Some recent news in antiproton source diagnostics

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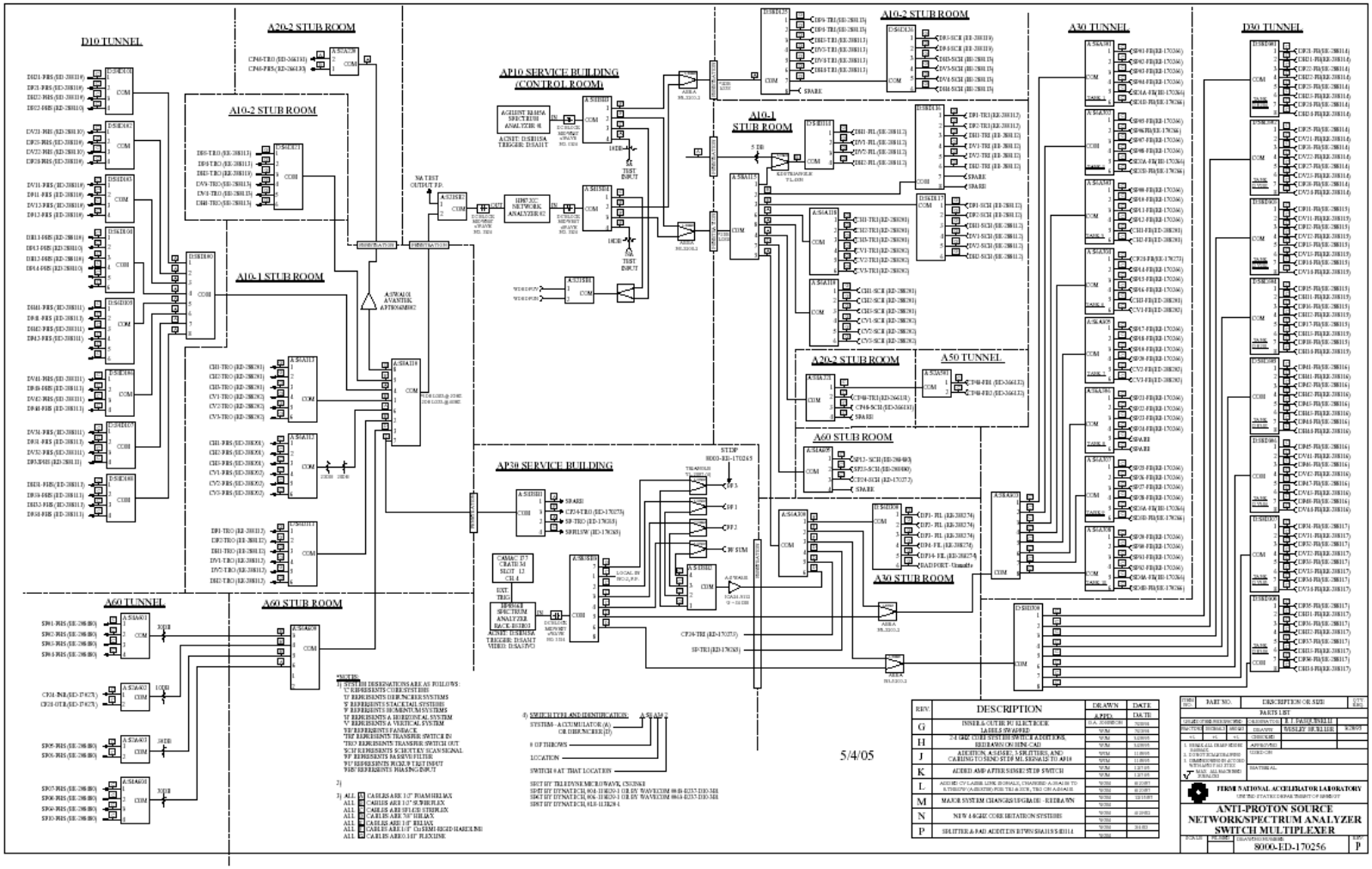
June 6, 2005

