Status of Online Model

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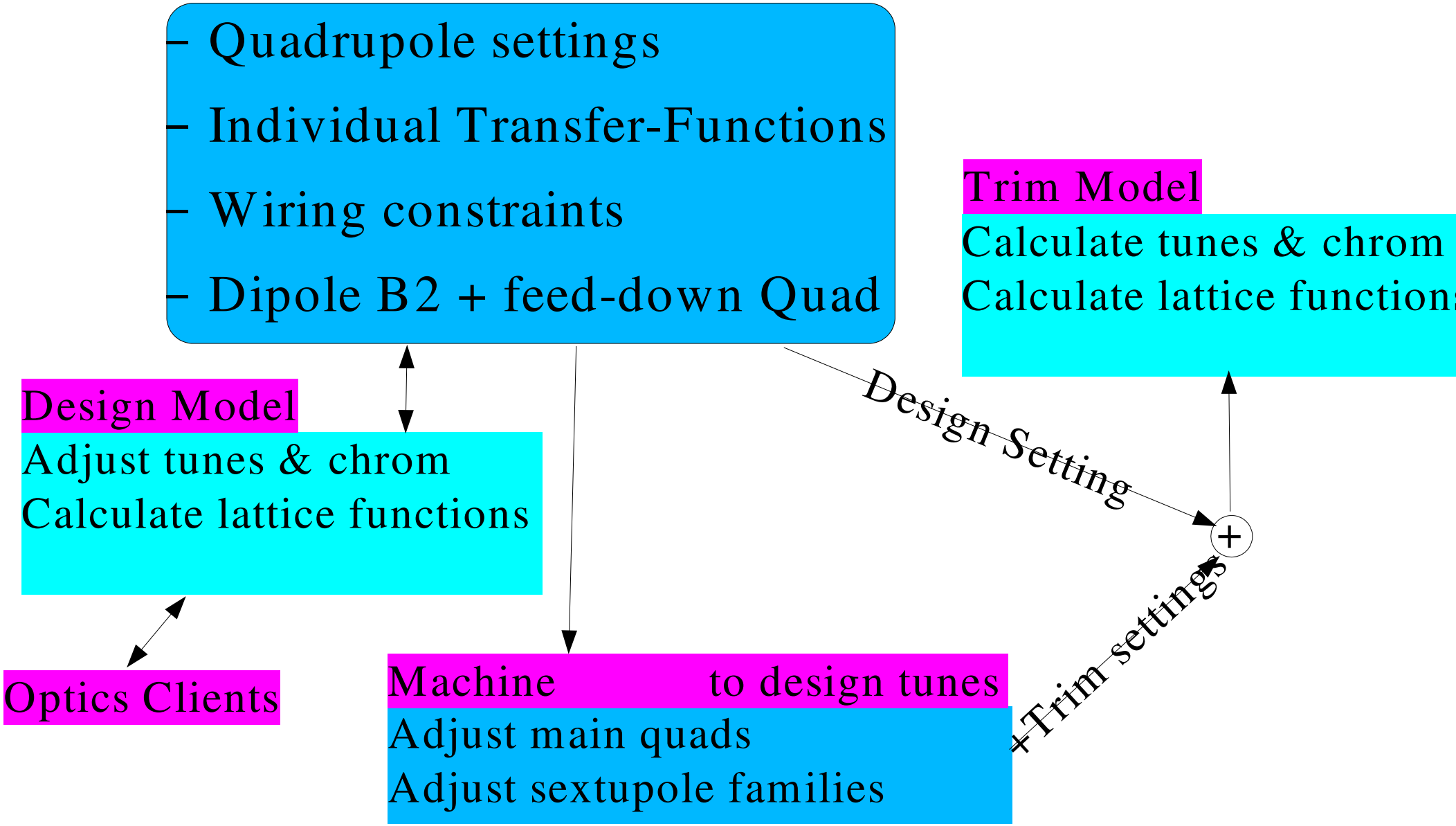
CAD/AP

Contents

- What does model do
- What did we change
- How well did the change work

- Ramp changes for next run
- Model plans

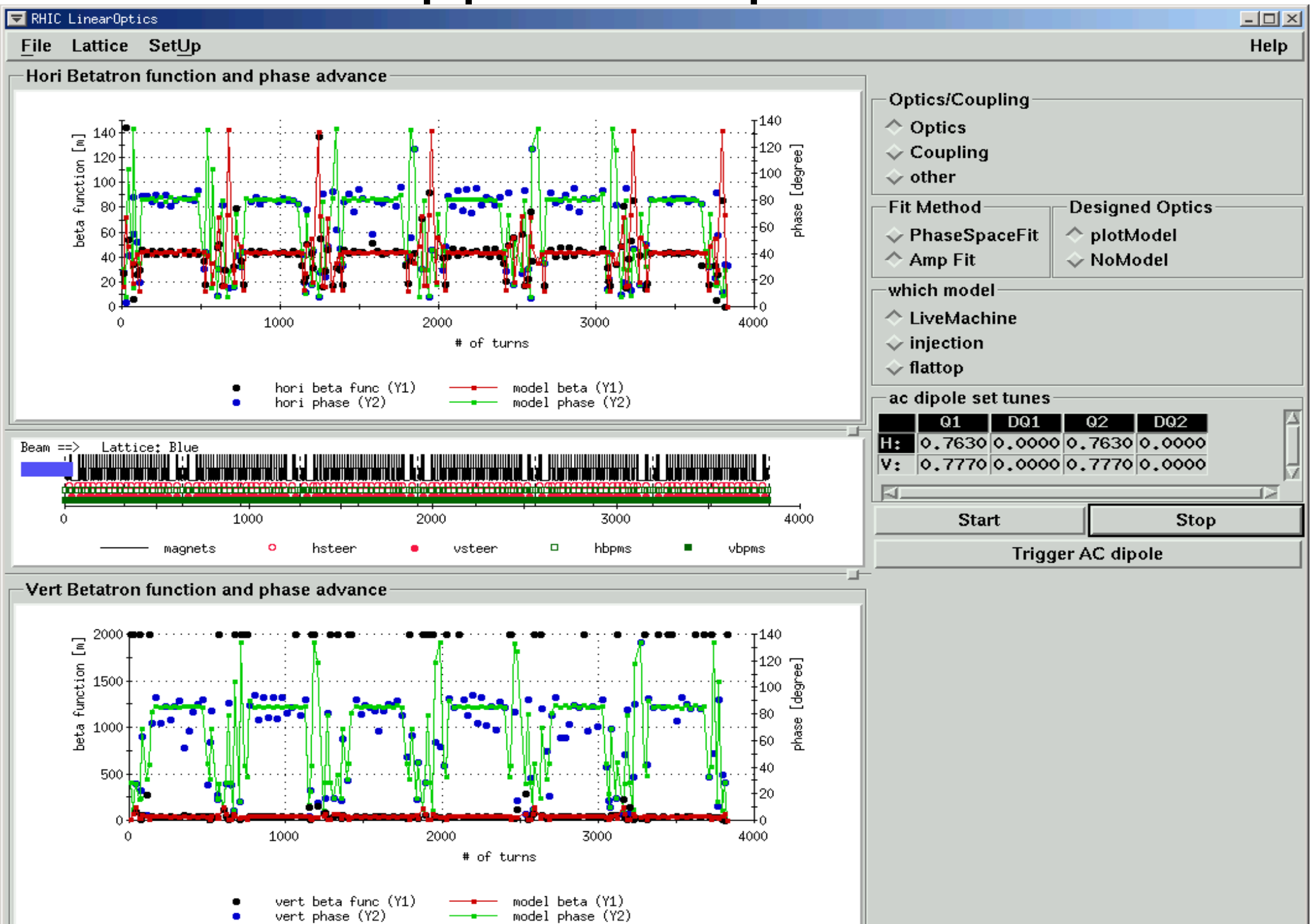
What model?


– Quadrupole settings
– Individual Transfer-Functions
– Wiring constraints
– Dipole B2 + feed-down Quad
Trim Model
Calculate tunes & chrom
Calculate lattice functions
Design Model
Adjust tunes & chrom
Calculate lattice functions
Design Setting
+
+Trim settings
Optics Clients
Machine to design tunes
Adjust main quads
Adjust sextupole families

