First orbit response measurements in 2002

First test measurements on FT beam :

- 26/05/31 : ±30 µrad kick @ 2000 ms (82 GeV), Int = ~ 10^{13} p.
- 31/05/31 : ±30 µrad kick @ 1740 ms (50 GeV), Int = 2 10^{13} p.

Change of time ⇔ orbit correction in the ramp.

BPM calibration performed before each measurement.

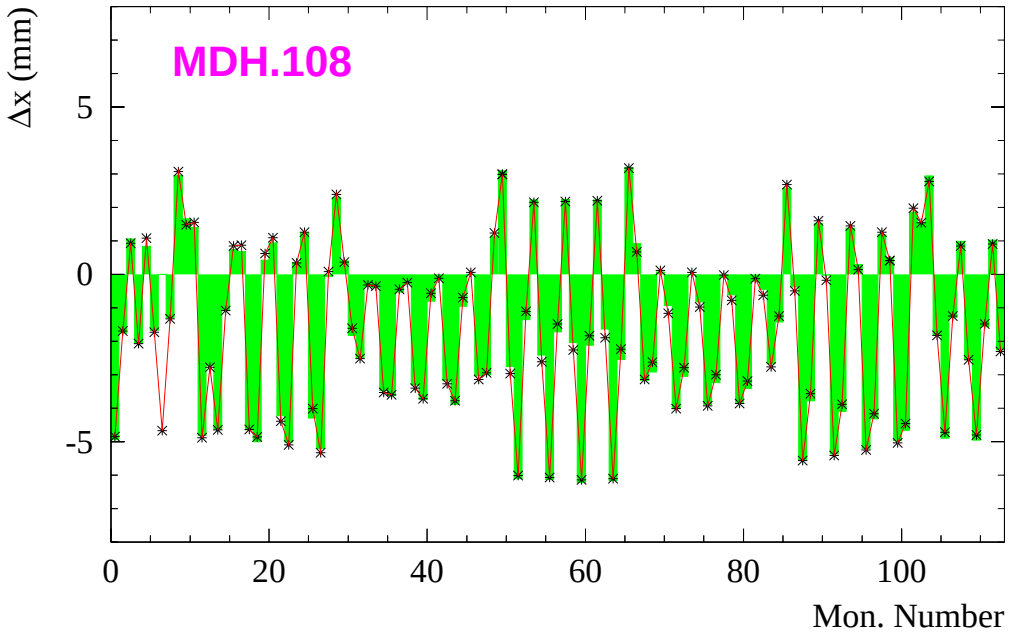
Data & fit quality similar to last years data

Already some new results.

Radial loop

Strong interference with the RF radial loop :

→ keeps the beam position constant @ RF BPM.
→ observe important dp/p shifts in the data !
→ depends on relative phase corrector – RF BPM.

