PLS Corrector PS Upgrade and Orbit measurement using DBPM

EPICS collaboration meeting on 6~7 October 2005

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POSTECH

Outline

-Status of Digital Corrector power supplies hardware
-Status of PS control system
-Data measurements
-Orbit measurements using Libera tryout DBPM
-Summary

Goals of orbit feedback

-Storage ring : 2.5 GeV 180 mA

-Orbit feedback operation using digital power supplies

-Orbit stability with feedback (RMS)

- Short term (1 hour) : < 1 μm
- Long term (12 hours) : < 3 μm

-Total 70 sets V type replaced and 32 V correction PS's are involved for orbit feedback

-98 BPMs used for beam position measurement

Present PS upgrade status

-PS Upgrade status

- **August and September 2005, 70 vertical PS were replaced to new digital controlled type**
- **September 2005, Hardware and Control system Commissioning**
- ***September 28 2005, User run starting***
- **Total budget : 650,000$ (Not include Control System)**

-DBPM

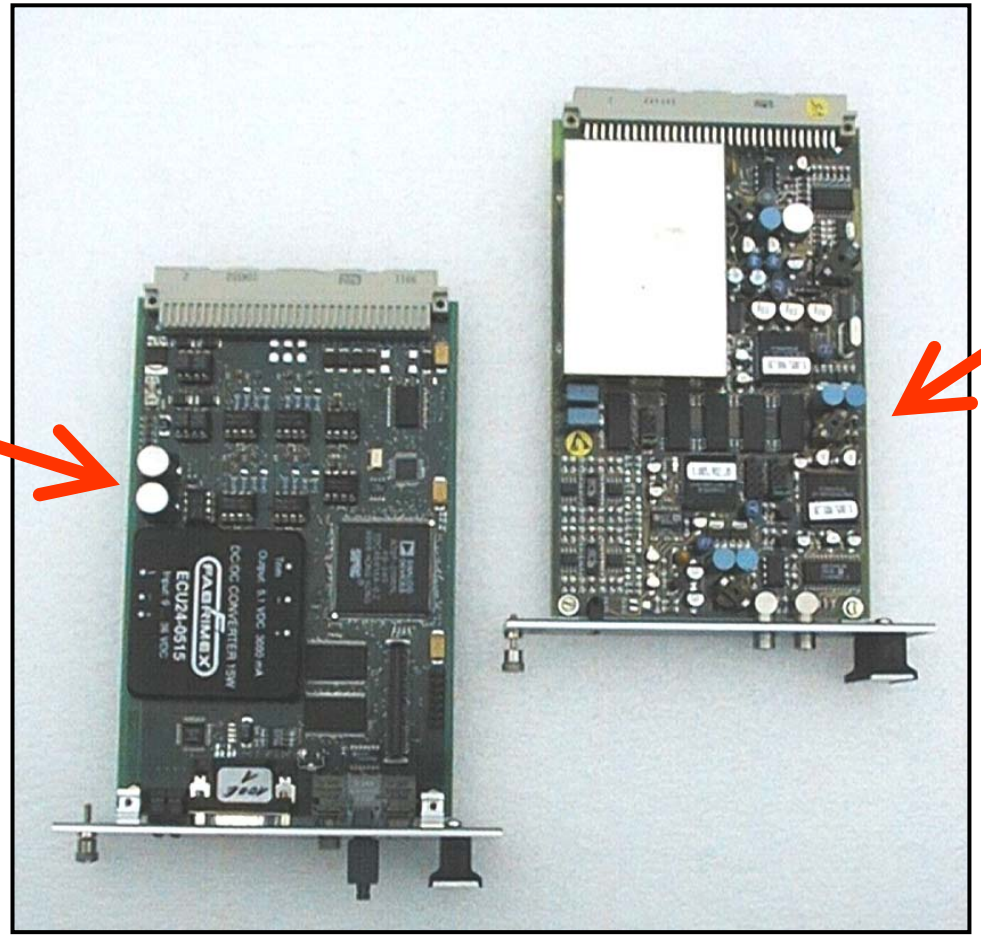
- **November 2003, Installed DBPM-2 from I-Tech**
- **August 2005, One of DBPM Libera tryout version installed for TBT, damping time, RMS and MEAN orbit data measurement**

Digital Control Unit from DIAMOND

- Originally developed by PSI EE group
- DIAMOND has full-license

DSP-controller incl. FPGA

- ➢6 Bit Digital Out
- ➢8 bit Digital Input
- ➢1 RS232
- ➢1 Fiber optics
- ➢Euro card size
- ➢Shark DSP
- ➢Shark links on backplane