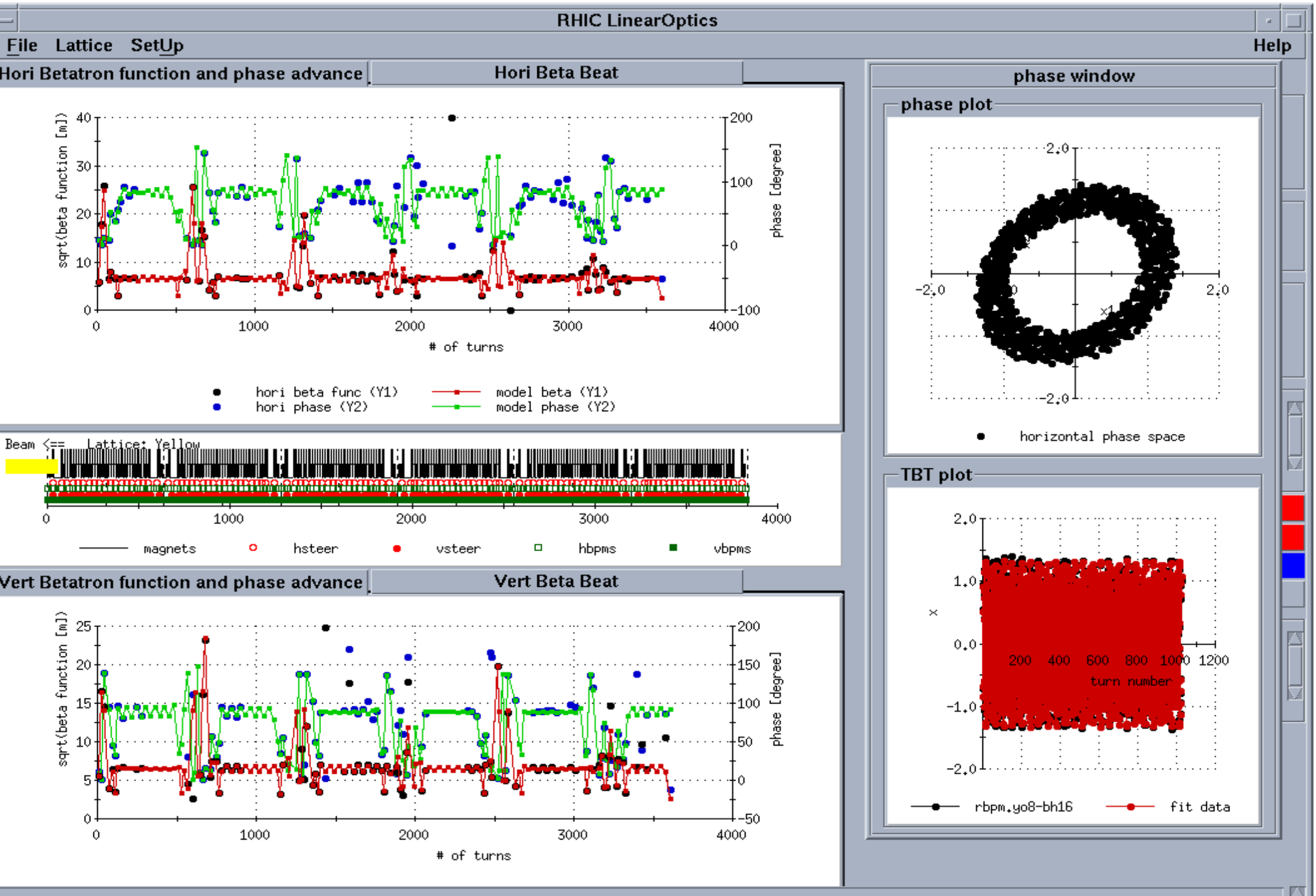
What was new in FY04

- Modified Quadrupole Transfer functions
  - Q123 vs. all other quadrupoles
    - Q123 = +0.28%, Other quads = -0.26% installed
    - 0.84% difference measured (Animesh Jain Feb 2004)
- Allowed for 'virtual' StepStones
  - Reduce tune wobbles