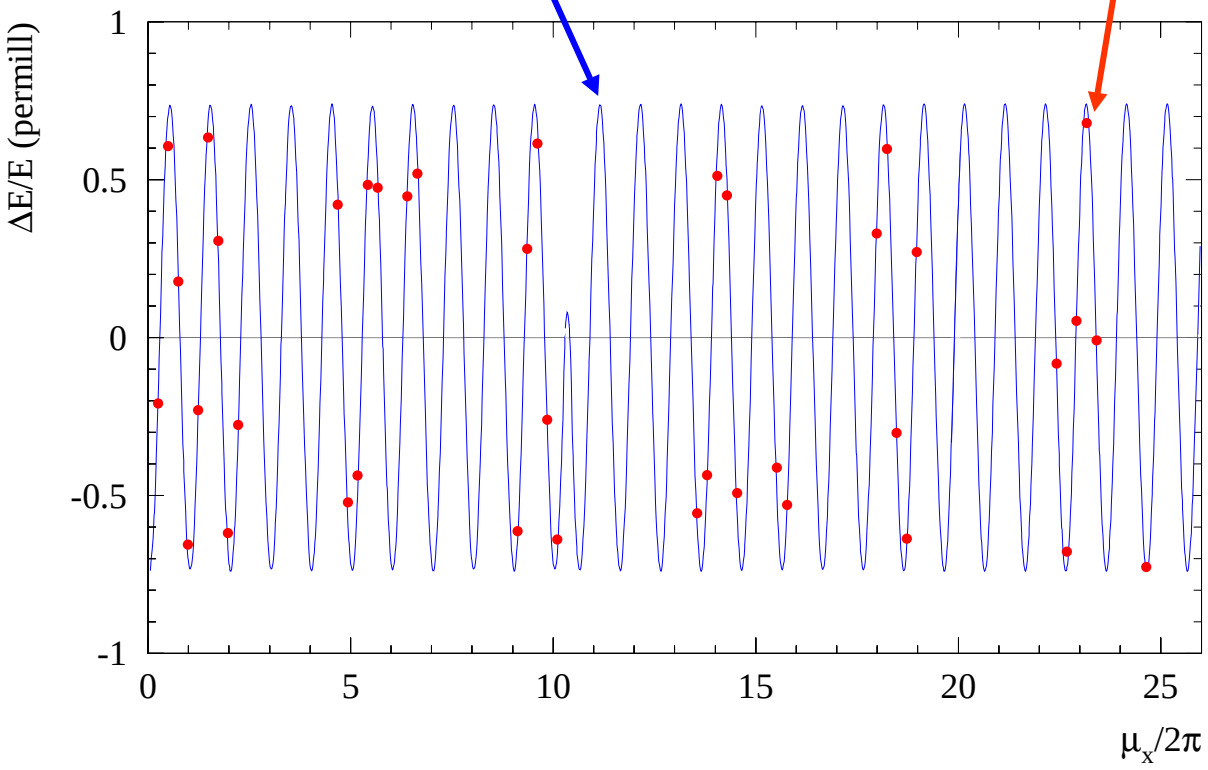


Orbit response
+
dp/p shift of ~ 0.6 permill

Radial loop II

Predicted dp/p shift
as a function of corrector phase
(from model)

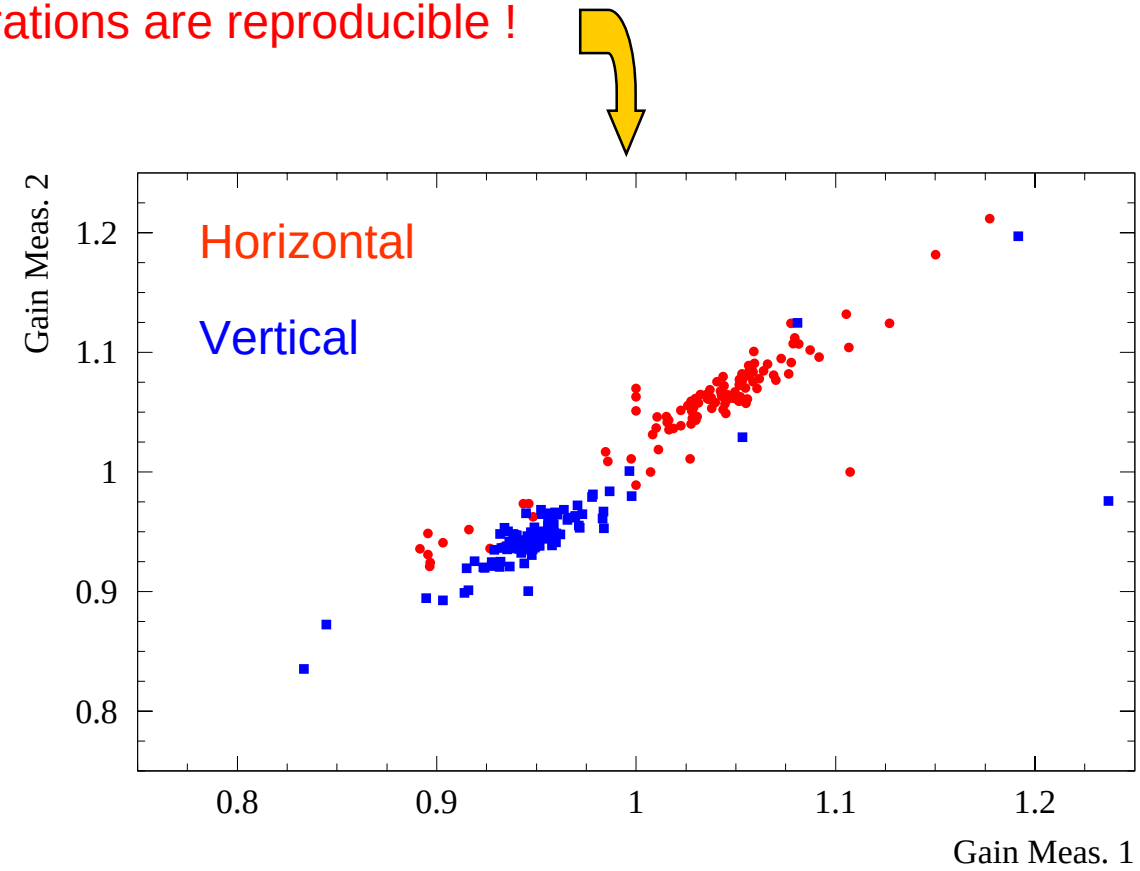
Measured dp/p shift
for each corrector
(from fit, corrected for calibration factor)