There are many diagnostics that I will *not* cover



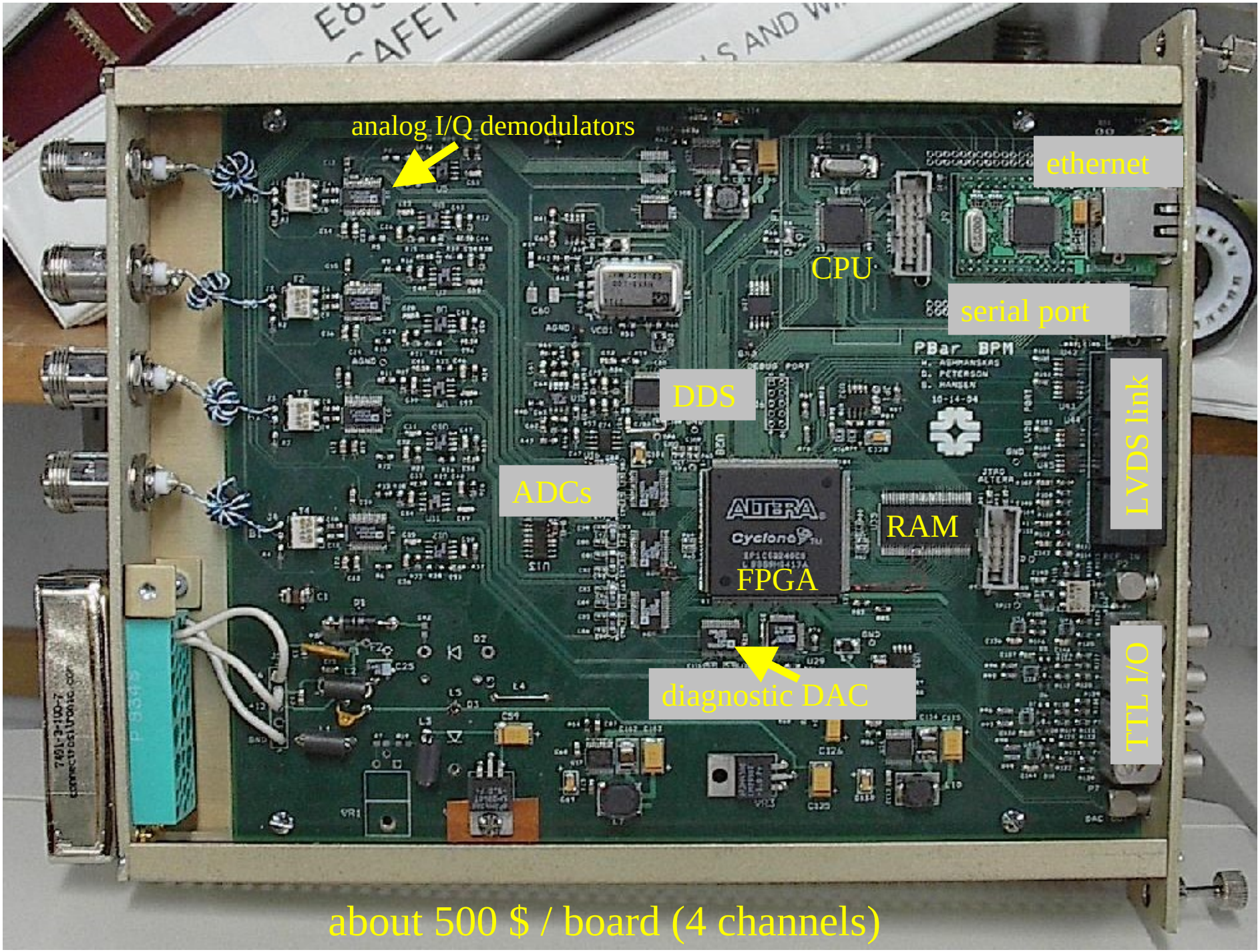
e.g. RJP's gift to diagnostic multiplexers ("switch tree")

- Recently, we have focused on increasing the information available while stacking
  - Try to monitor intensities at many stages
    - Ideally, you would know flux and phase space distribution at Booster, MI, AP1, AP2, at 2 or 3 points in Debuncher cycle, and at Accumulator injection & deposition orbits
    - Should be data-logged, so that you can ask, e.g.
      - How has D-to-A efficiency evolved since last year?
      - Is aperture work increasing Debuncher intensity?
      - Why (quantitatively) does slip stacking reduce A:PRDCTN?
  - Also try to monitor orbits while stacking
    - Facilitate aperture work
    - See if anything drifts