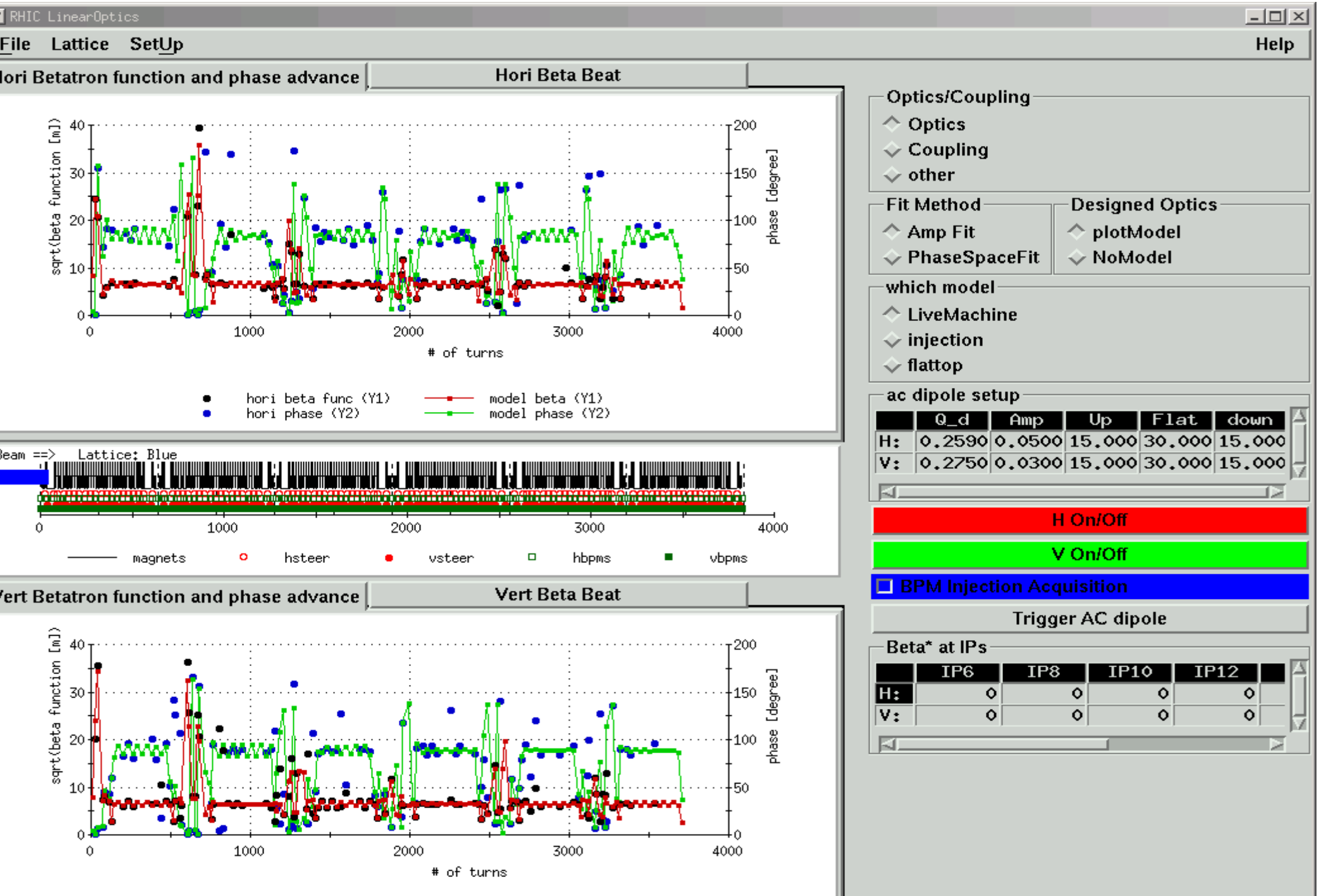
FY03 pp store optics/model



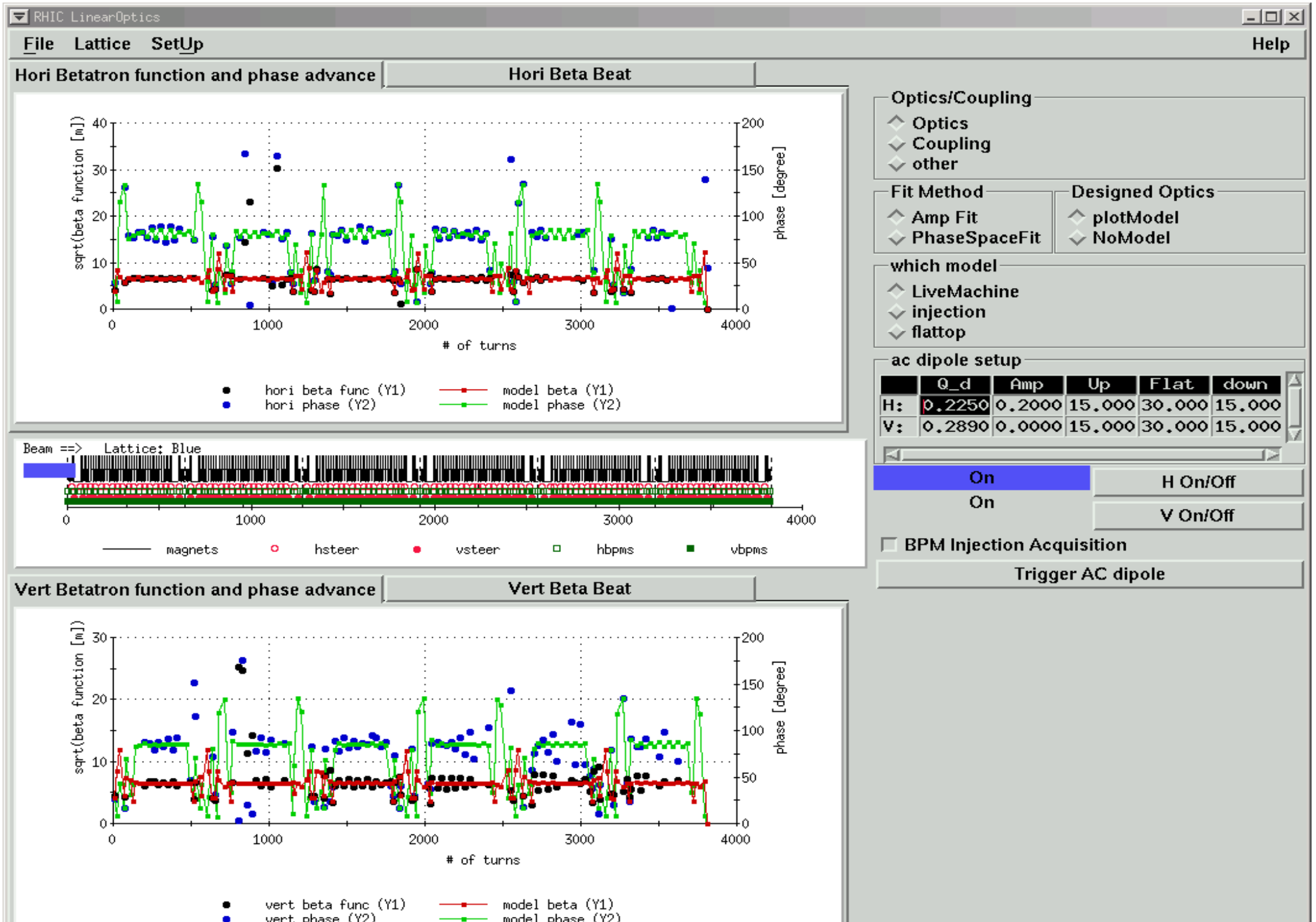
FY04 pp Yellow store optics



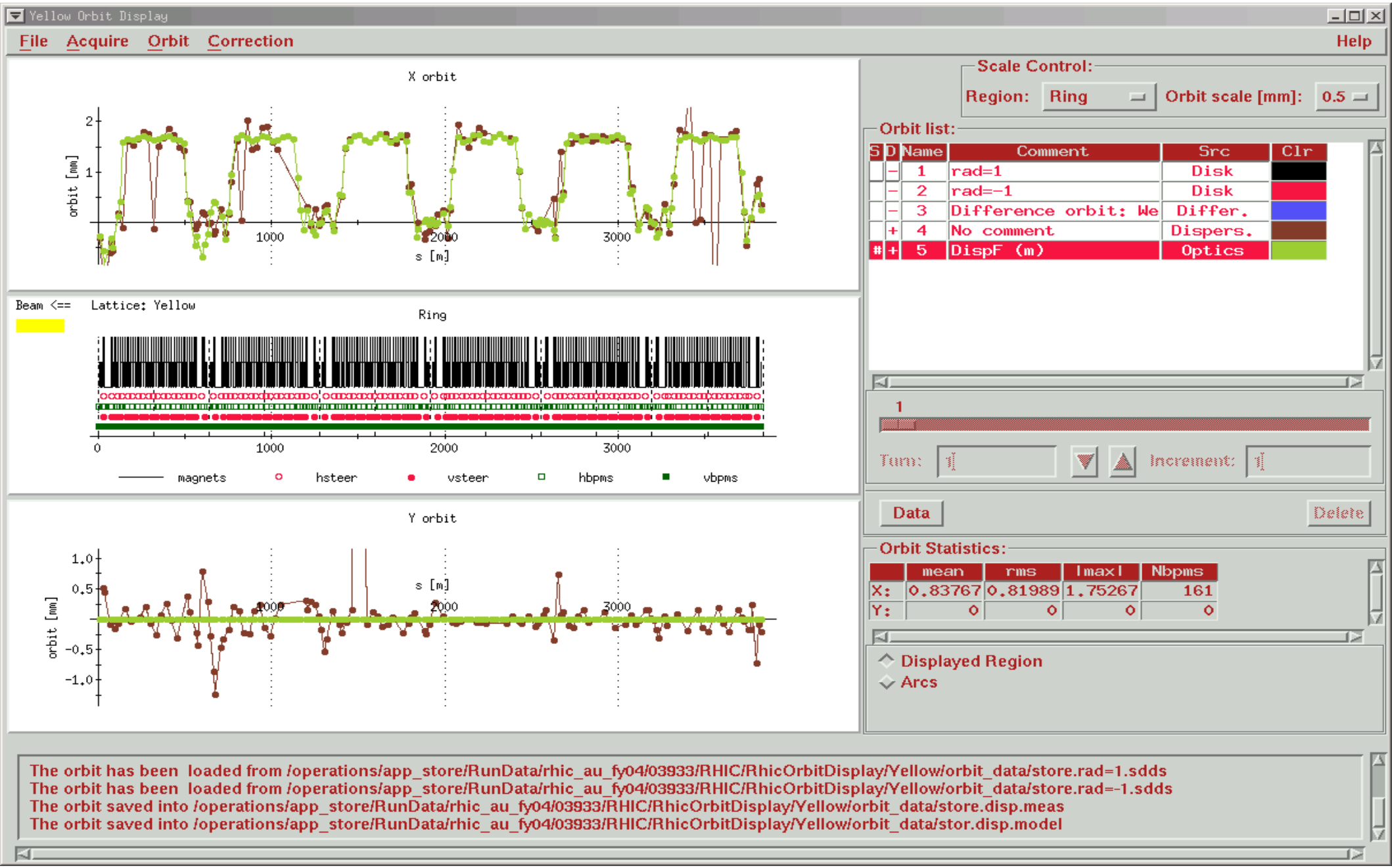
FY04 pp Blue store optics



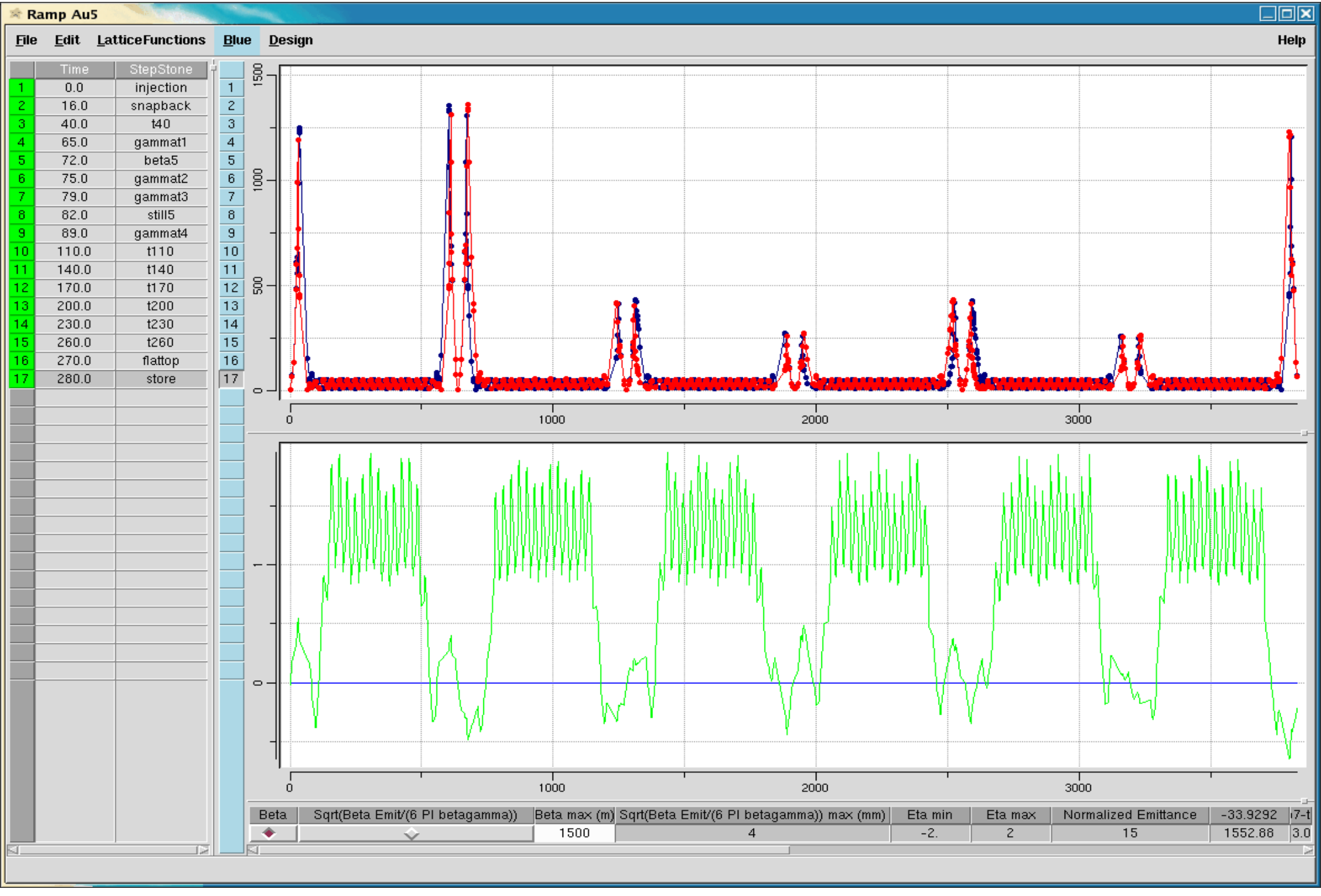
Au store Blue

