Observations from the OP side

Bernard Vandorpe (Measurement)

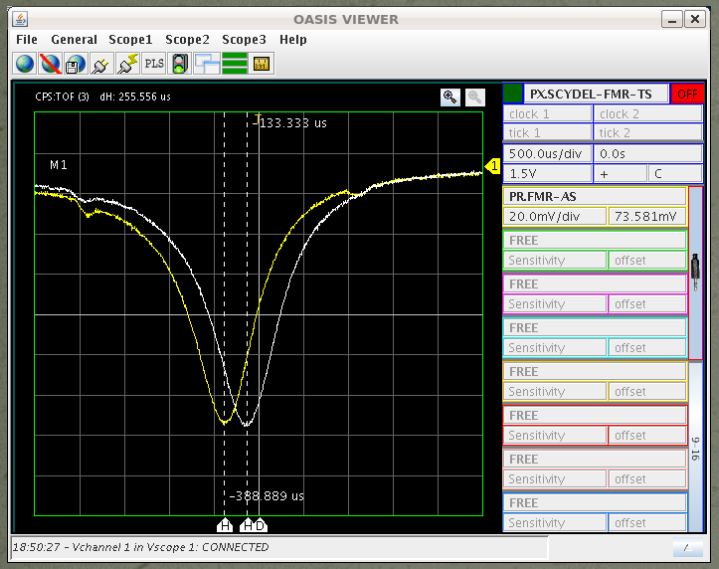
Oliver Hans (Presentation)

Many thanks to Bernard for the effort and explanations.

Please interrupt for questions!

B-train calibration

During the 2011 run, OP observed with the installed FMR, a field fluctuation.



OASIS FMR signal

The measurement shows a field fluctuation of 2 Gauss.
Sampler BfC has only 0.4Gauss fluctuation.

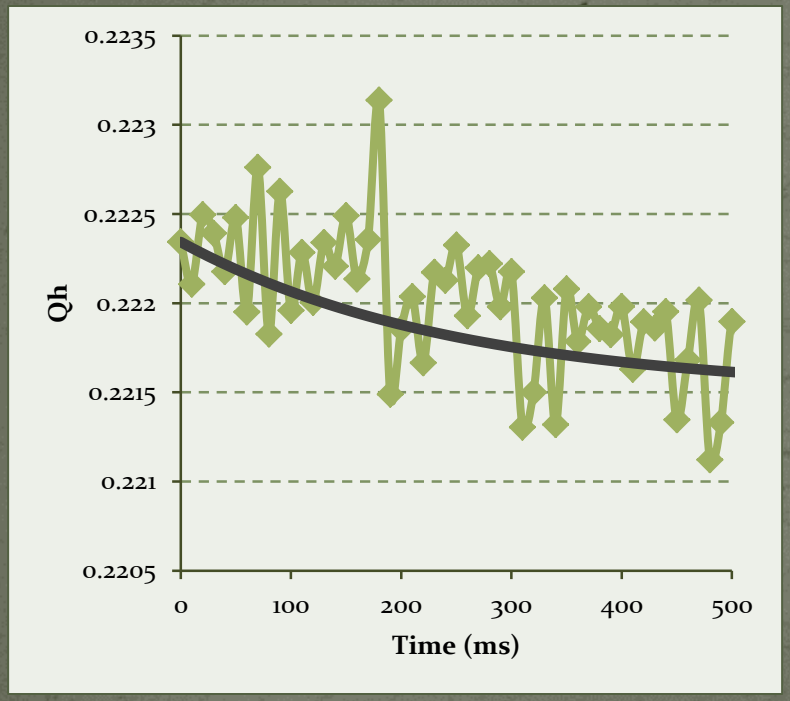
After some investigation the issue could be traced back to a calibration process taking place during the peaking strip signal.

The calibration window was shifted and OP sees this issue as solved.