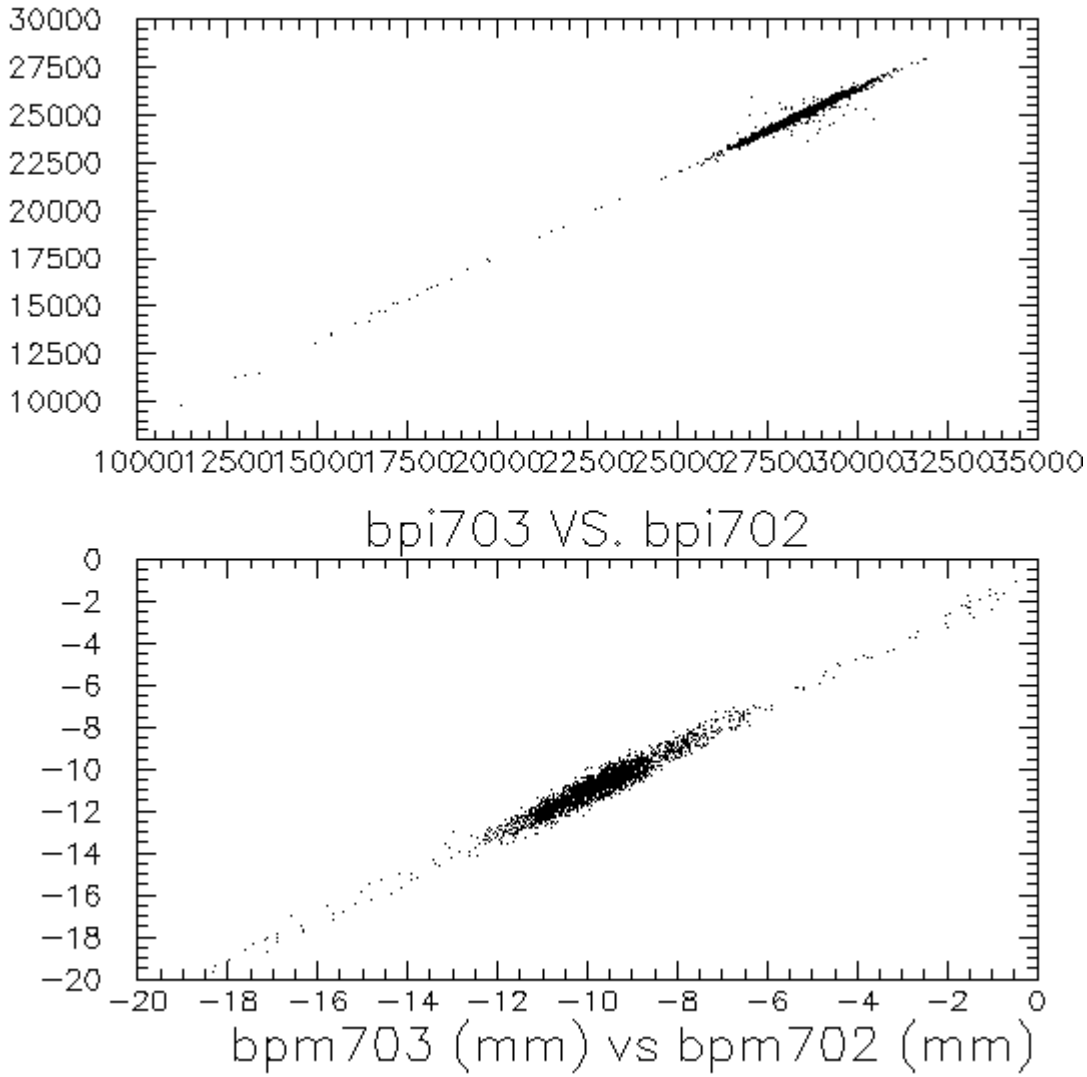
Some recent steps in that direction

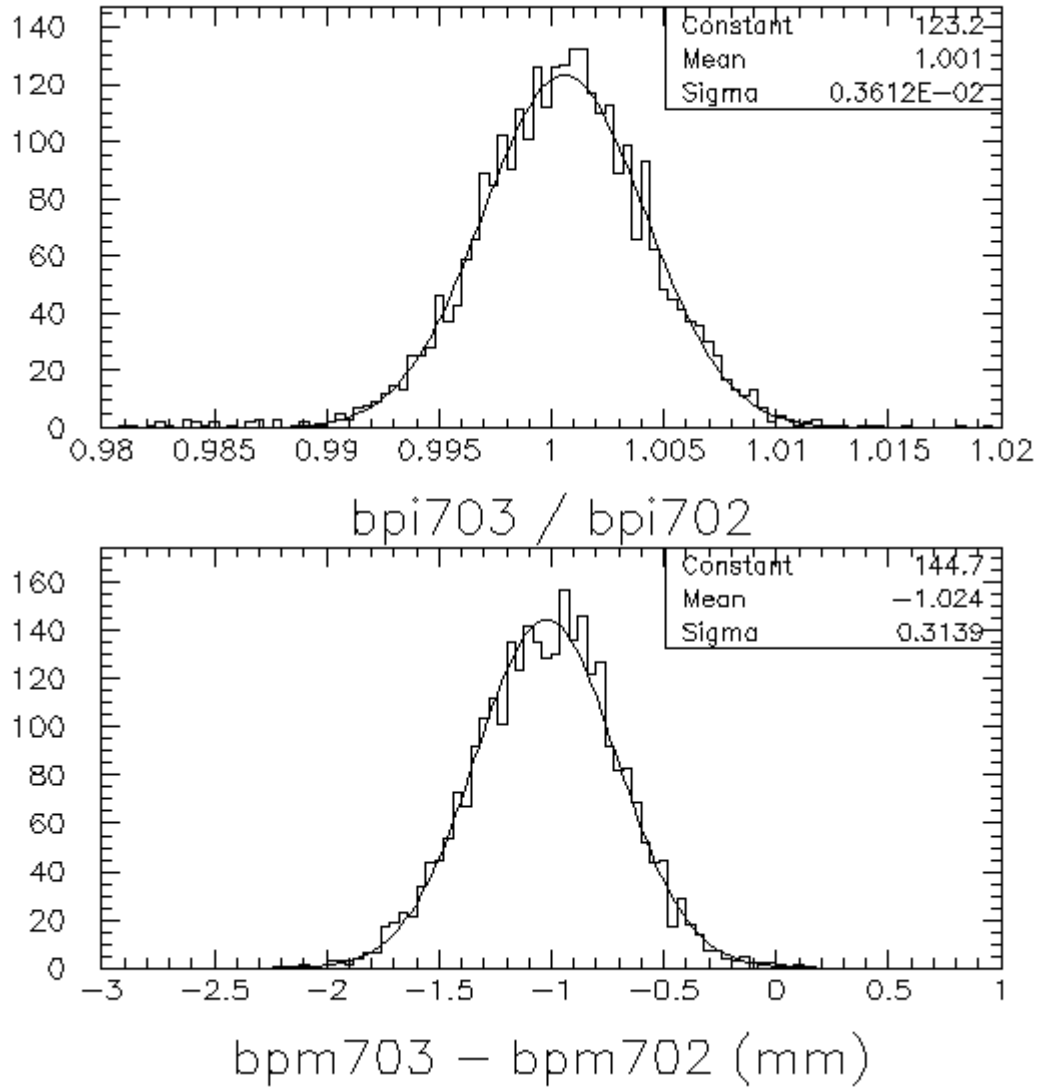
- AP2 line BPMs record secondary signals
  - but primary purpose is reverse proton studies
- Using Debuncher RF, can see ~ 10^8 antiprotons on Debuncher and/or D-to-A BPMs
  - work in progress to improve S/N $\Rightarrow$ resolution
  - 3 of 7 D-to-A BPMs will be more useful once rotated 90°
- Can see turn-by-turn oscillations on injection into Accumulator, so that you can …
  - adjust pulsed devices for orbit closure
  - check Debuncher barrier bucket timing
  - check centering in D-to-A quadrupoles
- Renewed interest in Debuncher DCCT and “gap monitor” for tracking antiproton current
- Toroids in AP2 and D-to-A lines coming soon
- We’re data-logging more of our existing diagnostics

