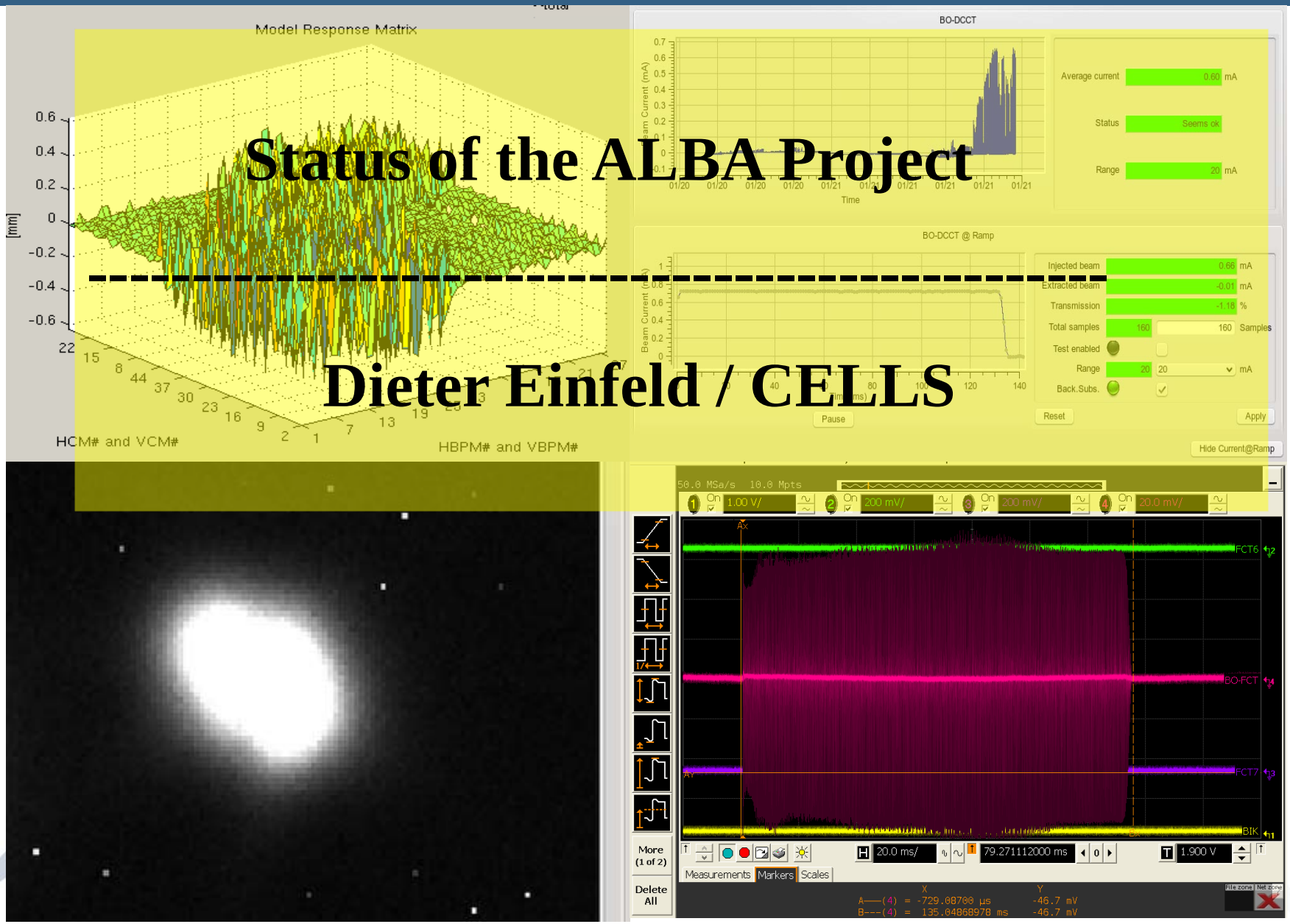
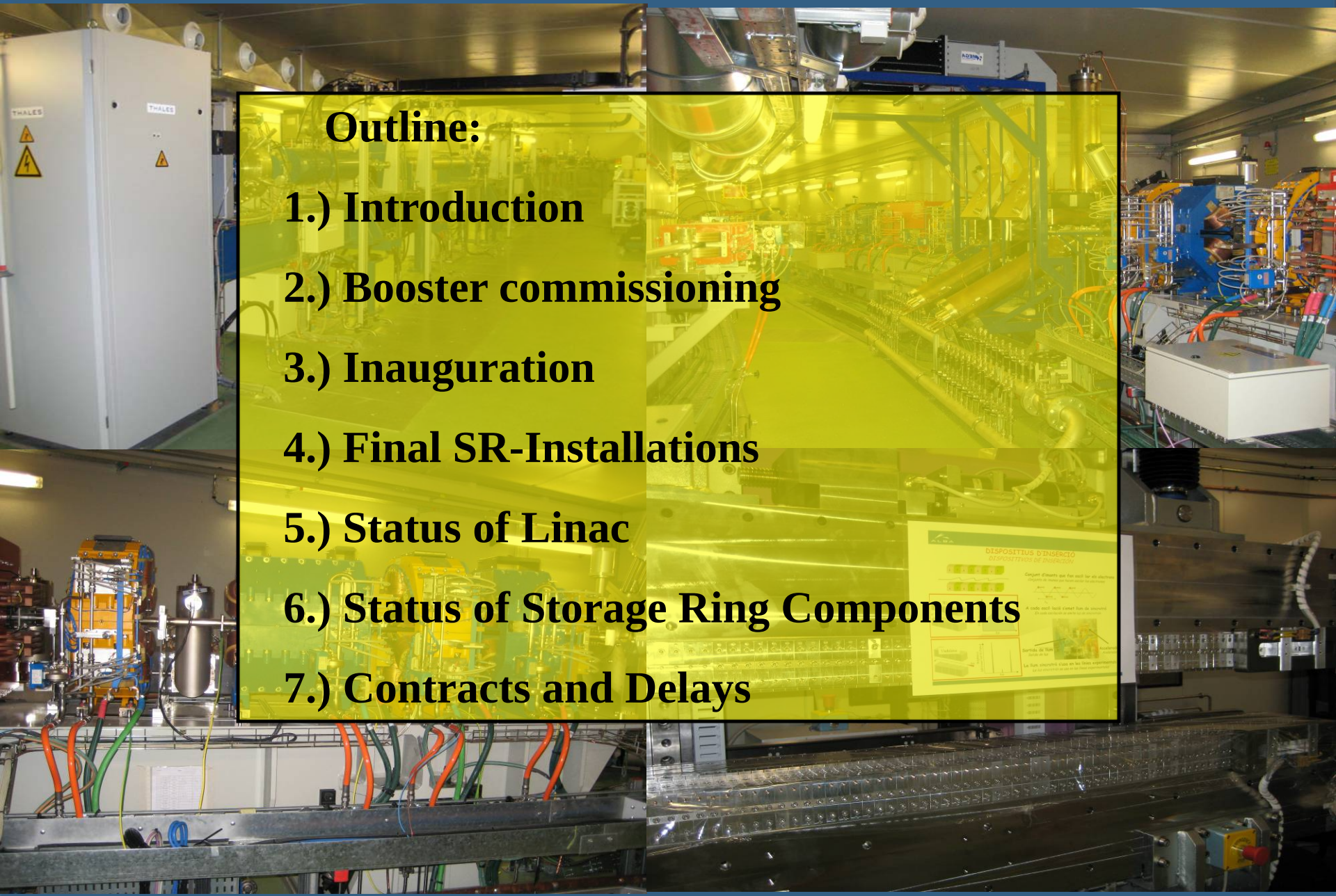


Status of the ALBA Project

Dieter Einfeld / CELLS



Outline:

1.) Introduction

2.) Booster commissioning

3.) Inauguration

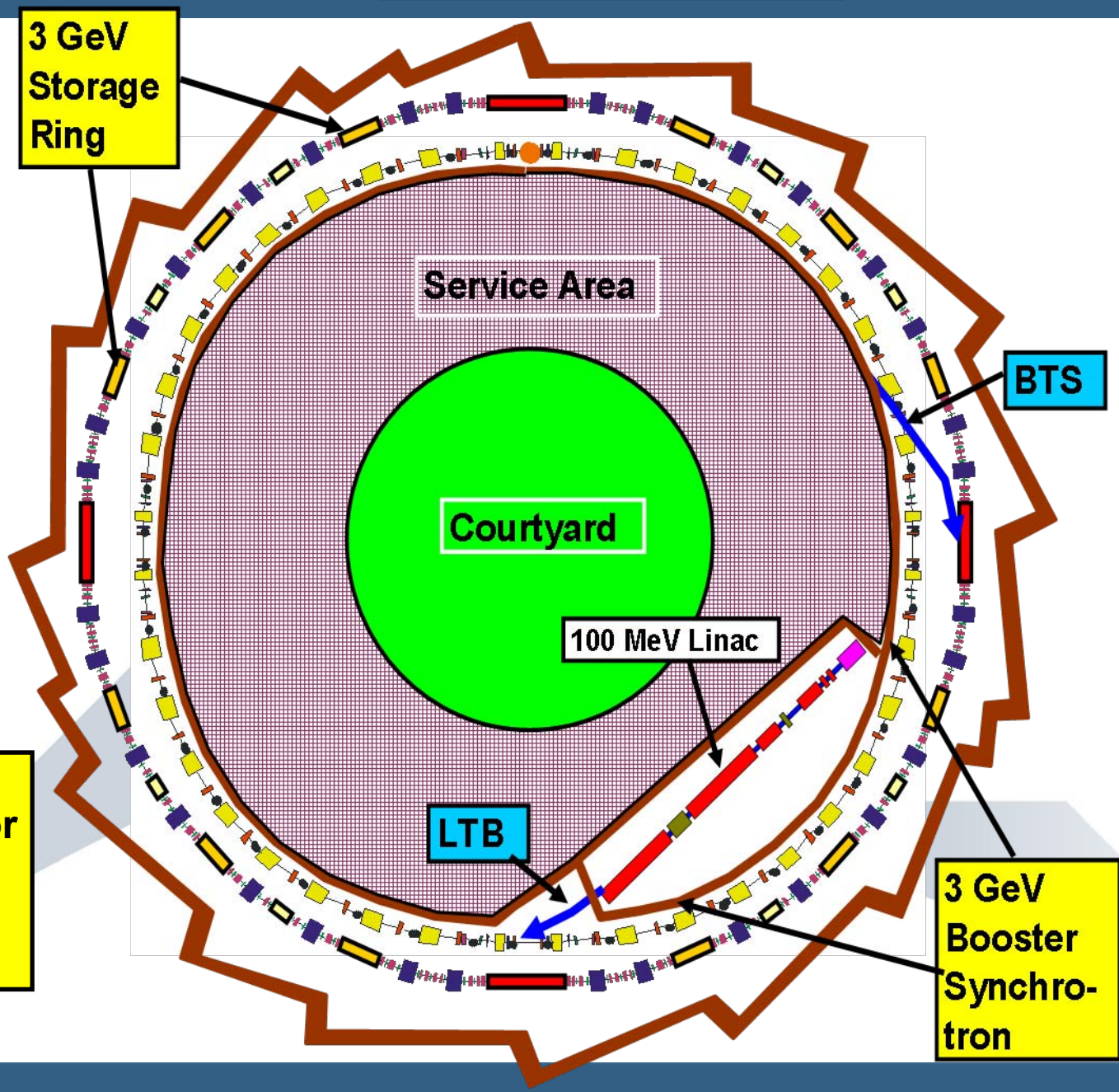
4.) Final SR-Installations

5.) Status of Linac

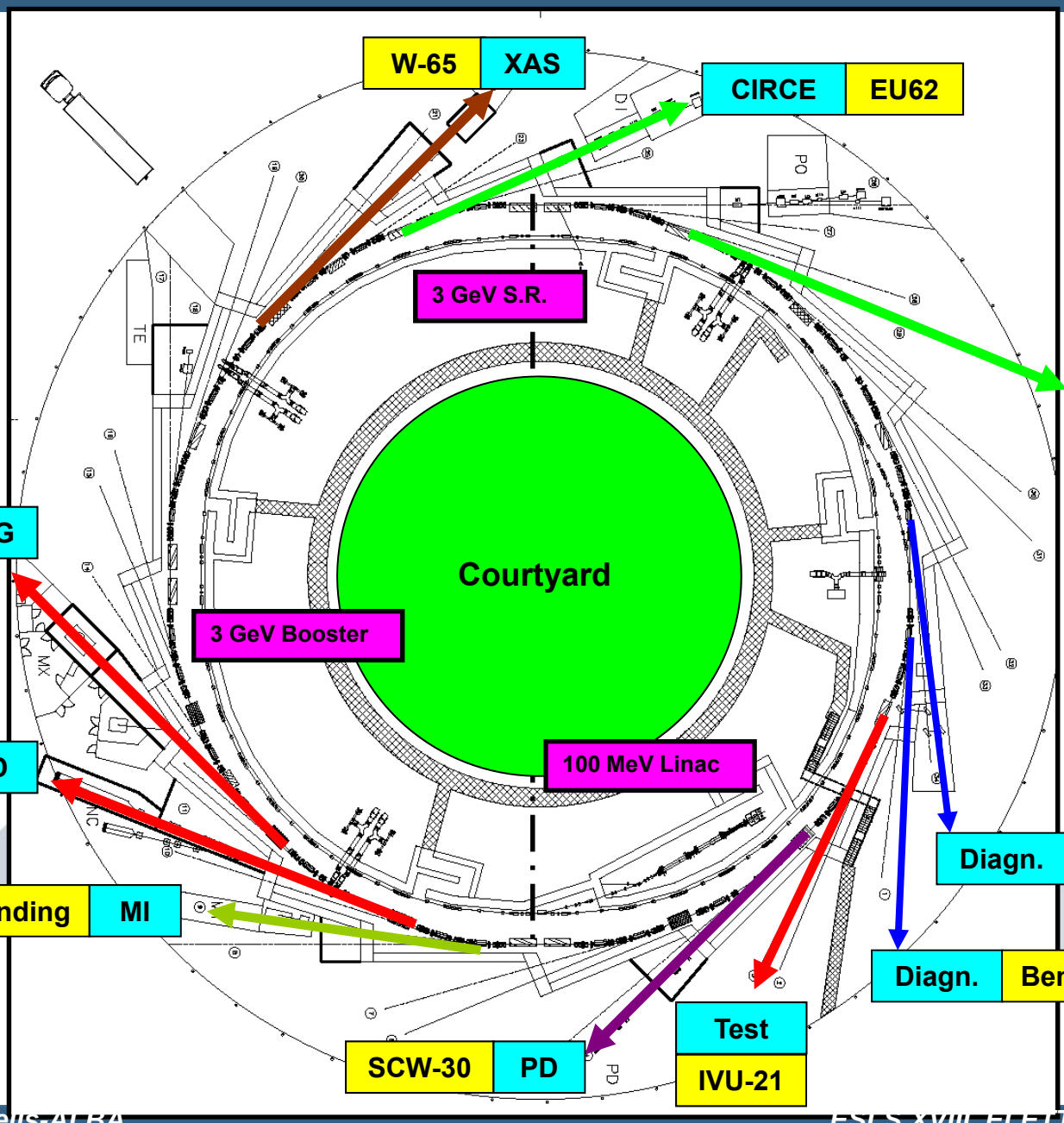
6.) Status of Storage Ring Components

7.) Contracts and Delays

I wanted to show you today the first results of the commissioning of the storage ring ALBA. Everything was prepared to start the storage ring commissioning, the Linac and the Booster were running very well and all subsystem have been tested. We worked very hard in order to start at Saturday the 20th of November. At Wednesday the 18th of November we got the message from the CSN (authority to give us the permission) that it is not allowed for us, starting the commissioning of the storage ring, because the final certificate is not issued. So we have to wait, perhaps until end of January. This is really a pity. Accordingly we have to change or time schedule.