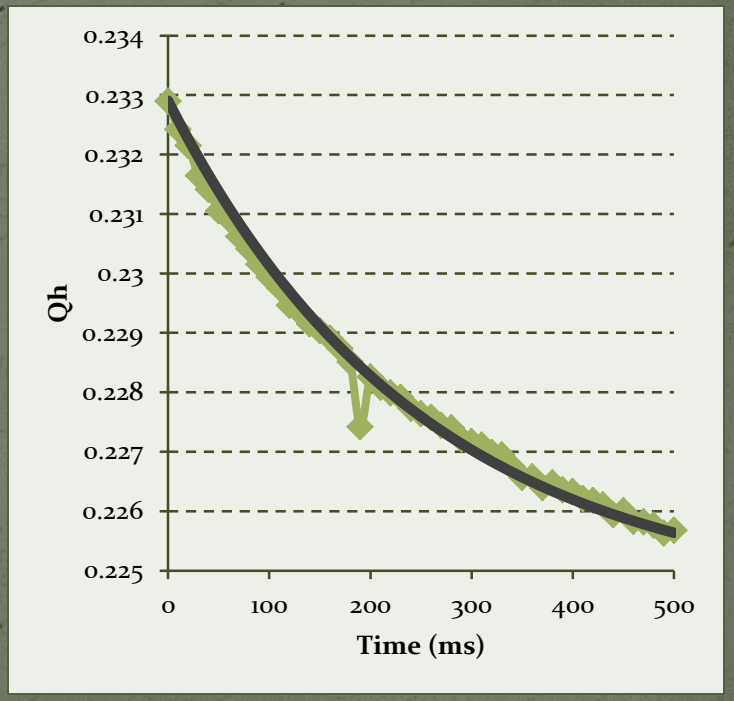
First observation

Tune stability on flat top

7000 Gauss flat top for 500ms
(14 GeV - 6666 Gauss)



12566 Gauss flat top for 500ms
(26 GeV)

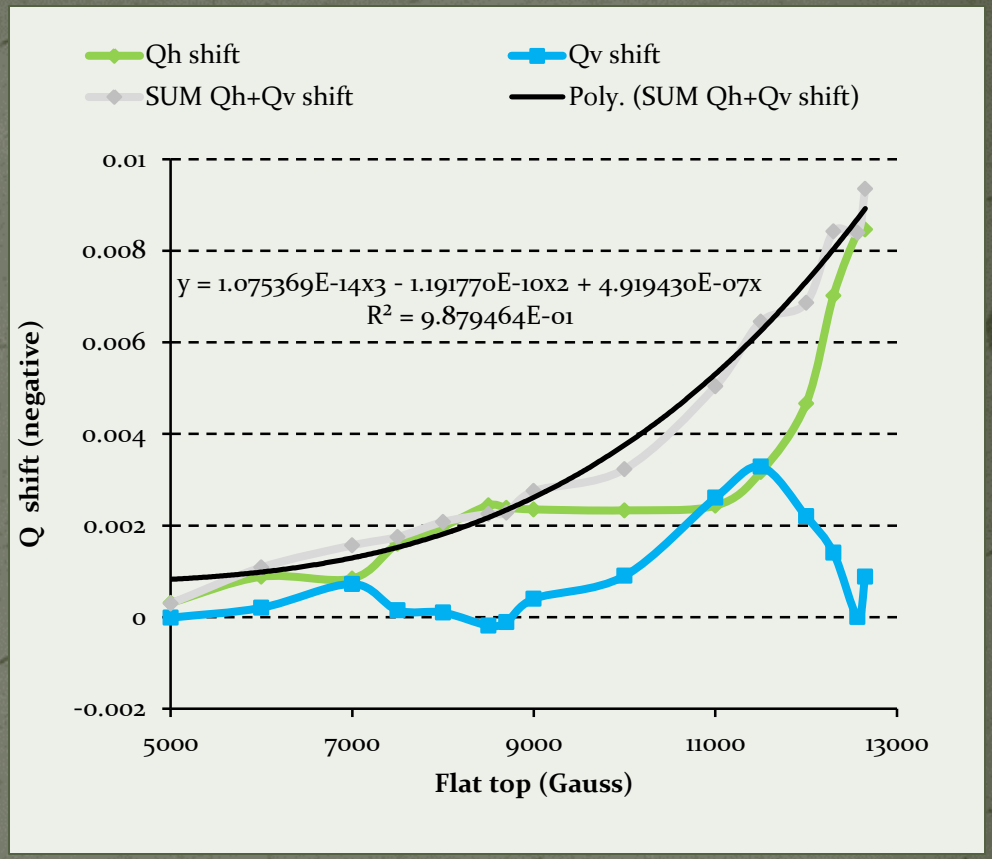


First observation

Tune stability on flat top

Bernard performed measurements on 14 different flat tops (Qh and Qv)

B-field (Gauss)	Qh start	dQh (10^{-3})	Qv start	dQv (10^{-3})
5000	0.226	0.31	0.303	-0.01
6000	0.223	0.88	0.306	0.20
7000	0.222	0.84	0.307	0.72
7500	0.220	1.6	0.312	0.15
8000	0.216	1.98	0.312	0.1
8500	0.215	2.44	0.313	-0.19
9000	0.216	2.39	0.313	-0.11
10000	0.218	2.35	0.312	0.40
11000	0.224	2.33	0.312	0.90
11500	0.225	2.43	0.327	2.61
12000	0.229	4.66	0.315	3.28
12300	0.234	7.01	0.291	2.20
12566	0.232	8.40	0.277	1.41
12650	0.224	8.46	0.267	0.00

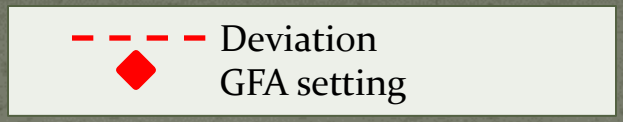


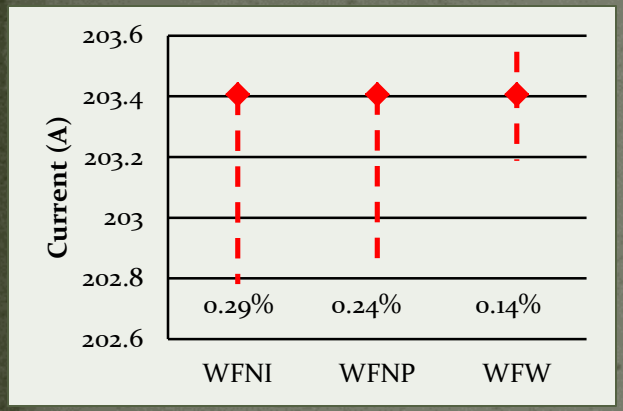
Observation:

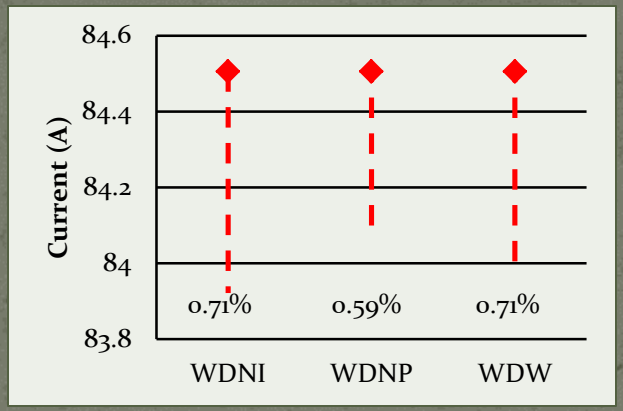
- Tune shift on flat top
- Higher flat top field -> higher dQh+v