Analog- Digital-Converter

- **➢2 ADC,16 Bit, 50 kHz**
- **➢4 ADC, 12 Bit**
- **➢2 DAC for debugging**

Installed PS in Shed #1 and Inside view

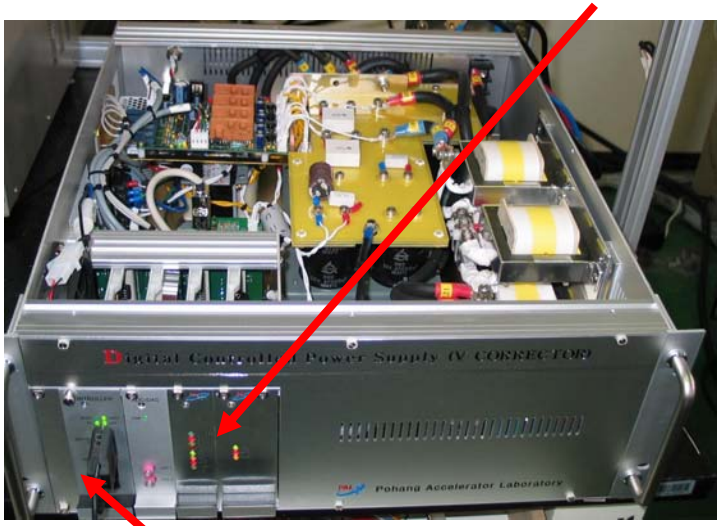
MVME5110-400 MHz

VMIC-3122
EVR
VIPC664

VME IOC Crate

Bergoz BPM

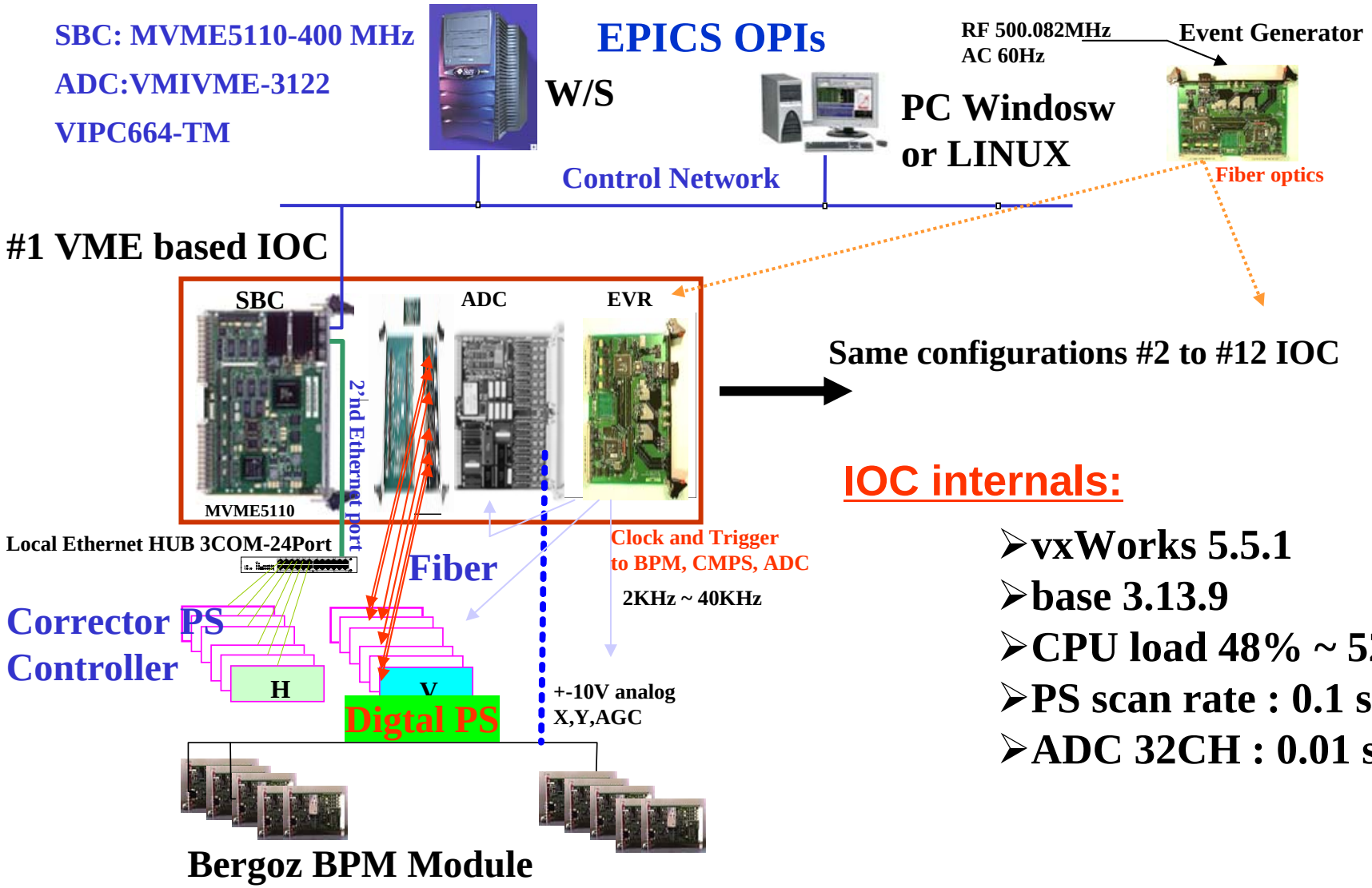
DCCT &
IO interface board



Digital PS and Control Rack

Optical fiber for EPICS interface

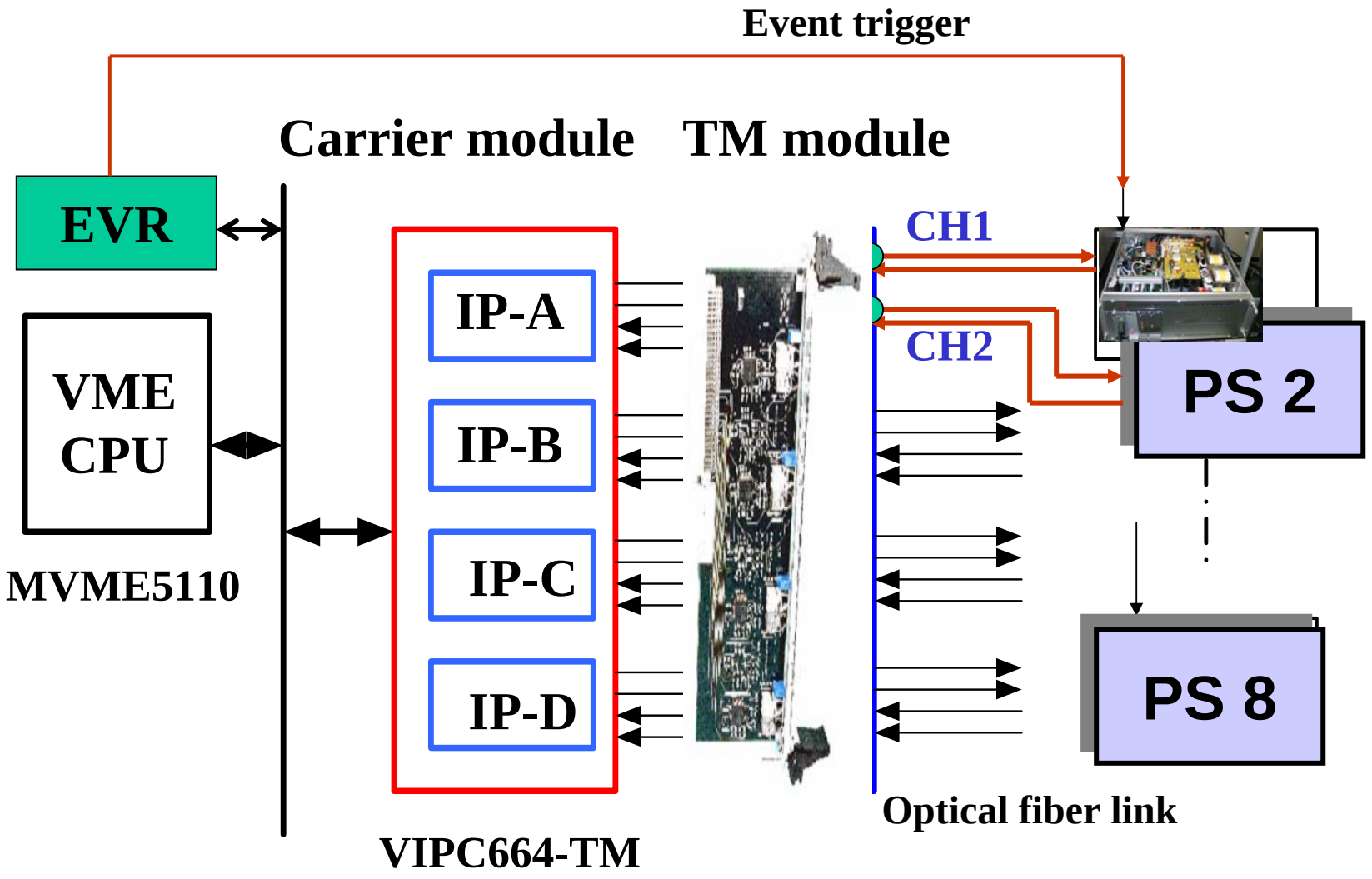
Power Supplies IOCs



IOC internals:

- vxWorks 5.5.1
