STATUS OF THE ALBA SYNCHROTRON LIGHT SOURCE: FROM COMMISSIONING TO OPERATION

M.Pont, CELLS-ALBA

08.08.2012

OUTLINE

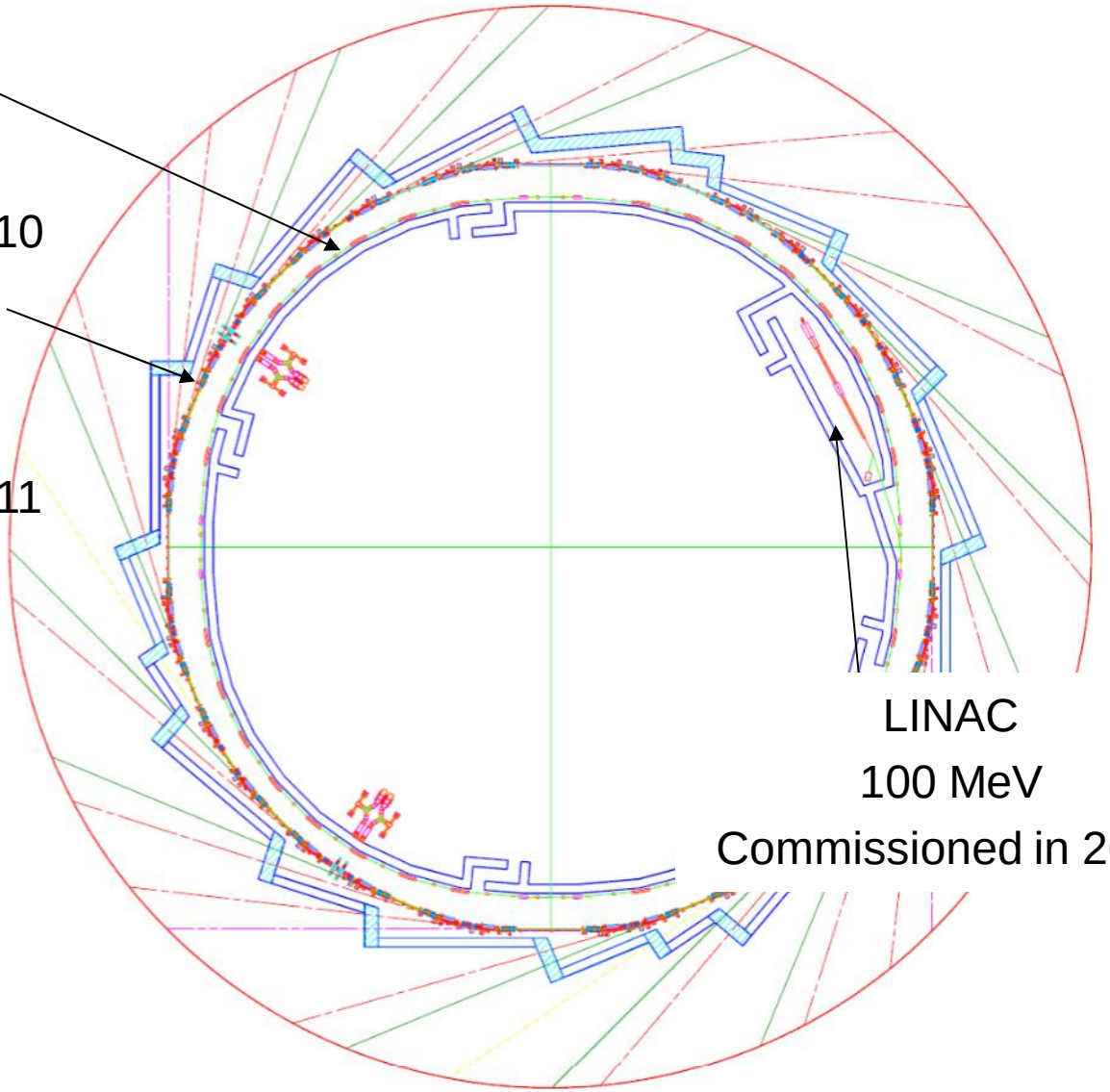
- The ALBA synchrotron light source
- Results of Commissioning
- Operation in 2012
- Summary and outlook

ALBA SYNCHROTRON LIGHT SOURCE

- In Cerdanyola del Valles, 15 km N of Barcelona (Spain)
- 150 permanent staff
- Operating budget for 2012: 16 MEUR