Excellent agreement !

BPM calibrations

- Calibration factors are similar to last years (rms spread).
- Much fewer bad BPM : only ~ 5 in total out of 226.
- Calibrations are reproducible !



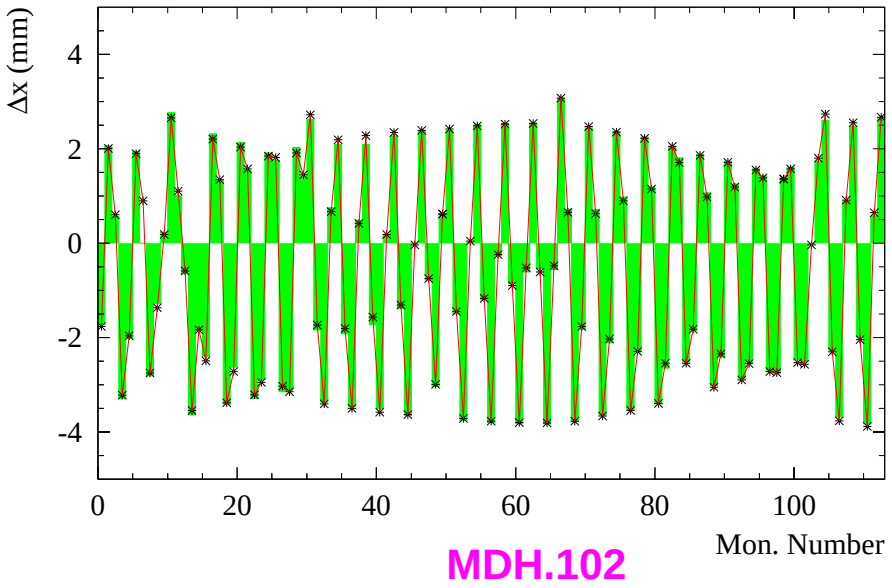
Same kick, same response ?

For same NOMINAL deflection & same β-function

→ not at all the same response !

