Recycler TBT lattice study

- TBT data
  - Horizontal & vertical planes.
  - Injection data
- Lattice function
  - Phase advance.
  - Beta & alpha functions.
- BPM diagnostics
  - RMS
  - Calibration

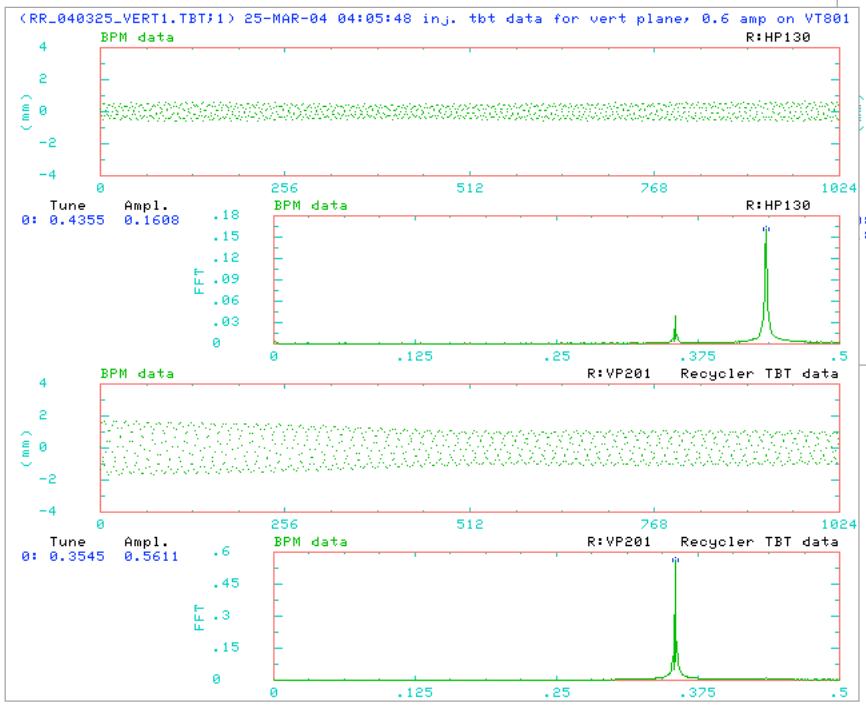
TBT analysis summary

- Lattice function
  - Calculated from PA1676.
    - ✓ RR60 trombone quads included.
  - No skew quads.
  - No trim sextupoles.
- Beta functions
  - Good agreement in the vertical plane.
  - Big beta wave in the horizontal plane.
- TBT phase analysis, (BLT style)
  - Phase advances.
  - TBT RMS.
  - Calibration.

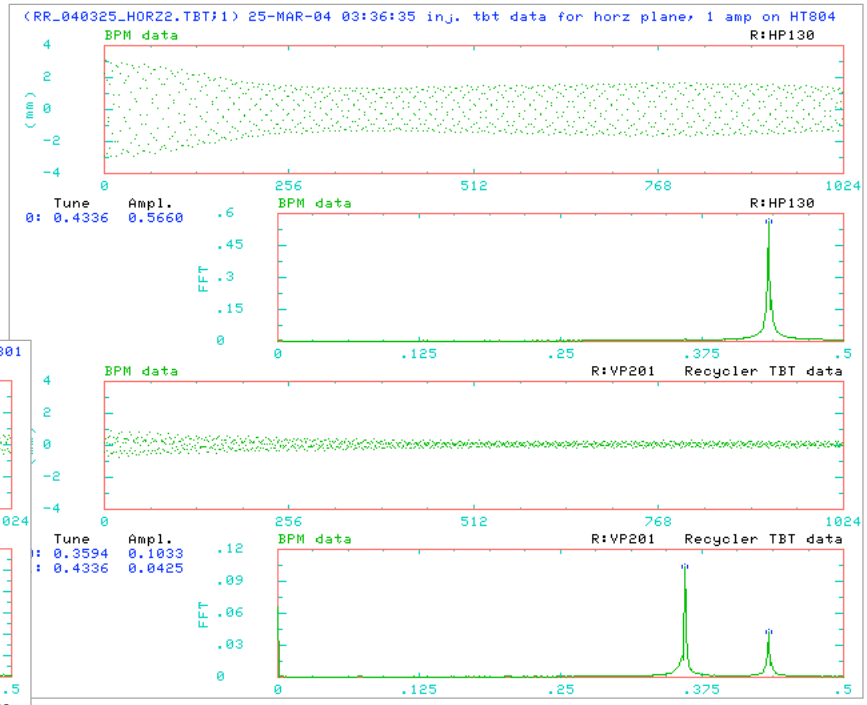
TBT data

Bare tune of the machine

	Horizontal	Vertical	
PA1676	25.4333	24.4118	Second order
	25.4355	24.4091	$\Delta p/p$ = -4.0E-3
TBT BPM	0.4150	0.4277	Trombone off
	0.4102	0.4316	Trombone & SQ off
Schottky	0.4139	0.4301	Trombone off
	0.4090	0.4340	Trombone & SQ off