BOOSTER
100 MeV – 3 GeV
Commissioned in 2010

STORAGE RING
3 GeV
Commissioned in 2011



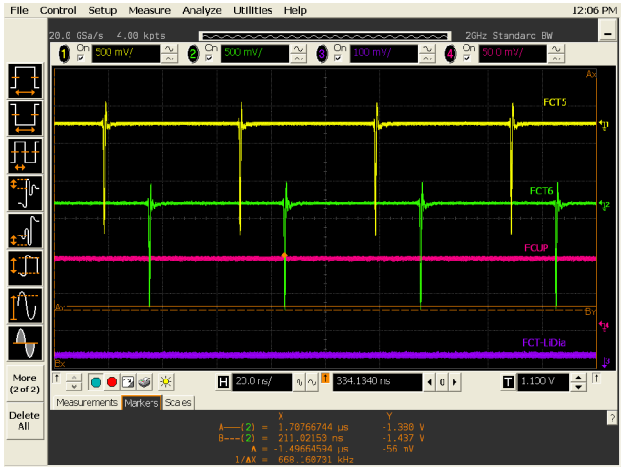
LINAC
100 MeV
Commissioned in 2008

100 MeV LINAC

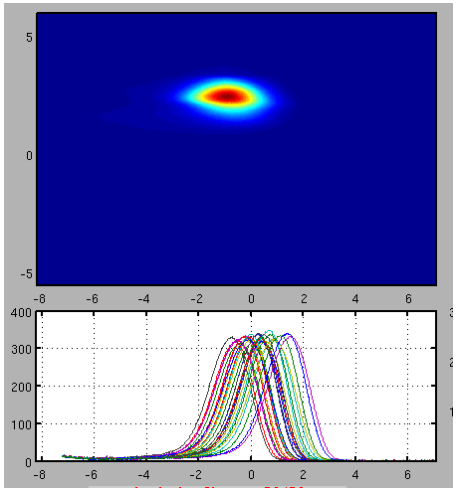
Main linac parameters:

Parameters		Specifications	Working
E	MeV	100-130	110
$\Delta E/E$	rms	< 0.50	0.16
Norm. $\varepsilon_{x,y}$	mm·mrad	< 30	< 15

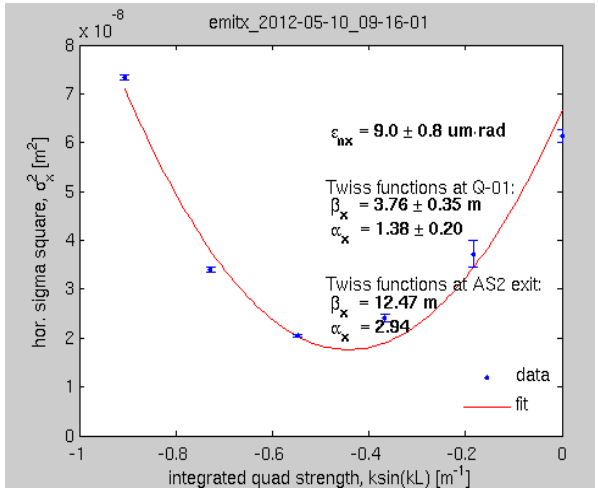
- All parameters within specs
- Operation modes: single bunch & multibunch



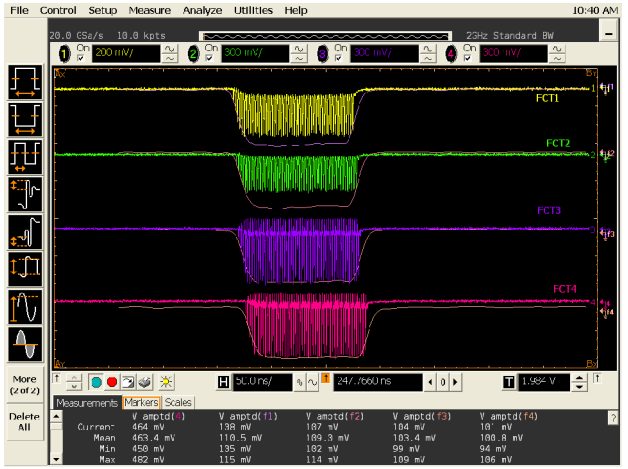
Few bunches mode
0.25 nC/bunch at linac exit



$\Delta E/E$ = 0.16% (rms)