- base 3.13.9
- CPU load 48% ~ 52%
- PS scan rate : 0.1 sec
- ADC 32CH : 0.01 sec

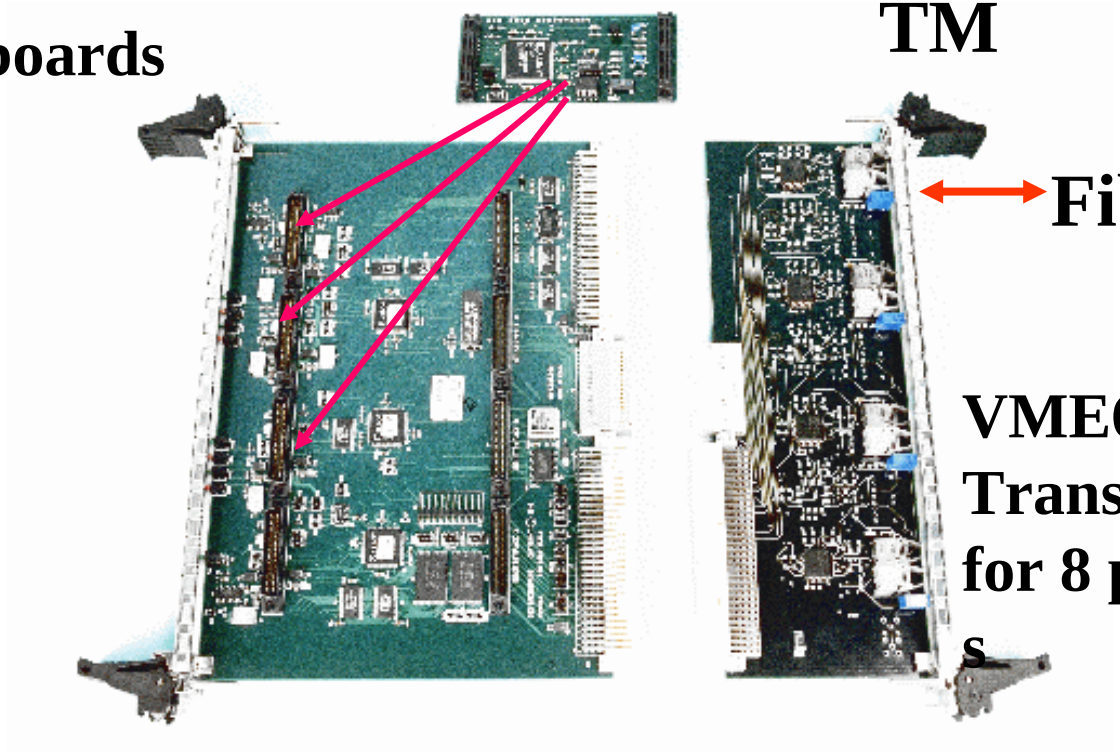
IOC and PS configuration



Control hardware

Industry Pack Carrier
VME64x 4 slot boards
Greenspring
Vipc664
Hytec 8002

Industry Pack Module
for 2 power supplies
TM



Fiber I/O port

VME64x
Transition module
for 8 power supplie
s

Web monitoring

Epics IOC Monitoring Server - Microsoft Internet Explorer

파일(F) 편집(E) 보기(V) 즐겨찾기(A) 도구(T) 도움말(H)