$\nu_x = 0.4355$, $\nu_y = 0.3545$

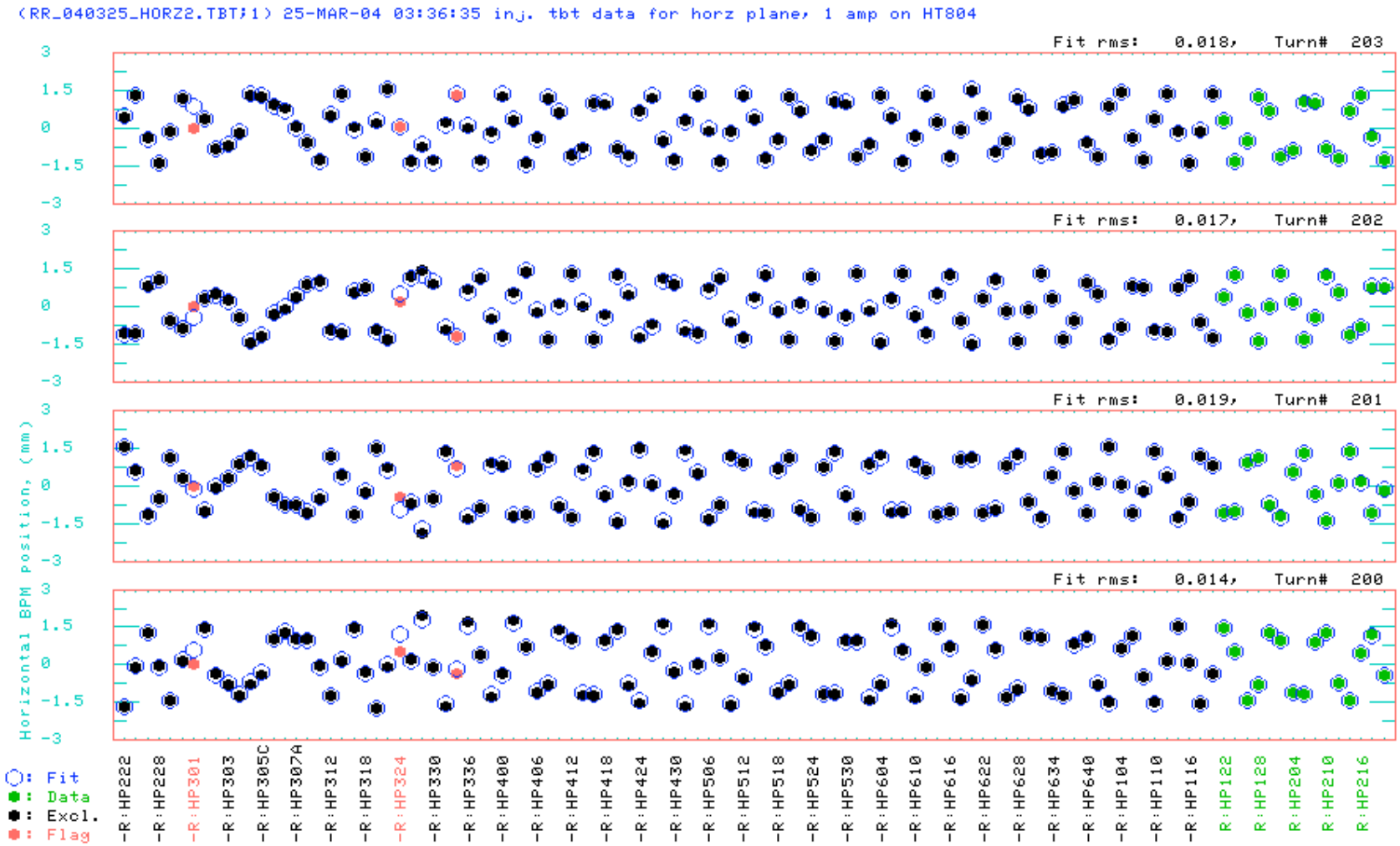


$\nu_x = 0.4336$, $\nu_y = 0.3594$

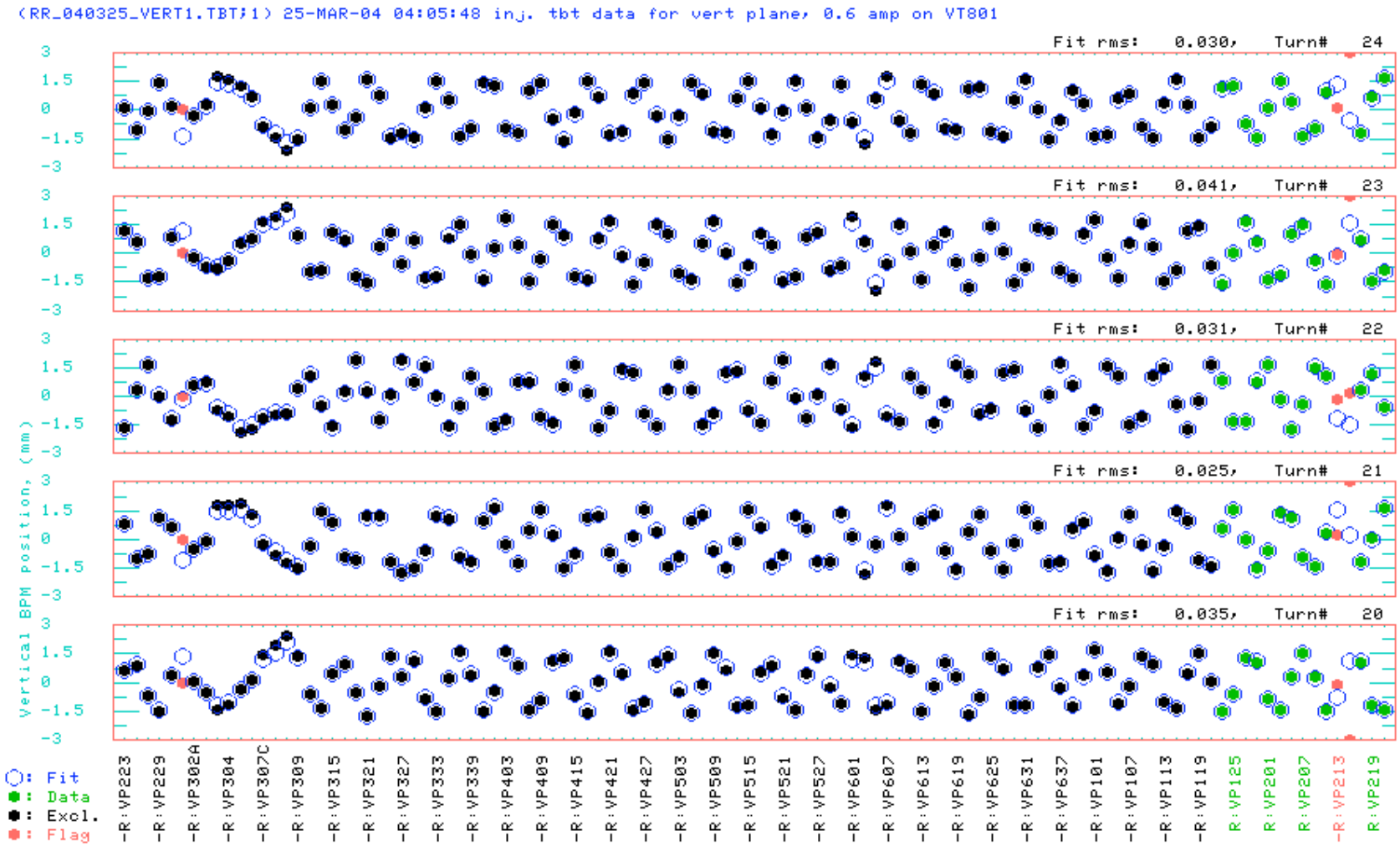
Trim settings

		D1 file #1035 23-Mar-04 7:59 PM	D1 file #1041 25-Mar-04 3:45 AM	D1 file #1047 26-Mar-04 3:47 AM	
Trim quads					
R:QT601	RR Quad Trim @ 601	-0.505	1.537	-0.569	Amps
R:QT602	RR Quad Trim @ 602	-0.073	-0.306	-0.04	Amps
R:QT603	RR Quad Trim @ 603	0.437	2.165	0.426	Amps
R:QT604	RR Quad Trim @ 604	0.051	0.546	-0.2	Amps
R:QT605	RR Quad Trim @ 605	1.897	1.394	1.997	Amps
R:QT606	RR Quad Trim @ 606	0.051	0.546	-0.2	Amps
R:QT607	RR Quad Trim @ 607	0.437	2.165	0.426	Amps
R:QT608	RR Quad Trim @ 608	-0.073	-0.306	-0.04	Amps
R:QT609	RR Quad Trim @ 609	-0.505	1.537	-0.569	Amps
R:QT309	RR Quad Trim @ 309	0	0	0	Amps
R:QT308	RR Quad Trim @ 308	0	0	0	Amps
R:QT304	RR Quad Trim @ 304	0	0	0	Amps
R:QT303	RR Quad Trim @ 303	0	0	0	Amps
R:SQ408	RR Skew Quad @ 408	9.082	9	11.12	Amps
R:SQ410	RR Skew Quad @ 410	9.064	9	11.1	Amps
R:SQ504	RR Skew Quad @ 504	2.502	2.5	3.656	Amps
R:SQ506	RR Skew Quad @ 506	2.502	2.5	3.656	Amps
Trim sextupoles					
R:S112	RR Sextupole @ 112	-1.411	-0.031	-1.411	Amps
R:S113	RR Sextupole @ 113	1.081	0.299	1.081	Amps
R:S119	RR Sextupole @ 119	1.086	0.299	1.086	Amps
R:S128	RR Sextupole @ 128	-1.411	-0.031	-1.411	Amps
R:S207	RR Sextupole @ 207	1.086	0.299	1.086	Amps
R:S330	RR Sextupole @ 330	-1.411	-0.031	-1.411	Amps
R:S412	RR Sextupole @ 412	-1.411	-0.031	-1.411	Amps
R:S413	RR Sextupole @ 413	1.08	0.299	1.08	Amps
R:S419	RR Sextupole @ 419	1.086	0.299	1.086	Amps
R:S428	RR Sextupole @ 428	-1.411	-0.031	-1.411	Amps
R:S507	RR Sextupole @ 507	1.087	0.299	1.087	Amps
R:S630	RR Sextupole @ 630	-1.417	-0.031	-1.417	Amps