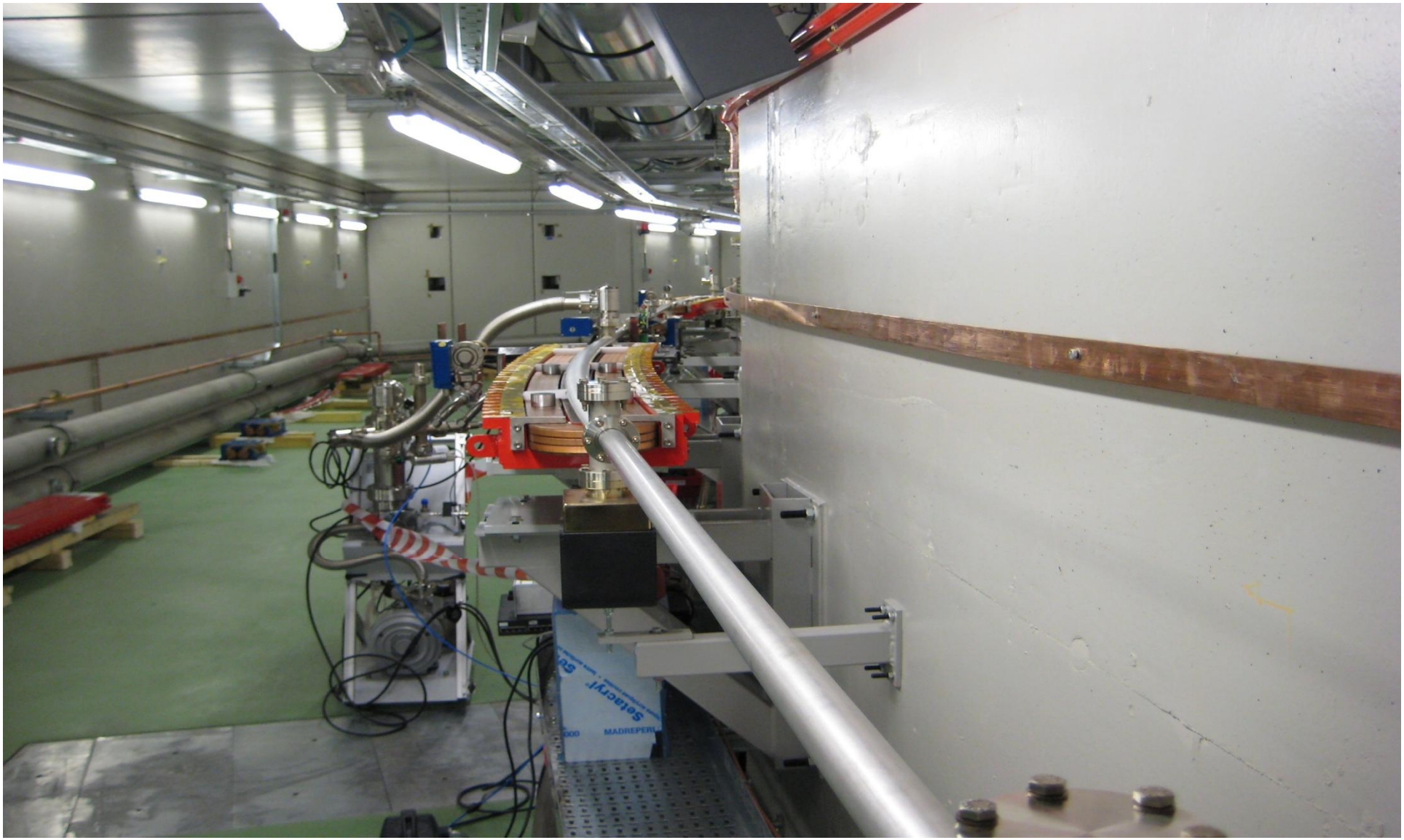


ε_x (norm.) ≈ 9 mm·mrad



Multibunch mode