Accelerator complex of ALBA


W-65
XAS
CIRCE
EU62
3 GeV S.R.
XMCD
EU-71
IVU-21
XALOG
Courtyard
3 GeV Booster
IVU-21
NCD
100 MeV Linac
Diagn.
Bending
Bending
MI
Diagn.
Bending
Test
IVU-21
SCW-30
PD

Big Milestones in 2010

1.) Dec. 2009: first beam in the booster

2.) Booster run in January (2.8 GeV)

3.) Official inauguration (March 2010)

4.) Installation of SR injection straight

5.) Booster run in July (no success)

6.) Booster run in Sept. / Oct. (3 GeV)

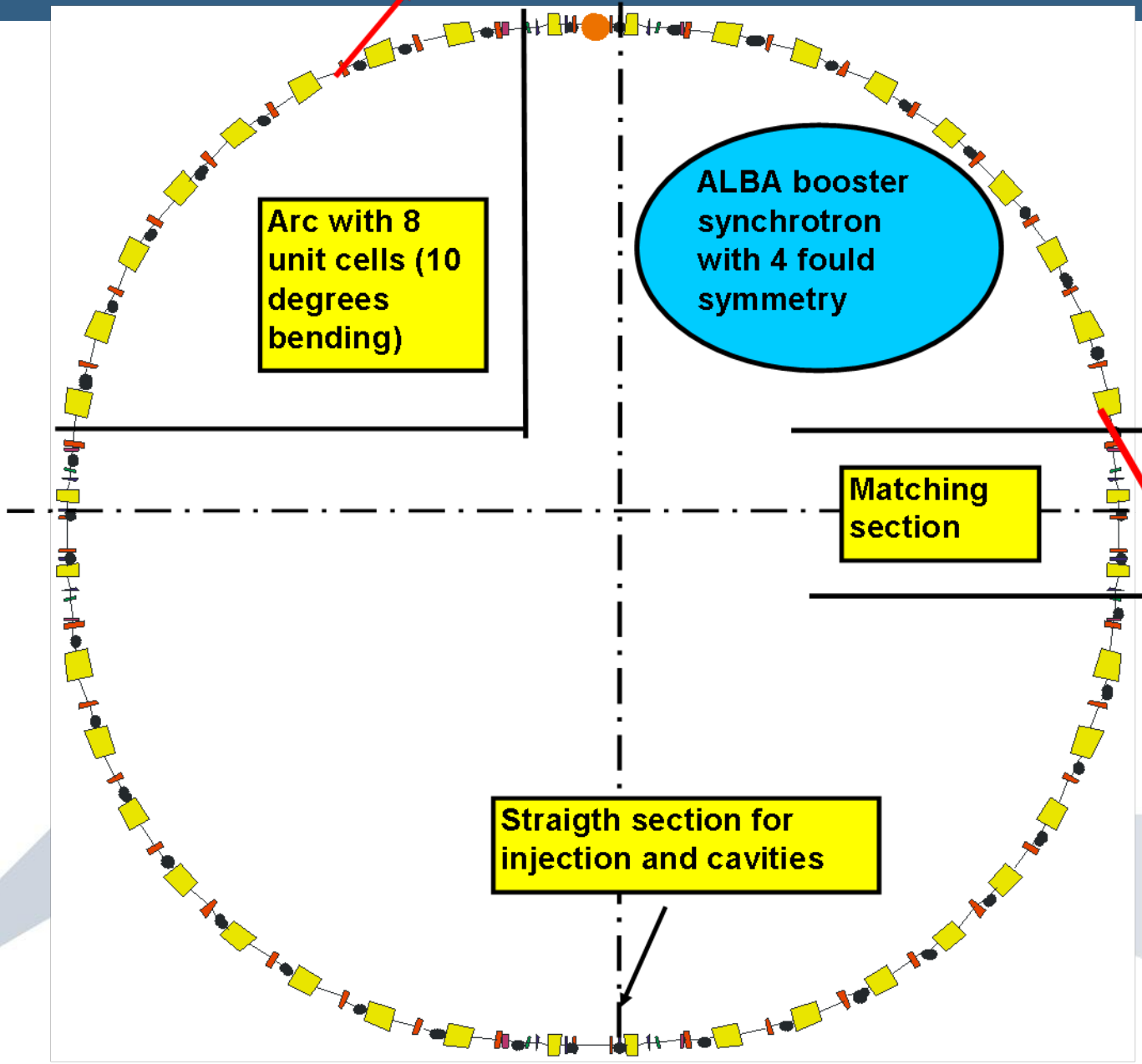
7.) Installation of BTS – transfer line

8.) Subsystem check for SR commissioning

and upcoming

9.) Beam in the storage ring (Certificate of CSN is missing)

Booster: Layout

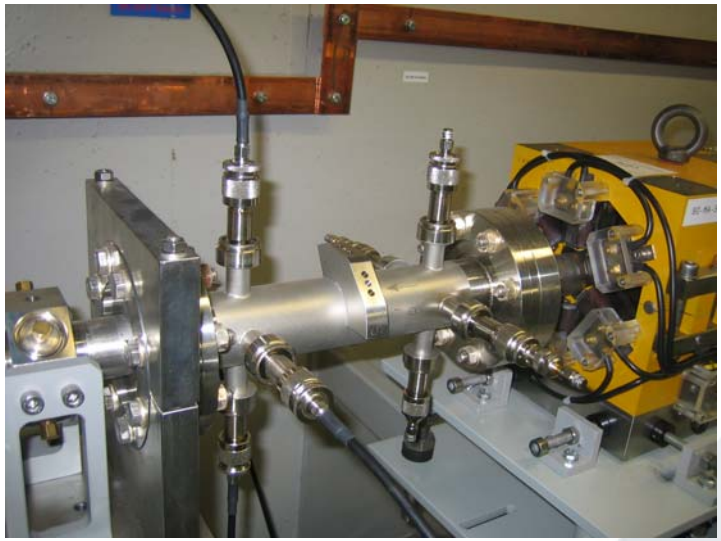


Diagnostics at the Booster:

Fully operational and commissioned

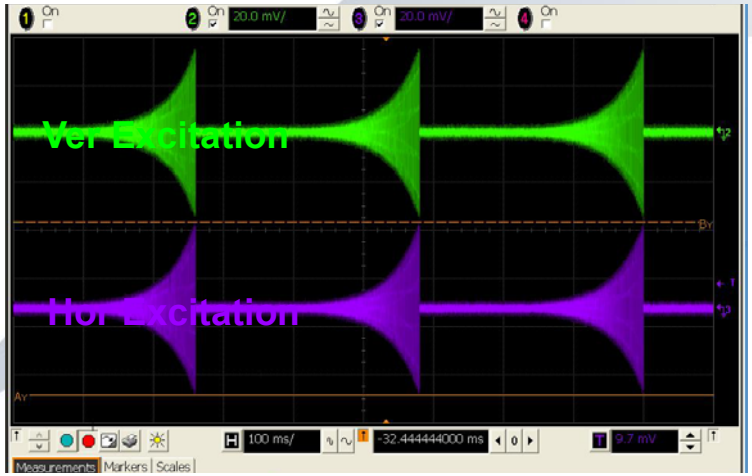
- 1 FCT: Fast Current Monitor
- 1 DCCT: DC Current Monitor
- 44 BPMs: (designed tunes are 12.42 and 7.38)
- 2 Striplines: one for beam excitation, one for beam position meas.
- 4 FSOTRs: with pneumatic motion, it allows to see injected beam)
- 1 FSH: located at extraction vacuum chamber and has motorized motion.
  It allows to see both injected and extracted beam.
- 3 SRMs: follow beam image along the ramp

Example: Tune meas. with Striplines

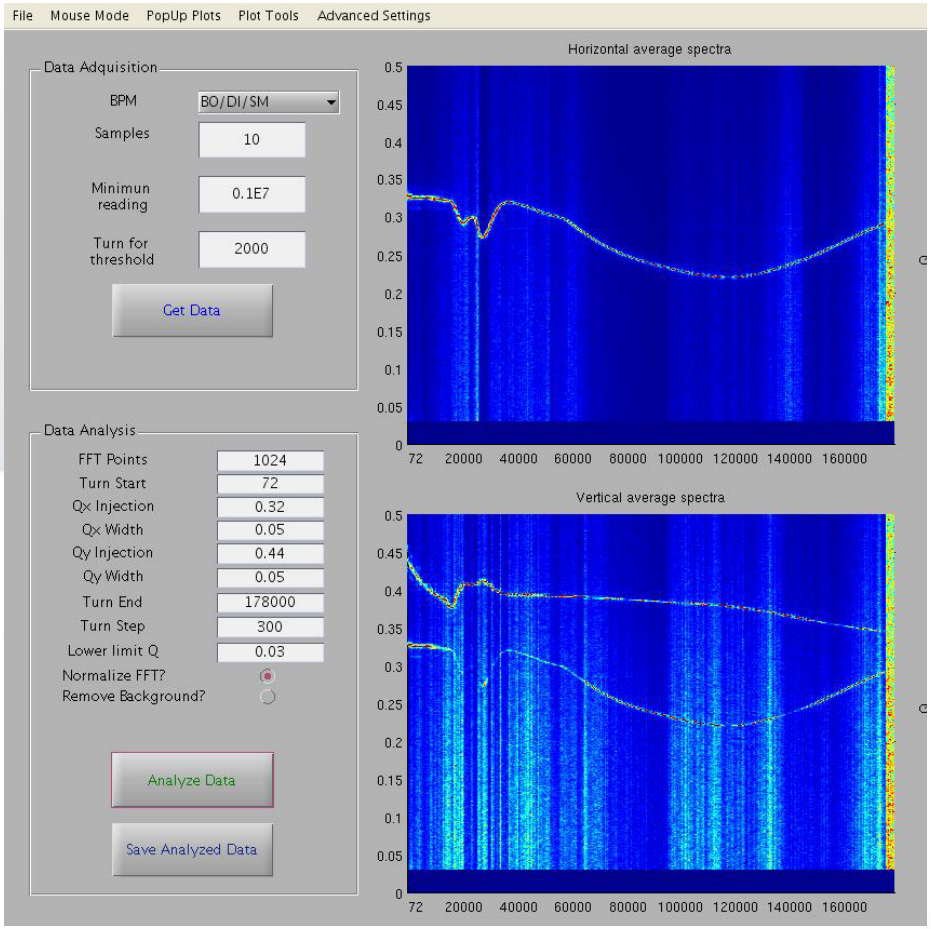


- One stripline BPM is used as kicker.
- One stripline BPM is used as position measurement, whose FFT provides tune

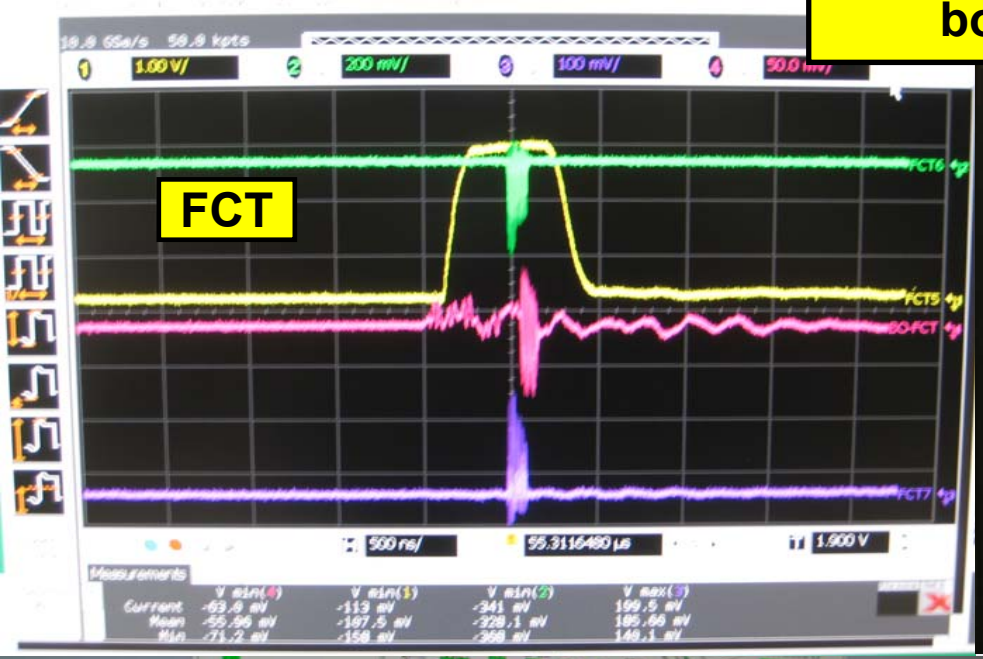
Amplitude of beam kick **increases in synchronism with beam energy**, so to have enough power to excite beam w.o. killing it.