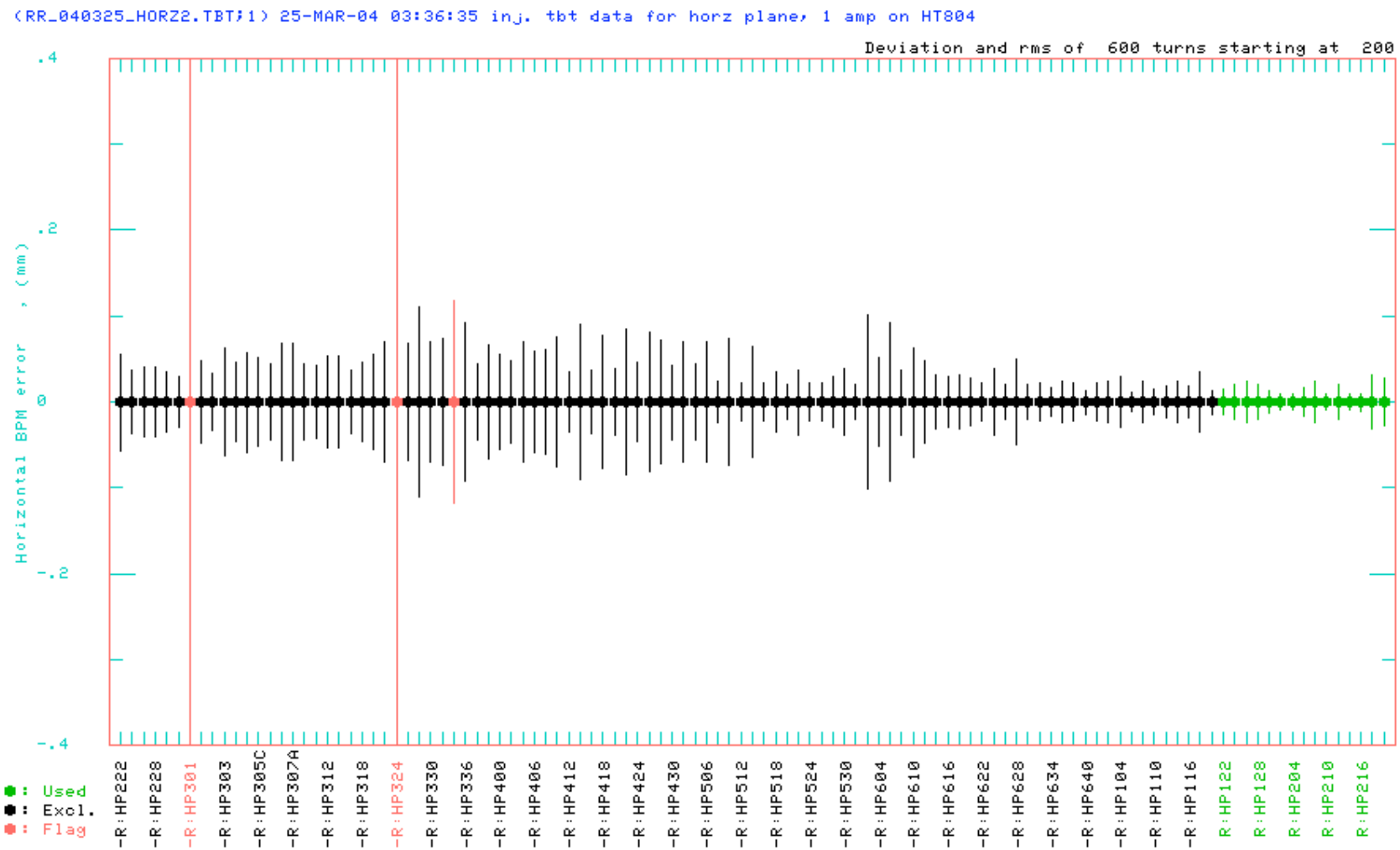
Ring-wide horizontal plane BPM data



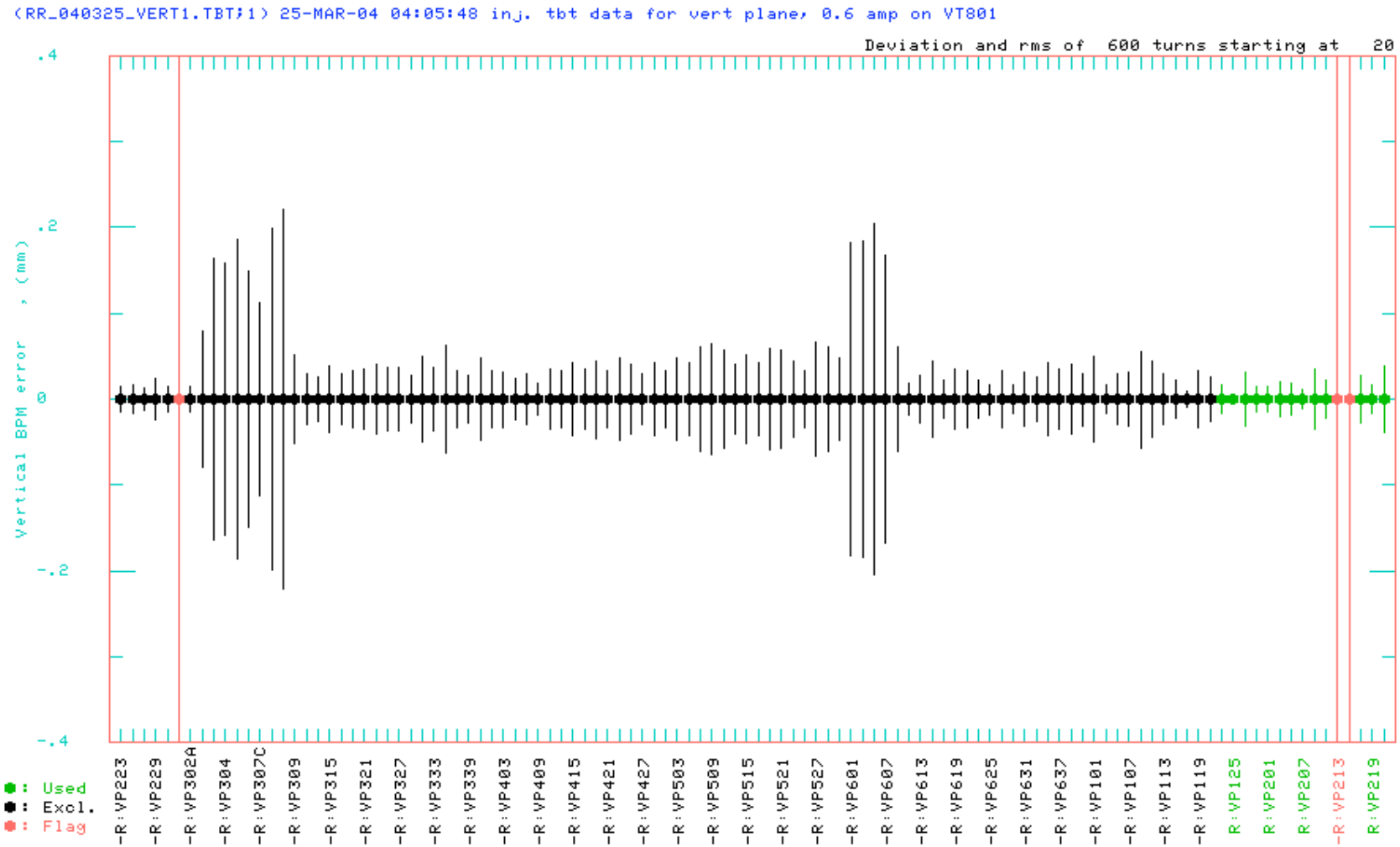
Ring-wide vertical plane BPM data



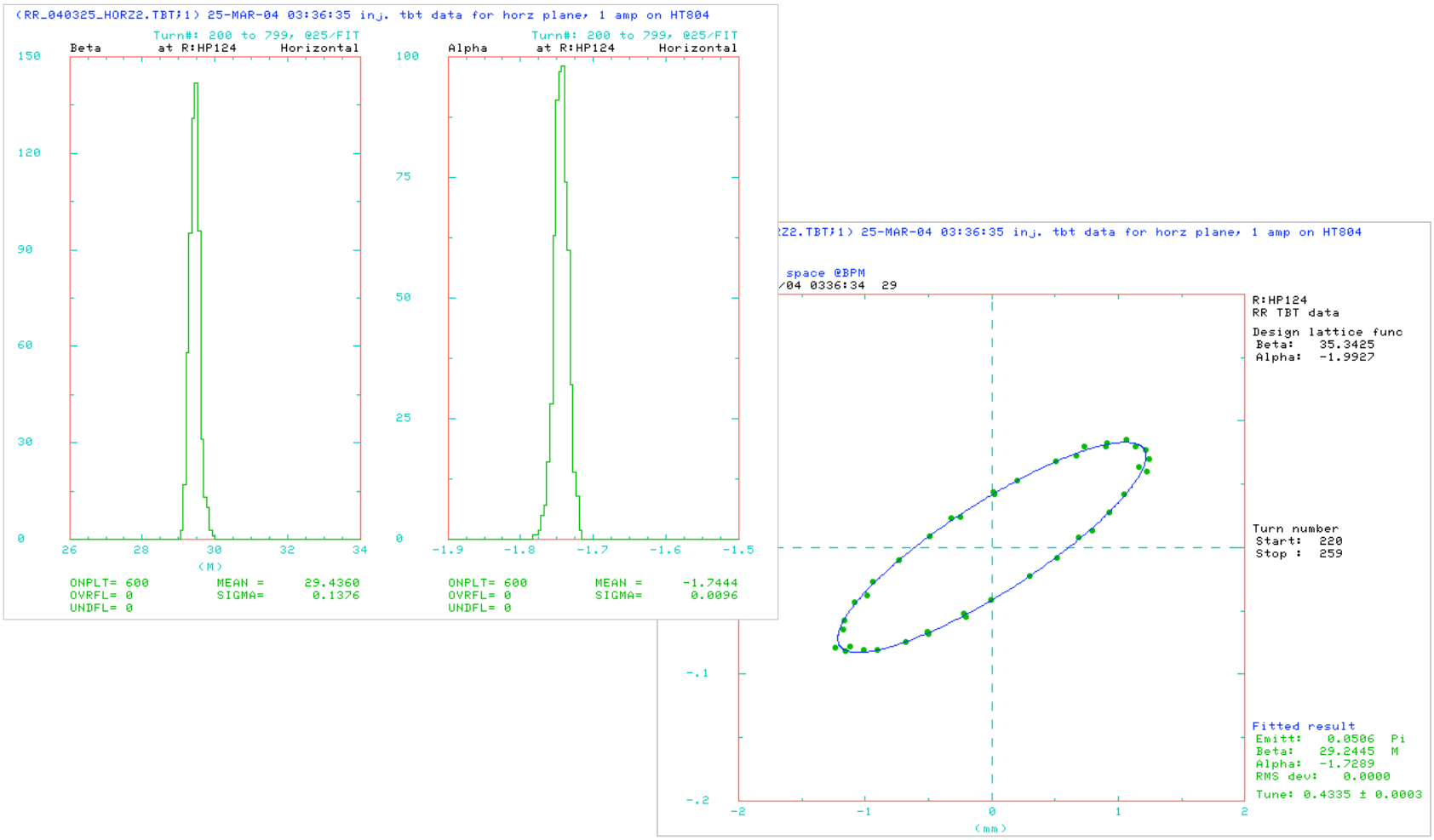