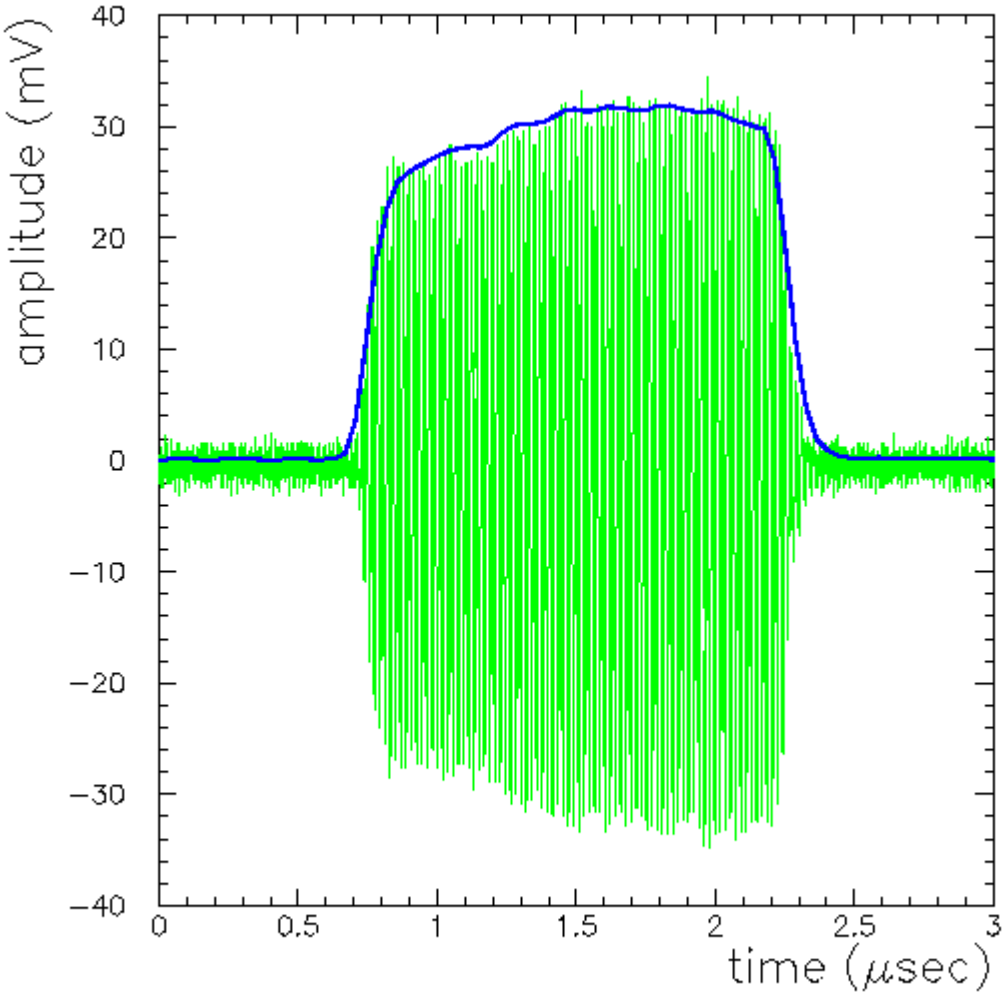
F27



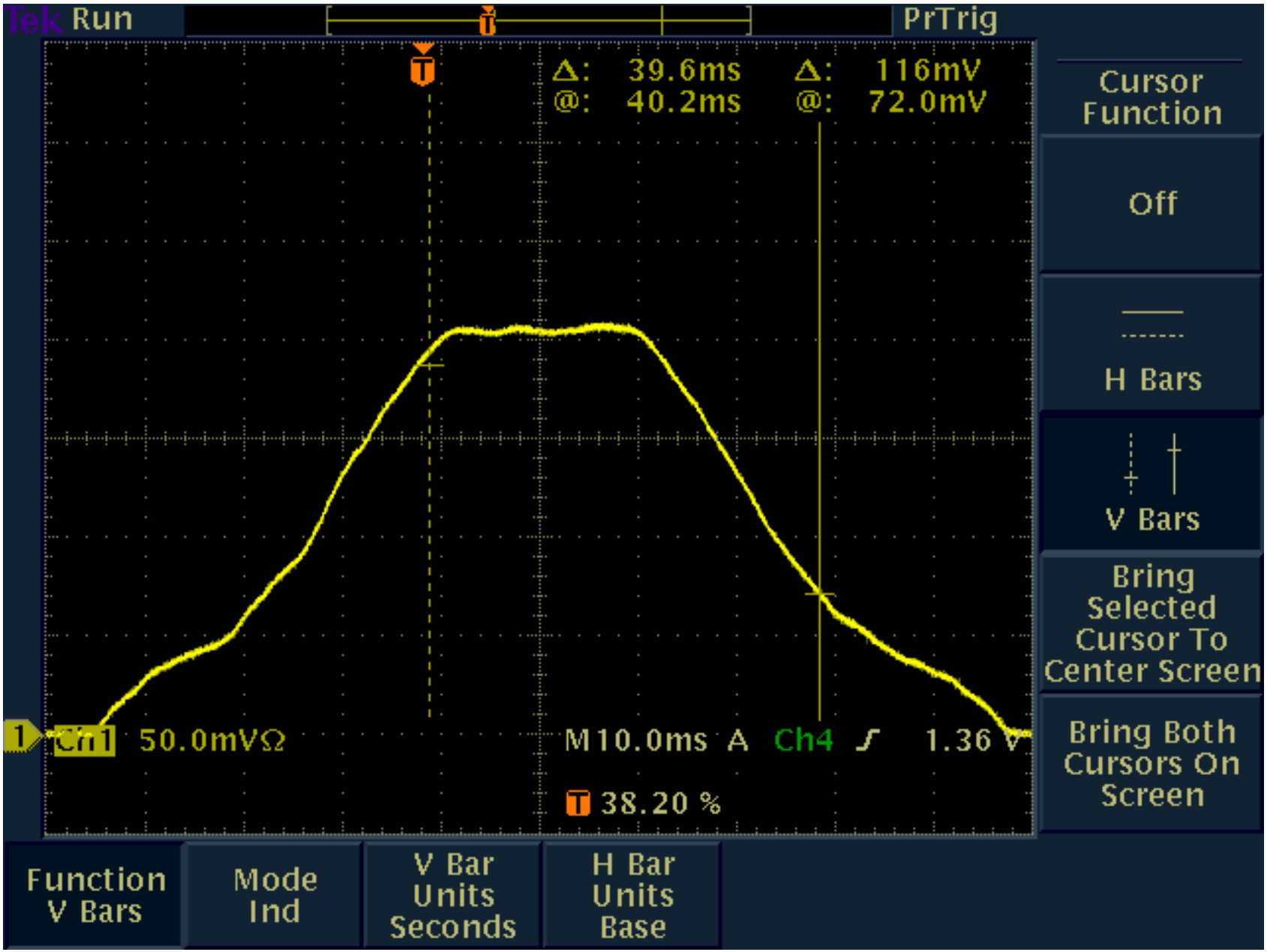
about 500 $ / board (4 channels)