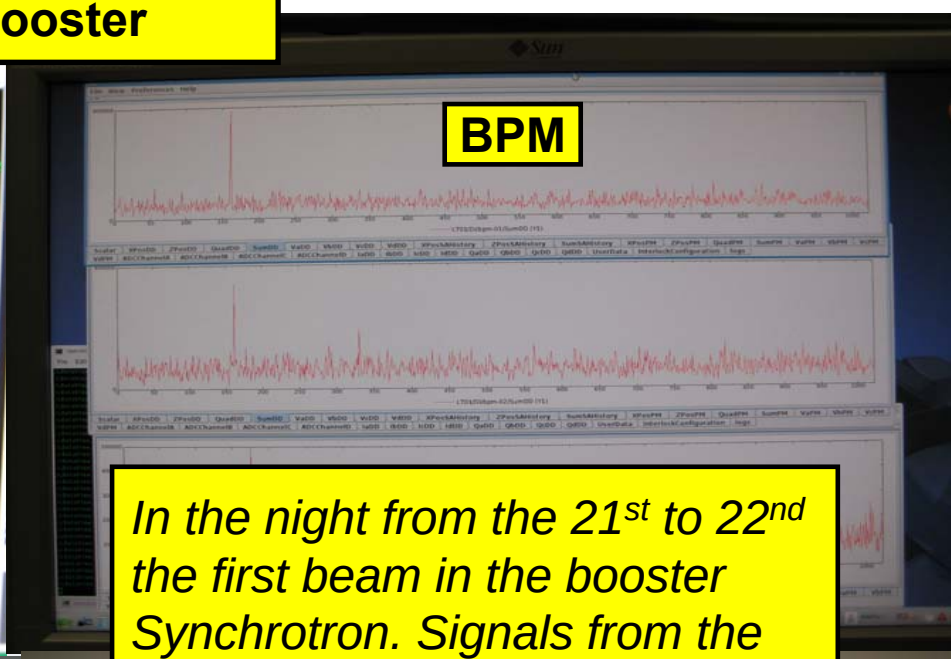


Tune measurement via FFT in MML:

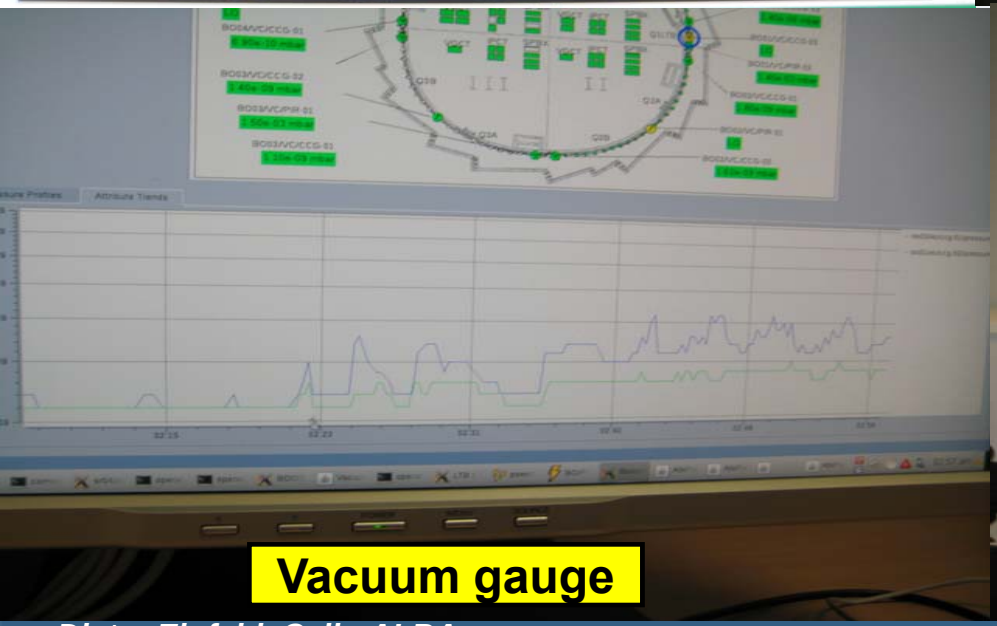


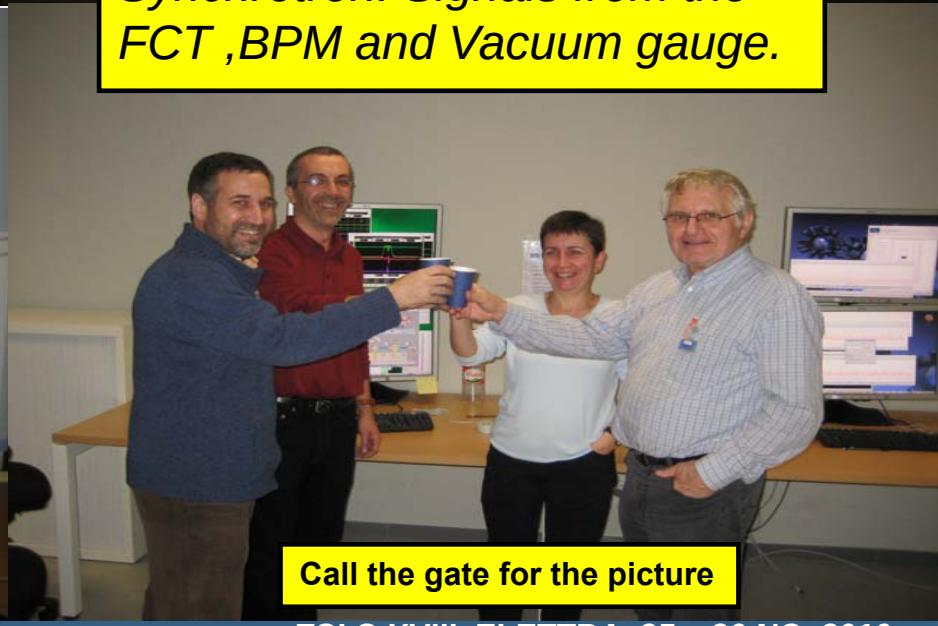
1st beam in the booster





In the night from the 21st to 22nd the first beam in the booster Synchrotron. Signals from the FCT ,BPM and Vacuum gauge.

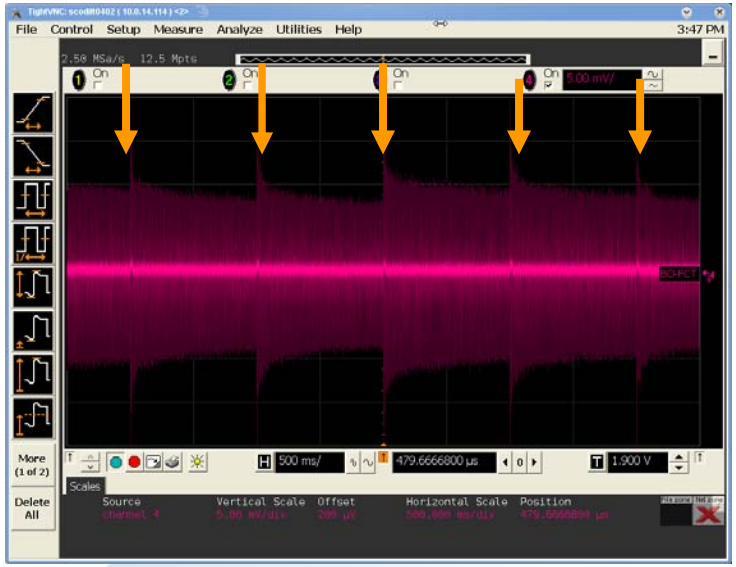




12.01.10 Beam in the BO, 1st turn

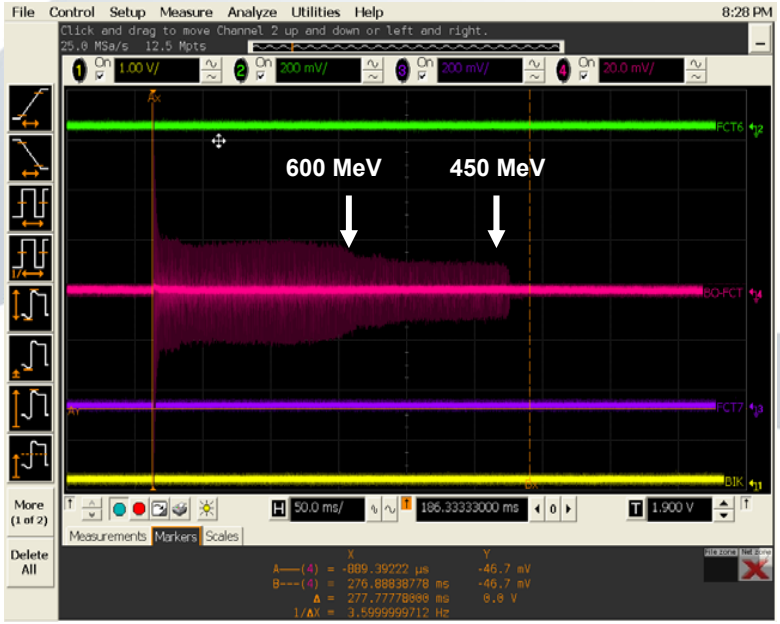
With vertical correctors BO

17.01.10: RF ON, beam captured

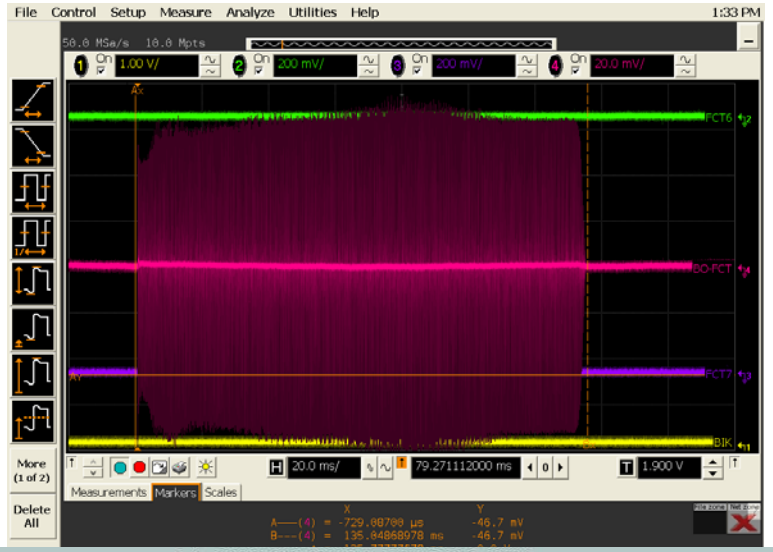


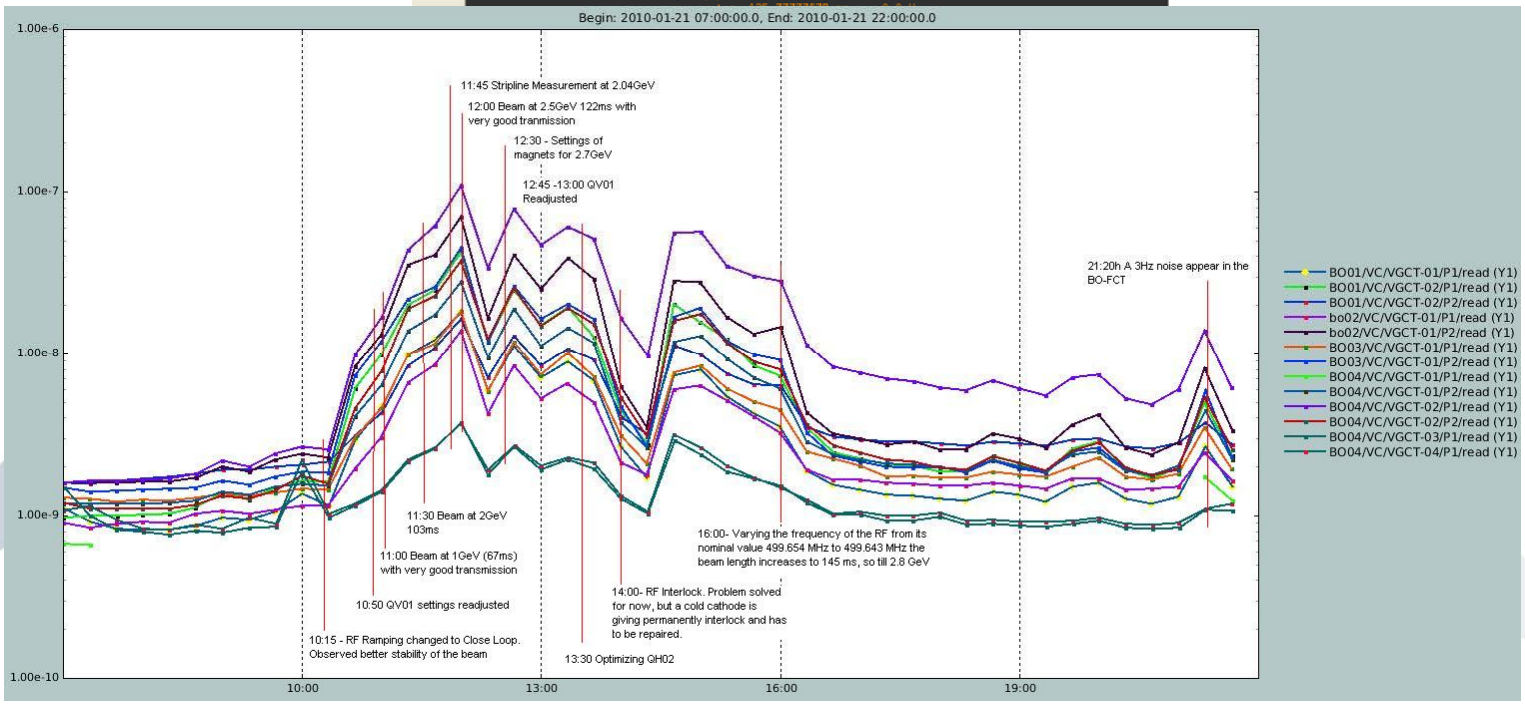
Injections 1 s apart

19.01.10 :Ramping to 600 MeV (PS + RF)