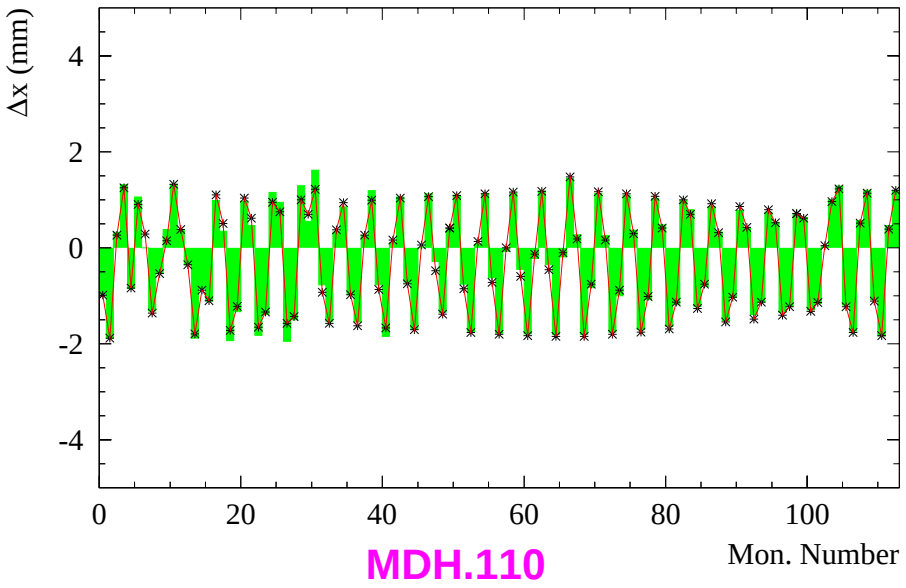
Δx = response (θ^+ = 30 μrad) - response (θ^- = -30 μrad)

Histogram : raw data



MDH.102

(*) + line : fit model



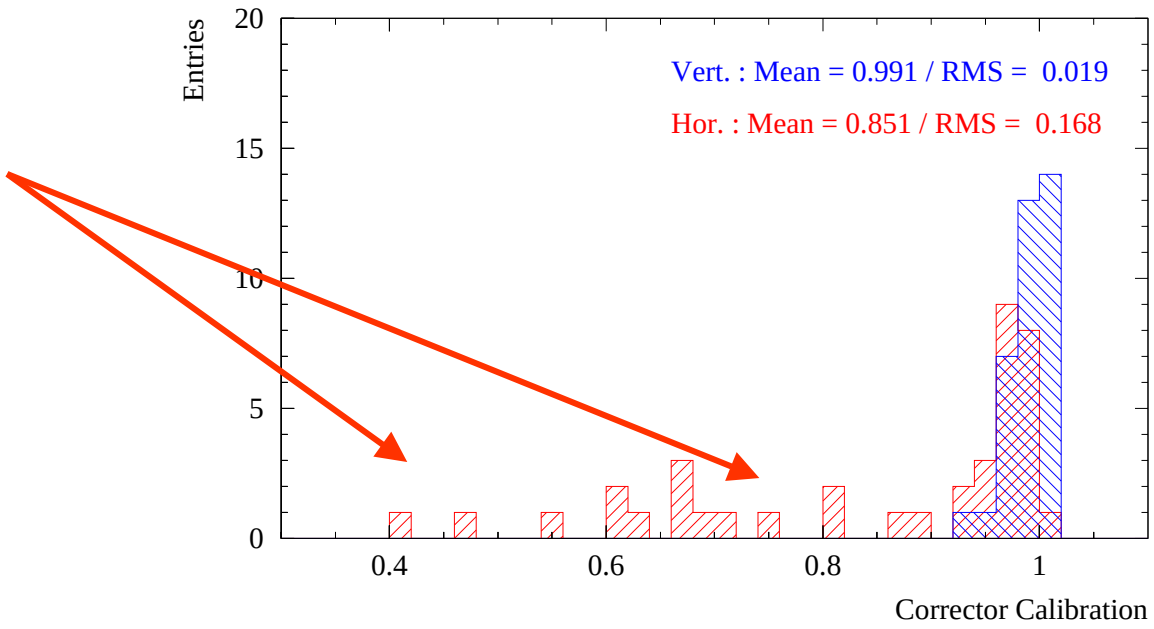
MDH.110

Corrector calibration factors

- H plane some correctors give only ~ ½ the nominal kick !
- V plane all give ~ nominal kick

