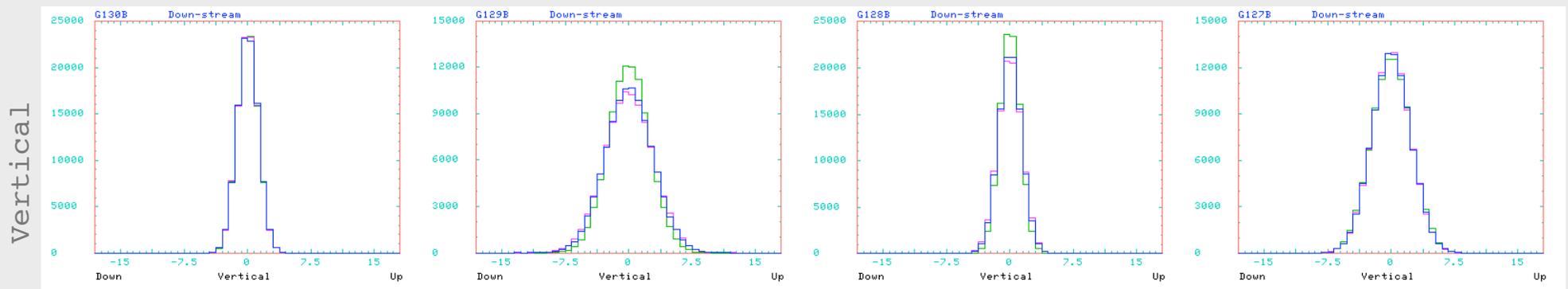


GD130 ds

GD129 ds

GD128 ds

GD127 ds

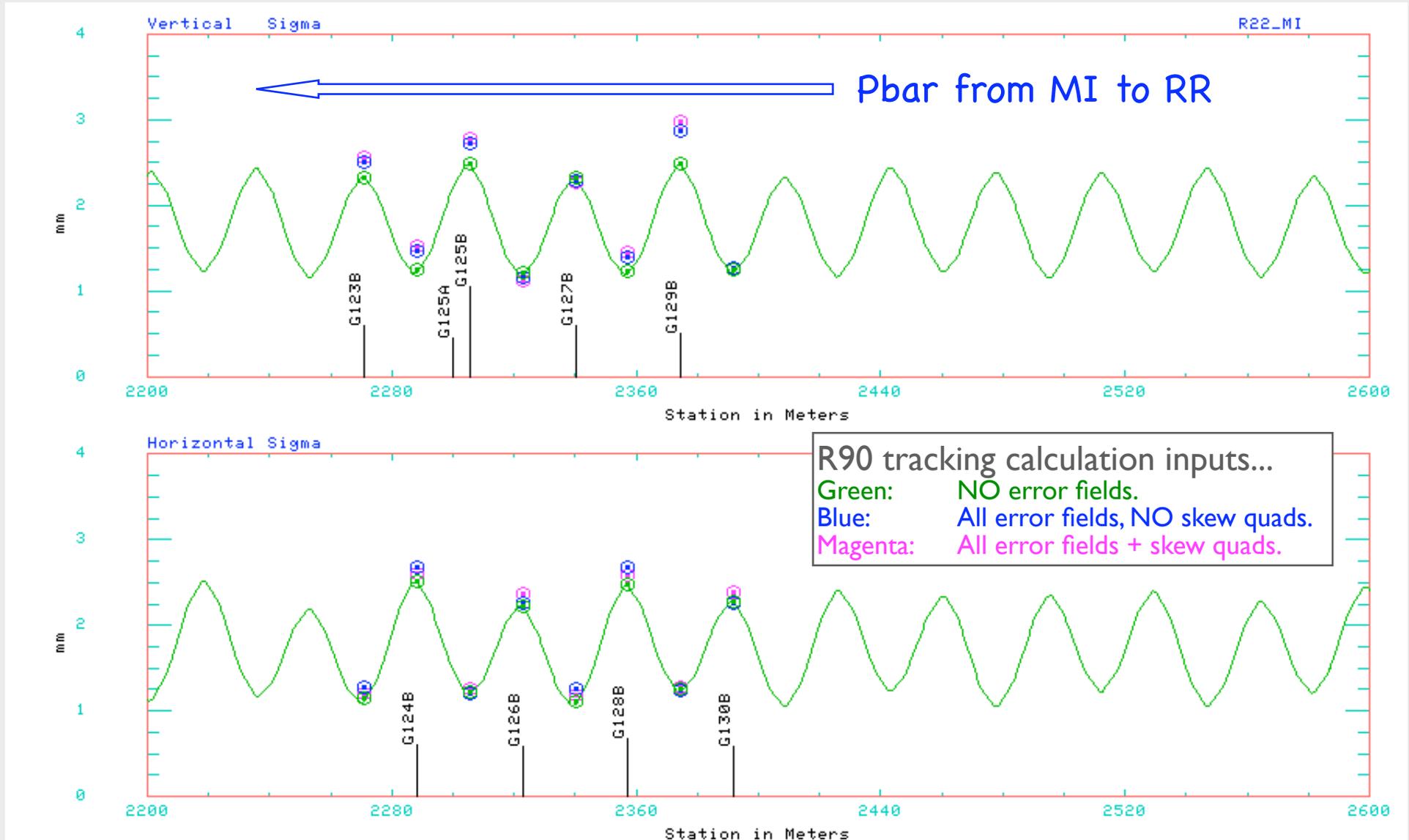


Tracking simulation

R90 tracking calculation inputs...

- Green: NO error fields.
- Blue: All error fields, NO skew quads.
- Magenta: All error fields + skew quads.

Effect of coupling on injection sigma



Tracking simulation

Conclusion

❖ Consistent with proton data

- ▶ Skew quads were on.
- ▶ First order and linear coupling.
 - Consistency verified.
 - Unknown horizontal orbit motion
- ▶ Qualitatively.
 - Not useful for quantitative analysis.

❖ MI 2.5 MHz data

- ▶ Data quality bad.
 - Intensity too low
 - Or, just bad BPM.