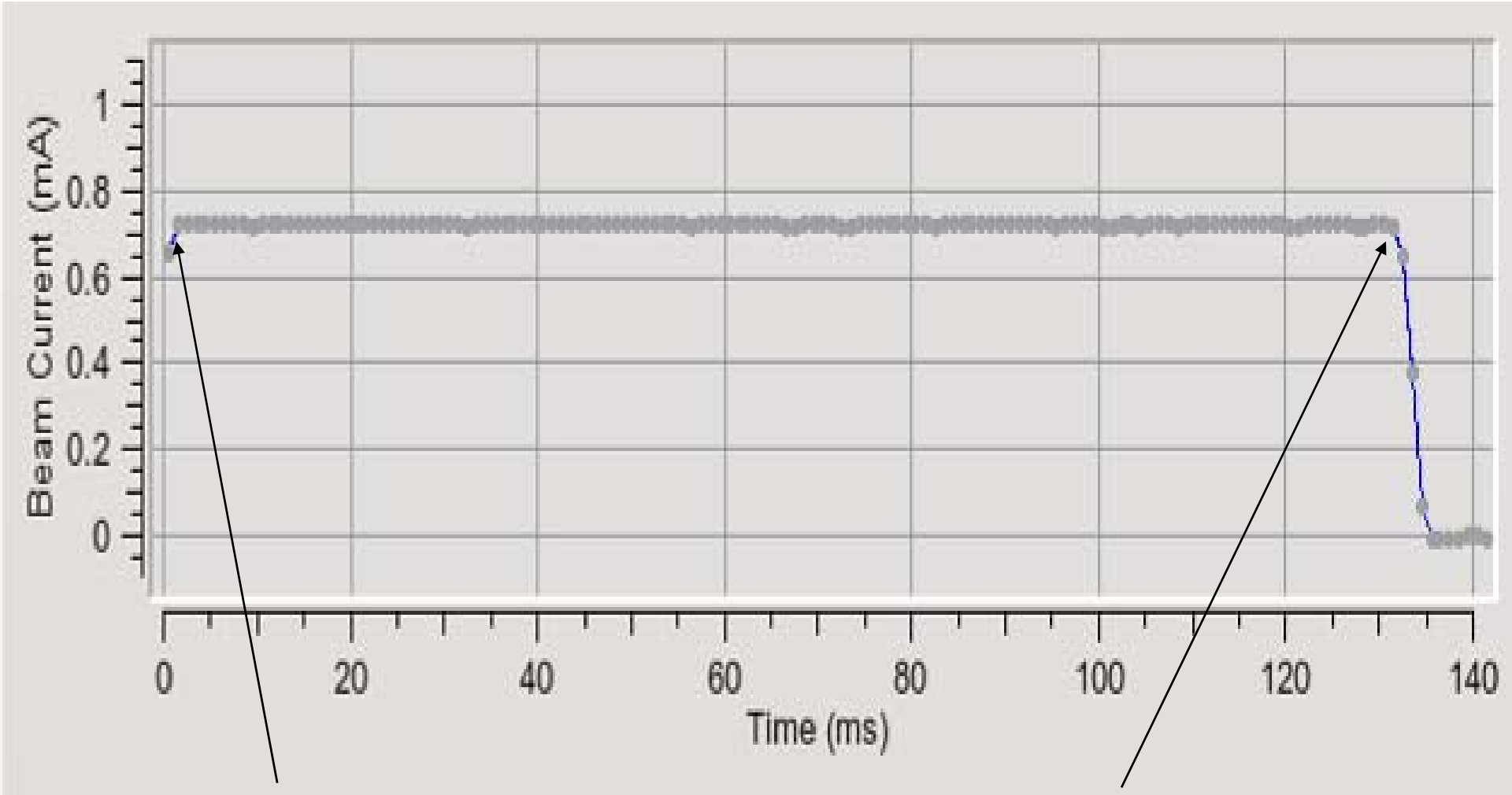


21.01.10: Ramping to 2.7 GeV (PS + RF)





Booster: acceleration from 100 MeV to 2.7 GeV

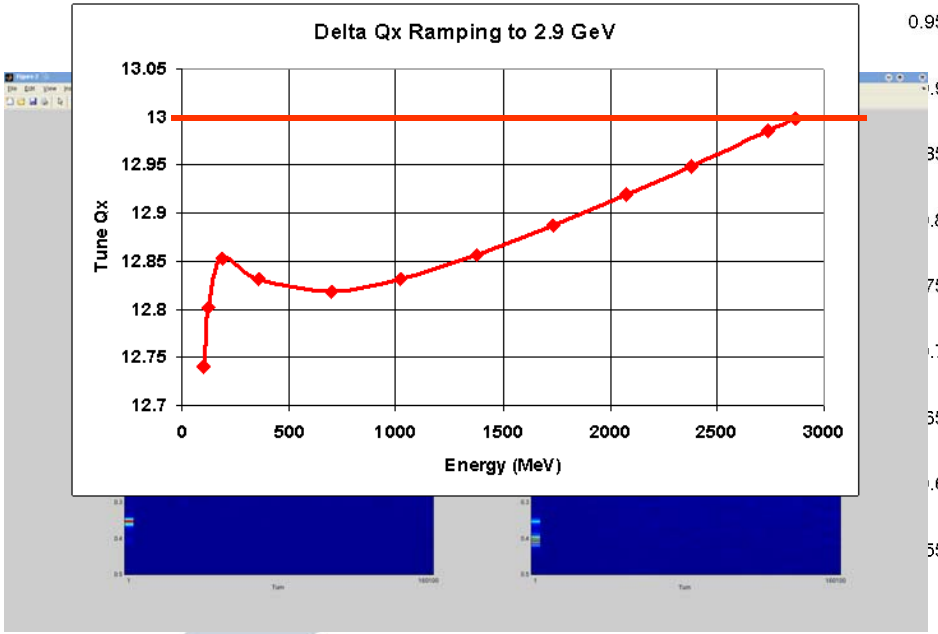


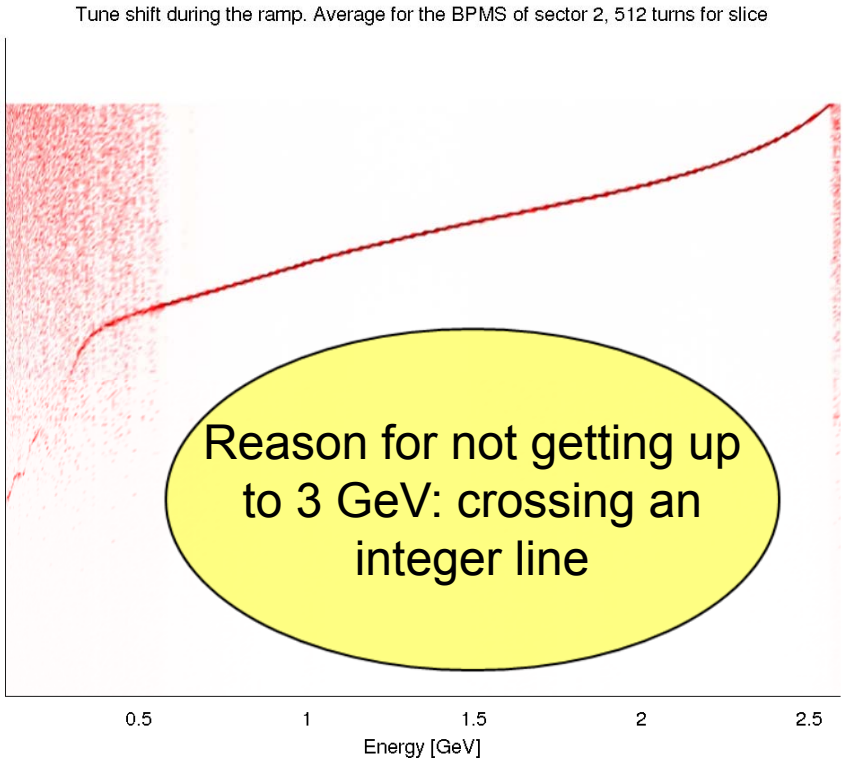
$I_{injected}$ = 0.7 mA

I = 0.7 mA 130 ms later

During ramping to 3.0 GeV

- ✓ **Reproducing the measurements using the magnets calibration**

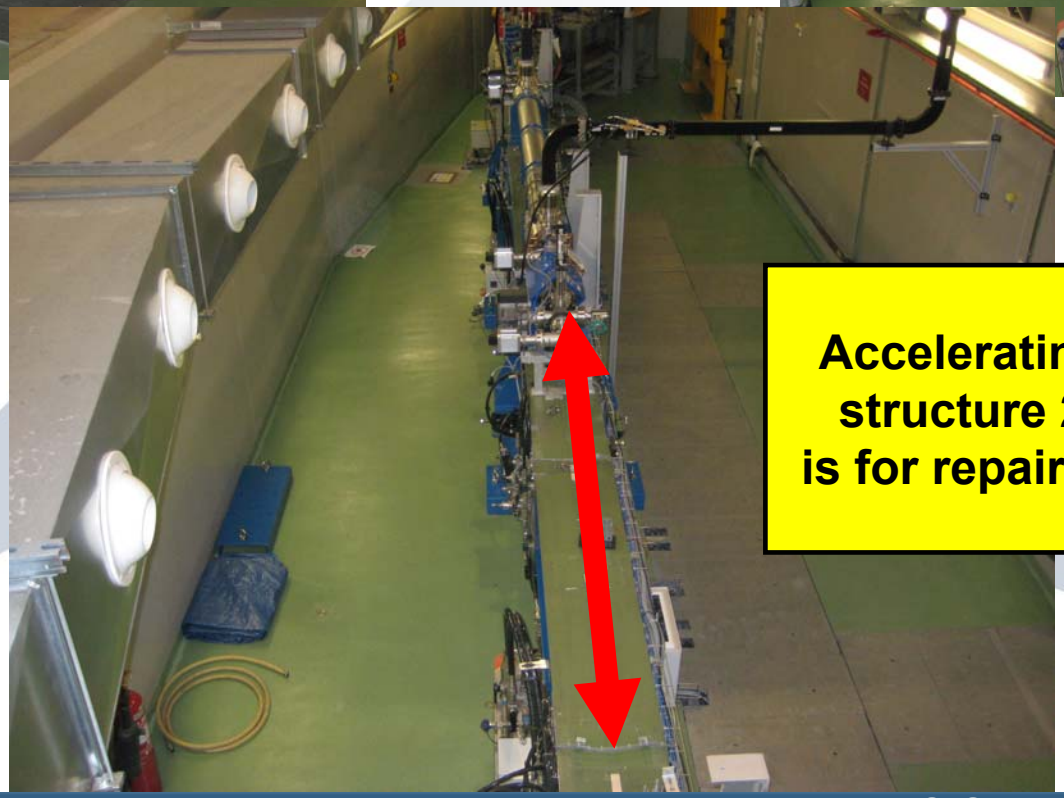




Good agreement with the measured tune


22nd of March: Official Inauguration of CELLS
INAUGURATION
INAUGURACIÓN
INAUGURACIÓ
ALBA


Installation of
injection straight



Accelerating structure 2 is for repairing

Booster Run in July

In July we had an other 2 weeks for booster commissioning. We have had only problems and no success:

1.) A lot of discharges in the Linac structure 2, reduction of the energy to 96 MeV. This gave us a lot of problems for the ramping.

2.) Failure in a booster bending power supply, running only with 1 power supply, change of the connections.

3.) Failure in the other booster bending power supply. Finishing of booster commissioning.

Changing of the commissioning time schedule: not a period of some weeks, instead each day

See results of the booster commissioning by the talk of Gabriele Benedetti (tomorrow).

POWER SUPPLIES

SR Power supplies:

Dipoles, Quads and Sexts: all delivered, installed, tested and now running on a daily basis.

- ✓ Stability ±10 ppm
- ✓ Resolution of 5 ppm

SR Corrector Power Supplies:

The delivery is not yet completed. But we have all CORH, CORV and SKEW correctors. Missing are the power supplies for the trim coils installed on the bending magnets .