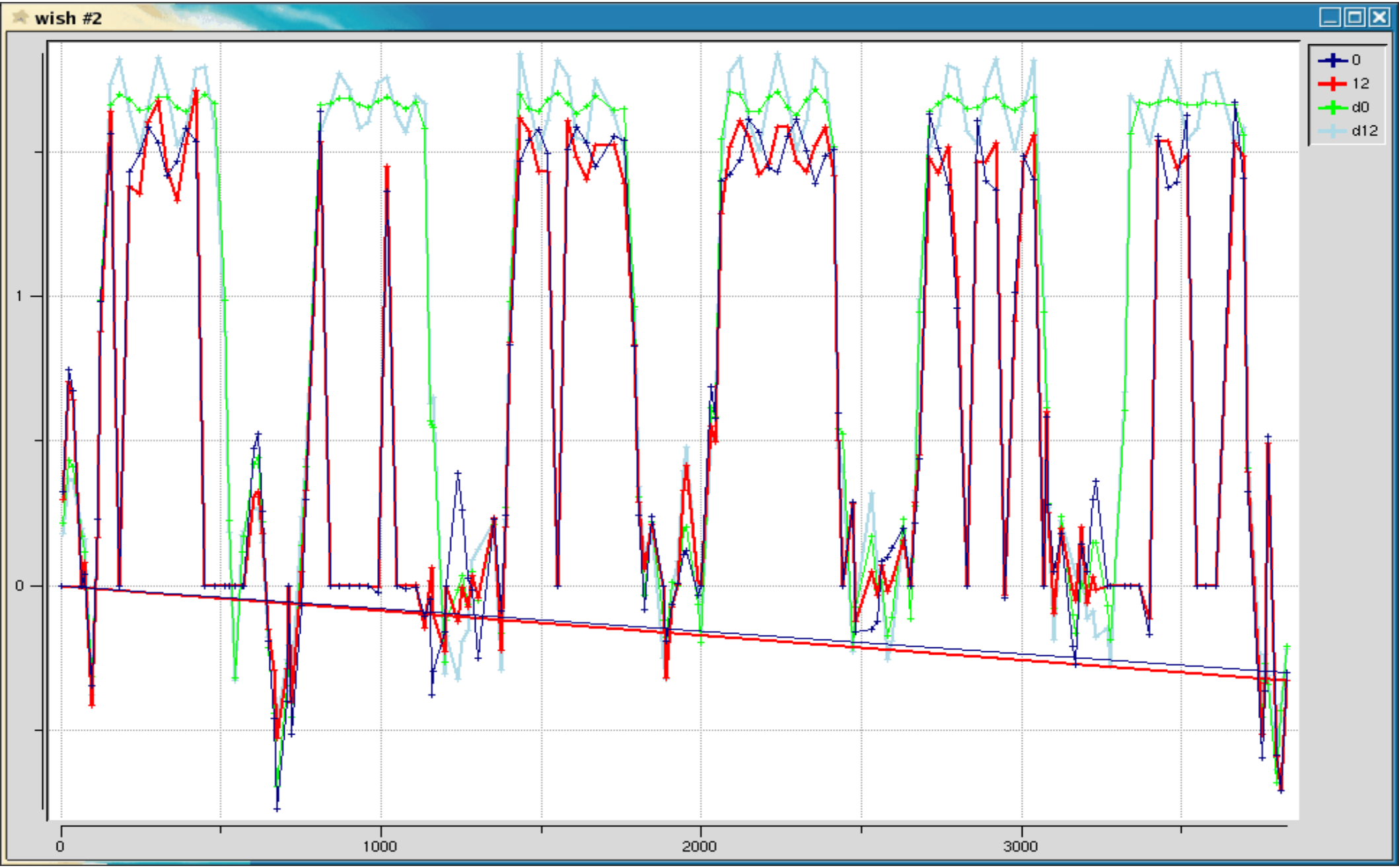


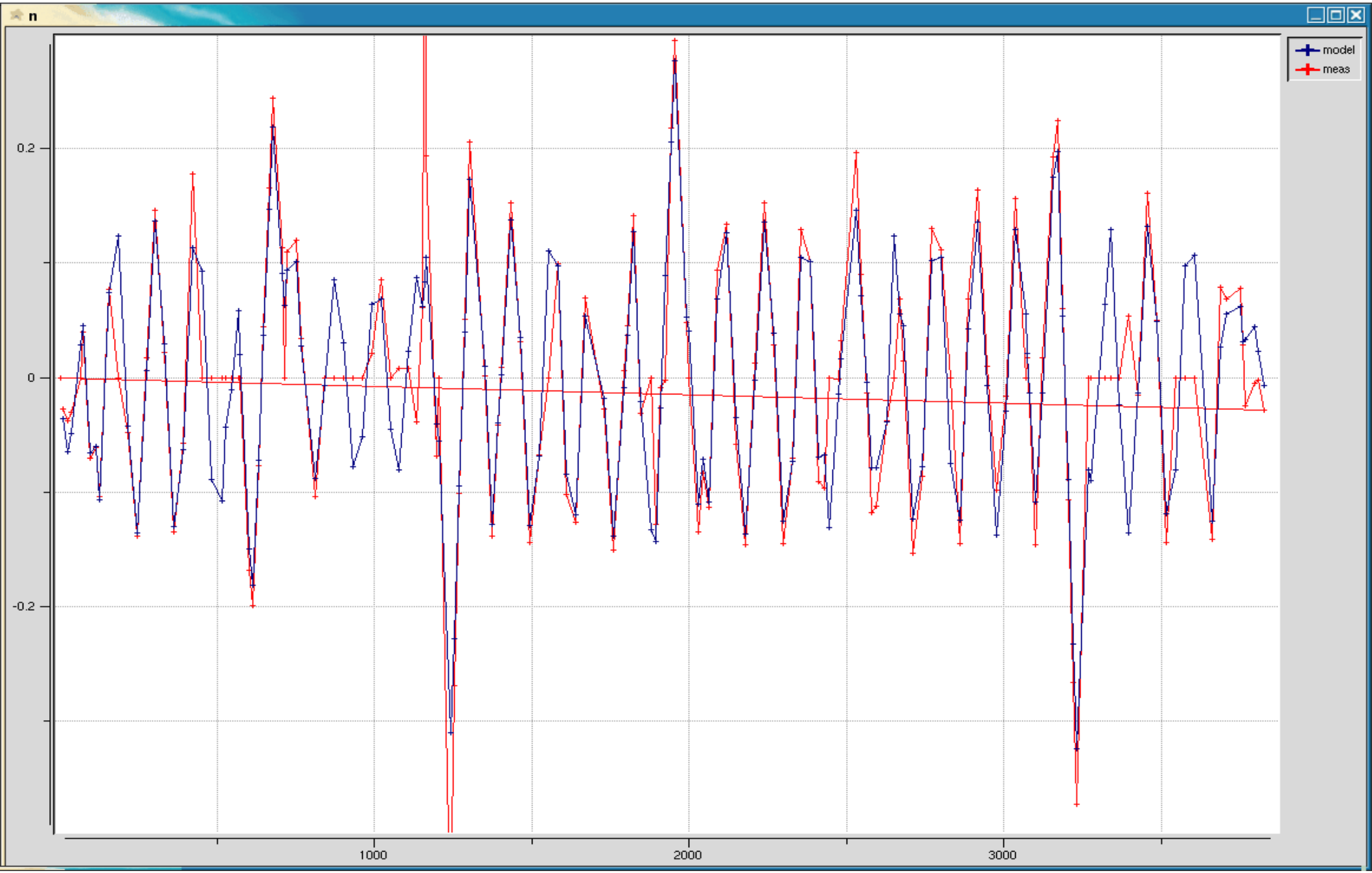
Au Yellow Store dispersion



-12% Beta squeeze at Phenix



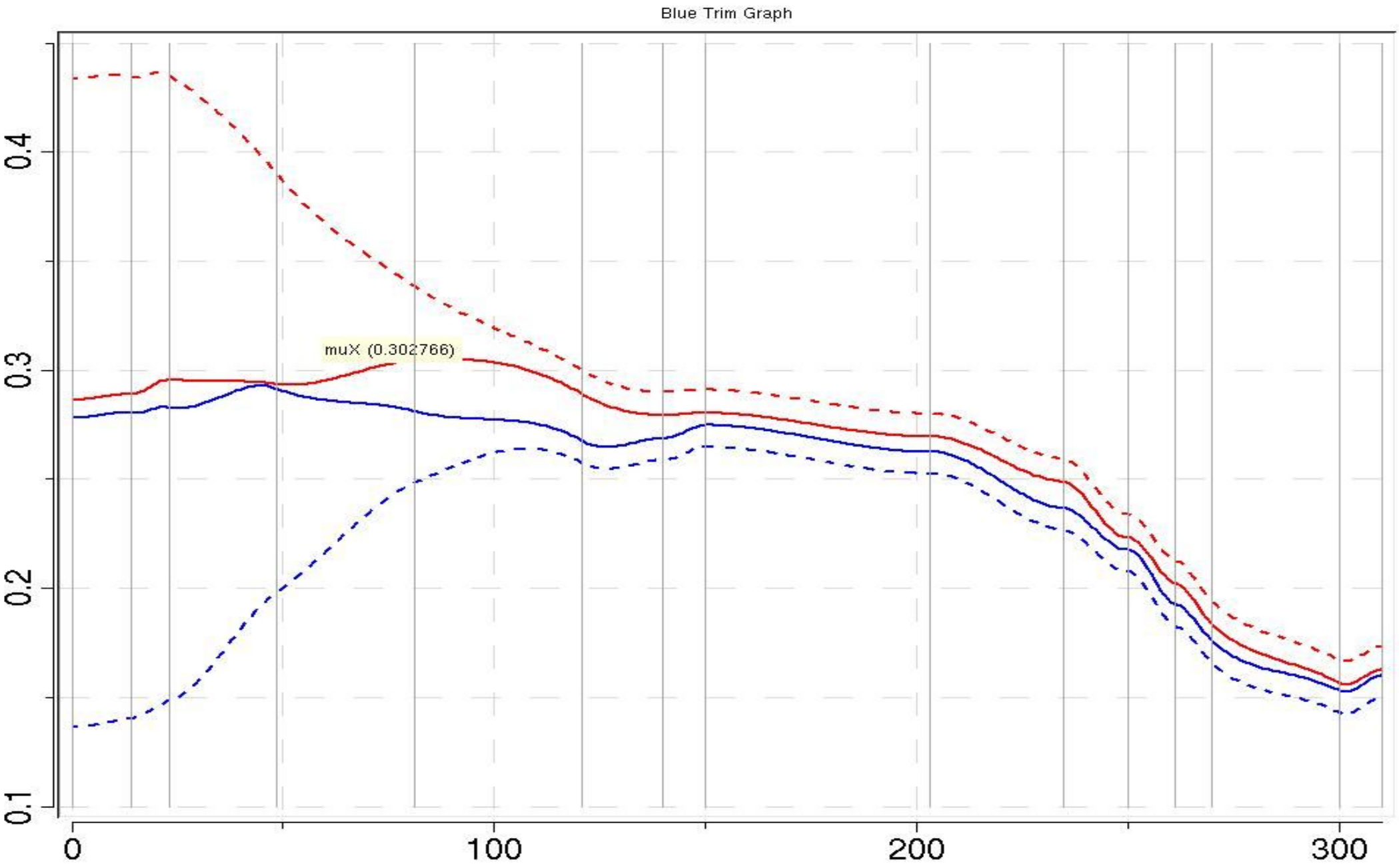

wish #2
0
12
d0
d12
1
0
0
1000
2000
3000


n
model
meas
0.2
0
-0.2
1000
2000
3000

Trim model
= metric of understanding