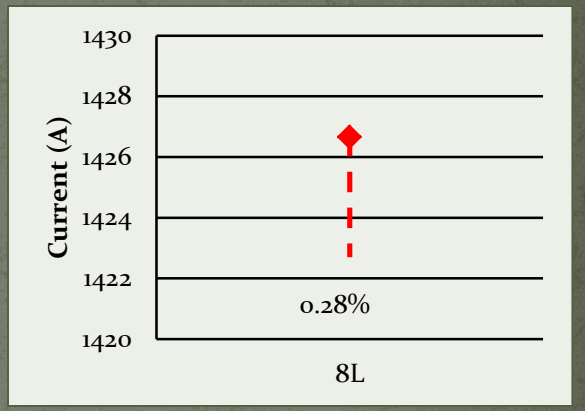
Machine stability seen by Samplers

PFW measured on 26 GeV flat top over 300ms, 5 cycles

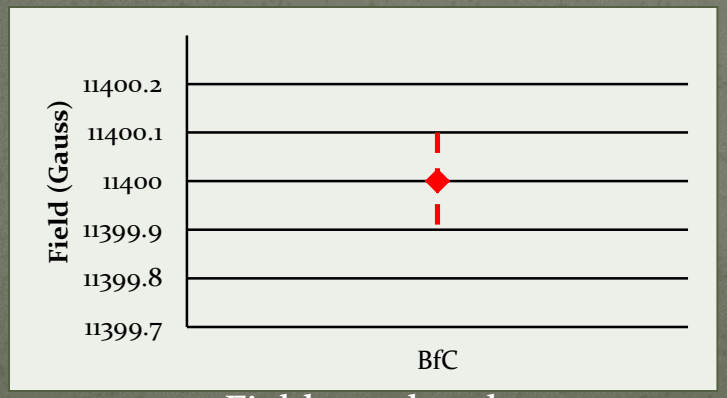








MPS on 24 GeV flat top for 700ms



Field regulated

Current regulated

Machine stability seen by Samplers

Matrix (B=12566 Gauss)	dI (A)	dQh	dQv
WFN	0.6	0.0009	-0.0004
WFW	0.3	0.0008	0.0005
WDN	0.6	-0.001	-0.0015
WDW	0.6	-0.0009	-0.0024
W8L	4	-0.0025	-0.0024

Tune shift calculated

Observed (B=12566 Gauss)	dQh	dQv
	0.0084	0.0014

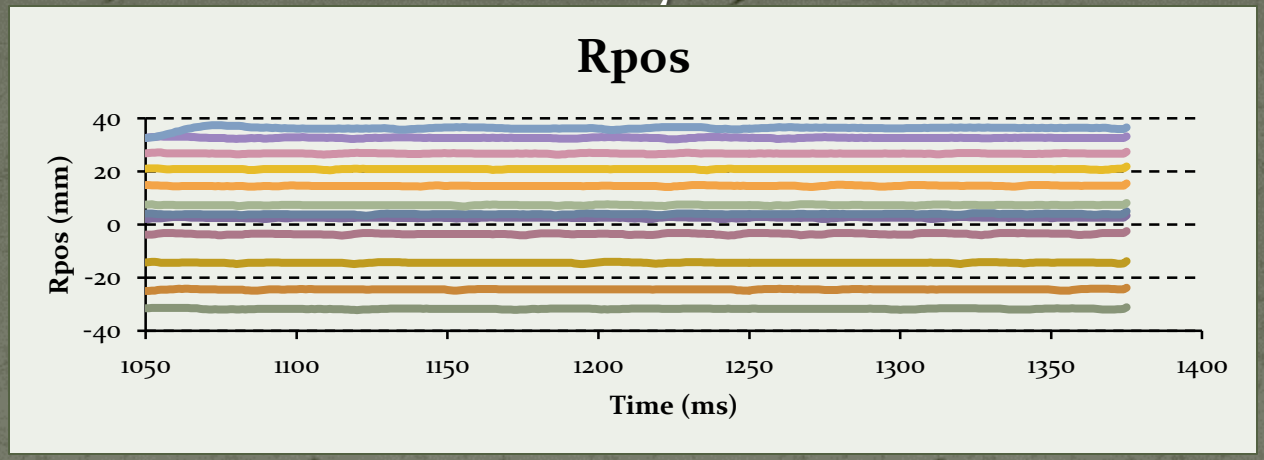
Tune shift observed

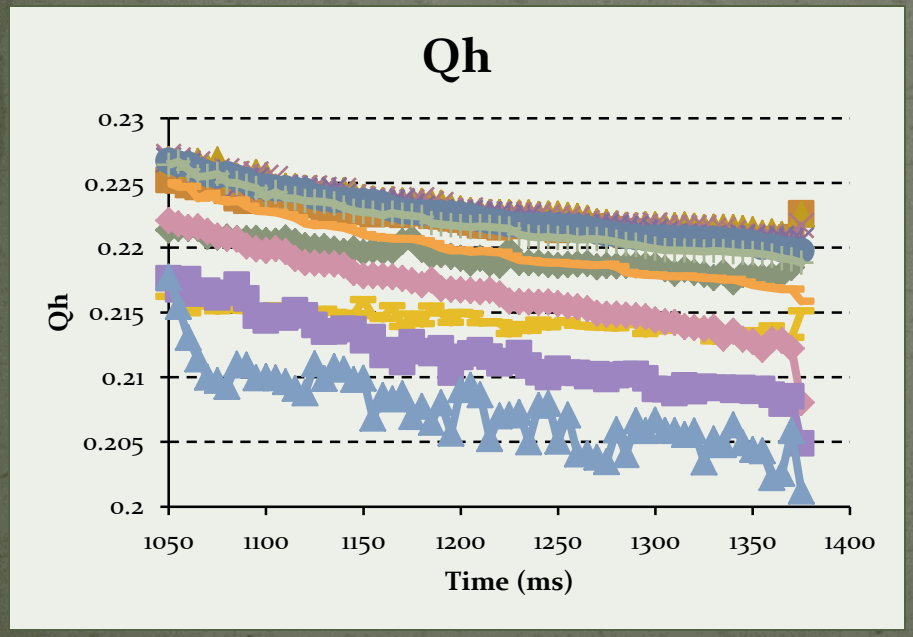
To be noted:
The PFW current has ripples, whereas the tune shift has clear 1st order function