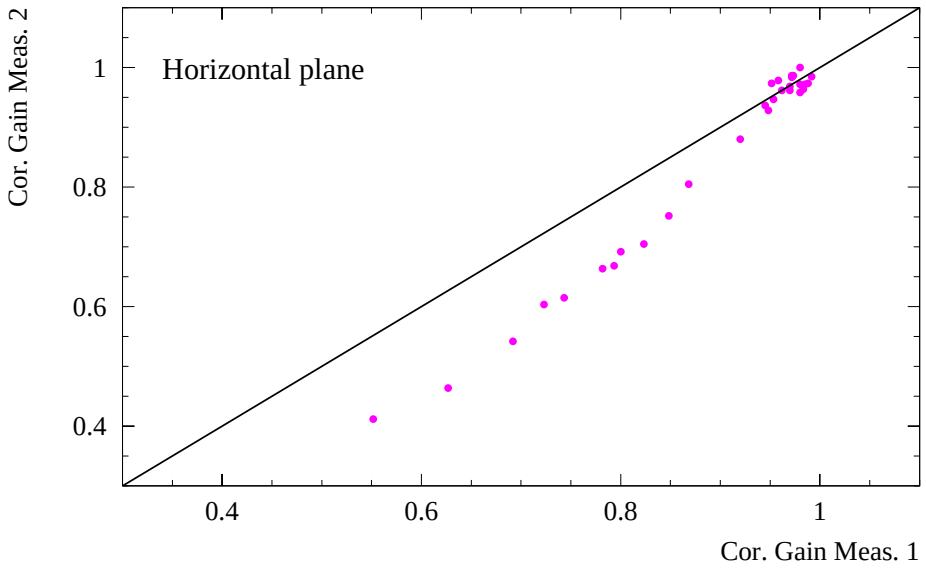
Statistics is based on ~ 35 out of 108 orbit correctors per plane, mostly from arcs (positions n*100 + 2 to n*100 + 10 , n = 1,6).

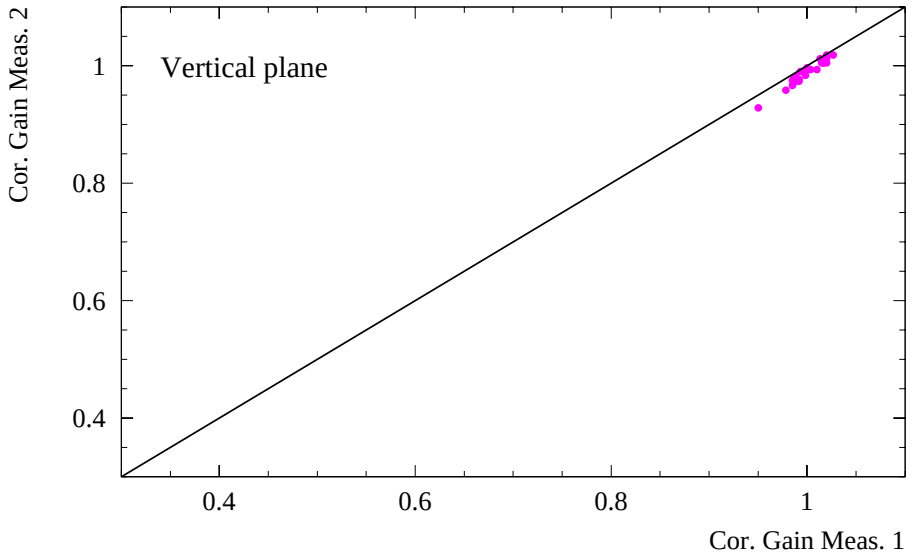
What a tail !