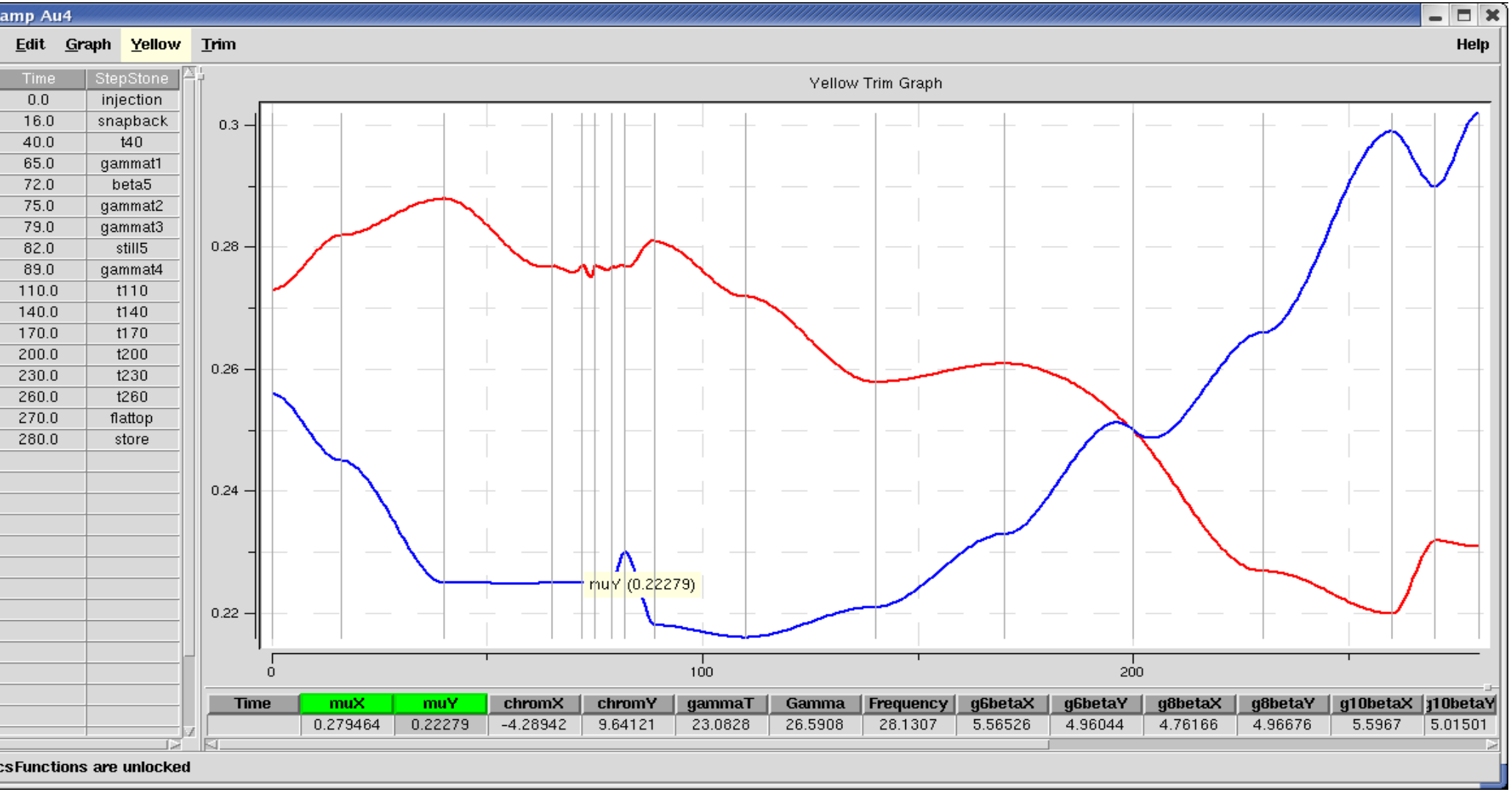
- Goal
  - Maximize understanding of linear optics at store
    - Move settings into 'design' model
      - Deliver right β^*, β^{max}
      - Better operational control: steering, bump-closure
  - Minimize turn-around time for different ramp