LOGIN

IOC

Beam Current

ORBIT & MPS Graph

ID BPM

PBPM

BTL_BPM

SR Vacuum

SR RF

MPS

BPM

Libera DBPM

SR MPS CORRECTOR

CH
CV
CH check
CV check

SR MPS UNIPOLAR

LINAC MODULATOR

SR TEMPERATURE

Linac 공조

PV Search

Bulletin Board

Visited: 13547
HELP

Data Refresh

IP : 141.223.48.193 OS : Windows 2000

Interv

SHED	MPS ID	PC SET POINT	READ BACK	Error (A)	DC Link	Out Vol	
1	P01CV3	35.285	35.297	-0.012	26.254	3.824	
	P01CV4	-40.095	-40.085	-0.010	26.457	-4.236	
	P01CV5	1.511	1.514	-0.003	27.205	0.191	
	P01CV6	69.246	69.257	-0.011	26.018	7.326	
	P02CV1	-48.423	-48.417	-0.006	26.489	-4.997	
	P02CV2	64.046	64.037	0.009	26.229	7.092	
2	P02CV3	-8.981	-8.992	0.011	26.852	-1.08	
	P02CV4	6.784	6.793	-0.009	25.787	0.854	
	P02CV5	-0.621	-0.623	0.002	26.287	-0.05	
	P02CV6	69.555	69.554	0.001	24.951	7.332	
	P03CV1	-50.355	-50.354	-0.001	25.266	-5.36	
	P03CV2	8.341	8.343	-0.002	25.787	0.838	
3	P03CV3	-7.857	-7.861	0.004	25.890	-0.98	
	P03CV4	28.911	28.920	-0.009	25.539	2.995	
	P03CV5	-22.610	-22.609	-0.001	25.550	-2.34	
	P03CV6	69.349	69.348	0.001	24.965	7.581	
	P04CV1	-51.158	-51.167	0.009	25.270	-5.65	
	P04CV2	-5.011	-5.017	0.006	25.885	-0.52	
4	P04CV3	-16.599	-16.598	-0.001	25.703	-1.841	PLOT
	P04CV4	18.027	18.032	-0.005	25.761	1.929	PLOT
	P04CV5	22.372	22.364	0.008	25.665	2.319	PLOT
	P04CV6	-34.028	-34.035	0.007	25.604	-3.401	PLOT
	P05CV1	24.454	24.449	0.005	25.716	2.472	PLOT
	P05CV2	-9.084	-9.078	-0.006	25.932	-1.124	PLOT
5	P05CV3	-21.322	-21.321	-0.001	25.777	-2.402	PLOT
	P05CV4	53.270	53.274	-0.004	25.301	5.915	PLOT
	P05CV5	-20.736	-20.726	-0.010	25.761	-2.000	PLOT
	P05CV6	24.158	24.157	0.001	25.668	2.508	PLOT
	P06CV1	-16.031	-16.036	0.005	25.821	-1.620	PLOT
	P06CV2	-18.342	-18.333	-0.009	25.703	-1.904	PLOT
6	P06CV3	20.296	20.297	-0.001	25.716	2.295	PLOT
	P06CV4	-1.045	-1.044	-0.001	26.288	-0.113	PLOT
	P06CV5	13.070	13.062	0.008	25.732	1.279	PLOT
	P06CV6	-66.202	-66.200	-0.002	25.070	-7.045	PLOT
	P07CV1	53.467	53.458	0.009	25.253	5.684	PLOT
	P07CV2	-42.891	-42.894	0.003	25.461	-4.622	PLOT
	P07CV3	48.909	48.920	-0.011	25.271	5.480	PLOT
	P07CV4	-17.715	-17.718	0.003	25.899	-1.862	PLOT