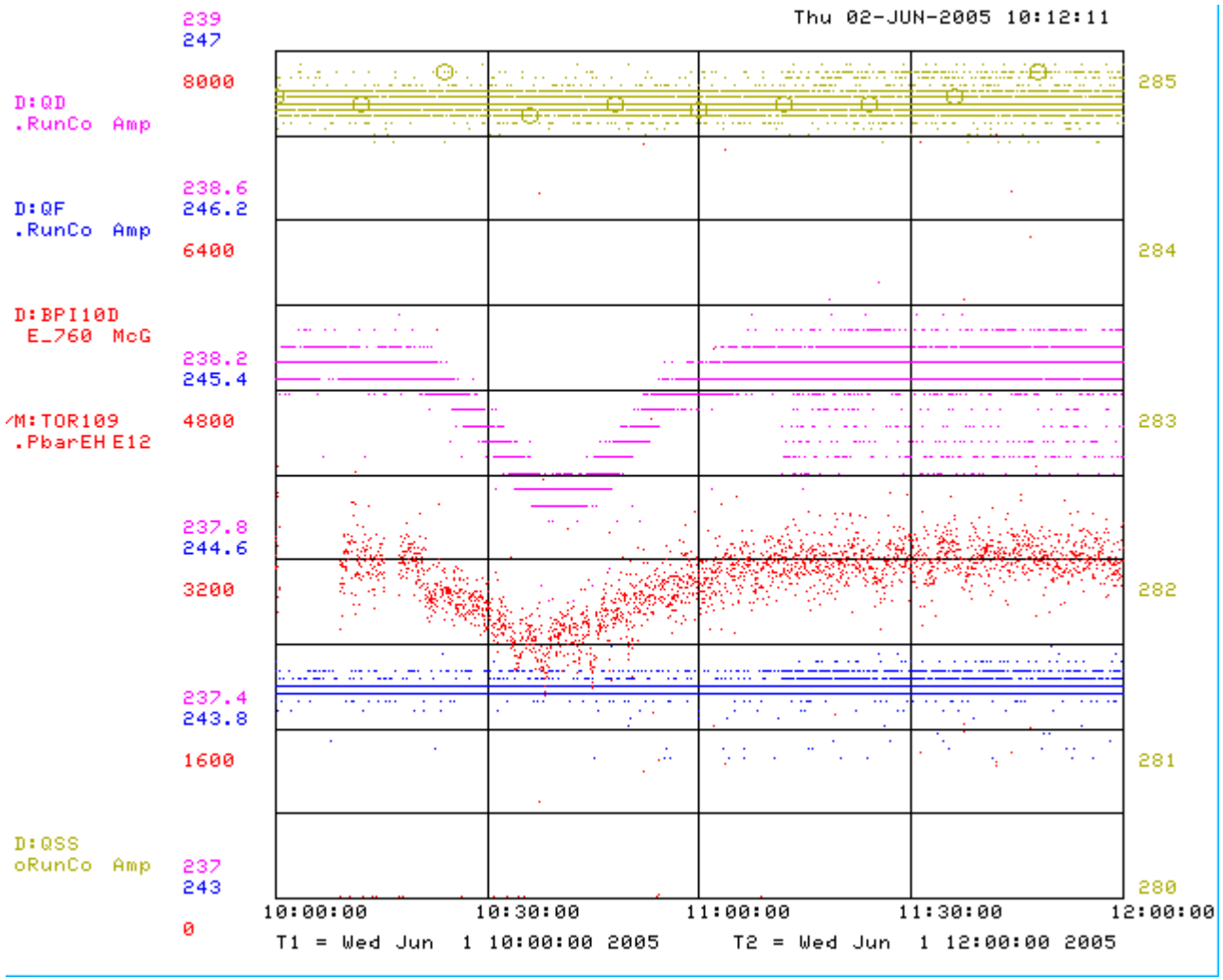

30000
27500
25000
22500
20000
17500
15000
12500
10000
10000 12500 15000 17500 20000 22500 25000 27500 30000 32500 35000
bpi703 VS. bpi702
0
−2
−4
−6
−8
−10
−12
−14
−16
−18
−20
−20 −18 −16 −14 −12 −10 −8 −6 −4 −2 0
bpm703 (mm) vs bpm702 (mm)