Comparison of 2 measurements

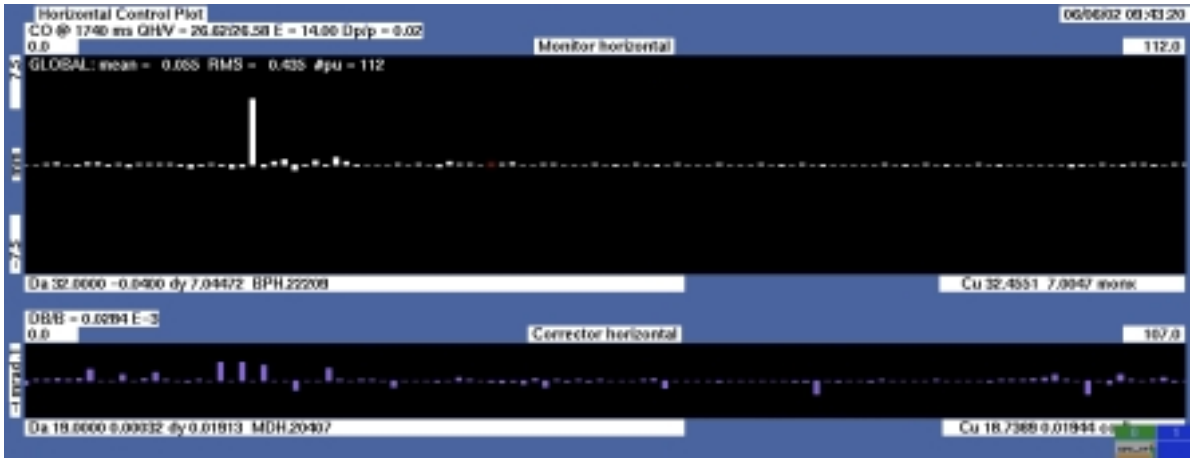
Corrector calibrations are ~ reproducible.



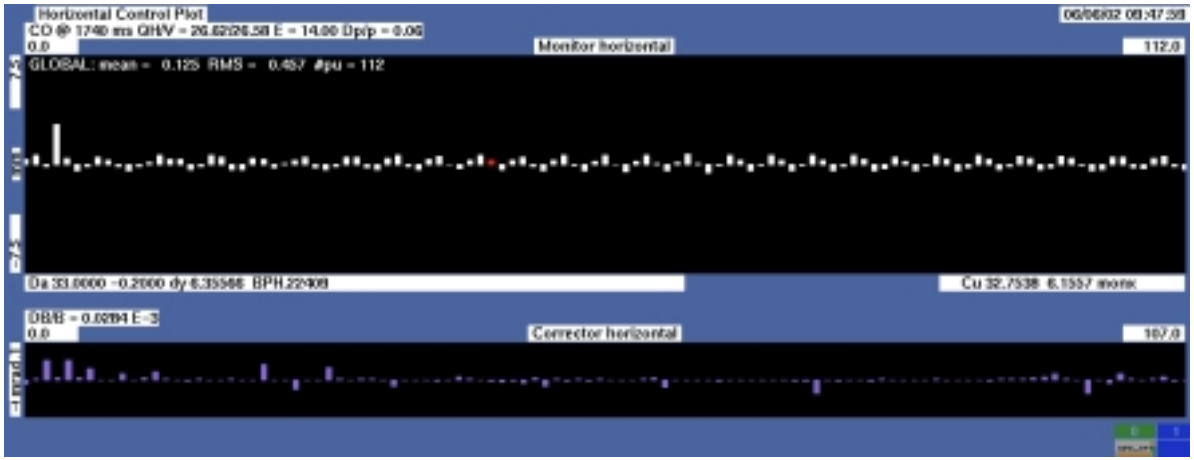


Bump test

Test with a 5 mm 3 corrector bump :



Good correctors :
Amplitude ~ nominal
Bump is well closed



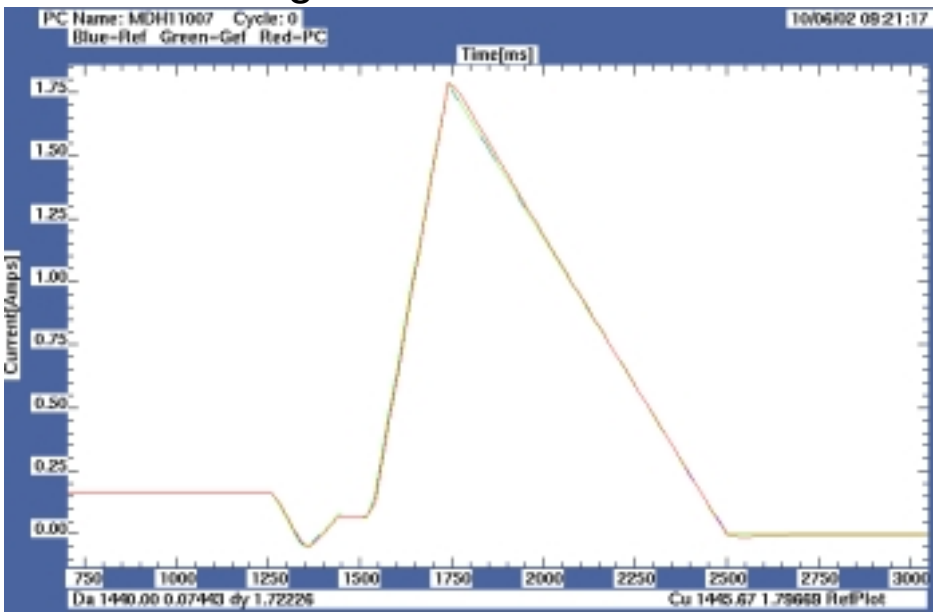
Bad correctors :
Amplitude ~ ½ nominal
Bump not closed