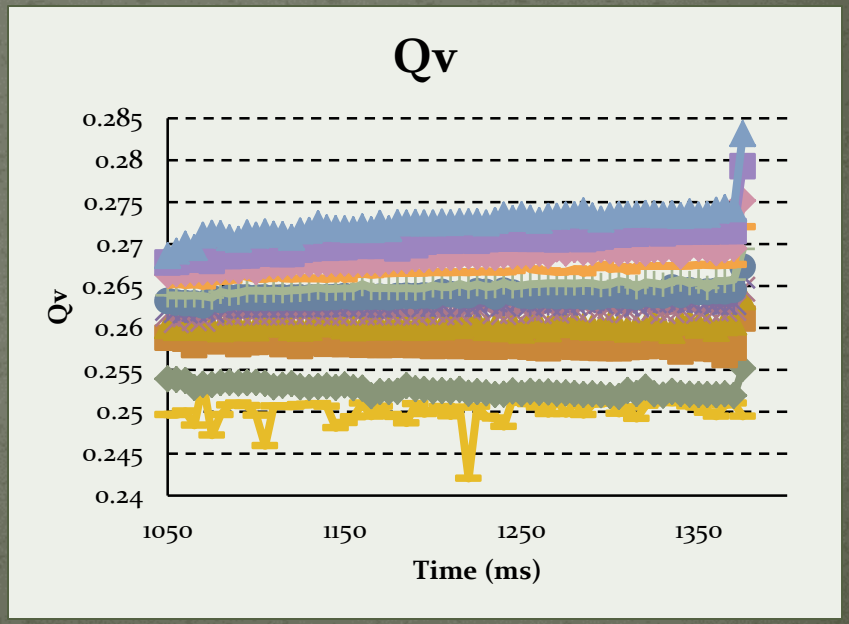
Second observation

Tune stability vs MRP

Measurenents on 26 GeV flat top with a length of 300ms



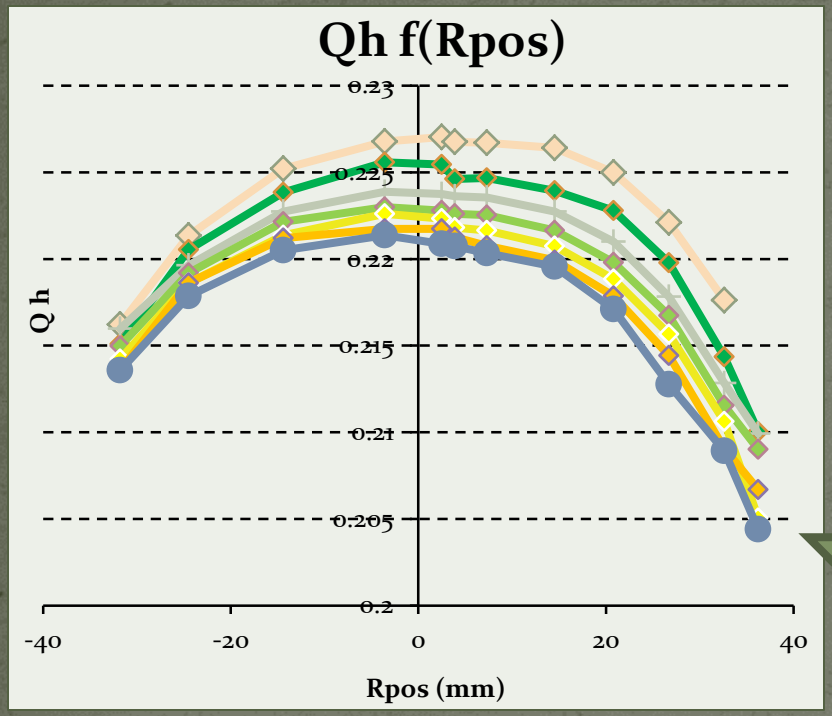


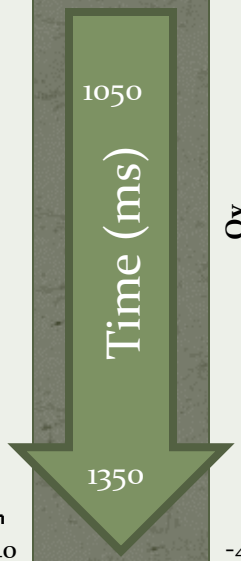


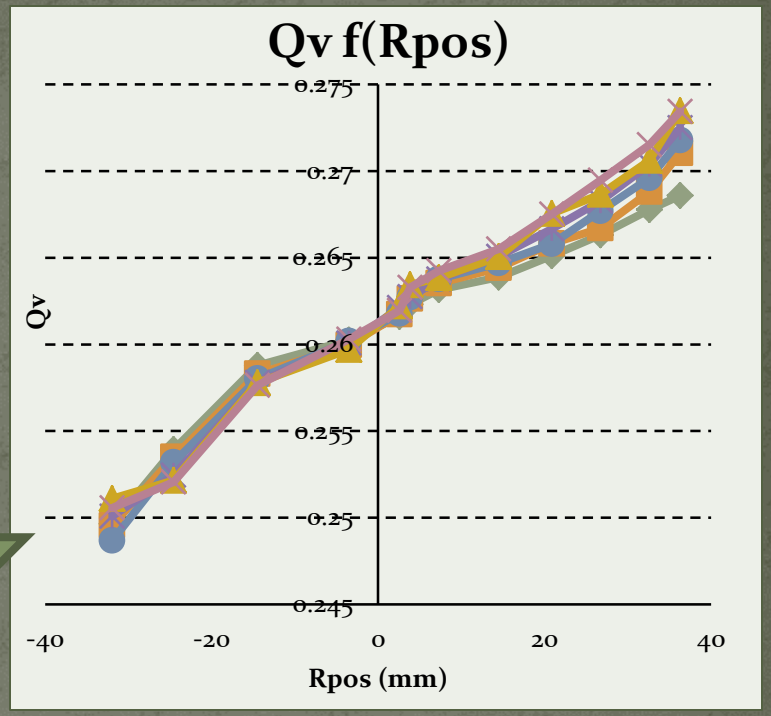
Second observation

Tune stability vs MRP

Measurenents on 26 GeV flat top with a length of 300ms

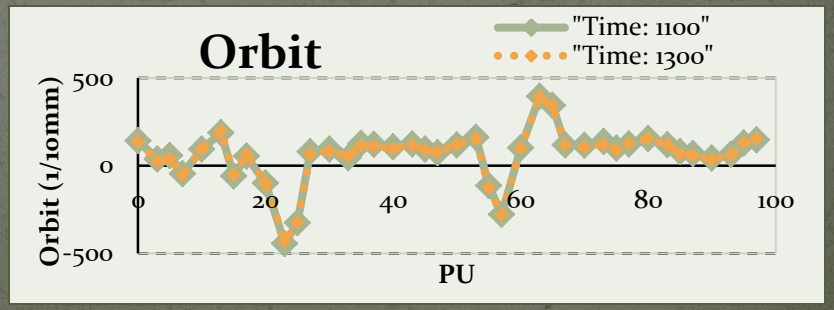






No orbit deformation observed (orbit H and V measured at Rpos -20, 0, 30mm)

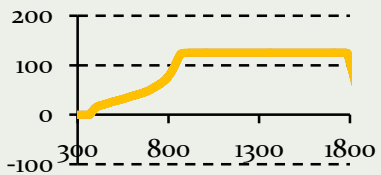
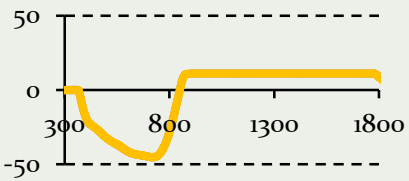
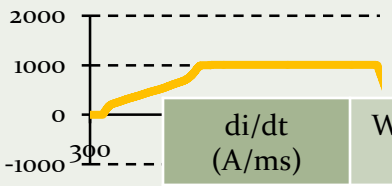