4 nC at linac exit

BOOSTER



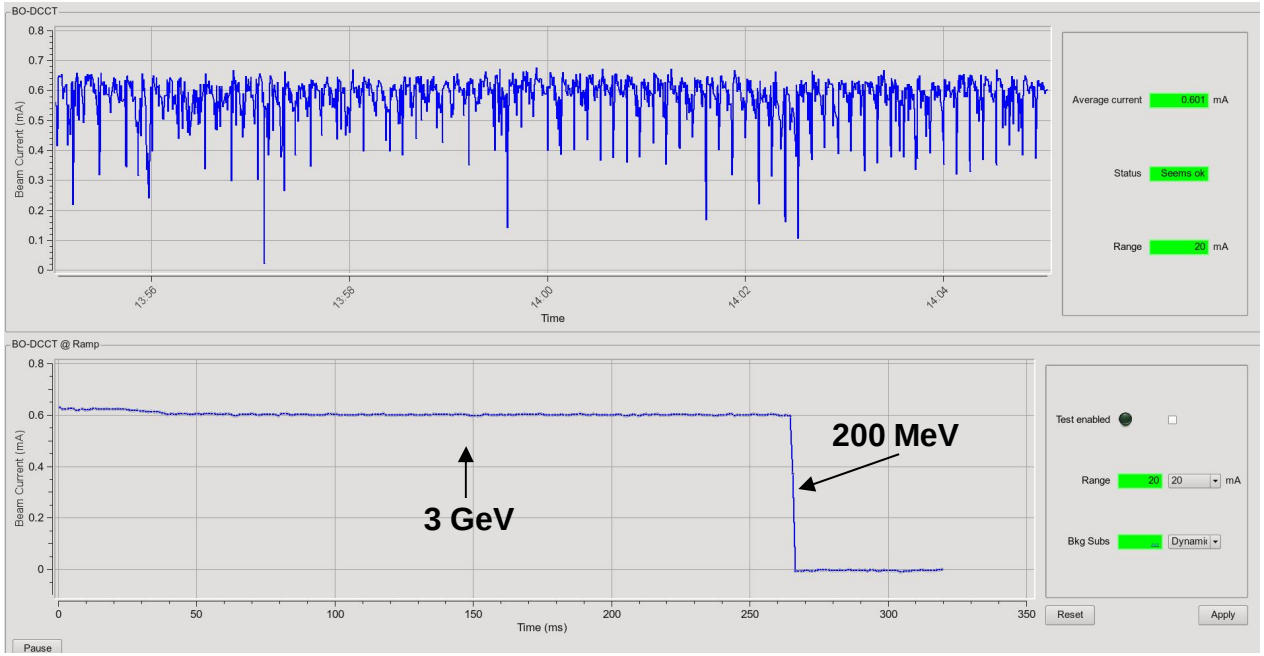
Main BO parameters:

C = 249.6 m, shares tunnel with SR

E = 110 MeV to 3.0 GeV

$\varepsilon_x \approx 10$ nm·rad

Repetition rate: 3.125 Hz

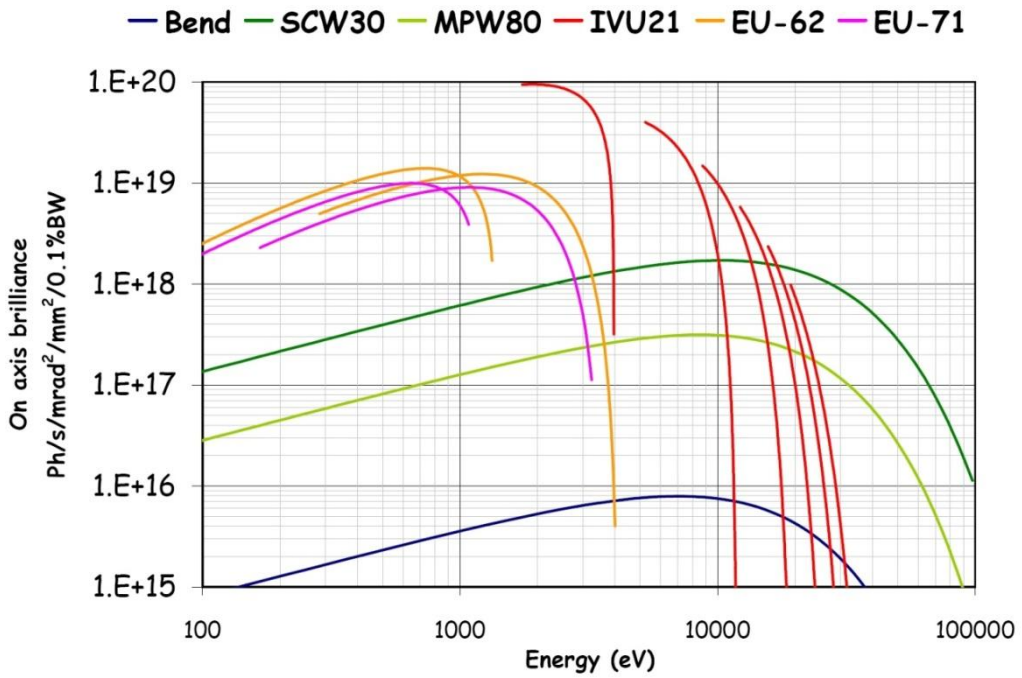


Main parameters of the Storage Ring

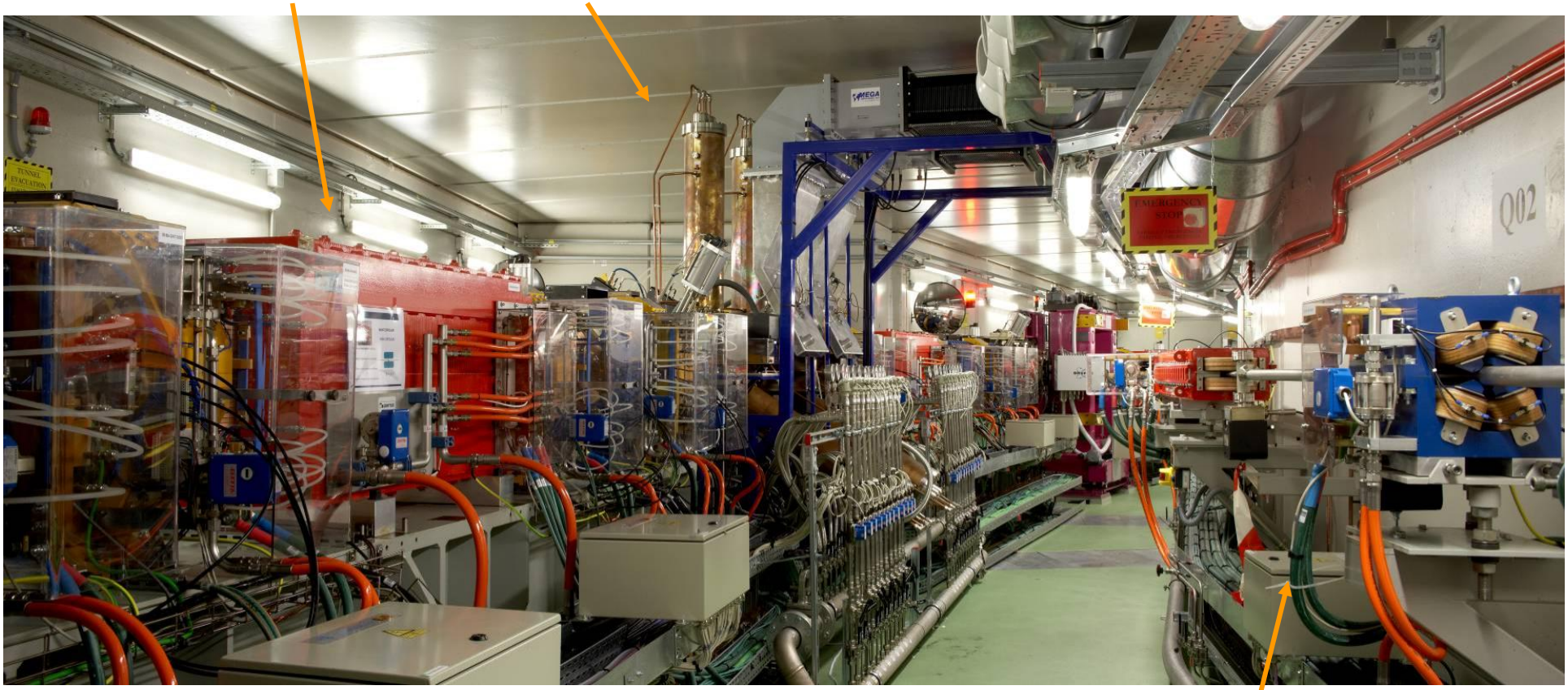
Electron beam energy	3.0 GeV
Storage Ring Circumference	268.8 m
Number of cells	16
Symmetry	4
Straight section lengths	4 x 7.8 m (3 ID's)
	12 x 4.3 m (12 ID's)
	8 x 2.3 m (1 ID's)
Beam current	400 mA
Emittance	4.3 nm.rad
Hor. Beam sizes	100 - 300 um
Ver. Beam sizes	7 – 16 um
RF frequency	500 MHz