- ✓ 3 dB at 1 kHz for the output current
- ✓ Stability ±20 ppm
- ✓ Resolution of 5 ppm

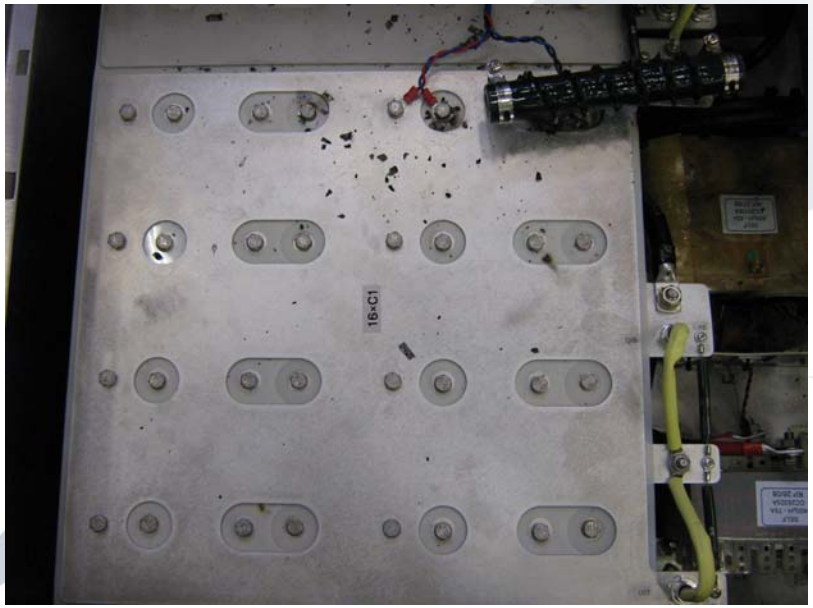
POWER SUPPLIES

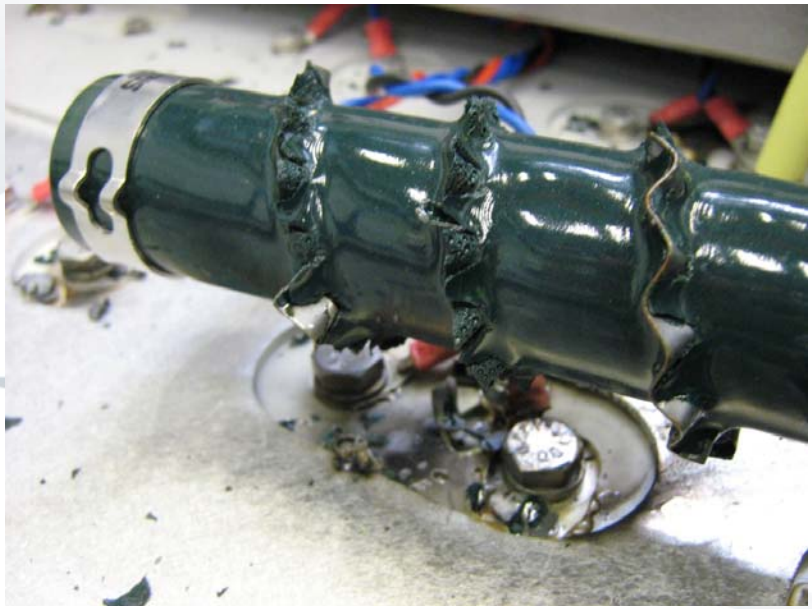
BO Power Supplies:

1 Dipole power supply had failed 3 times.

Defective capacitor that cause failure of the semiconductors.

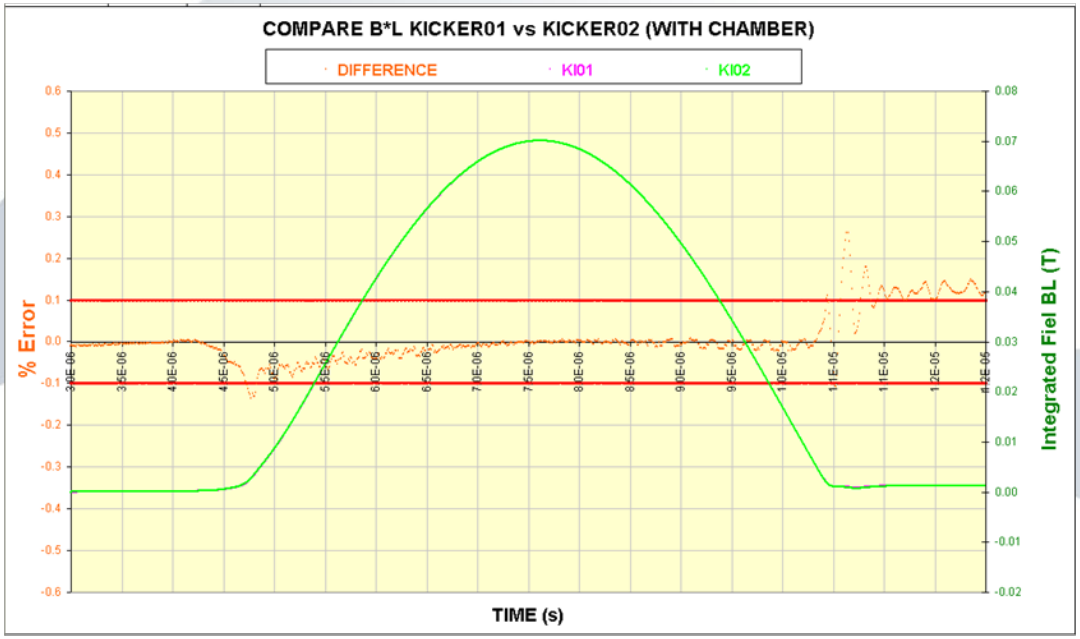
Solution: Exchange the capacitor for another with tighter tolerances



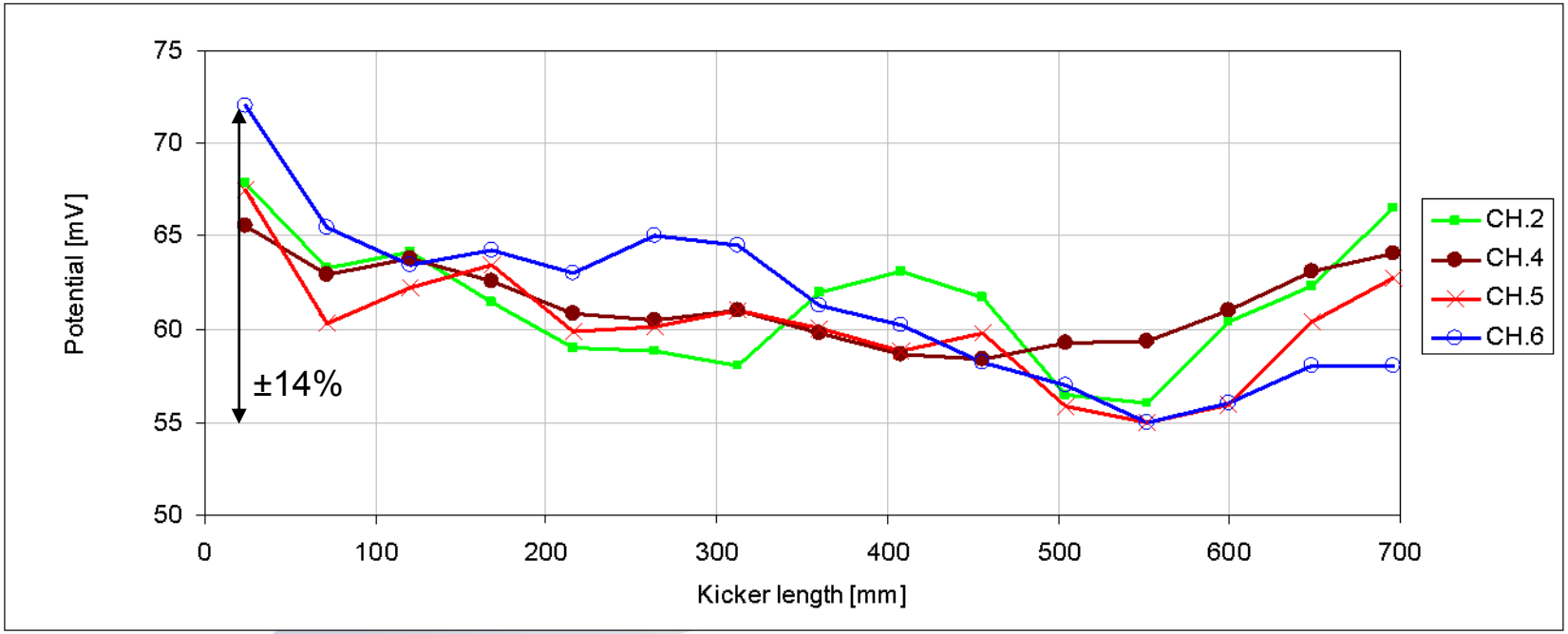


SR PULSED ELEMENTS

- ✓ Installed, and cabled during this year
- ✓ SR KICKERS
  - ✓ Jitter < 1 ns (peak to peak)
  - ✓ Amplitude stability < 0.08%
  - ✓ kickers identity ≈ 0.1%



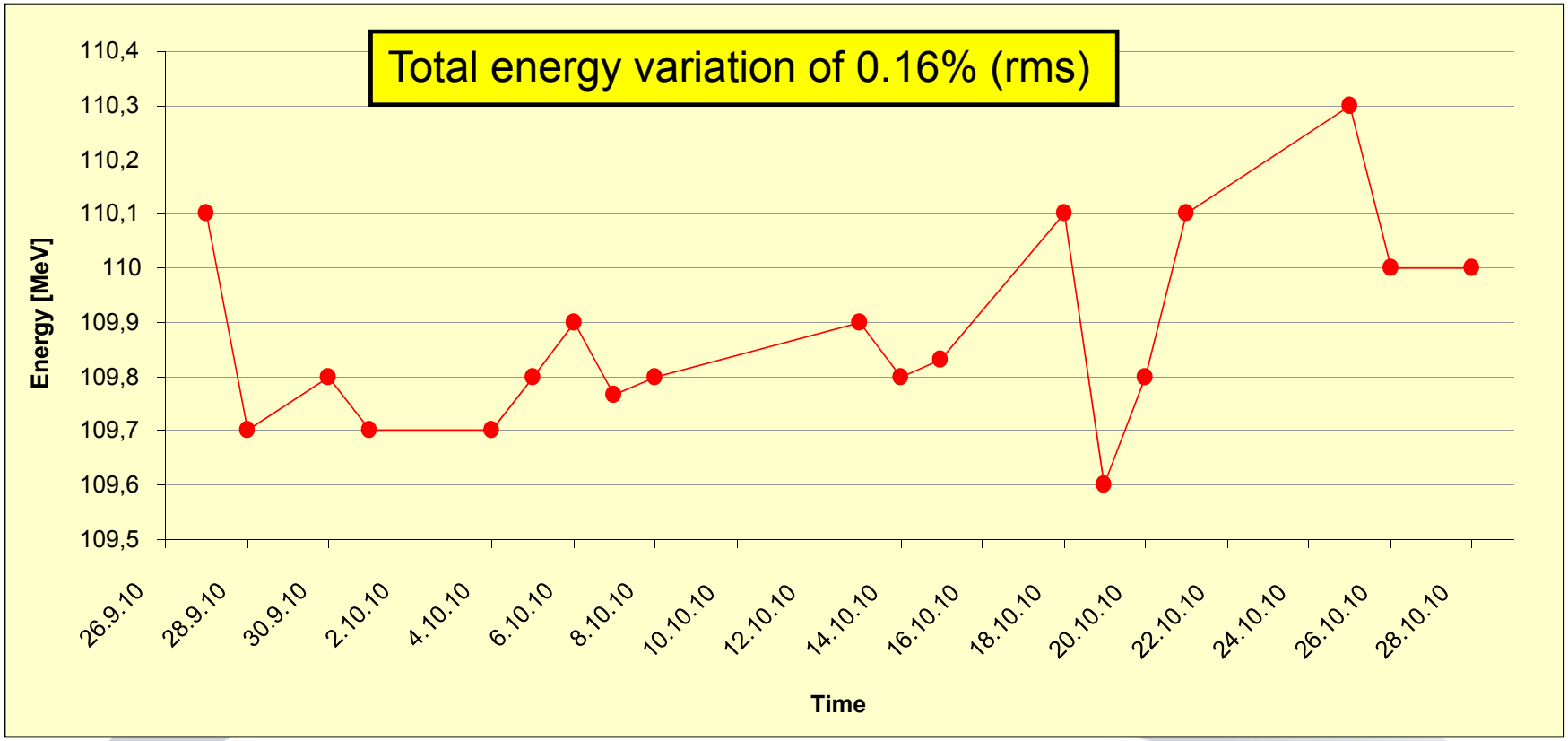
400 nm coating, homogeneity within ± 14% in ± 25 mm of the center (top and bottom)