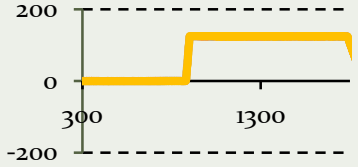
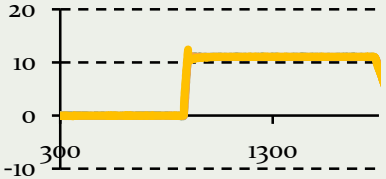
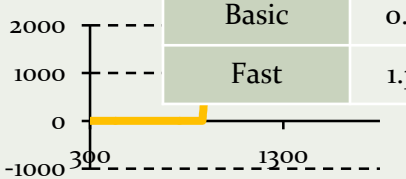
Example: Hor. Orbit for Rpos 0mm



Third observation

Tune vs PFW dI/dt

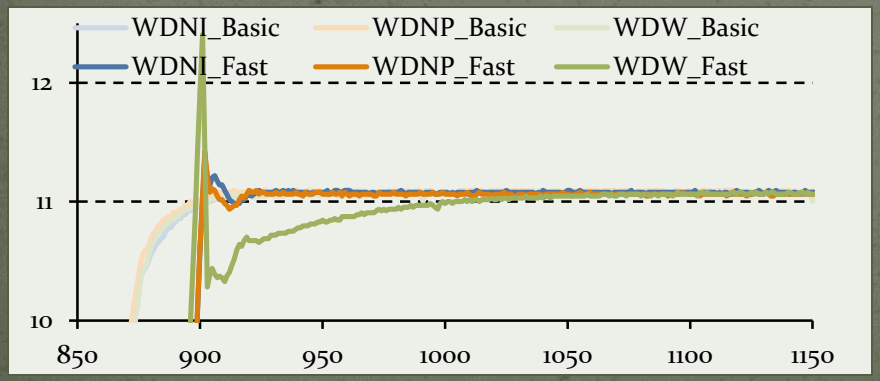
Measurements with a 24 GeV ION beam

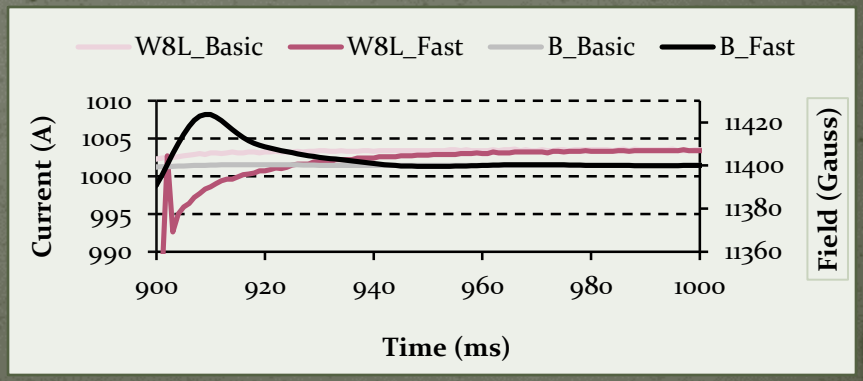
PFW setting	WFNI; WFNP; WFW	WDNI; WDNP; WDW	W8L
Basic *(Vandorpe setting)*			
Fast *(Lachaize setting)*			

di/dt (A/ms)	WFW	WDW	W8L
Basic	0.61	0.53	3.50
Fast	1.32	0.11	10.34
		/5	x3

With fast ramp PFW and B-field have important over shoot. Stabilized at C1000.