Horizontal BPM RMS deviations



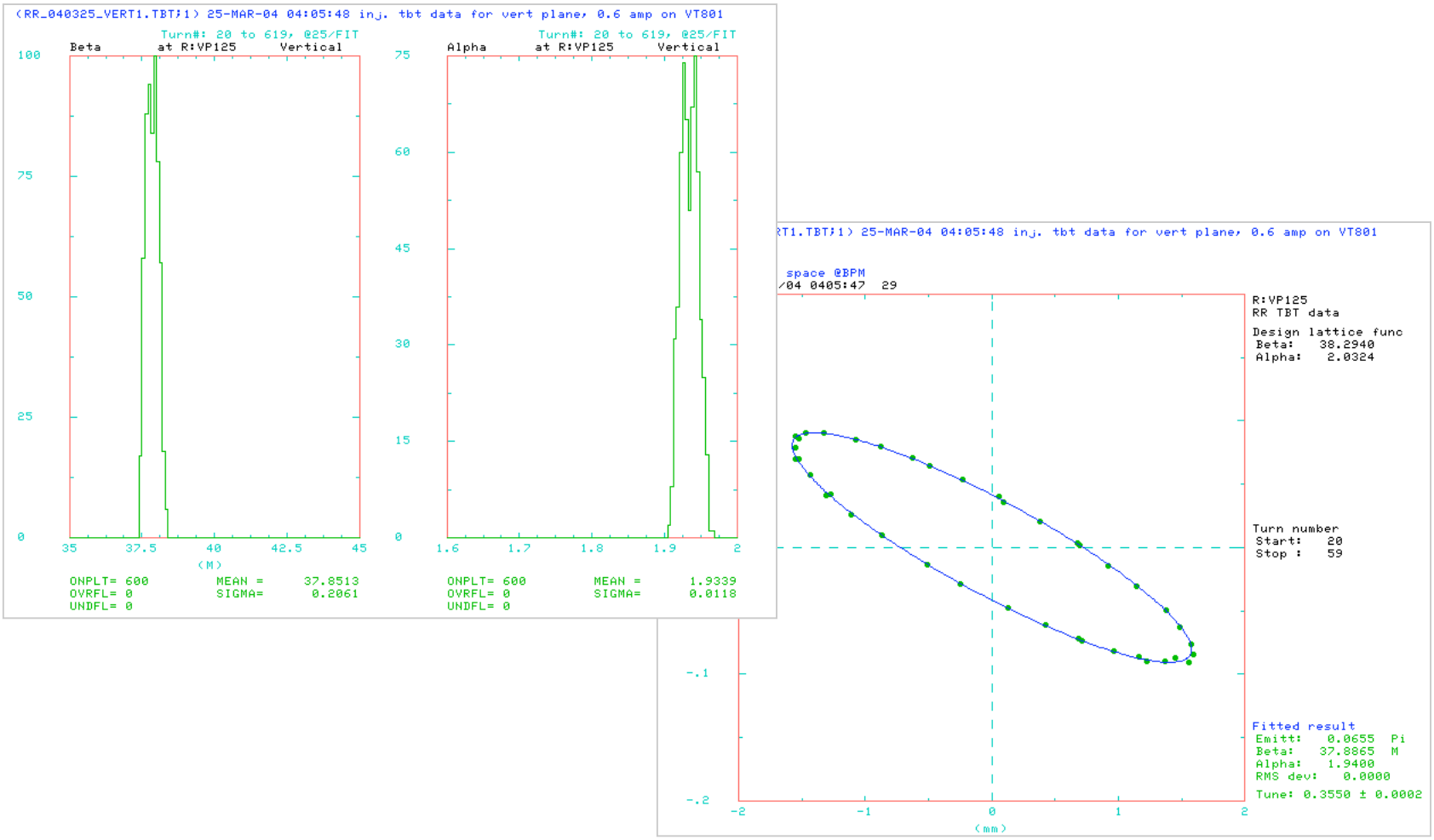
Vertical BPM RMS deviations



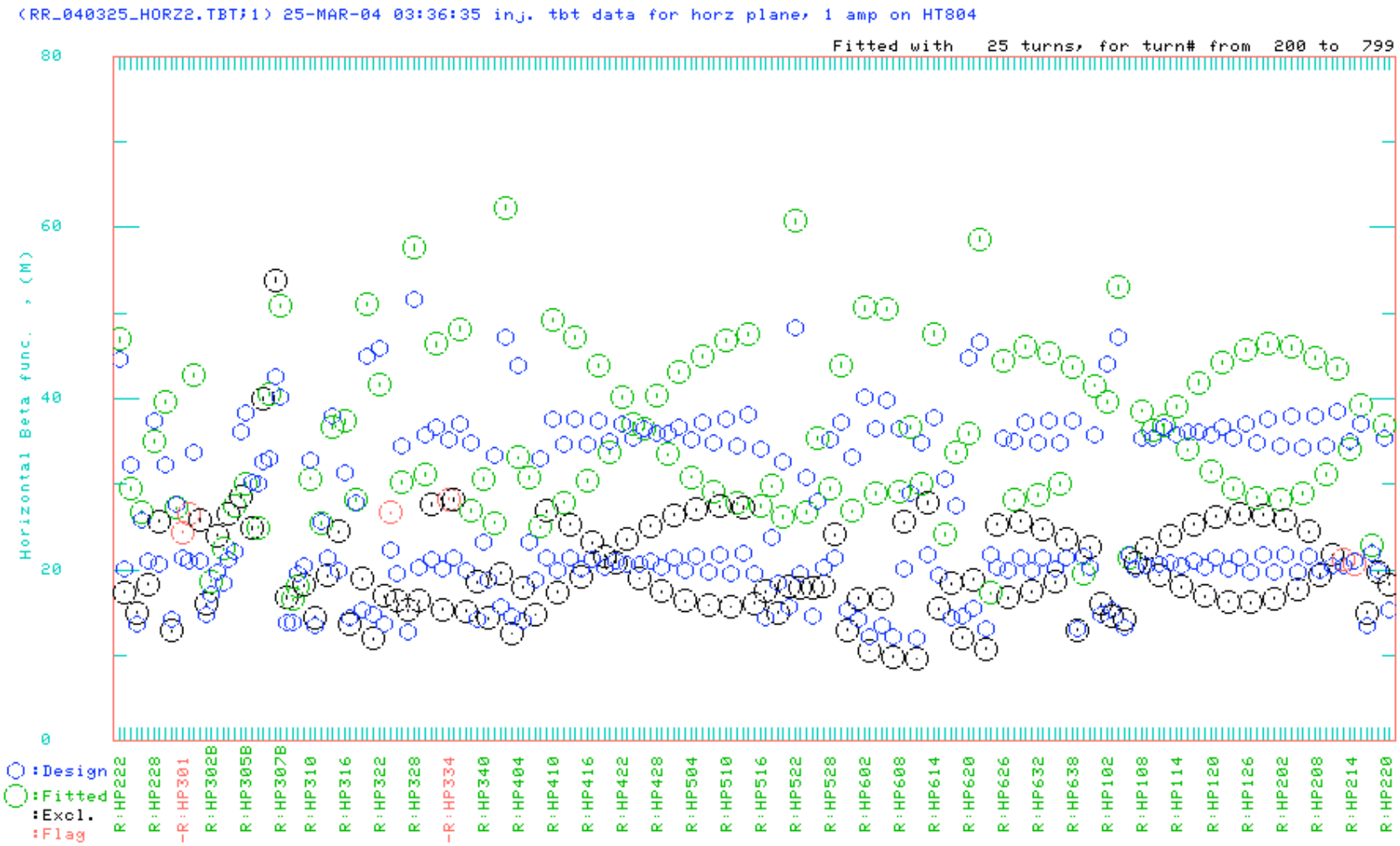
Horizontal plane lattice fucntion @HP124