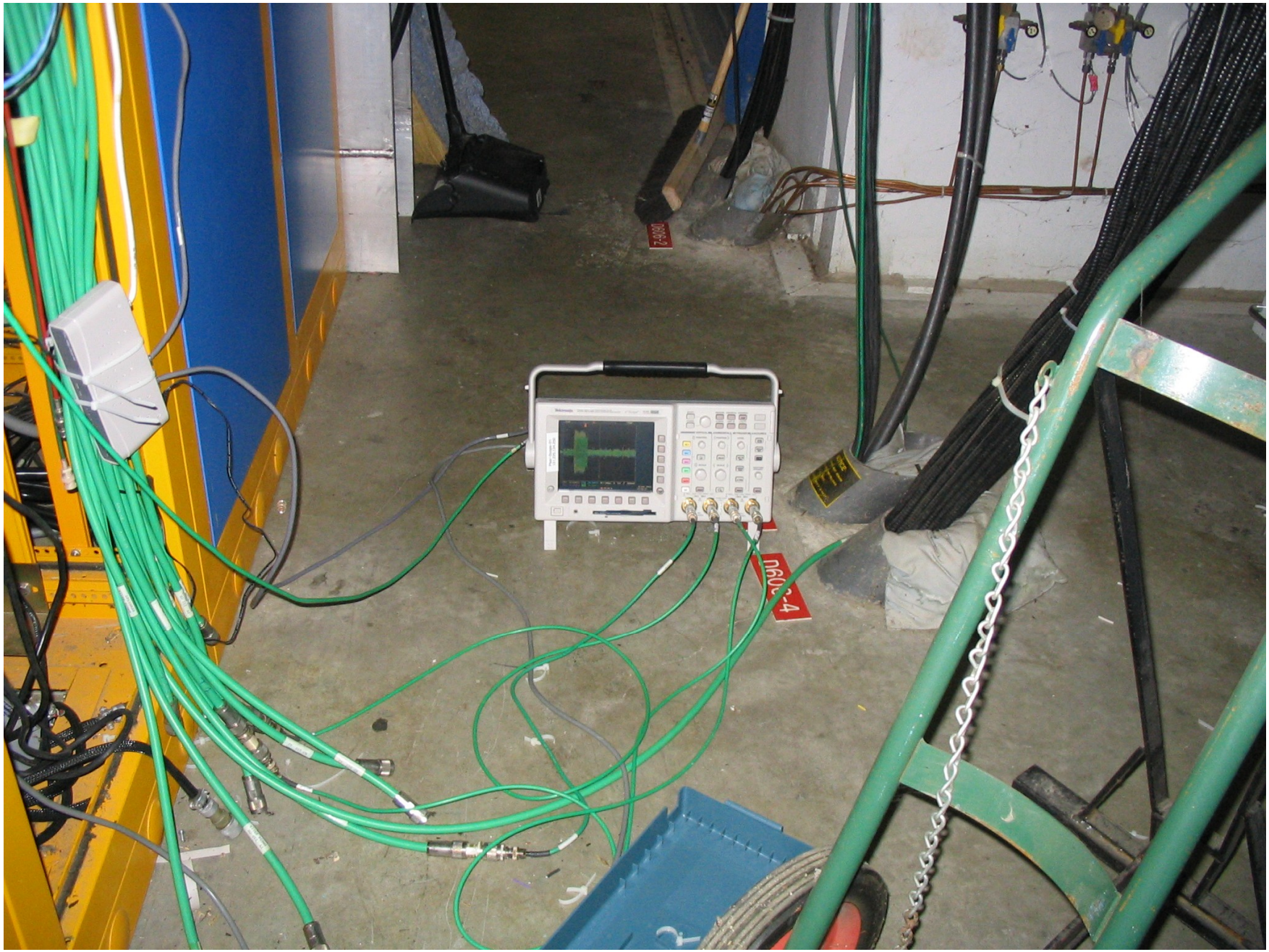

Constant 123.2
Mean 1.001
Sigma 0.3612E−02
140
120
100
80
60
40
20
0
0.98 0.985 0.99 0.995 1 1.005 1.01 1.015 1.02
bpi703 / bpi702
Constant 144.7
Mean −1.024
Sigma 0.3139
160
140
120
100
80
60
40
20
0
−3 −2.5 −2 −1.5 −1 −0.5 0 0.5 1
bpm703 − bpm702 (mm)