Measurement done between 1000 – 1700 ms

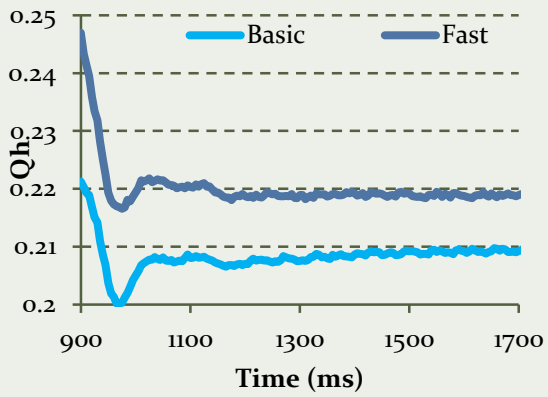
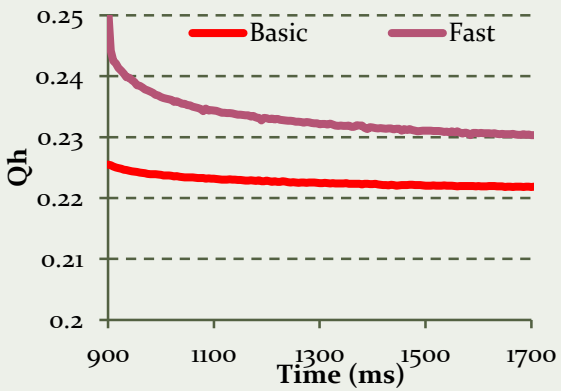
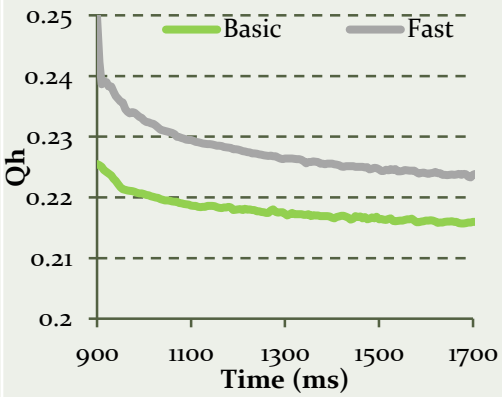
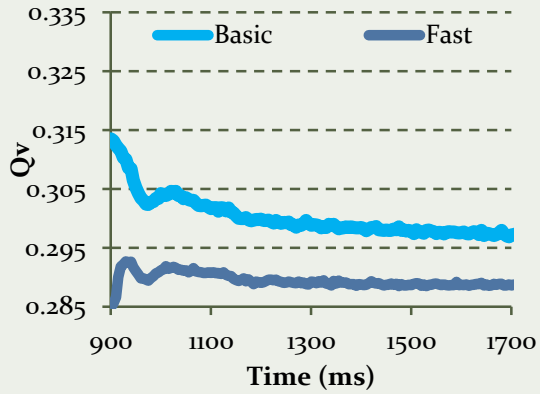
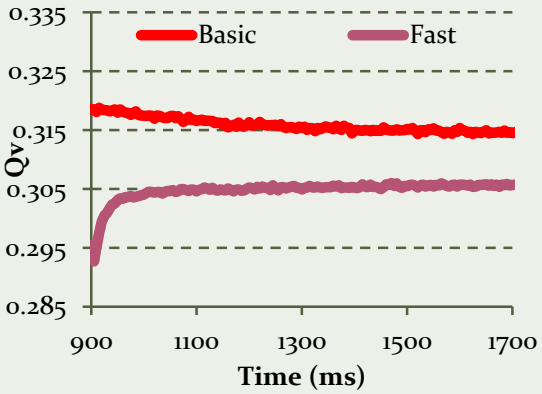
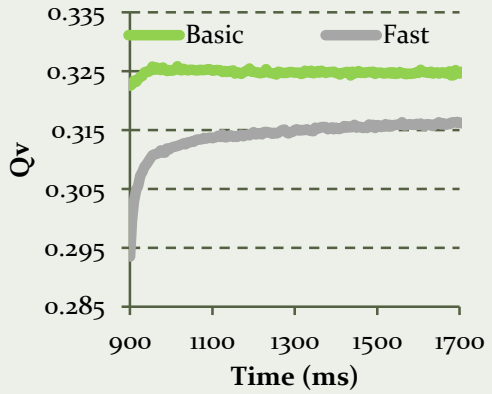