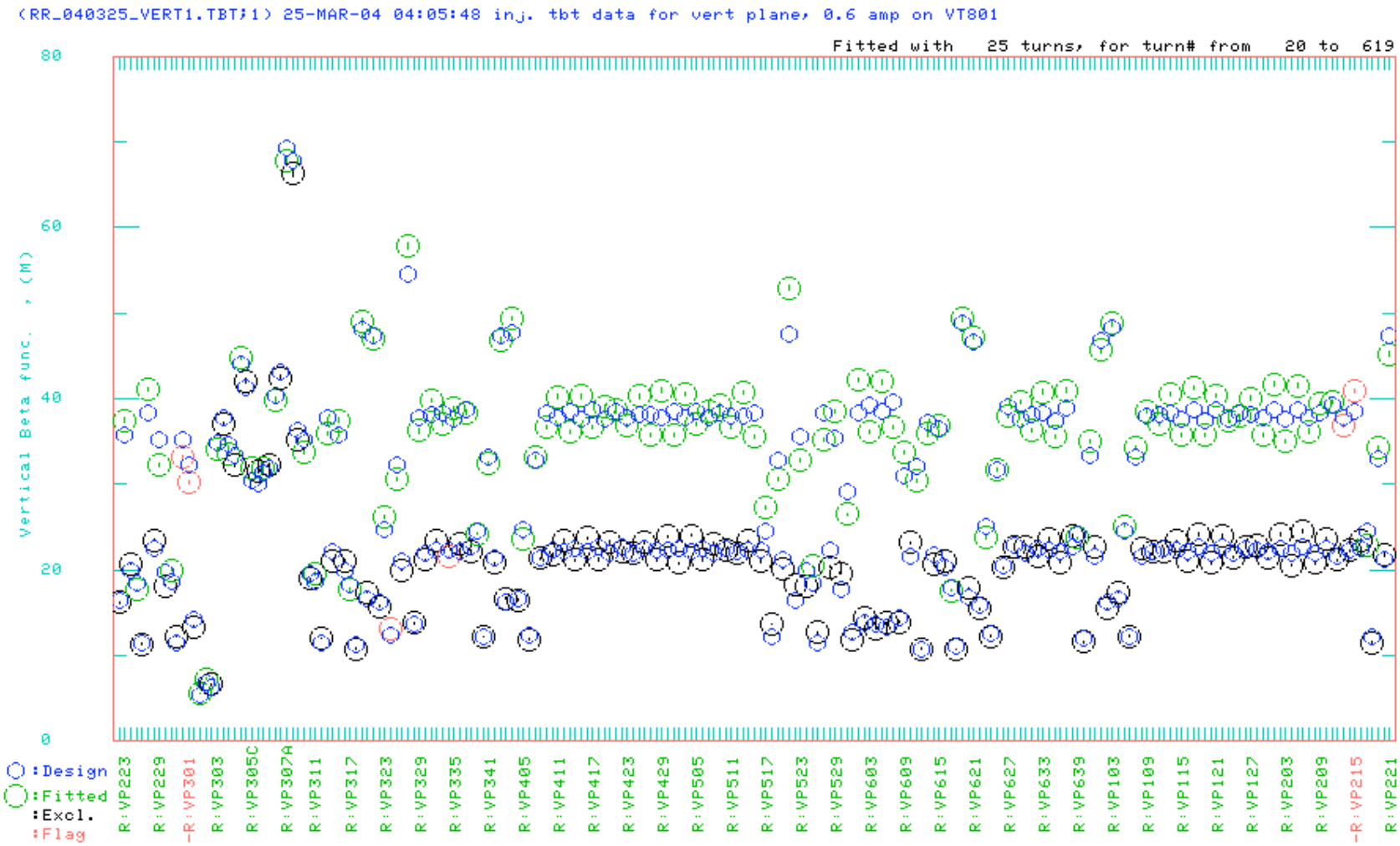
Vertical plane lattice fucntion @VP125



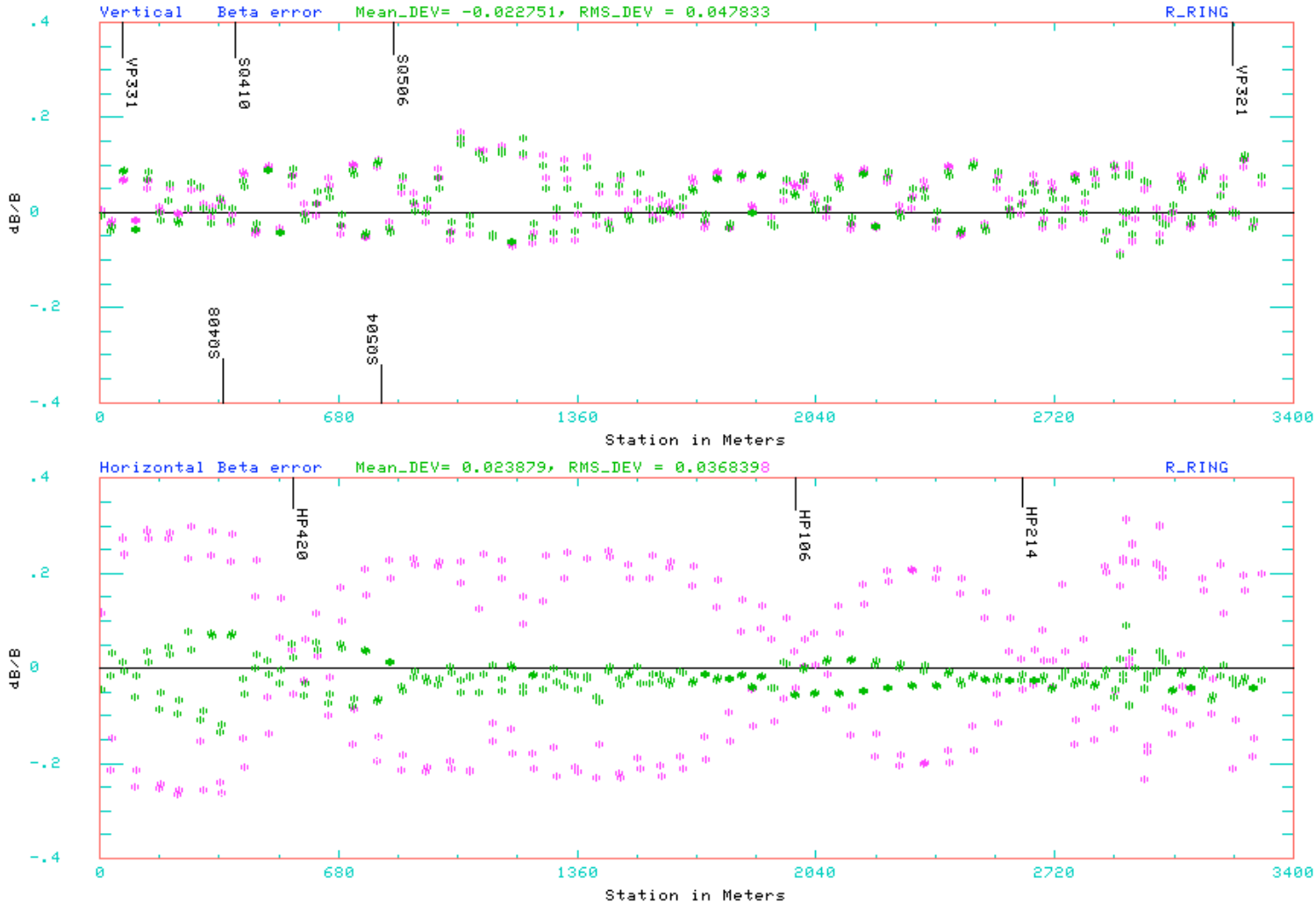
RR horizontal beta, all houses



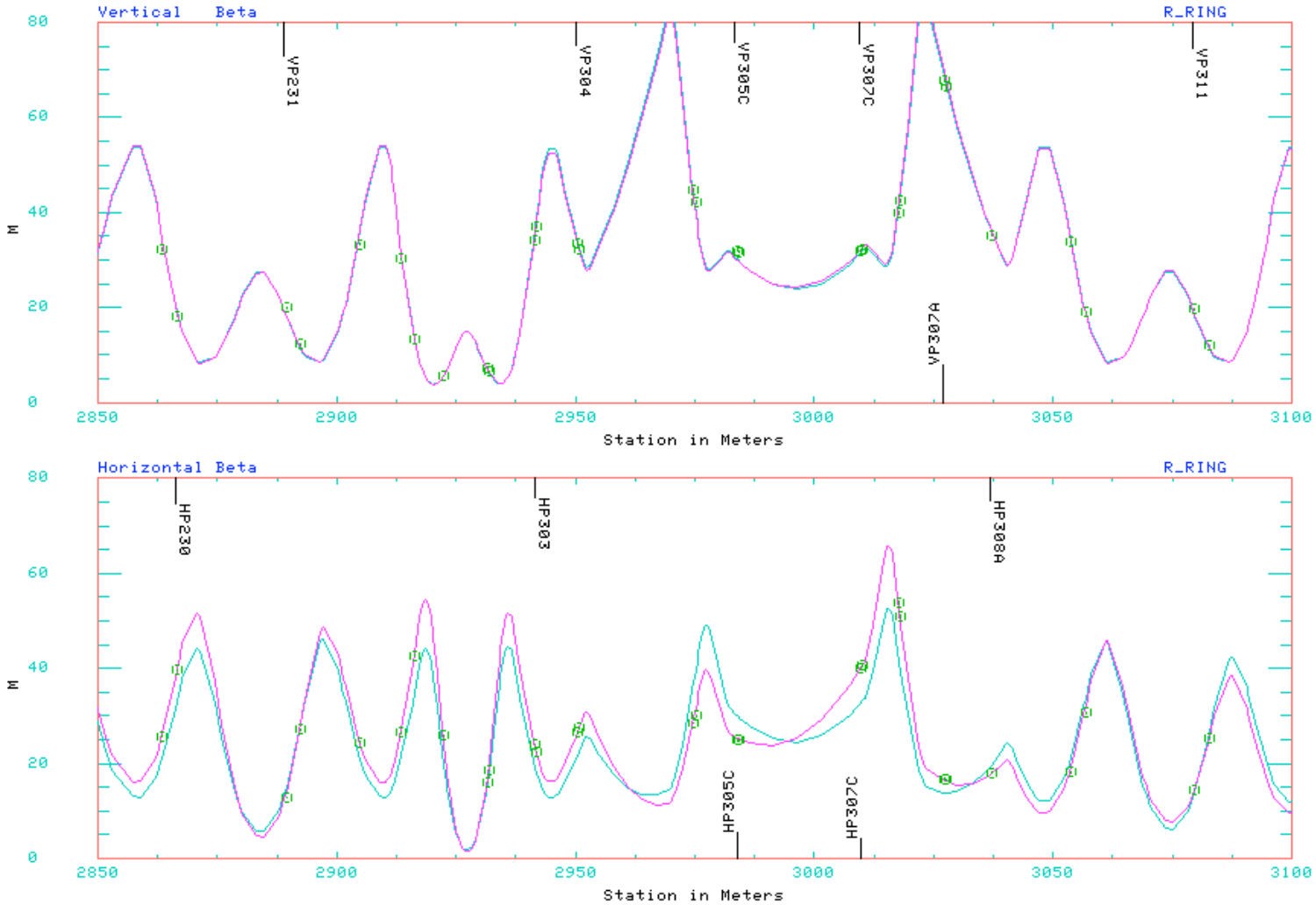
RR vertical beta, all houses



Beta error around the ring



Beta function around 30 straight



Simulating the observed beta wave

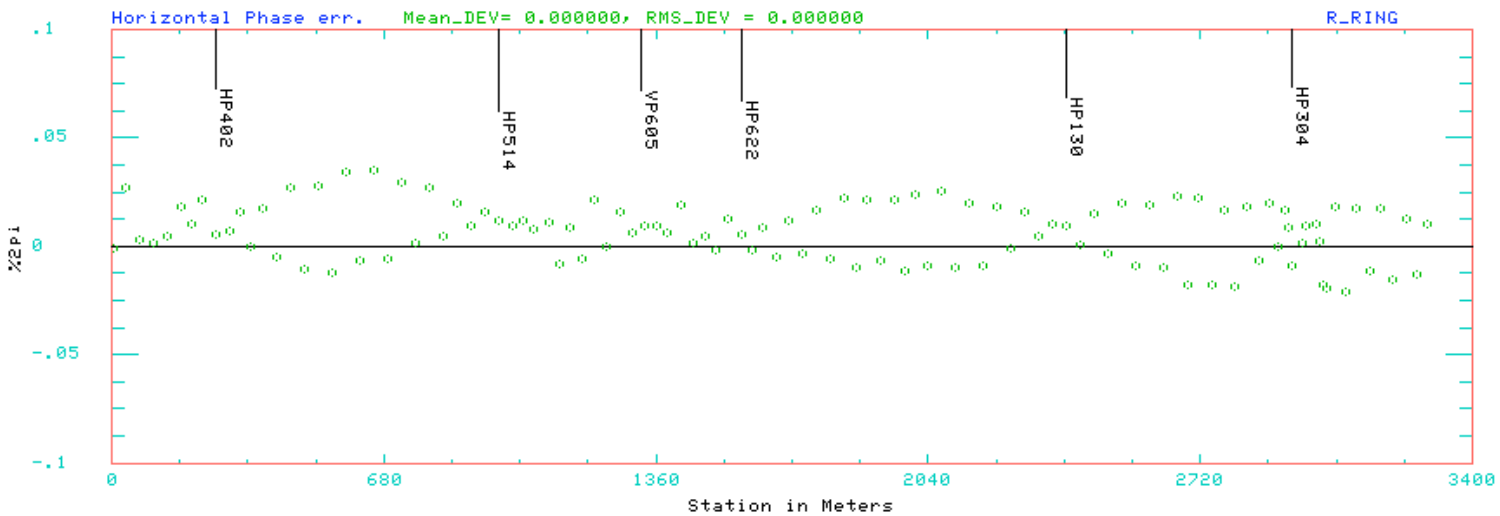
DB device page