Chambers	R [Ohm]
CH.2	4.81
CH.4	4.27
CH.5	4.28
CH.6	4.36

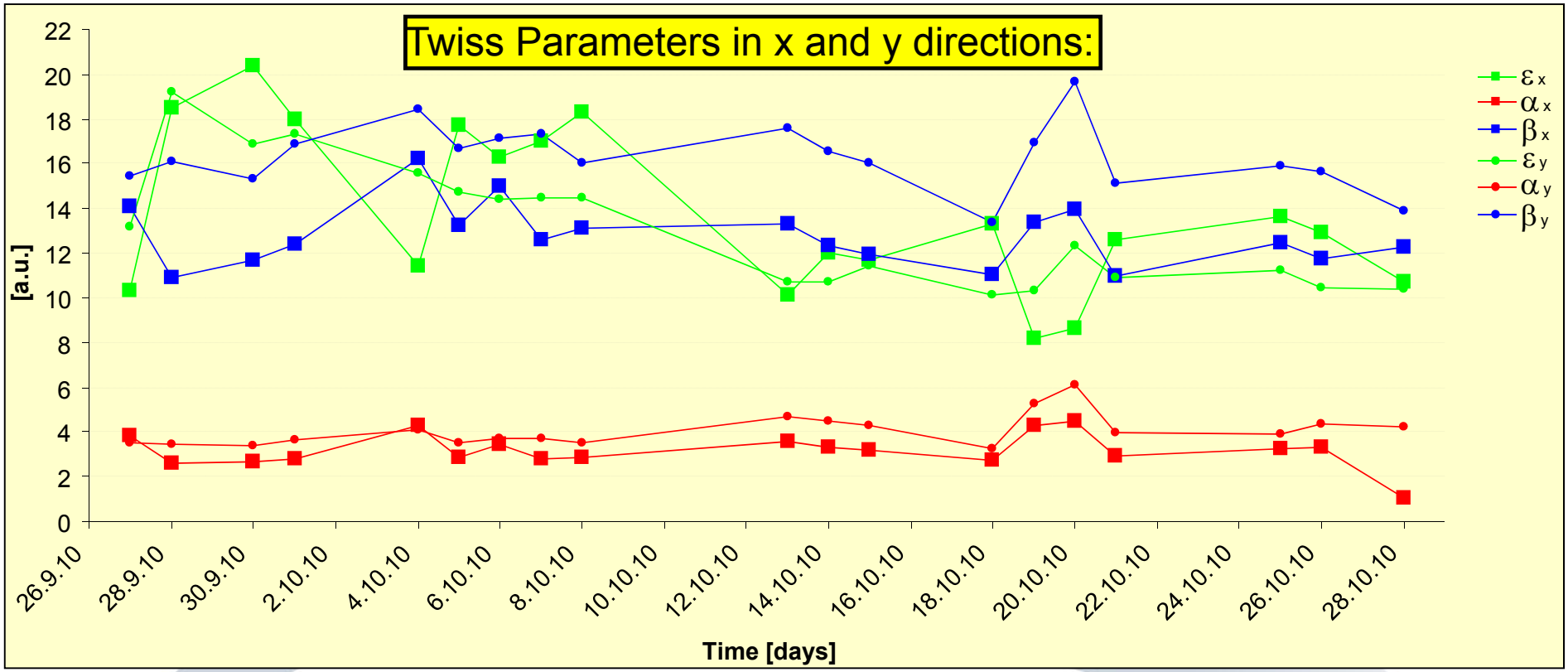
Installation of BTS-Transfer line

Stability of the linac beam parameters during Booster Commissionning, Oct. 2010



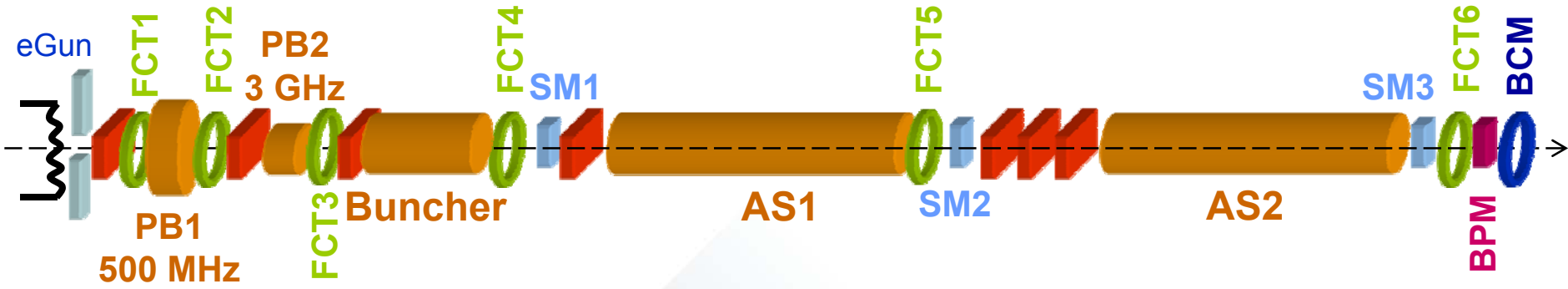
- The highest fluctuations in all parameters are correlated to water cooling instabilities.
- All parameters are within specifications

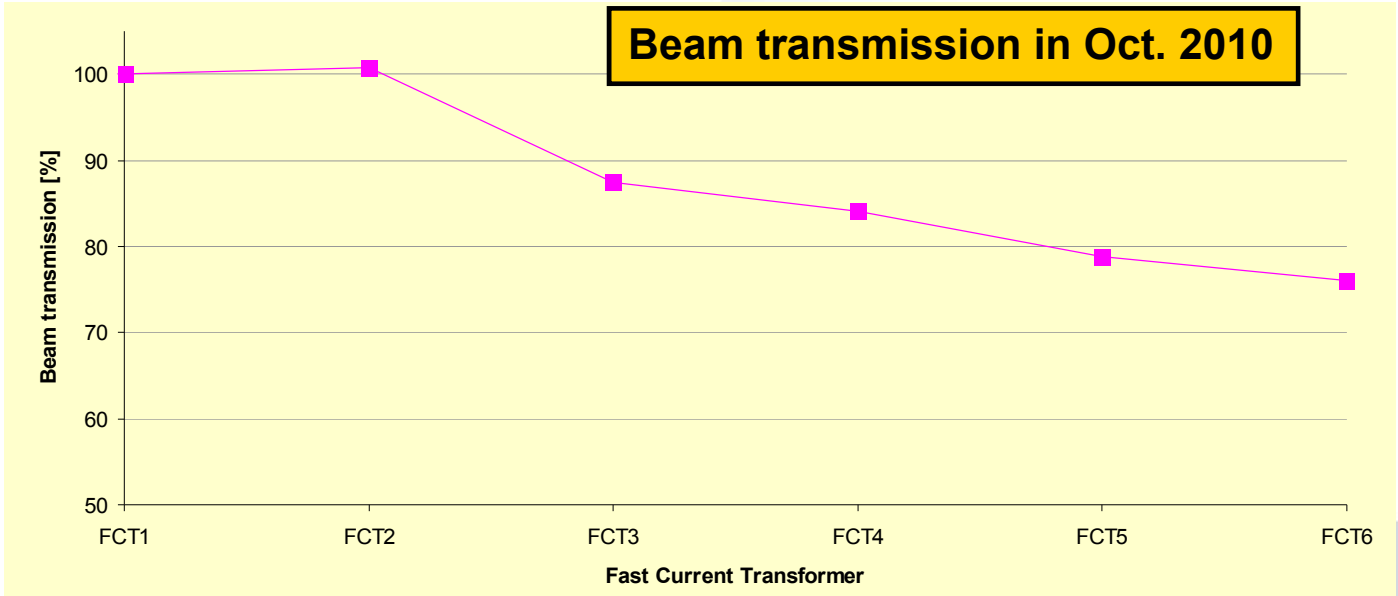
Stability of the linac beam parameters during Booster Commissionning, Oct. 2010



- The highest fluctuations in all parameters are correlated to water cooling instabilities.
- All parameters are within specifications

Linac beam transmission in MBM

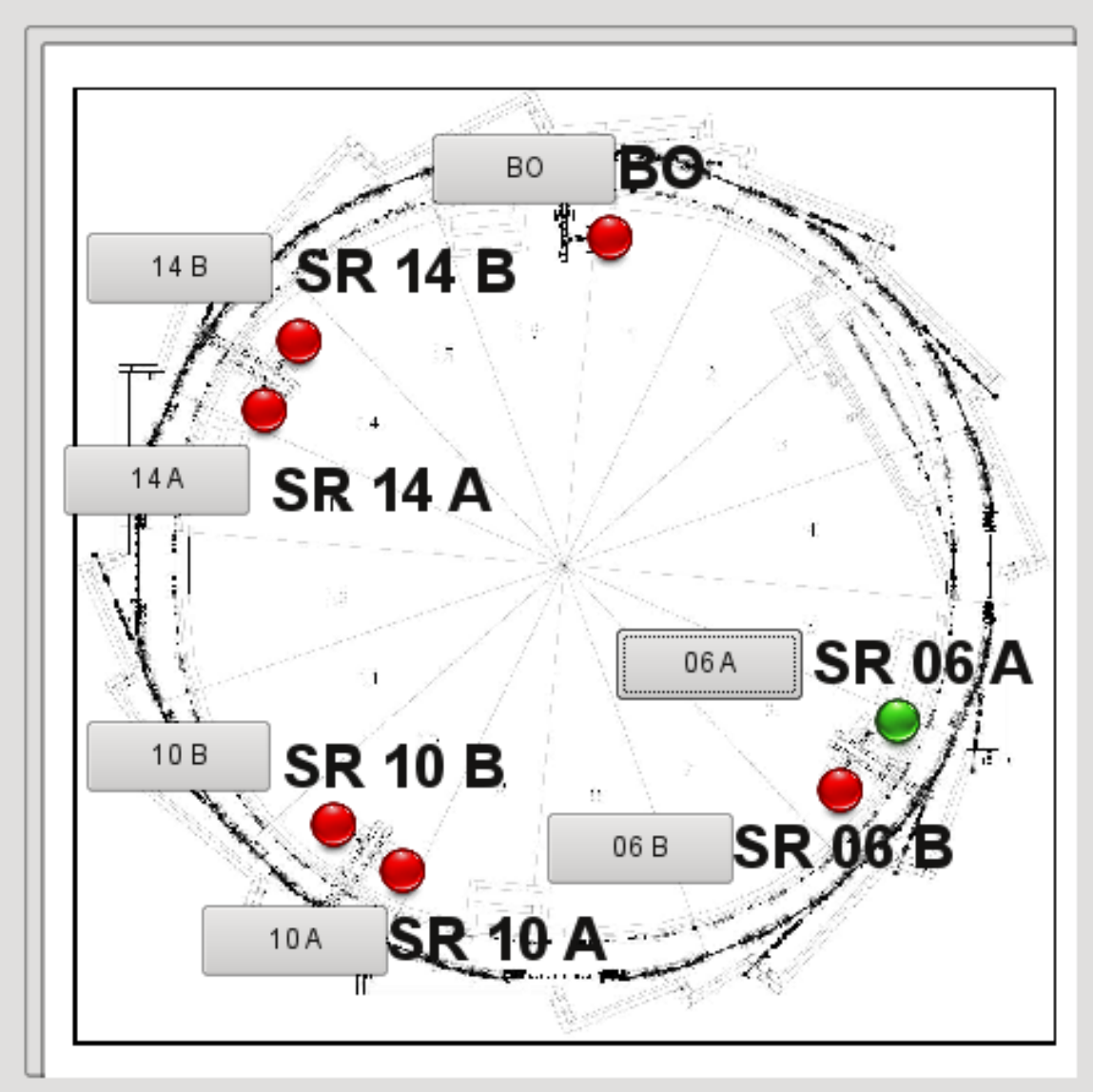




Major losses:
Between 30 and 65 MeV, so, in AS1.

	Beam Parameters	Buncher transmission	Linac transmission
Calculation	MBM, 112ns, 4nC, 120 MeV	95%	67%
Measurement Oct. 2010	MBM, 112ns, 1nC, 110 MeV	96%	76%

RF = Plant

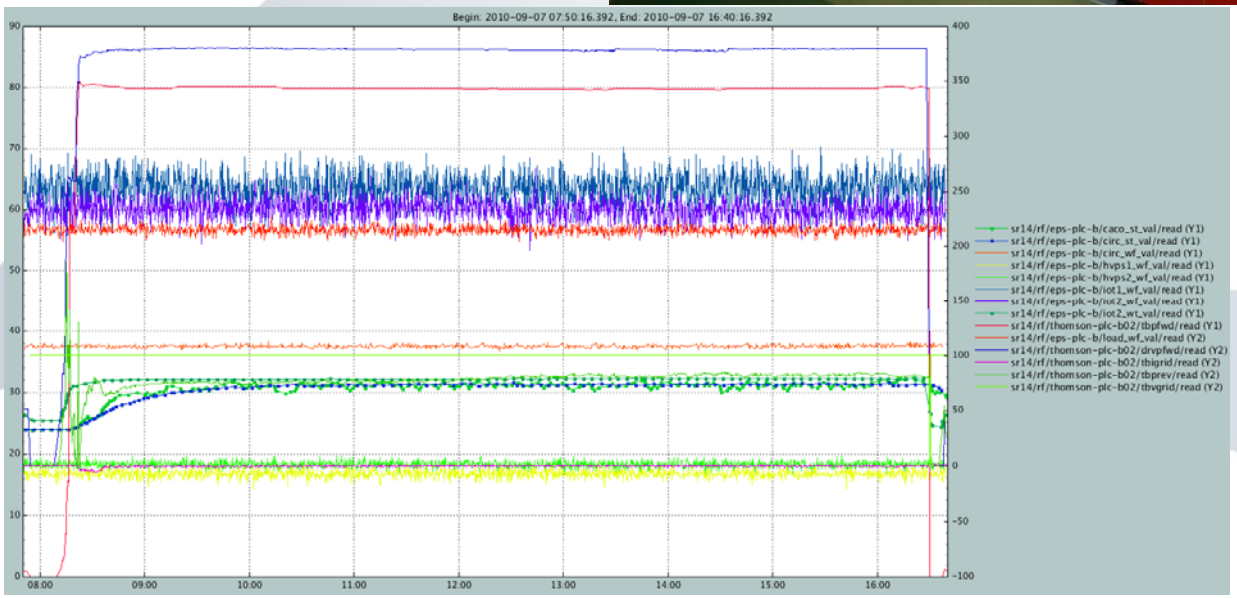

BO
BO
14 B
SR 14 B
14 A
SR 14 A
06 A
SR 06 A
10 B
SR 10 B
06 B
SR 06 B
10 A
SR 10 A

SR-Transmitters

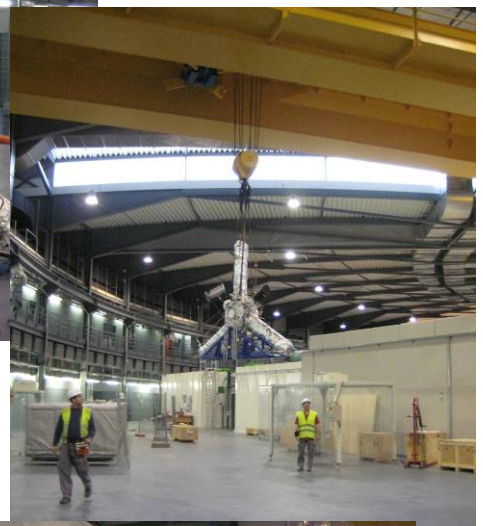
March - September 2010:

✓ RF Commissioning (with Thomson)