FY03 pp trim tunes

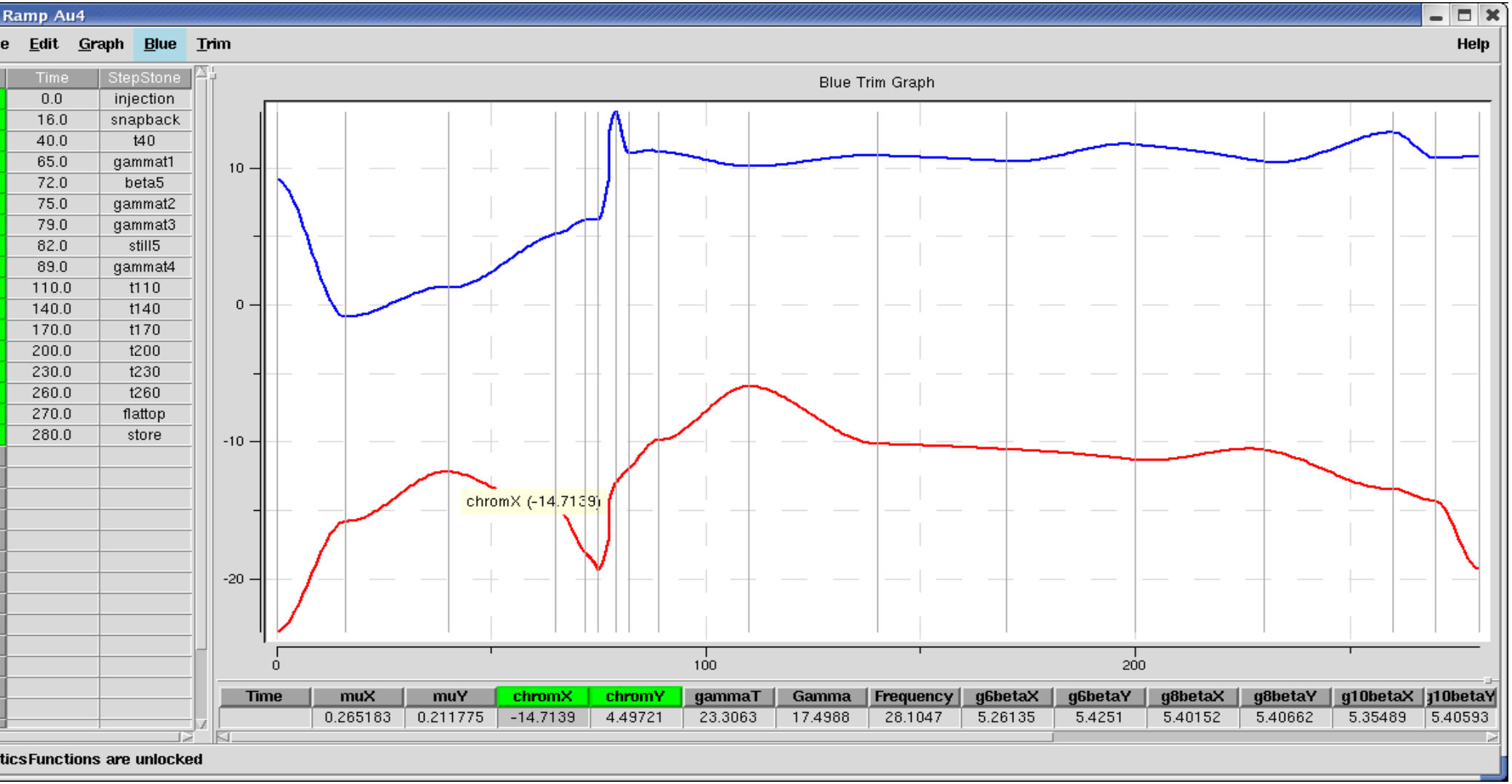


Blue Au4 trim tunes

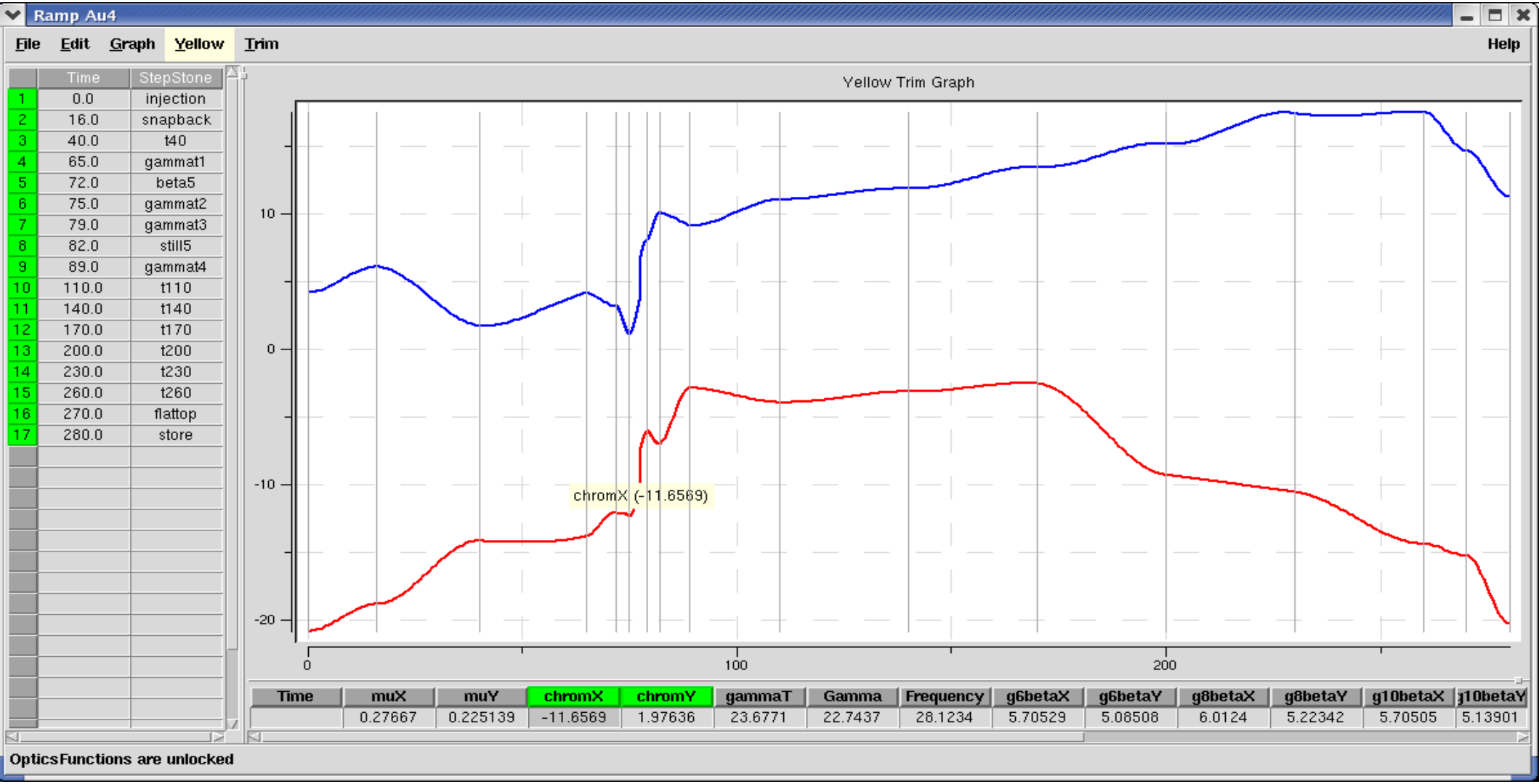
Yellow Au4 trim tunes



Blue Au4 trim chromaticity



Yellow Au4 trim chromaticity



	Time	StepStone
1	0.0	injection
2	16.0	snapback
3	40.0	t40
4	65.0	gammat1
5	72.0	beta5
6	75.0	gammat2
7	79.0	gammat3
8	82.0	still5
9	89.0	gammat4
10	110.0	t110
11	140.0	t140
12	170.0	t170
13	200.0	t200
14	230.0	t230
15	260.0	t260
16	270.0	flattop
17	280.0	store

Time	muX	muY	chromX	chromY	gammaT	Gamma	Frequency	g6betaX	g6betaY	g8betaX	g8betaY	g10betaX	g10betaY
	0.27667	0.225139	-11.6569	1.97636	23.6771	22.7437	28.1234	5.70529	5.08508	6.0124	5.22342	5.70505	5.13901

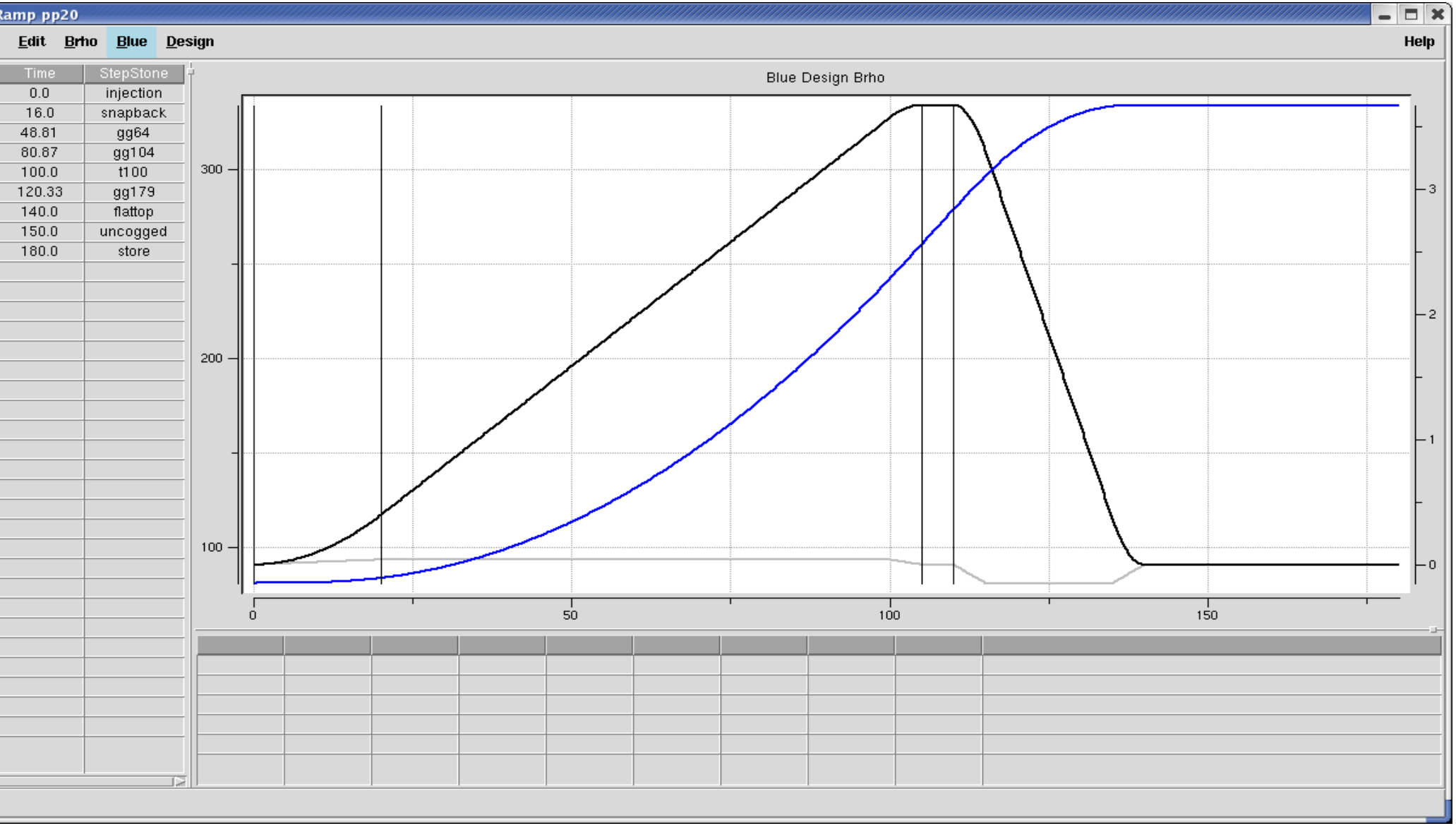
Challenges

- Tune
  - RF Frequency error
  - Transfer-function errors
    - Q123 vs. rest, where does the 0.3% go?
  - Orbit and Coupling effects
- Chromaticity
  - Model mismatch