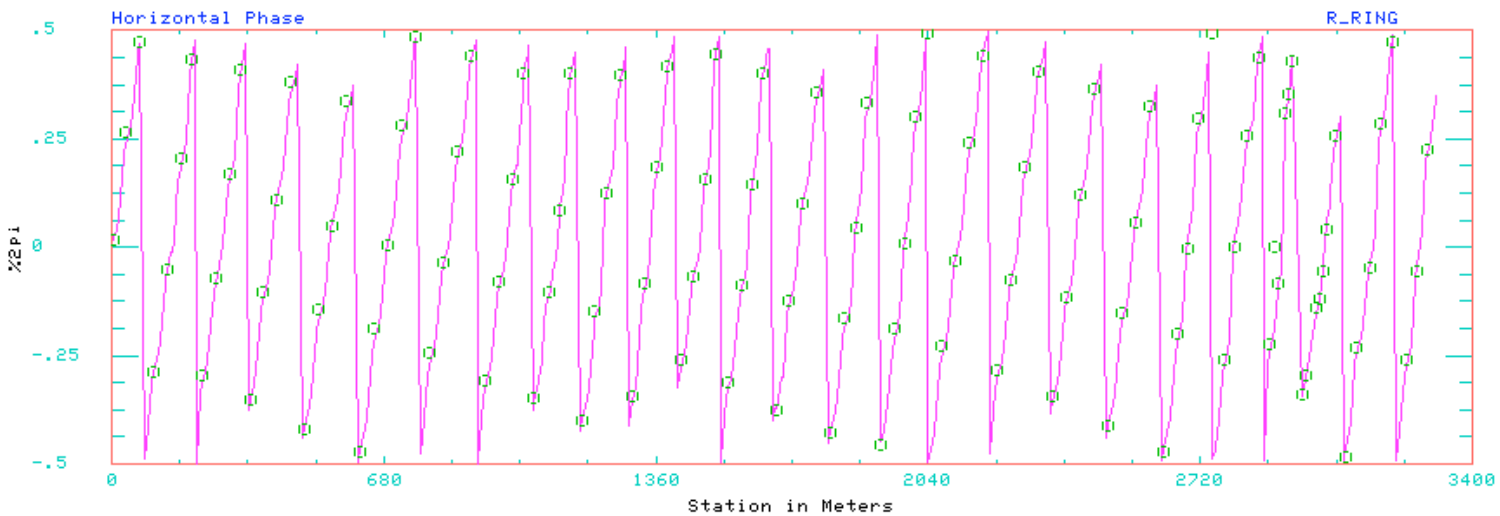
*Page length: [45] *History depth:[15]

DB_name		Setting	prev_set	reading	prev_read
R:QT601	Amps	0		1.537	0
R:QT602	Amps	0		-.306	0
R:QT603	Amps	0		2.165	0
R:QT604	Amps	0		.546	0
R:QT605	Amps	0		1.394	0
R:QT606	Amps	0		.546	0
R:QT607	Amps	0		2.165	0
R:QT608	Amps	0		-.306	0
R:QT609	Amps	0		1.537	0
R:SQ408	Amps	0		-5	0
R:SQ410	Amps	0		5	0
R:SQ504	Amps	0		-1	0
R:SQ506	Amps	0		1.5	0