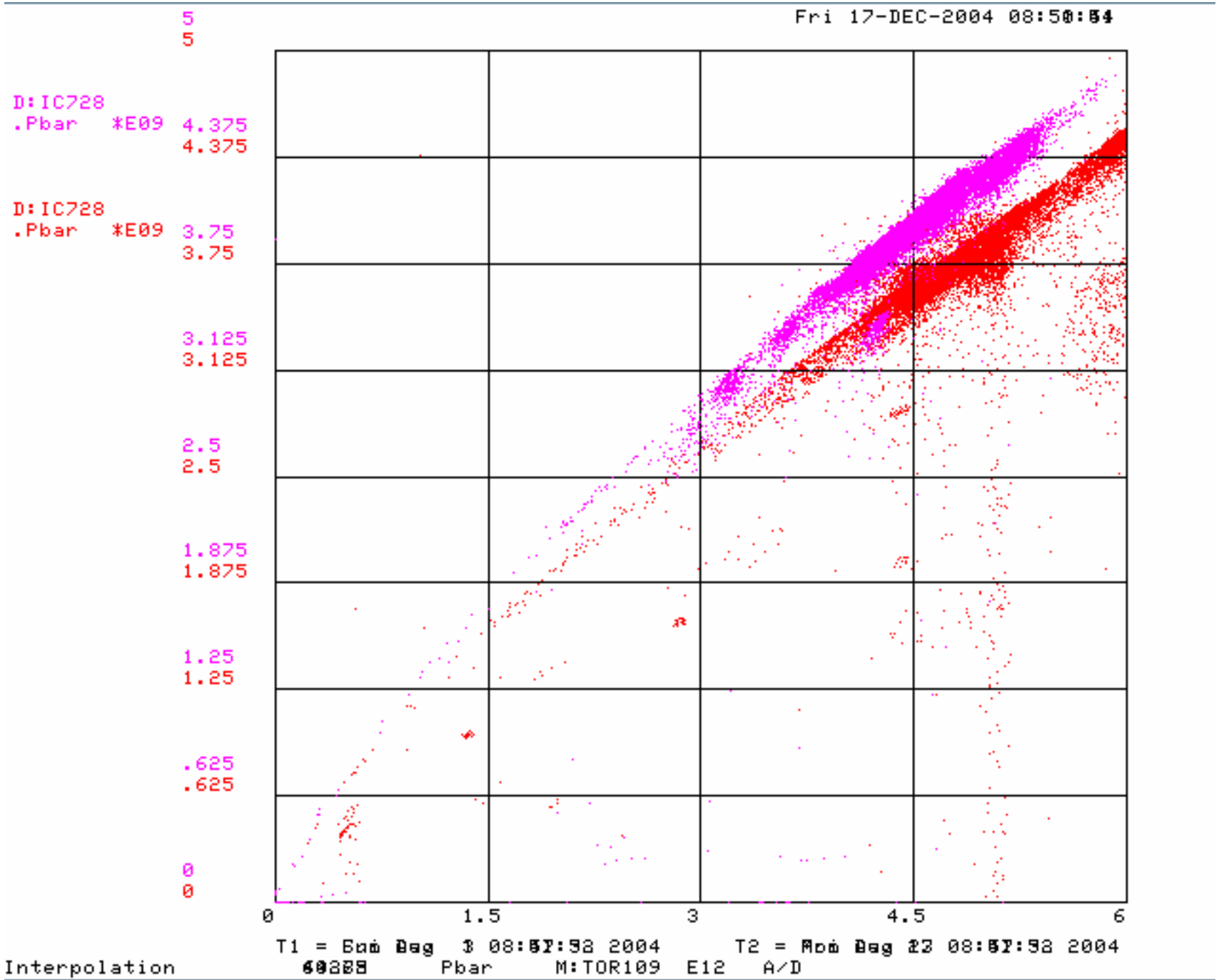

amplitude (mV)
40
30
20
10
0
−10
−20
−30
−40
0
0.5
1
1.5
2
2.5
3
time (μsec)


ANTIPROTON PULSE POWER SUPPLY POWER MODULE
DC CURRENT TRANSFORMER INTENSITY MONITOR SYSTEM
DC CURRENT TRANSFORMER
ROW
COLUMN


Tek Run
PrTrig
Δ: 39.6ms
@: 40.2ms
Δ: 116mV
@: 72.0mV
Cursor Function
Off
H Bars
V Bars
Bring Selected Cursor To Center Screen
Bring Both Cursors On Screen
Ch1 50.0mVΩ
M10.0ms A Ch4 1.36 V
38.20 %
Function V Bars
Mode Ind
V Bar Units Seconds
H Bar Units Base


Thu 02-JUN-2005 10:12:11
239
247
8000
D:QD
.RunCo Amp
285
238.6
246.2
D:QF
.RunCo Amp
6400
284
D:BPI10D
E_760 McG
238.2
245.4
M:TOR109
.PbarEH E12
4800
283
237.8
244.6
3200
282
237.4
243.8
1600
281
D:QSS
oRunCo Amp
237
243
280
0
10:00:00
10:30:00
11:00:00
11:30:00
12:00:00
T1 = Wed Jun 1 10:00:00 2005
T2 = Wed Jun 1 12:00:00 2005