All SR transmitters has passed the SAT



SR Dampy Cavities: Installation

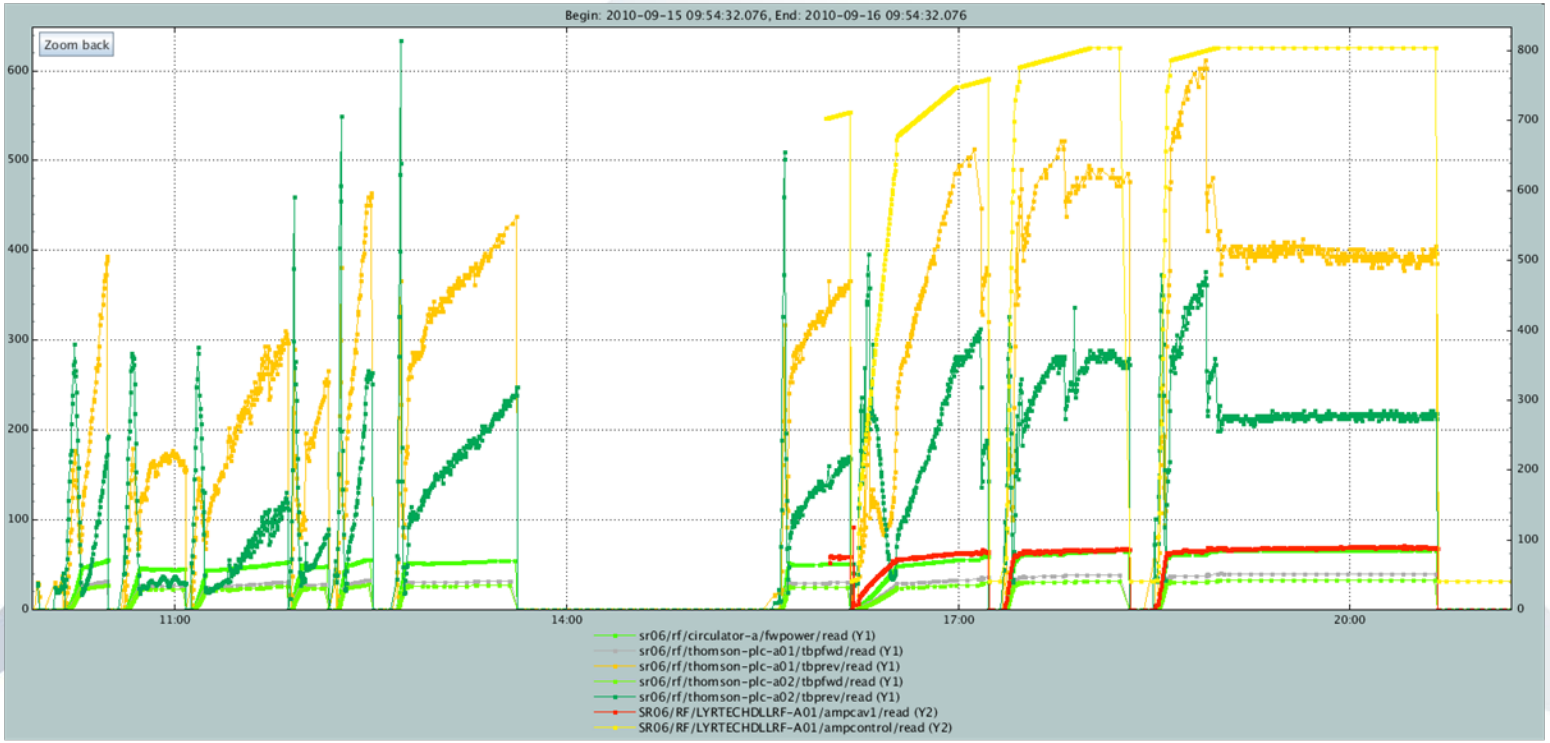


- ✓ All 6 performing well
- ✓ Installed and bake-out in situ
- ✓ Alignment, cabling and cooling ready

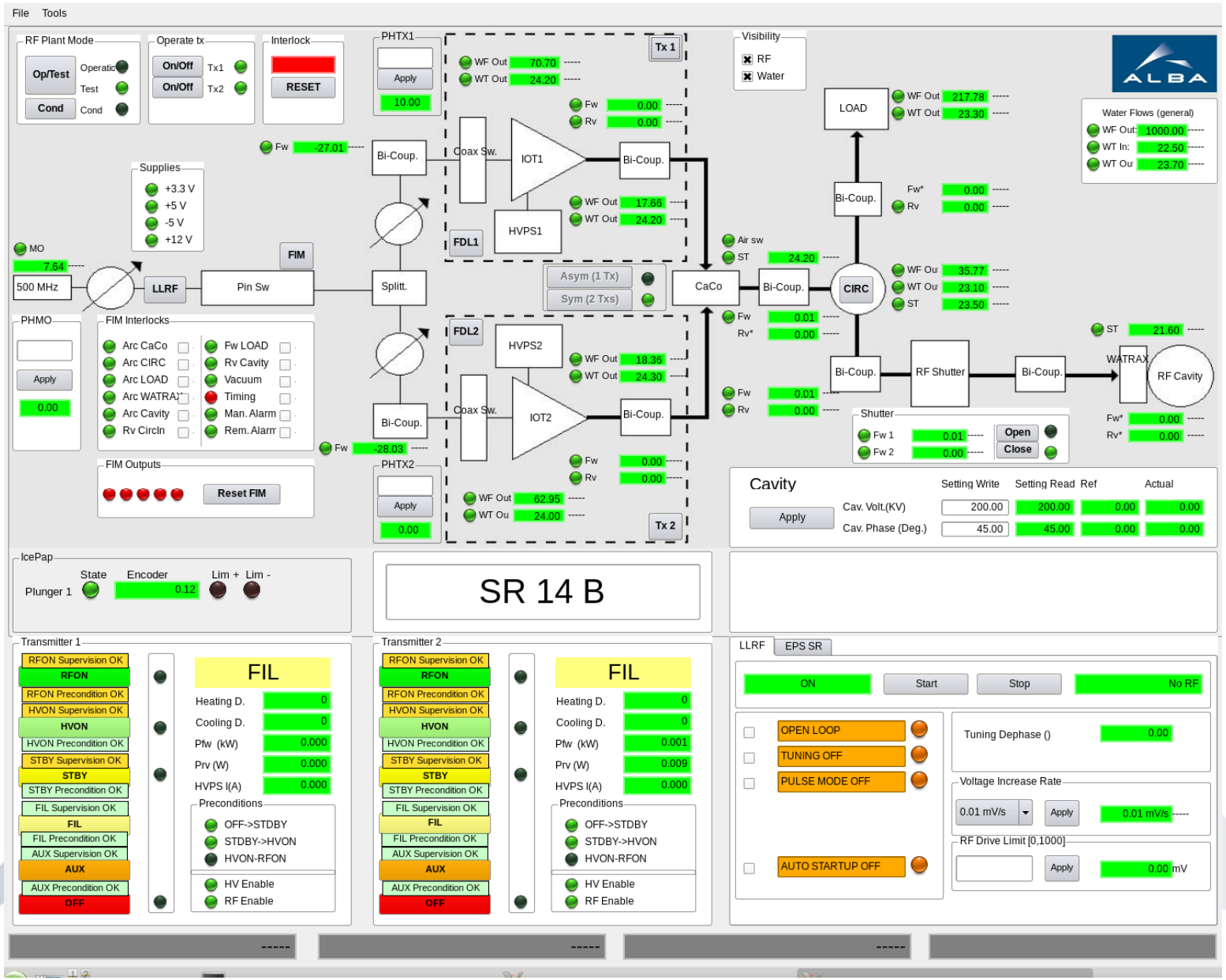
SR Dampy Cavities: Conditioning and Calibration

June – October 2010:

- ✓ All RF Plants ready
- ✓ All 6 cavities conditioned up to 70 kW
- ✓ Calibration pending



RF - GUIs


File Tools
RF Plant Mode
Op/Test
Cond
Operation
Test
Cond
Operate tx
On/Off Tx1
On/Off Tx2
Interlock
RESET
PHTX1
Apply
10.00
Fw -27.01
Bi-Coup.
Coax Sw.
IOT1
Bi-Coup.
HVPS1
FDL1
WF Out 70.70
WT Out 24.20
Fw 0.00
Rv 0.00
WF Out 17.66
WT Out 24.20
Tx 1
Supplies
+3.3 V
+5 V
-5 V
+12 V
MO
7.64
500 MHz
LLRF
Pin Sw
FIM
Splitt.
Asym (1 Tx)
Sym (2 Txs)
PHMO
Apply
0.00
FIM Interlocks
Arc CaCo
Arc CIRC
Arc LOAD
Arc WATRAX
Arc Cavity
Rv Circln
Fw LOAD
Rv Cavity
Vacuum
Timing
Man. Alarm
Rem. Alarm
FIM Outputs
Reset FIM
FDL2
HVPS2
IOT2
WF Out 18.36
WT Out 24.30
Fw -28.03
PHTX2
WF Out 62.95
WT Ou 24.00
Tx 2
Visibility
RF
Water
LOAD
WF Out 217.78
WT Out 23.30
Water Flows (general)
WF Out: 1000.00
WT In: 22.50
WT Ou 23.70
Air sw
ST 24.20
CaCo
Bi-Coup.
CIRC
WF Ou 35.77
WT Ou 23.10
ST 23.50
Fw 0.01
Rv* 0.00
RF Shutter
ST 21.60
WATRAX
RF Cavity
Fw* 0.00
Rv* 0.00
Shutter
Fw 1 0.01
Fw 2 0.00
Open
Close
Cavity
Setting Write
Setting Read
Ref
Actual
Cav. Volt.(KV) 200.00 200.00 0.00 0.00
Cav. Phase (Deg.) 45.00 45.00 0.00 0.00
IcePap
State
Encoder
Lim +
Lim -
Plunger 1 0.12
SR 14 B
Transmitter 1
RFON Supervision OK
RFON
RFON Precondition OK
HVON Supervision OK
HVON
HVON Precondition OK
STBY Supervision OK
STBY
STBY Precondition OK
FIL Supervision OK
FIL
FIL Precondition OK
AUX Supervision OK
AUX
AUX Precondition OK
OFF
FIL
Heating D. 0
Cooling D. 0
Pfw (kW) 0.000
Prv (W) 0.000
HVPS I(A) 0.000
Preconditions
OFF->STDBY
STDBY->HVON
HVON-RFON
HV Enable
RF Enable
Transmitter 2
Heating D. 0
Cooling D. 0
Pfw (kW) 0.001
Prv (W) 0.009
HVPS I(A) 0.000
LLRF
EPS SR
ON
Start
Stop
No RF
OPEN LOOP
TUNING OFF
PULSE MODE OFF
AUTO STARTUP OFF
Tuning Dephase () 0.00
Voltage Increase Rate
0.01 mV/s
Apply
0.01 mV/s
RF Drive Limit [0,1000]
Apply
0.00 mV

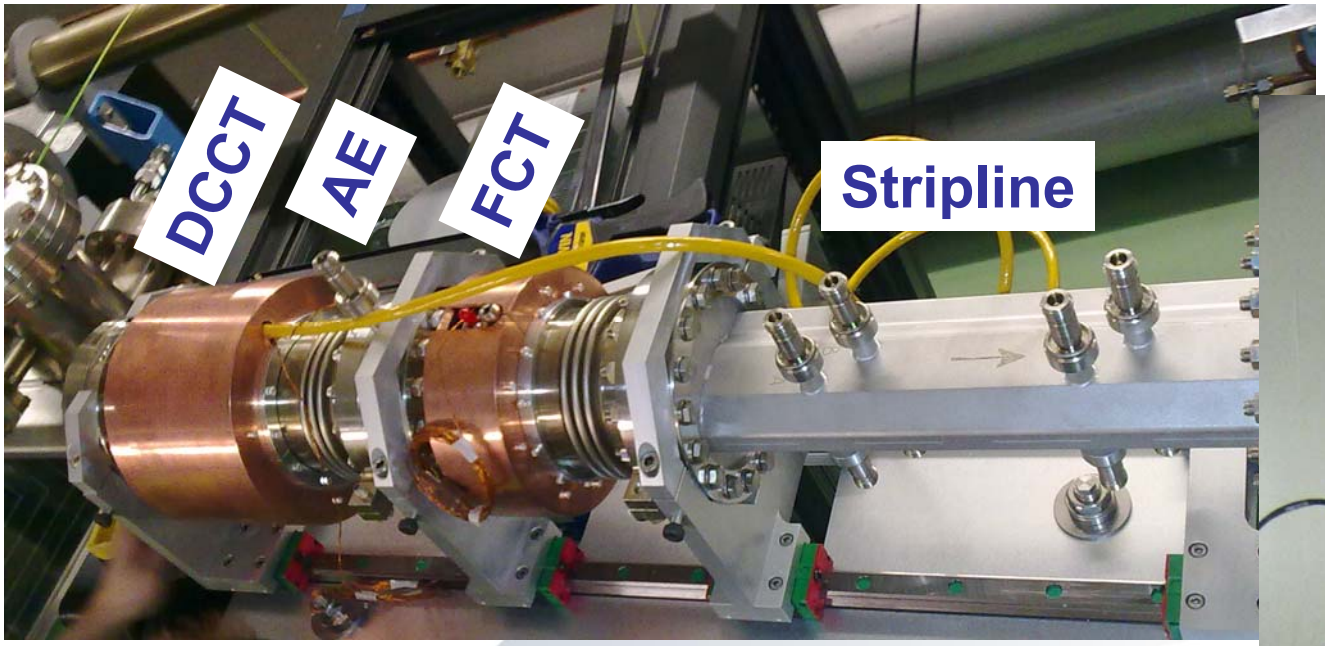
Diagnostics at the Storage Ring (SR):

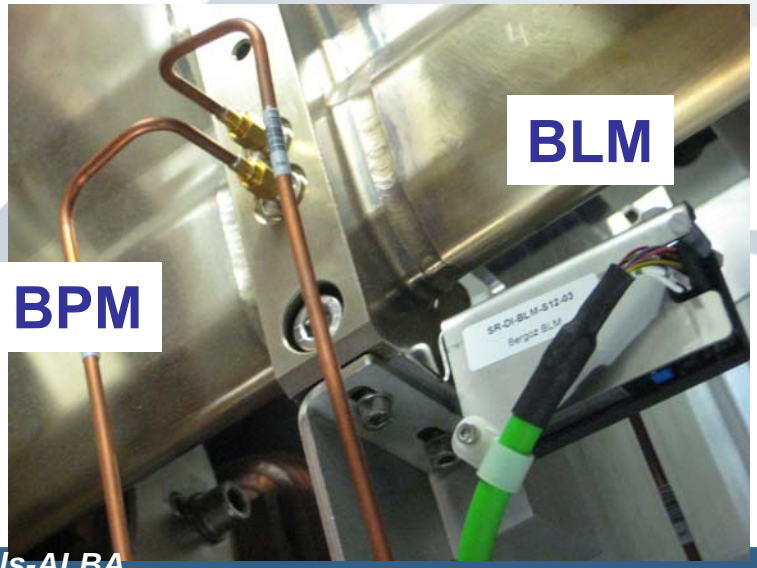
Mechanical setups:	everything installed
Cabling:	few miscabled items being corrected
GUIs:	all operational, but some need more progress

→ Need beam for fully commission!