PC current

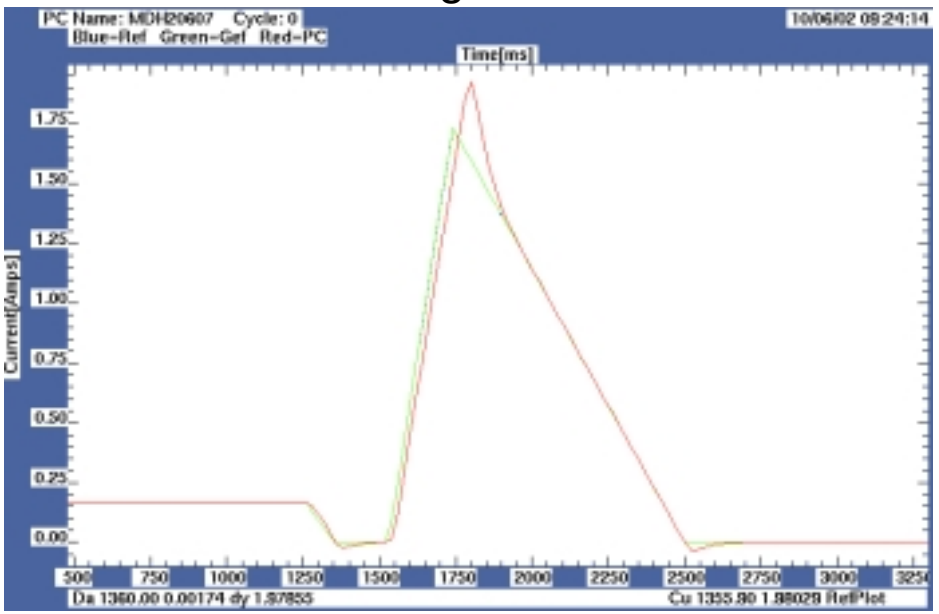
PC test with a very large bump (12 mm) ⇔ very large dI/dt :

Difference of regulation or load !

a ‘bad’ corrector (cal. < 0.5) :
no lag, no overshoot



a ‘good’ corrector (cal. ~ 1) :
PC lags + overshoot



the bump is still growing by ~20%
during ~30 ms after the peak in the current !

Resistance of magnet & cables

Quick resistance measurement :

- not much to see…
- ~ within specified limits (9.6 to 13.4 Ω).

Magnet #	R (Ω)	Kick (fit, μrad)
102	11.1	59
104	9.8	42
106	9.7	40
108	11.4	58
110	9.5	27

Nominal kick : 60 μrad

Magnet resistance ~ 7 Ω.

Statistics on H corrector calibrations

Sextant	# measured	# < 90%
1	9	5
2	7	0
3	5	1
4	7	2
5	5	4
6	6	2
Sum	39	14

Summary

- An important fraction of horizontal correctors does not give the right field.
- The effect is reproducible and visible on orbit response and bump closure.
- There is no such effect on the vertical correctors.
- So far the cause is not known.
- Next step : PO will check 2 or more correctors (regulation, load)
  in BA1 on Wednesday.