인터넷

4 days

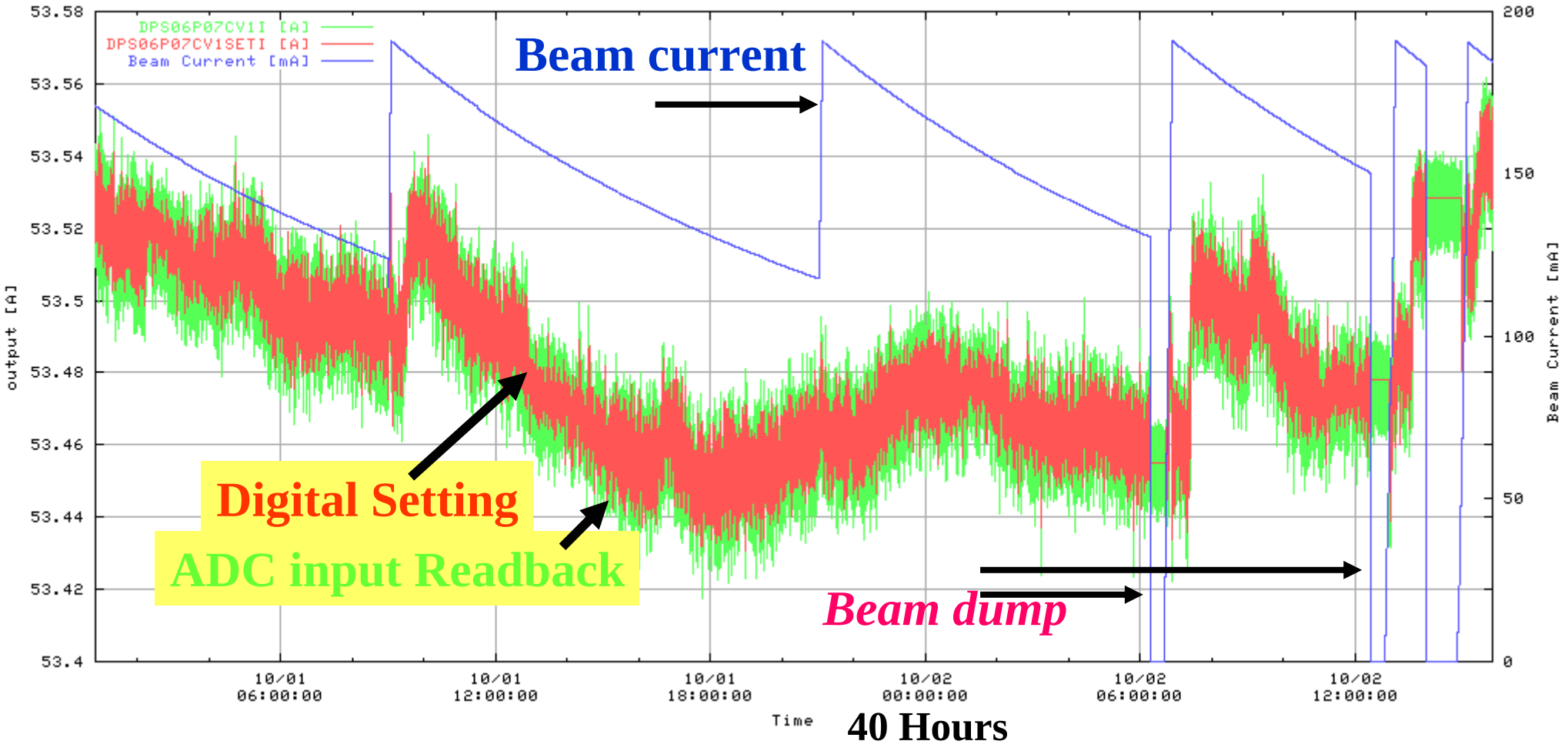
10 min

-PPC linux

-mySQL

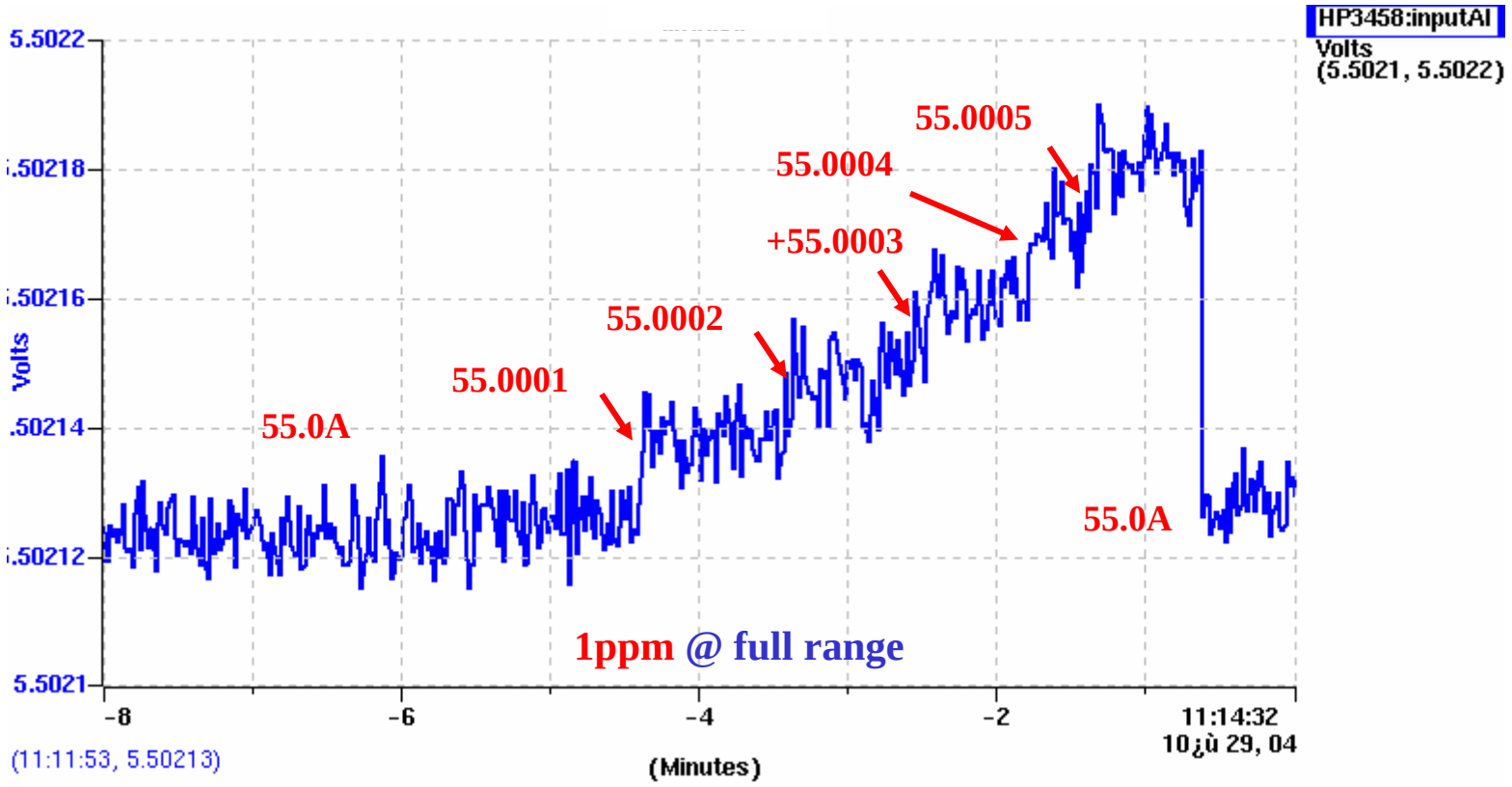
-GUNPLOT

DPS Feedback operations - 1