Fri 17-DEC-2004 08:50:54
5
5
D:IC728
.Pbar *E09
4.375
4.375
D:IC728
.Pbar *E09
3.75
3.75
3.125
3.125
2.5
2.5
1.875
1.875
1.25
1.25
.625
.625
0
0
0
1.5
3
4.5
6
T1 = Sun Dec 3 08:57:58 2004
T2 = Mon Dec 27 08:57:58 2004
Interpolation
60288
Pbar
M:TOR109 E12 A/D

Likely targets for future action

- Check that we understand bunch length and spot size on antiproton production target
- Record intensity during Accumulator stacking RF manipulations ⇒ D-to-A efficiency
- Reduce frequency spectrum in Debuncher after bunch rotation to a few numbers and log them (D:FFTEFF)
- Be able to trust beam widths reported by SEM grids
- Because they are the focus of aperture work, monitor orbits in AP2, **Debuncher**, D-to-A while stacking

- Periodically characterize Debuncher cooling?
- Understand in detail first few turns in Debuncher??
- Calibrated flux measurement down/up AP2???

- Any suggestions?

- Want to help?

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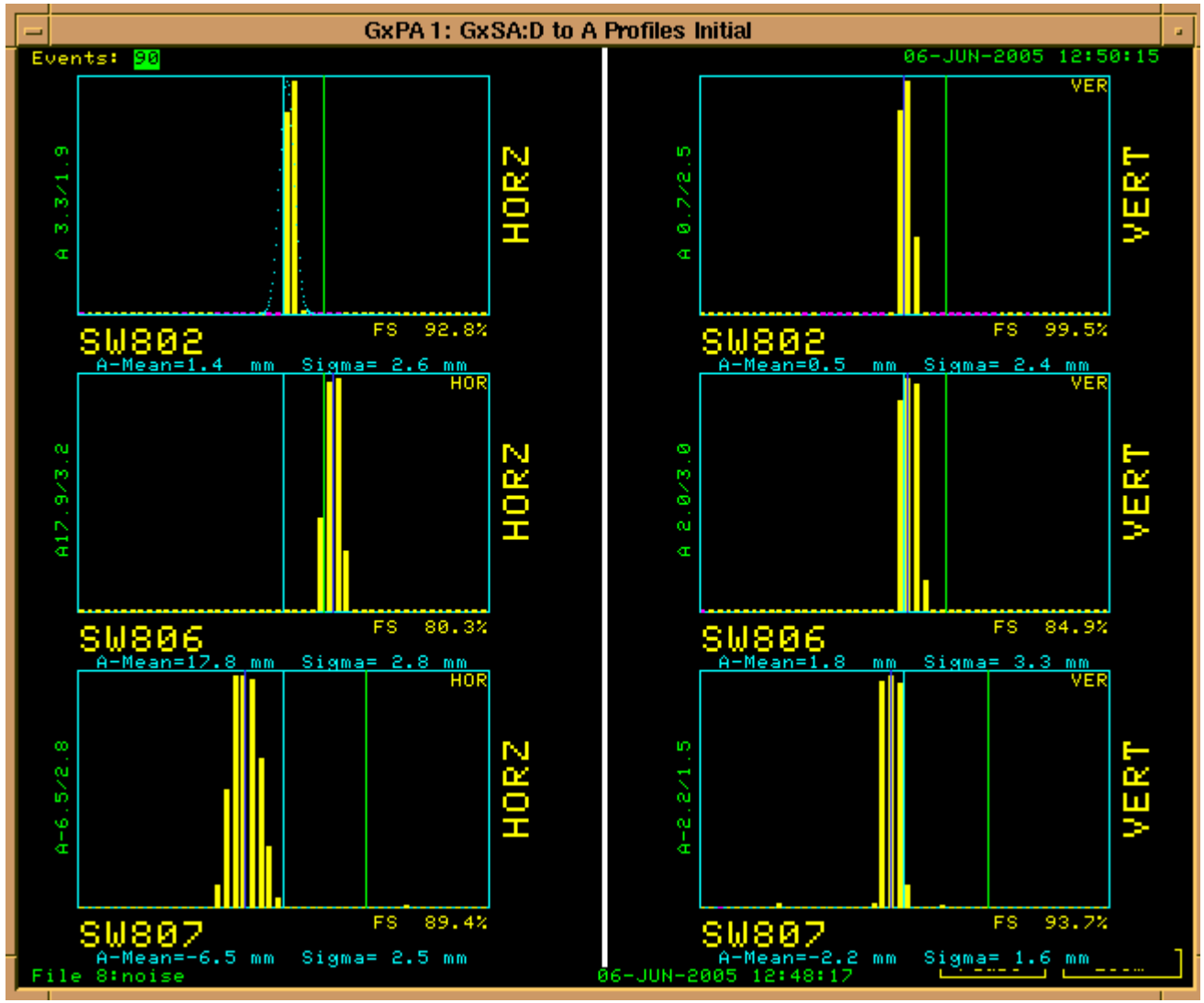

betaX=40m at 807; betaY=30m at 806

Would like to make this measurement (H, V, and dP) more routine