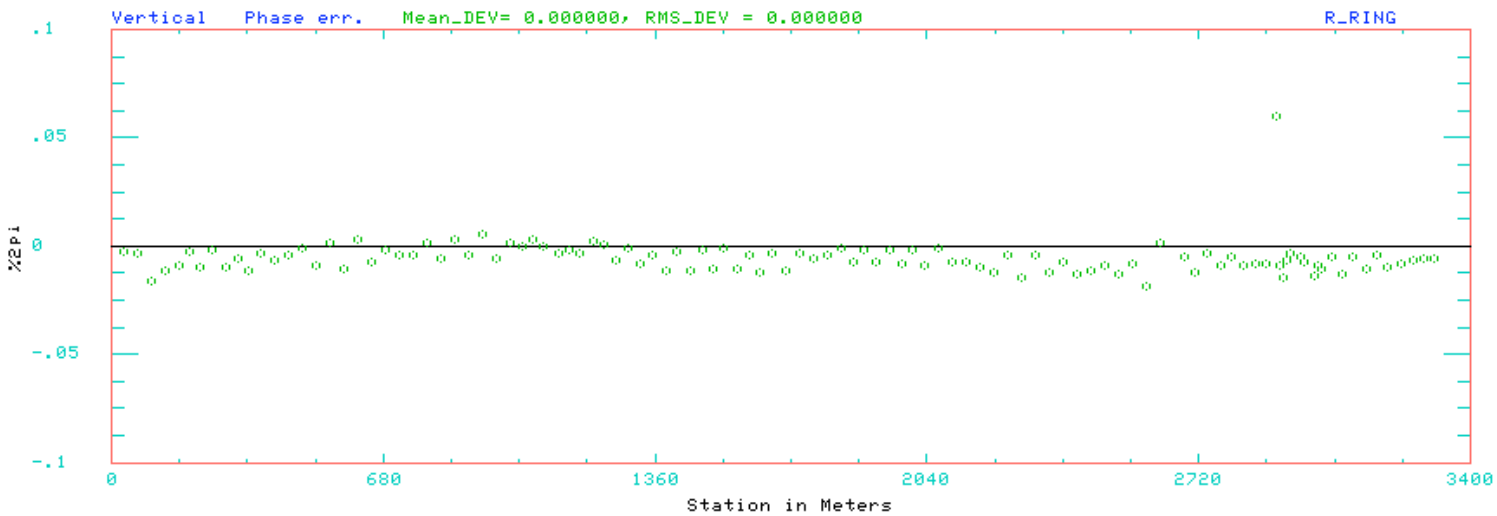
<Exit> 22:35 of 45

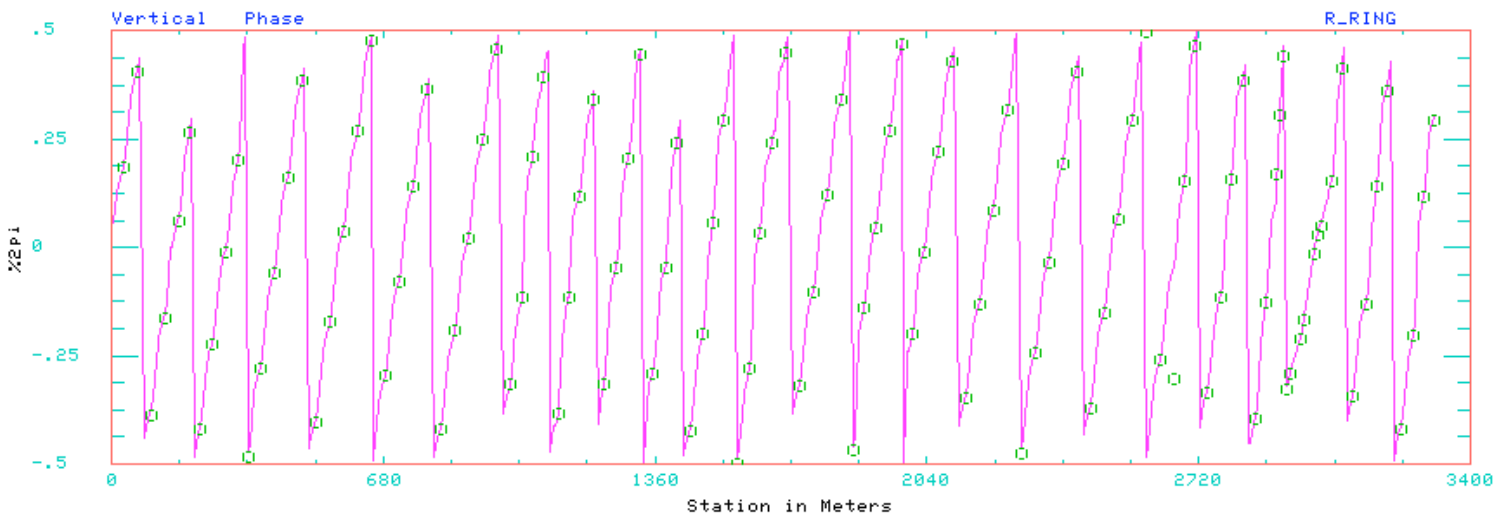
Horizontal phase advance from TBT data



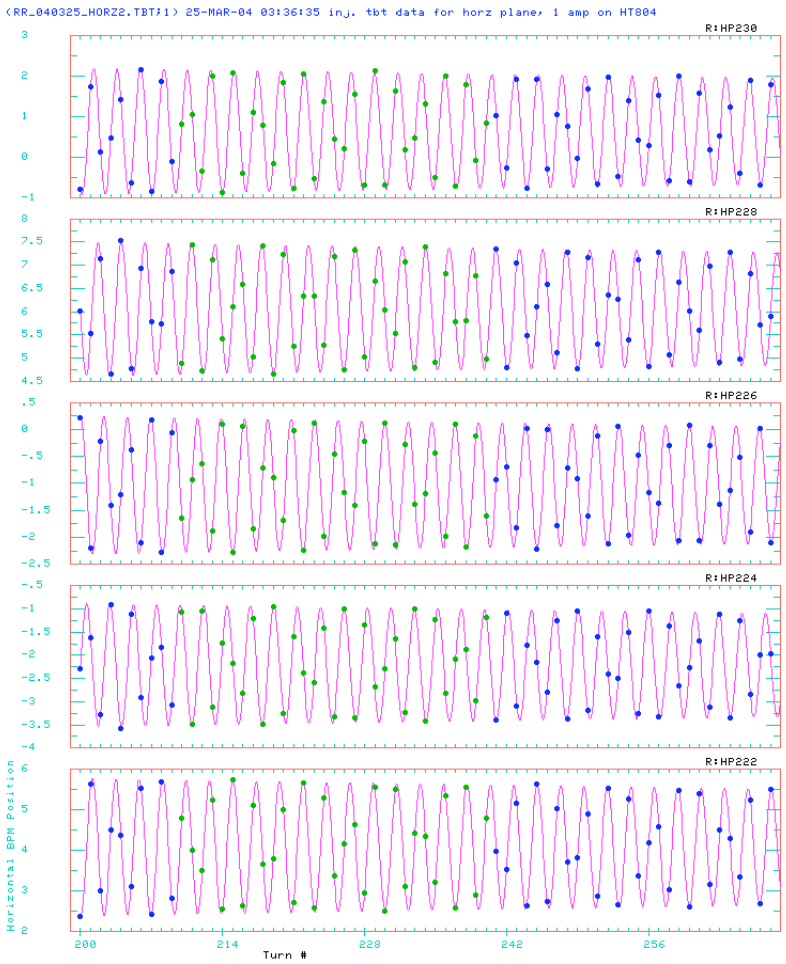


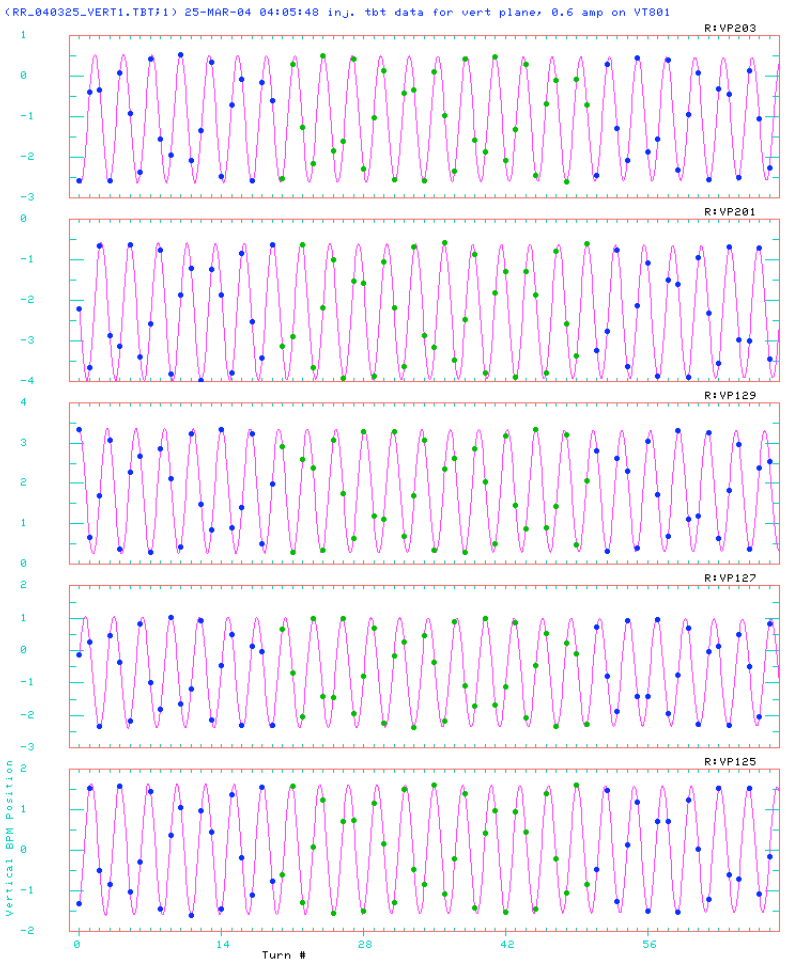
Vertical phase advance from TBT data



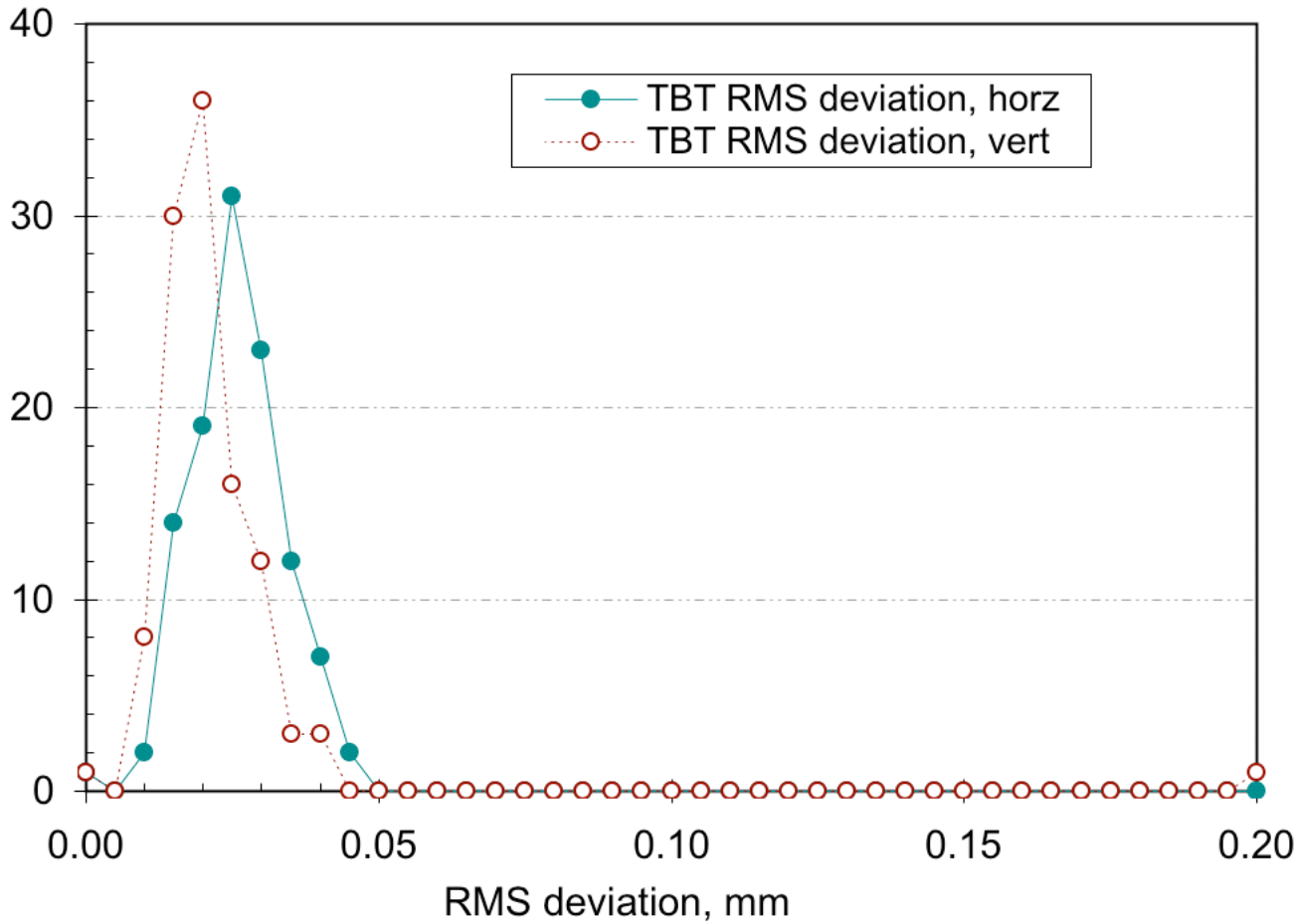


BLT style analysis for TBT data

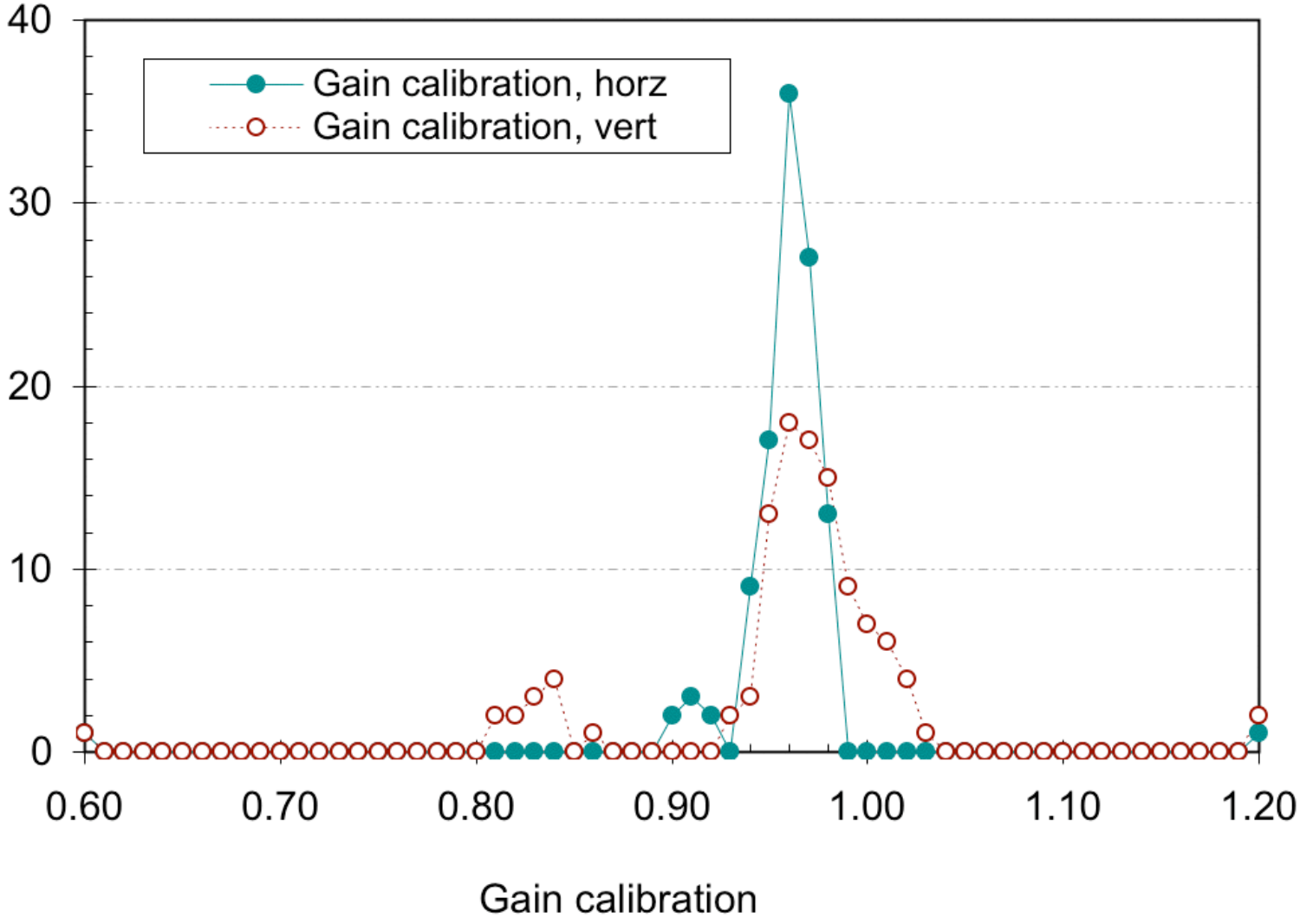




TBT RMS deviation



Gain calibration from TBT analysis



Calibration, and MI8 style BPMs

		Hor	vert				
	MI8 BPM	0.9067	0.8255				
	RRH BPM	0.9569					
	RRV BPM		0.9703				
		0.948	0.851	RR style relative to MI8 style			
			0.898	RRV relative to RRH			
	R:HP602	0.904				R:VP601	0.834
	R:HP604	0.904				R:VP603	0.802
	R:HP606	0.909				R:VP605	0.812
	R:HP608	0.918				R:VP607	0.82
	R:HP610	0.917					
						R:VP301	0
	R:HP302A	0.932				R:VP302A	0.939
	R:HP302B	0.961				R:VP302B	0.826
	R:HP303	0.895				R:VP303	0.838
RR31	R:HP304	0.944			RR31	R:VP304	0.833
RR31	R:HP305B	0.94			RR31	R:VP305B	0.821
RR31	R:HP305C	0.942			RR31	R:VP305C	0.831
RR31	R:HP307C	0.945			RR31	R:VP307C	0.859
	R:HP307B	0.963				R:VP307B	0.802
	R:HP307A	0.9				R:VP307A	0.828
	R:HP308A	0.949				R:VP309	0.939
	R:HP310	0.969				R:VP311	0.986
	R:HP312	0.965					