Current setting and ADC input readback by feedback operation

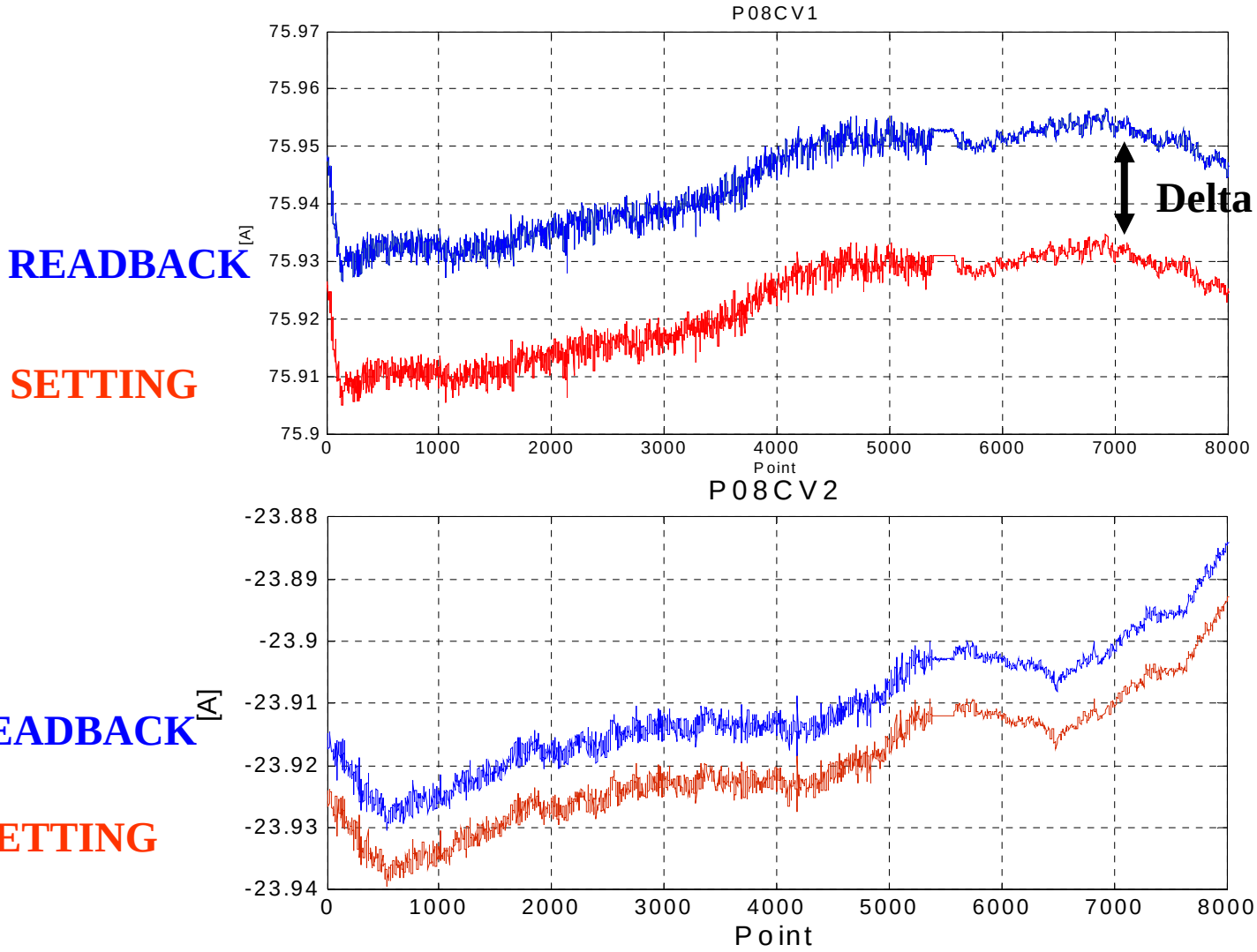
Step response test



V*10 is Amps

Step response @55(A), 100uA step(1ppm)