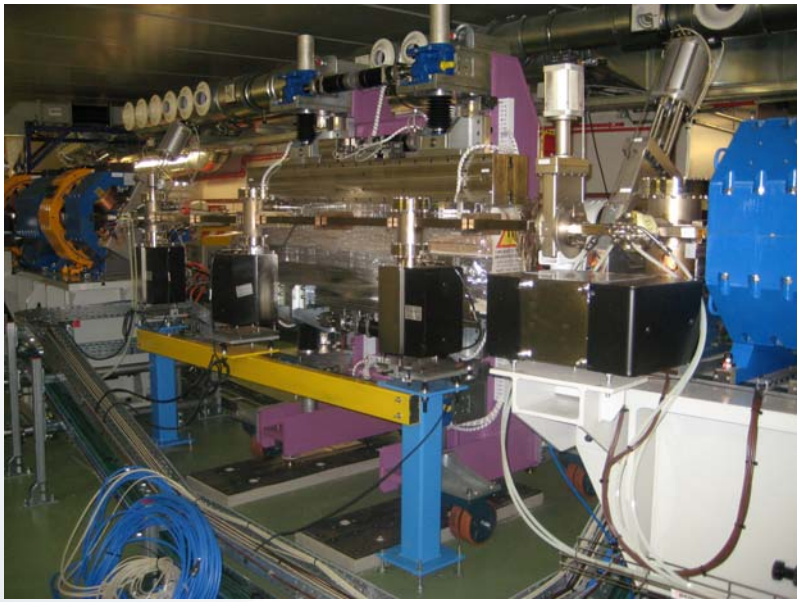
- 1 FCT: Fast Current Monitor
- 1 DCCT: DC Current Monitor
- 1 AE: Annular Electrode (uncalibrated beam signal)
- 1 Stripline: for beam excitation
- 5 FSVs: with pneumatic motion, one at each quadrant
- 2 FSH: located at injection section, monitor beam injection angle
- 2 SCR: one vertical, one horizontal scraper
- 123 BPMs: orbit, plus 3 spares for tune and feedback system
- 128 BLMs: monitor beam losses around the ring
- 1 pinhole: transverse beam size (and emittance) using xrays
- 1 streak cam.: longitudinal beam size

Mechanical installation





Apple-II undulators EU62, EU71



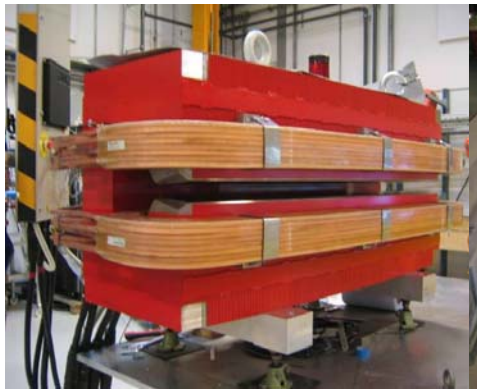
- Production on time
- 1st undulator measured at CELLS - OK
- 2nd undulator measured at CELLS - OK

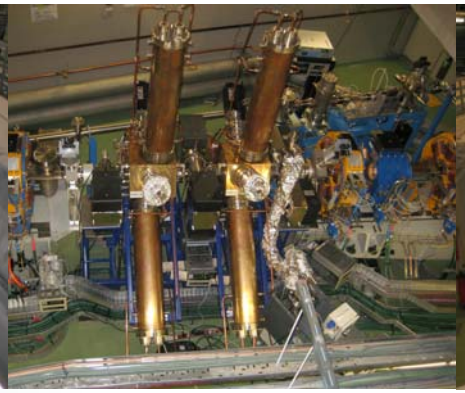
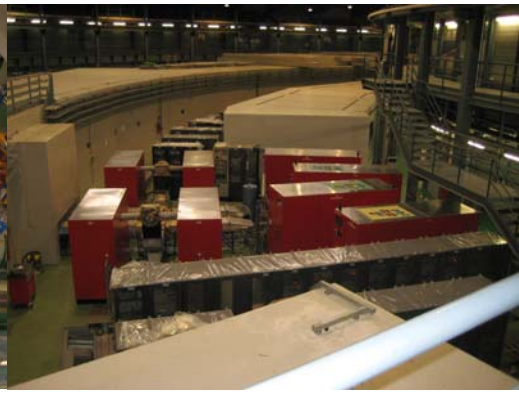
- Mechanical errors within tolerances
- Field and phase errors within tolerances
- Undulators waiting for installation

Insertion Device status – Nov 2010

ID	Status
IVU21	Beamlines: Macromol. Christallography, Non-crystalline diff. Features: λu=21.6 mm, L=2 m, Be=0.7954 T, K=1.60 Status: manufacturing being finished. FAT passed
EU71 EU62	Beamlines: Magnetic Dichroism, Low energy spectrosc. + PEEM Features: λu=71.36 mm, L=1.650 m, Be=0.9460 T, K=6.31 (H pol) Features: λu=62.36 mm, L=1.761 m, Be=0.8843 T, K=5.15 (H pol) Status: placed in storage ring tunnel. SAT passed
SC-W31	Beamline: High resolution powder diffraction Features: λu=30.01 mm, L=1.755 m, Bo=2.15 T, K=6.03 Status: parked in service area waiting for installation. SAT passed
W80	Beamline: X-ray absorption spectroscopies Features: λu=79.93 mm, L=0.999 m, Bo=1.7374 T, K=12.97 Stauts: software final adjustment being finished. SAT passed

ALBA-Contracts



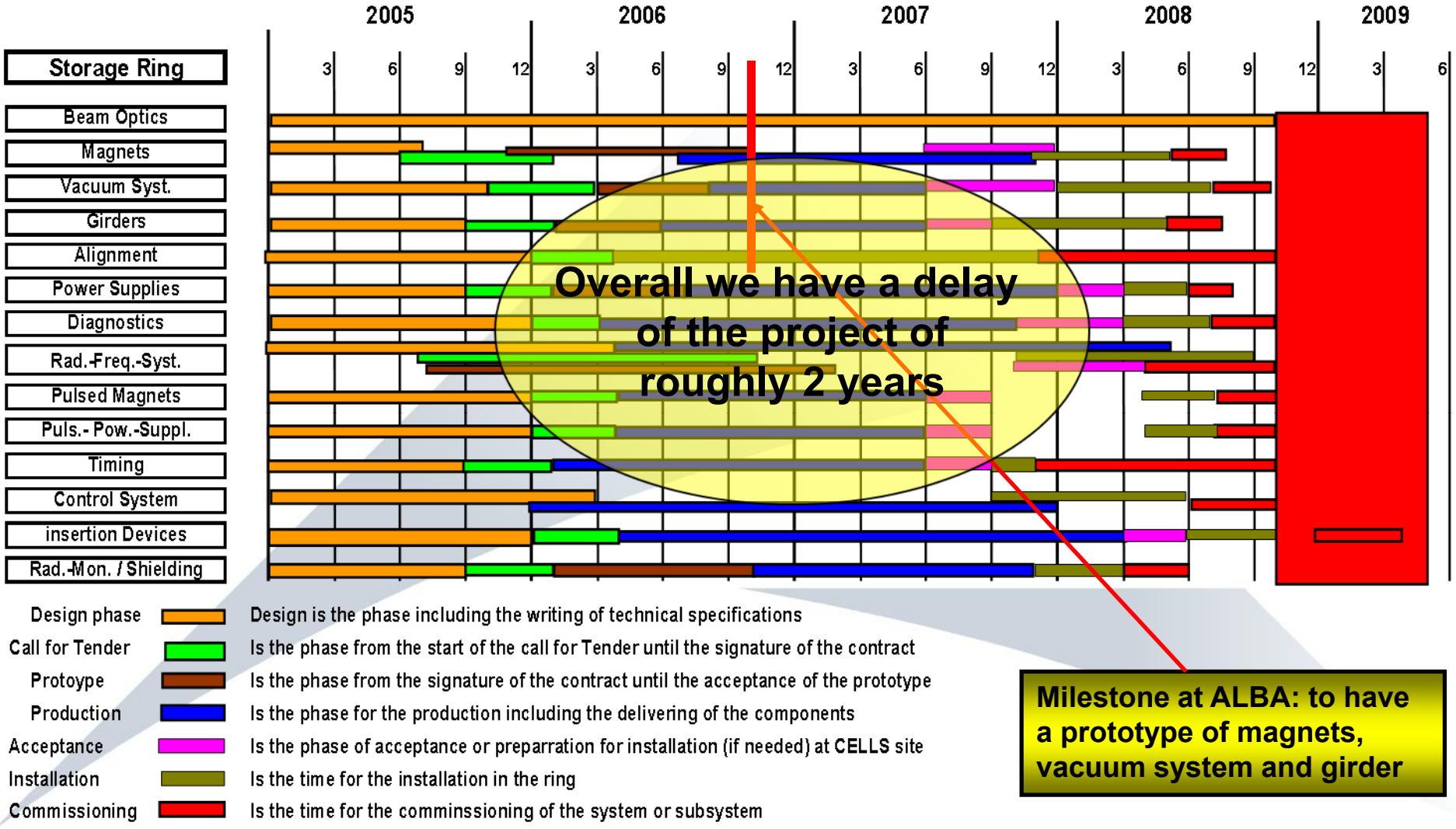
Number	Components	Delay
9	Magnets (storage ring, booster, transfer lines)	2 * 6 month
1	Pulsed magnets	1 * 15 month
4	Power supplies (storage ring, booster, transfer lines)	2 * 15 month
1	Power supplies pulsed elements	okay
13	Vacuum system(chambers, bellows, pumps, etc	1 * 12 month
3	Girders and supports	1 * 8 month
11	RF-System (cavities, WG-system, transmitters, etc)	1 * 18 month
3	Diagnostics	okay
4	Insertion devices	1*5, 1*9, 1*17
1	Front ends	okay
Σ = 50		Σ = 11

Because of reorganisation of the company

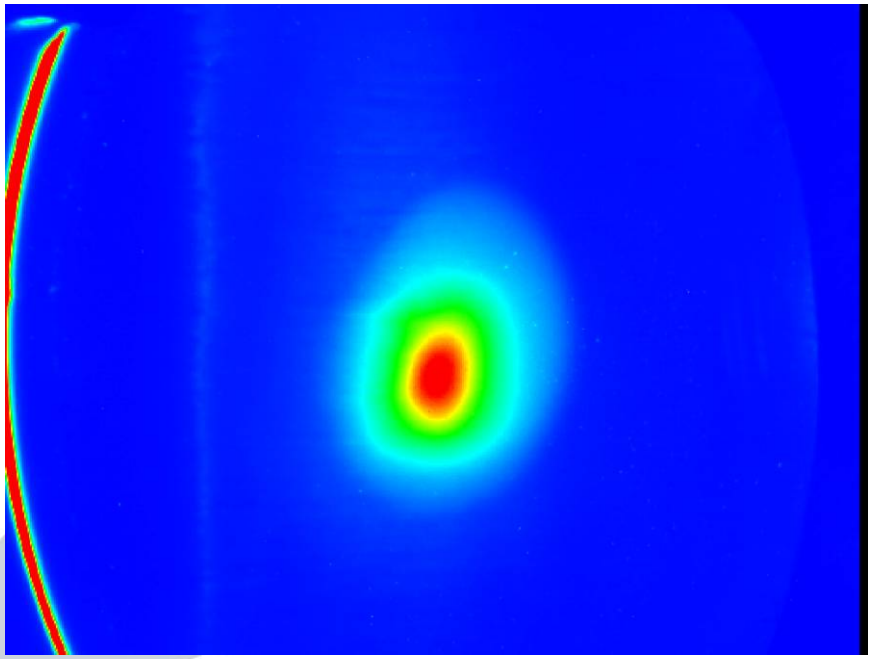
ALBA-Contracts

Components	Reasons for the delay
Magnets	Magnetic measurements and type of alignment
Pulsed magnets	Problem with the Titanium coating and reorganisatin of the company
Power supplies	Lot of discussions about the regulation card
Vacuum system	Problems with the subcontractor to deliver the right steel
Girders and supports	Problems with the alignment of the milling machine
RF-System	Problems with the circulator (magnets and regulation)
Insertion devices	Problems with the liner and reorganisation fo the company

Time schedule presented at the MAC in spring 2005



Beam in the Linac: 2008
Beam in the Booster: 2009



Let us hope that we have in 2010 / 2011 a nice beam in the storage ring

Thank you very much