Third observation

Tune vs PFW dI/dt

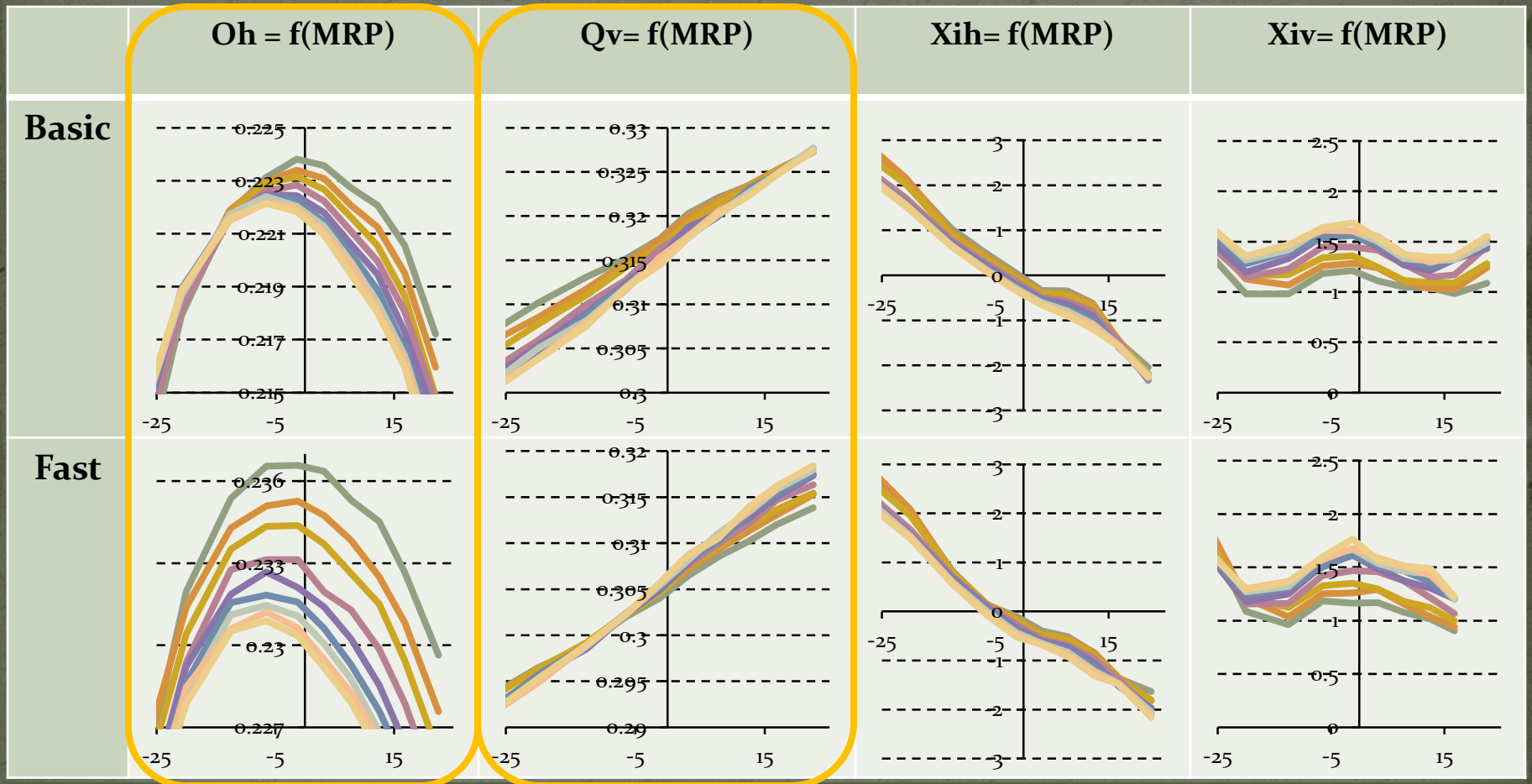
Measurements with a 24 GeV ION beam

	MRP -20 mm	MRP 0 mm	MRP +20 mm
Qh			
Qv			

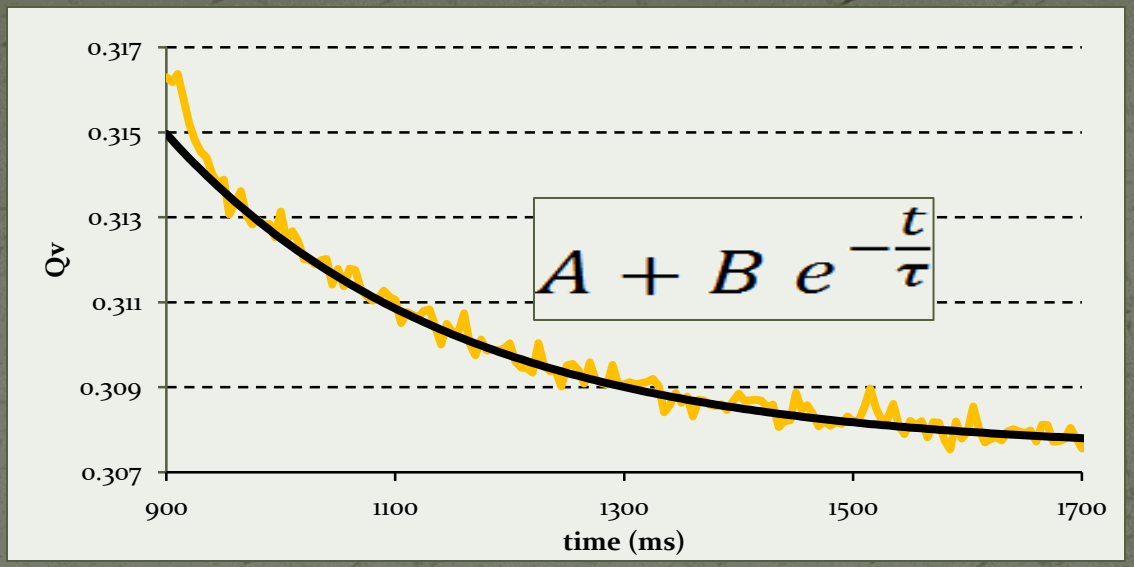
Third observation

Tune vs PFW dI/dt

Measurements with a 24 GeV ION beam



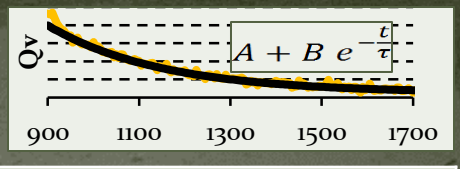
Analysis

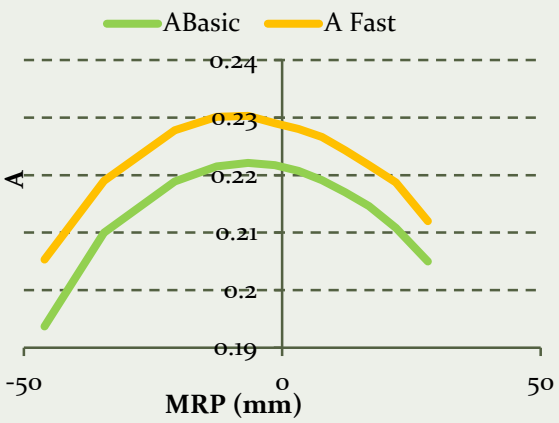
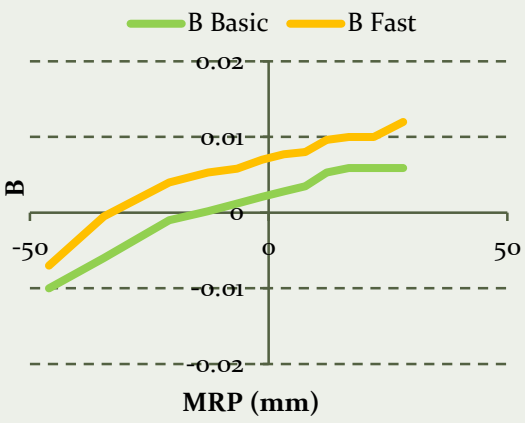
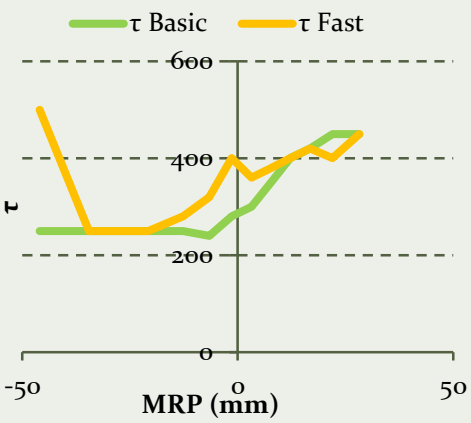
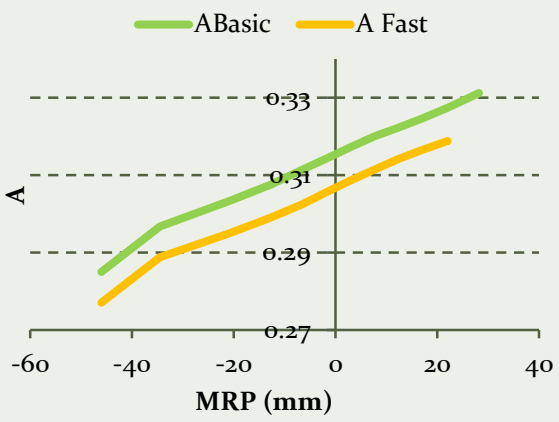
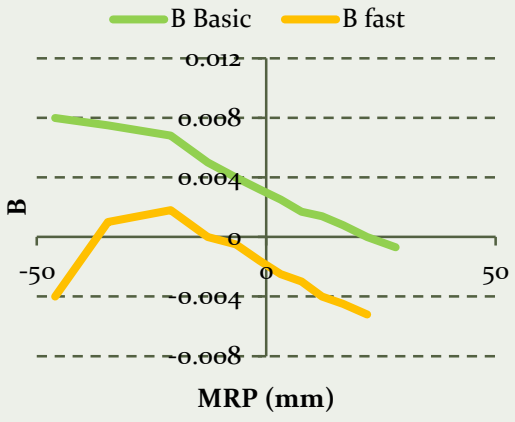
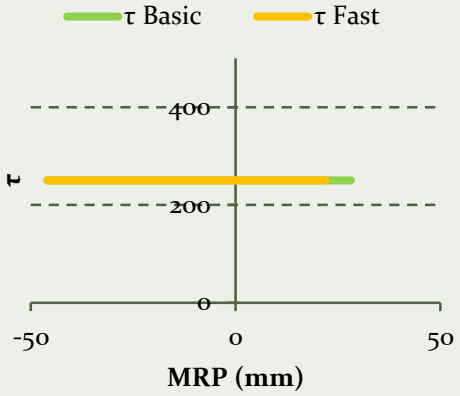


Example:

- Vertical tune
- Basic PWF setting
- MRP-10 mm

Analysis



	A Asymptote	B coefficient	τ
Qh			
Qv			

Summary

Machine settings are stable (what OP can see via Sampler)
Tune is not stable

$$dQ = f \begin{cases} \text{Time} \\ \text{Field} \\ dI/dt \ \text{(PFW)} \\ \text{MRP} \end{cases}$$

Tune changes with a first order function of time.
With a coefficient depending on B-field, MRP and dI/dt (PFW).

Outlook

Measurement campaign

1st Find a setting to measure the influence of one single PFW (WFW, WDW .....)
2nd More measurements with current regulation.

All data shown in this presentation, and many more, could be found at:
\\Cs-ccr-samba1\pcshare\user\vandorpe\public\QhOnFlatTop

The measurement campaign was not always straight forward.
But Bernard did a great job.

Discussion