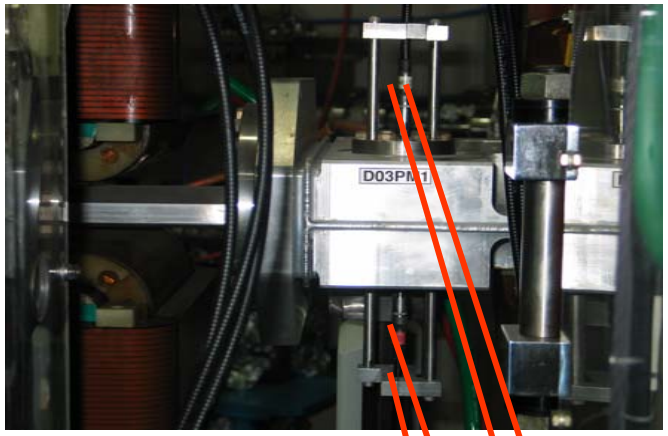
DPS Feedback operations - 2



Current setting and DCCT output readback by feedback operation

Operating output currents of vertical corrector

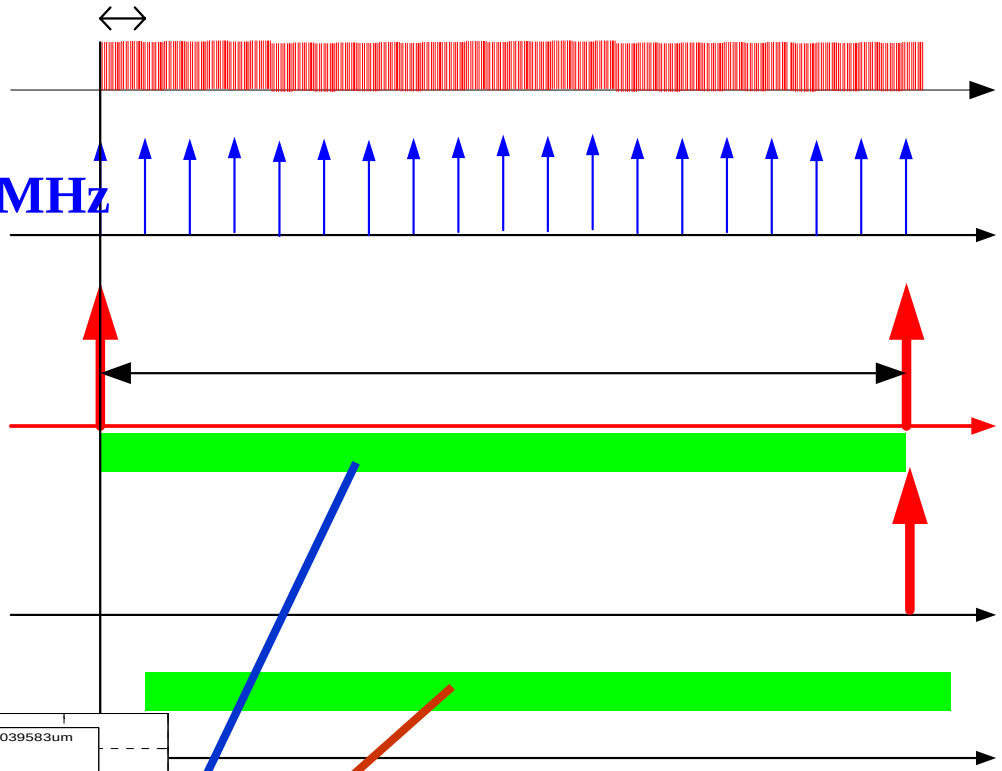
Timing of DBPM for data sampling

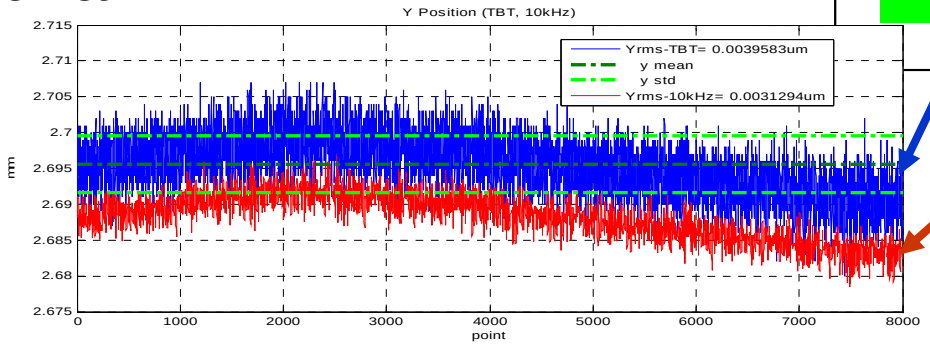


A,B,C,D

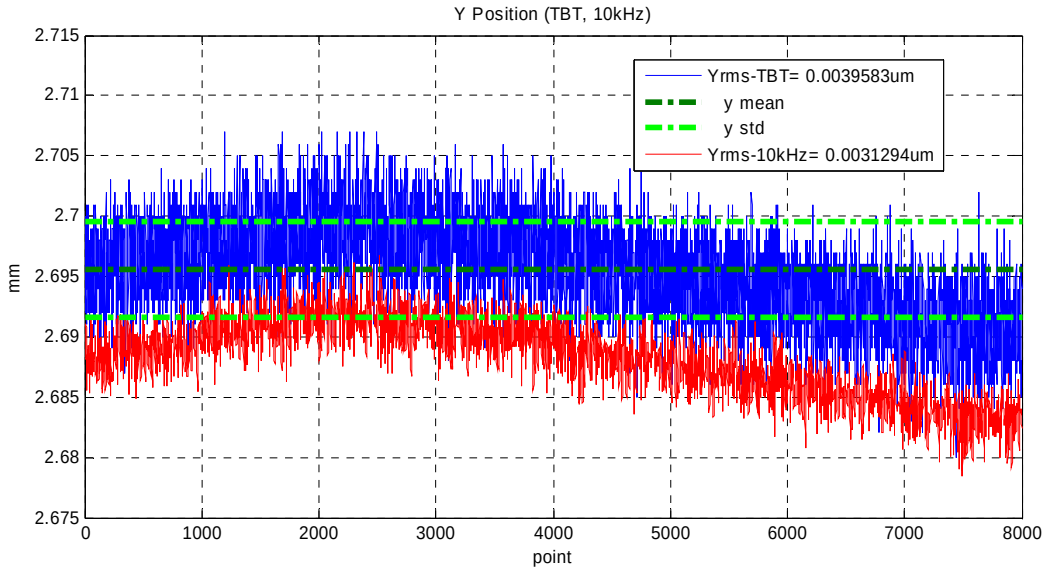
Ethernet

f_s =1.068 MHz



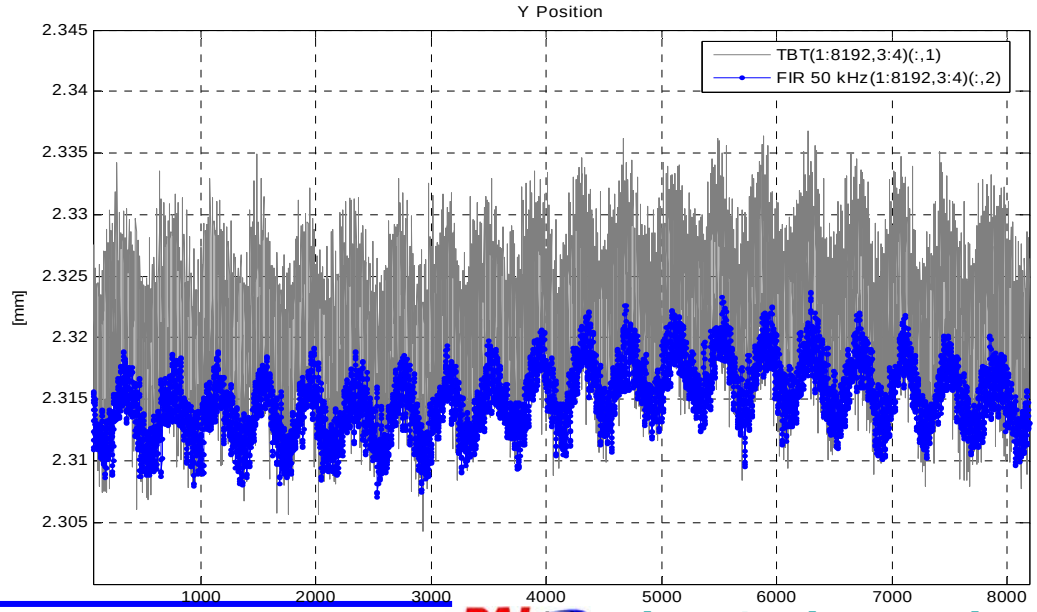


Turn by turn data measurement

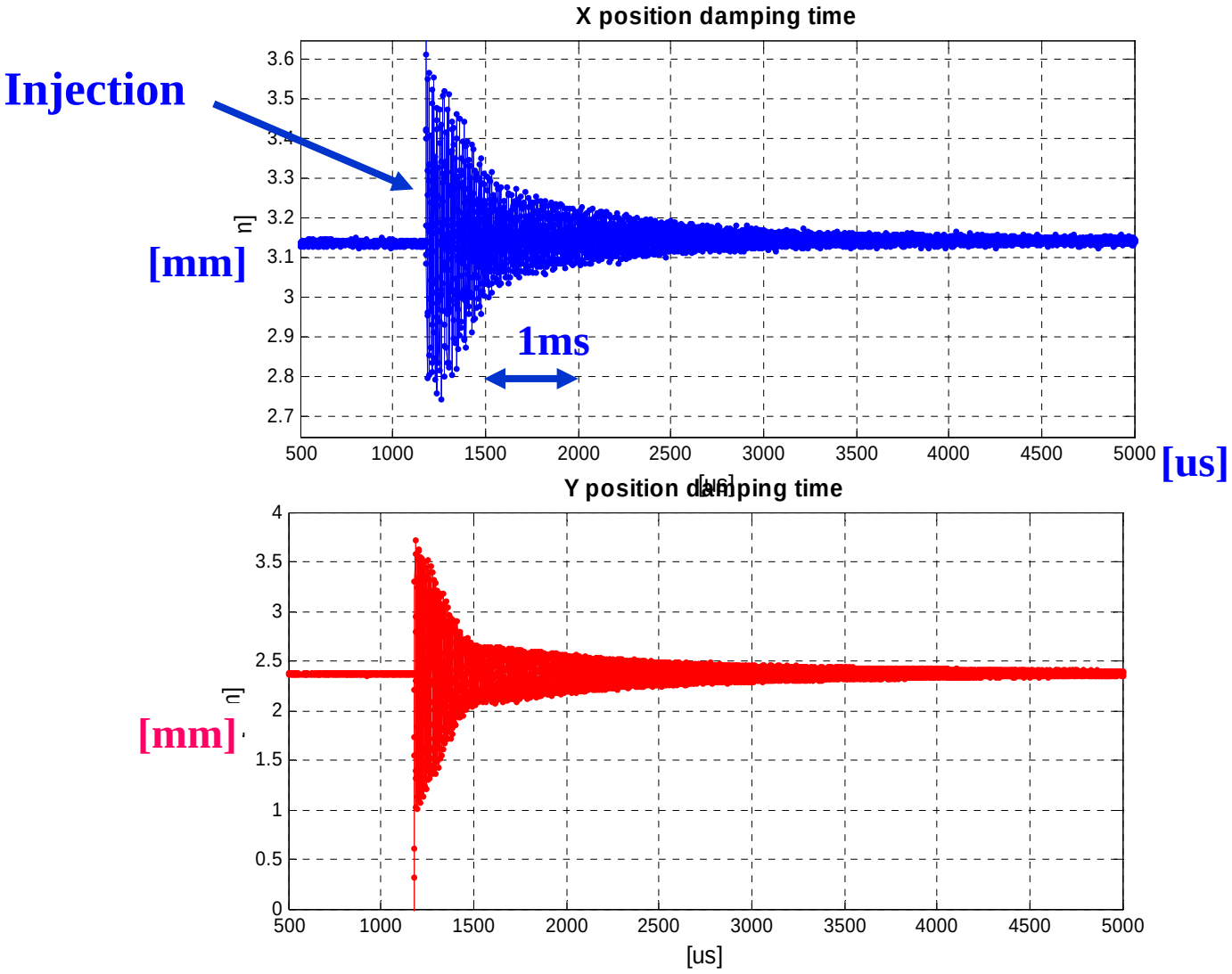


FIR filter TBT to 50 kHz

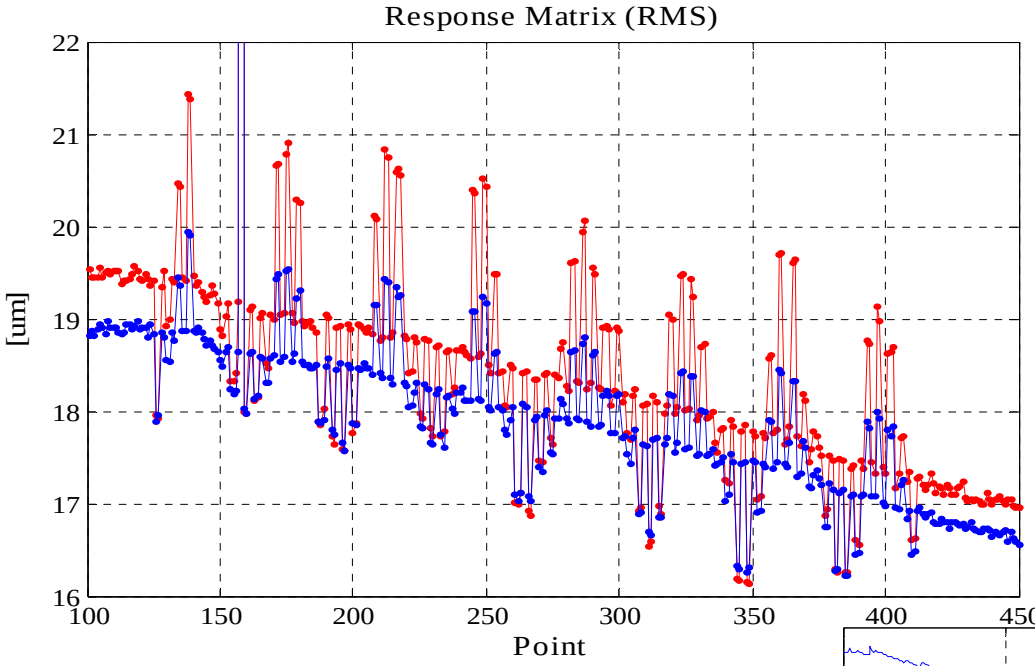
Upper: TBT data,
Lower: Filtered data

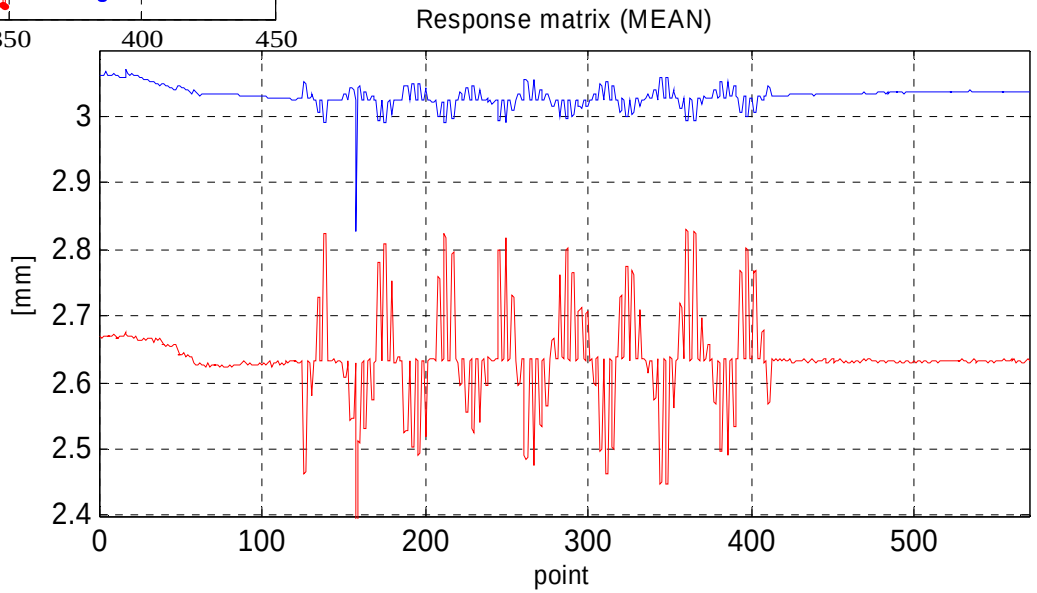


Damping time measurement



Response matrix measurement





Summary

-Digital Power Supplies

- **The PLS orbit feedback operation is based on EPICS control system.**
- **70 of 19-bit digital controlled PS and there control systems working very well.**
- **Satisfactory operation result used digital controlled PS**

-DBPM Libera

- **Testing with Libera DBPM for orbit measurements**
- **We need replace full access version software for more fast and widely applications (Tryout versions are just opened HTTP for access data, It takes 15 seconds of 8,000 data samplings)**

Planes

Digital Power Supplies:

- **Just performance monitoring**

Digital BPM:

- **Full accessible version driver install and porting EPICS IOC and optimization**
- **Single bunch testing for LINAC**

Acknowledgement

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- **Tony dobing, Mark Heron in DIAMOND**

for the many advice and support during the work.