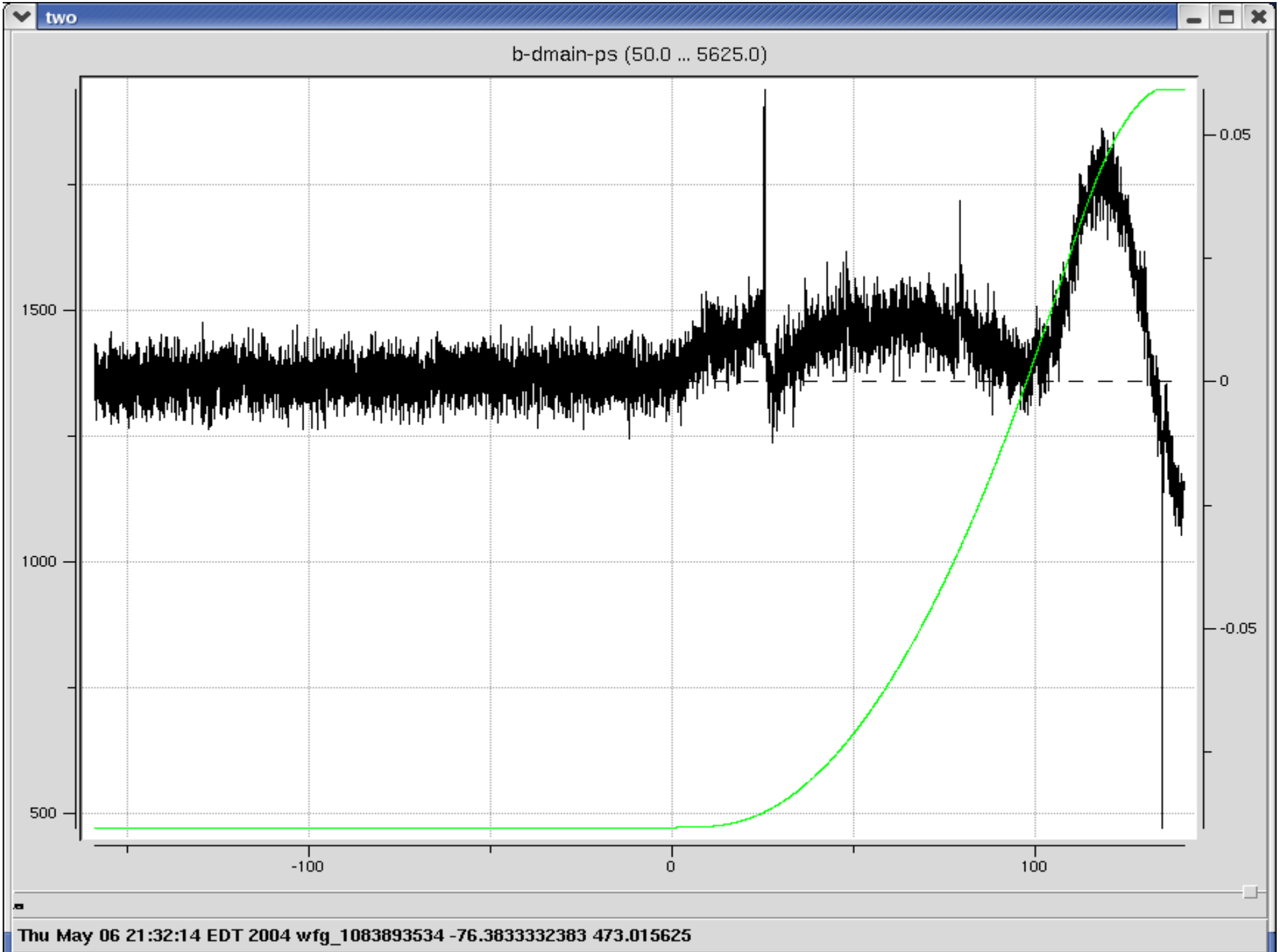
Ramp Features & Plans

- Quartic start Brho ramp
  - Separate ps tracking errors & Transition

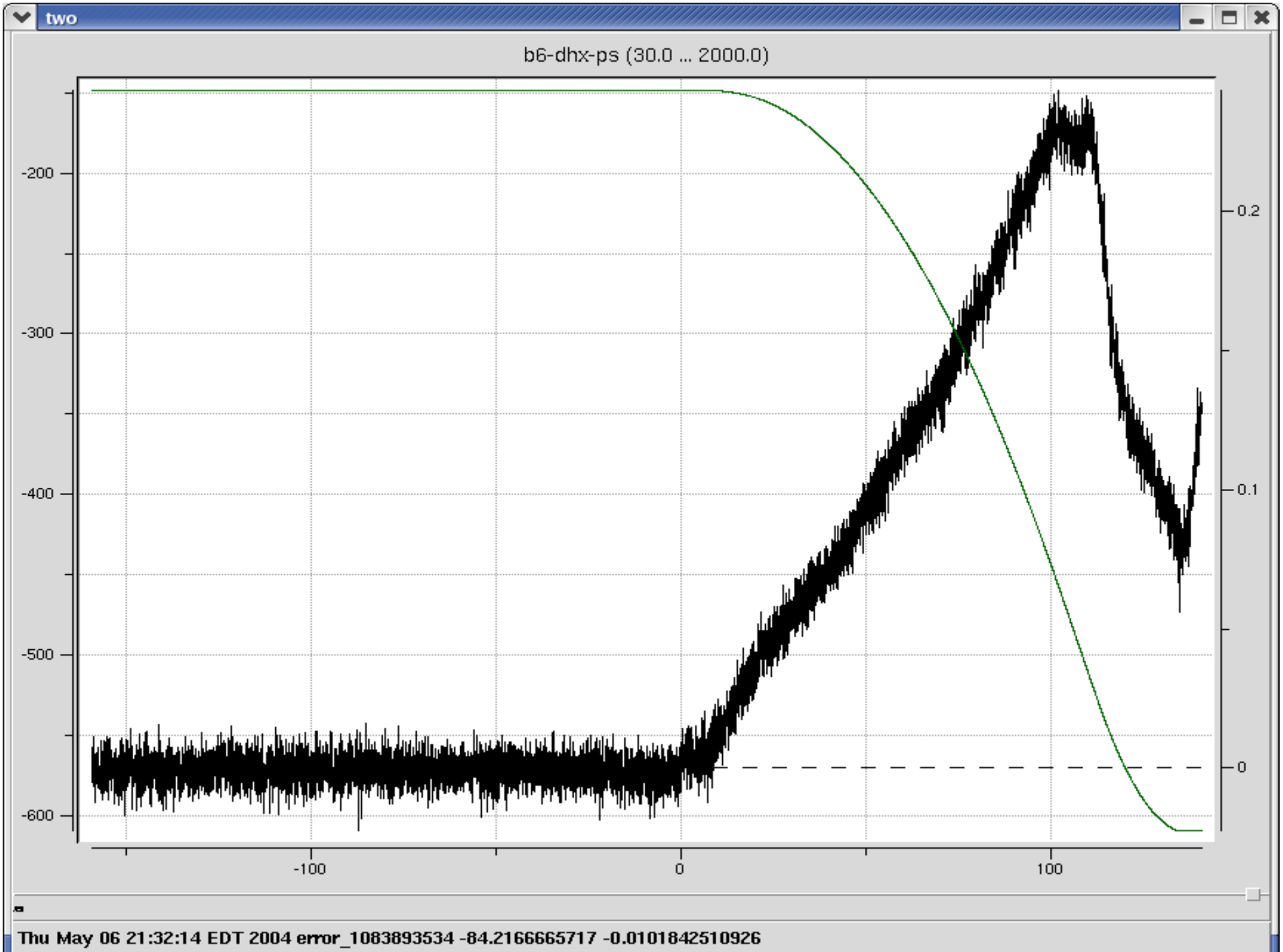
Brho, Brho', Brho'' for pp



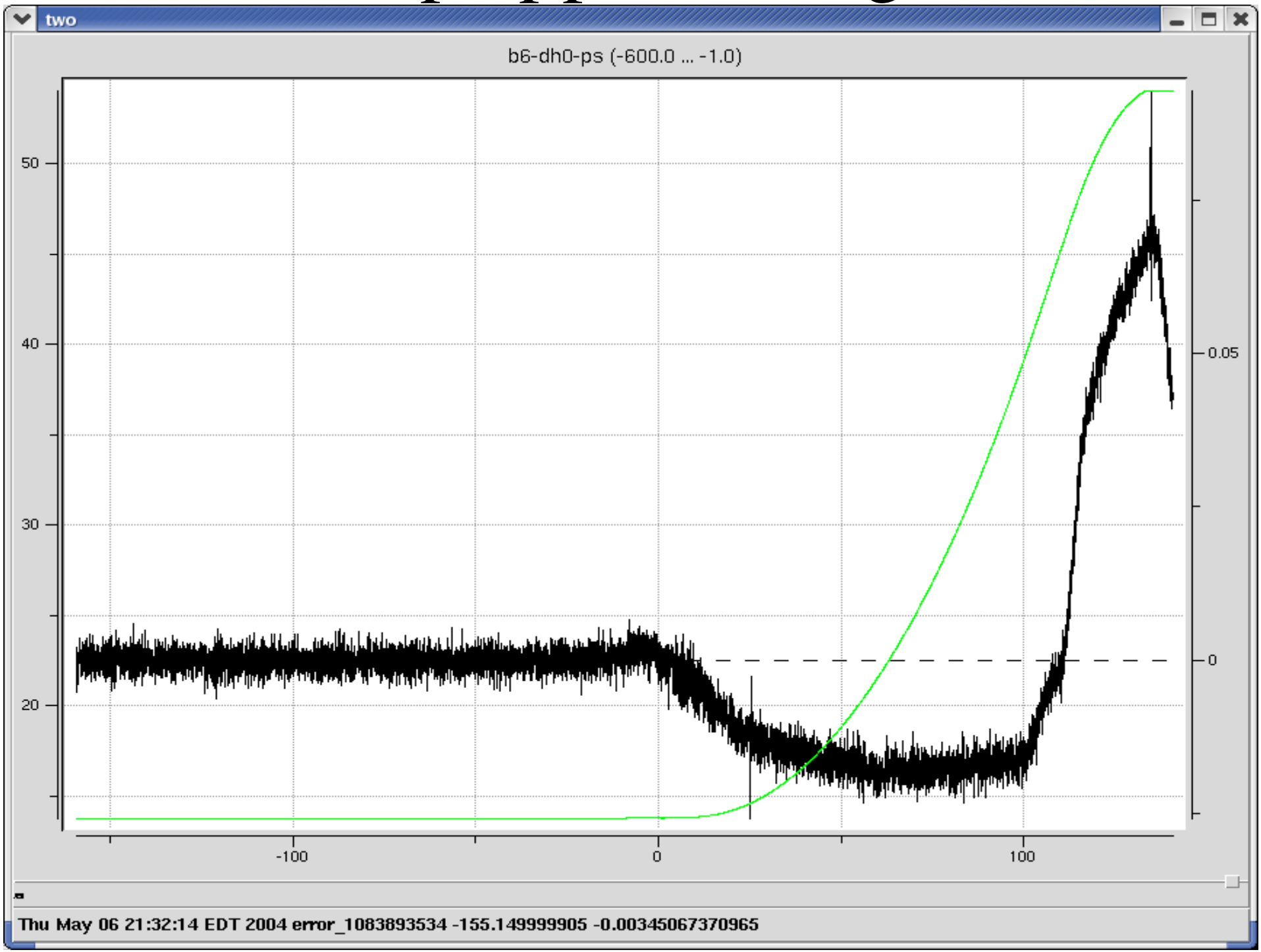
b-dmain-ps pp tracking error



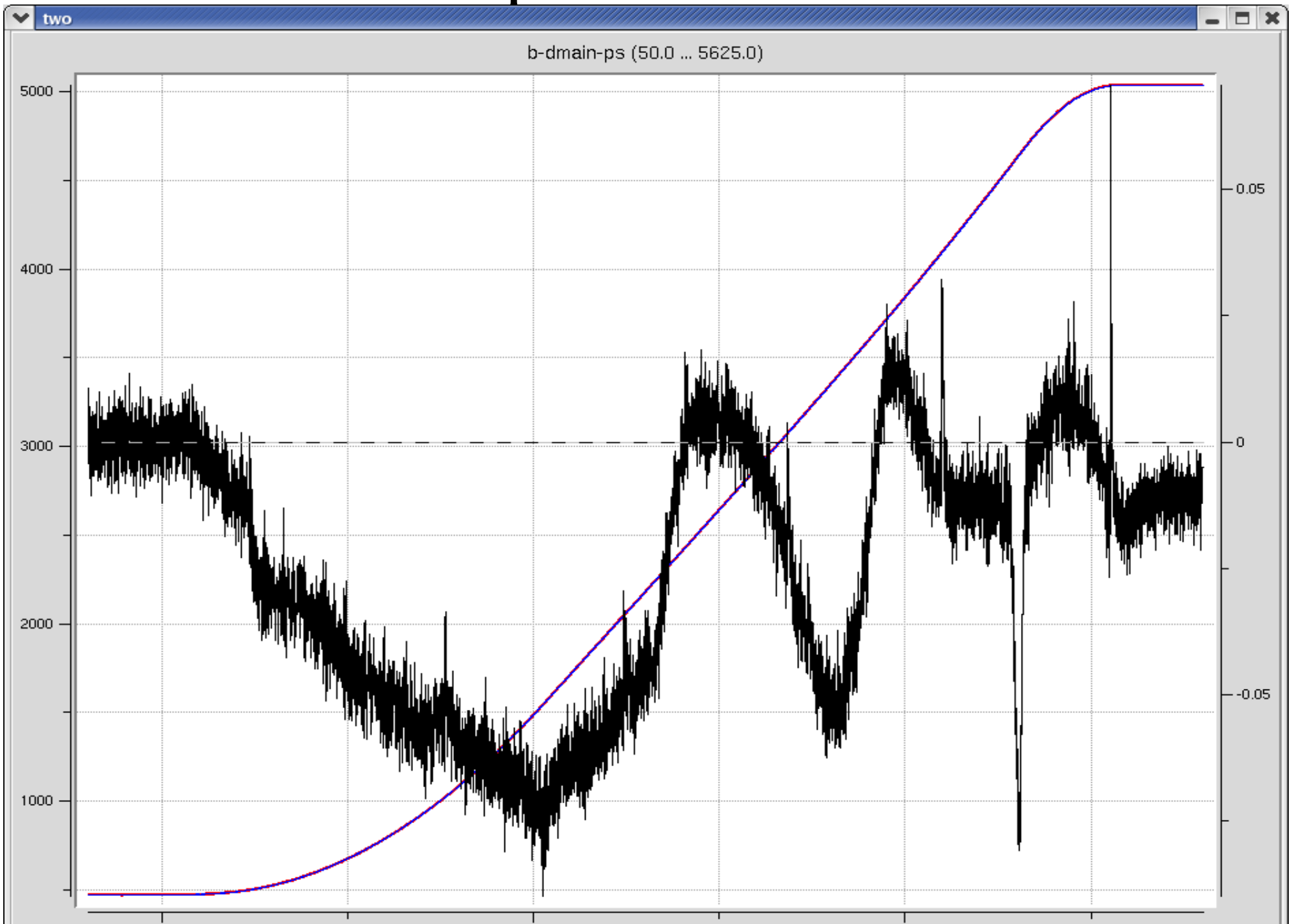
b6-dhx-ps pp tracking error



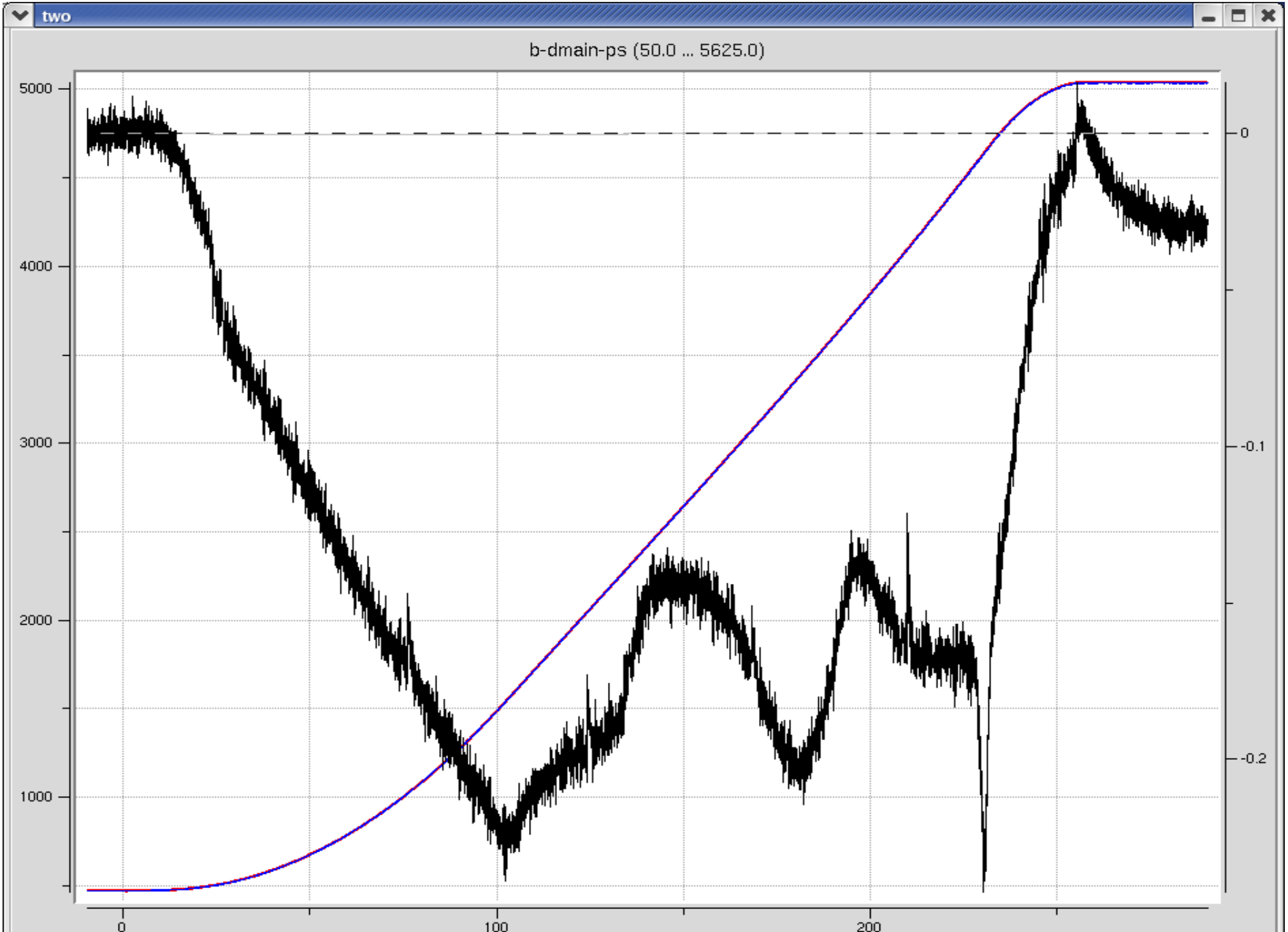
b6-dh0-ps pp tracking error



b-dmain-ps error Au Jan 3



b-dmain-ps Au error: Feb 02



Brho'' effect at flattop

- Seems to cause coupling
  - Need to explain this
    - orbit move in DX?
- Reduce power-supply tracking errors
  - Slow down flattop approach

Model Plans

- Fit with online model
  - Wiring constraints, Individual TF
    - Beta squeeze without the dispersion penalty
- Address challenges
  - Fix remaining 0.3% TF
  - Fix chromaticity mismatch
  - Add (some) orbit effects
    - Predict tune/coupling change from steering, bumps
- Do we need better coupling modeling?