Phase I beamlines: **6 x IDs**

1 x Bending



- **Spectral range: from UV (80 eV) to hard x-rays (50 keV)**
- **High brilliance: 10^{20} at 2 keV**


Bending
RF cavities
SR
Booster

9 March 2011 (2nd day)

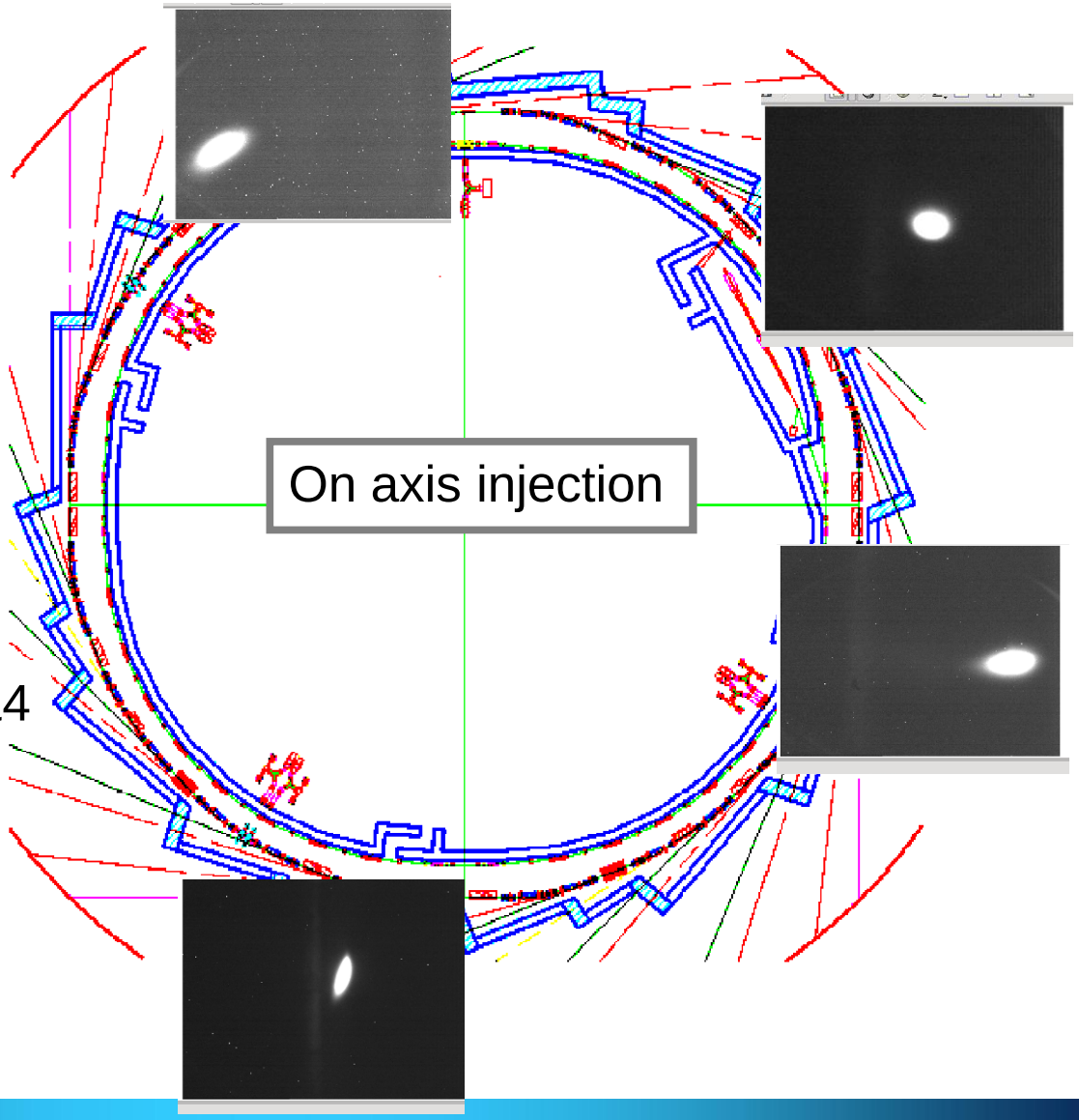
- Recabling Quads:

✓ Sectors 1&2

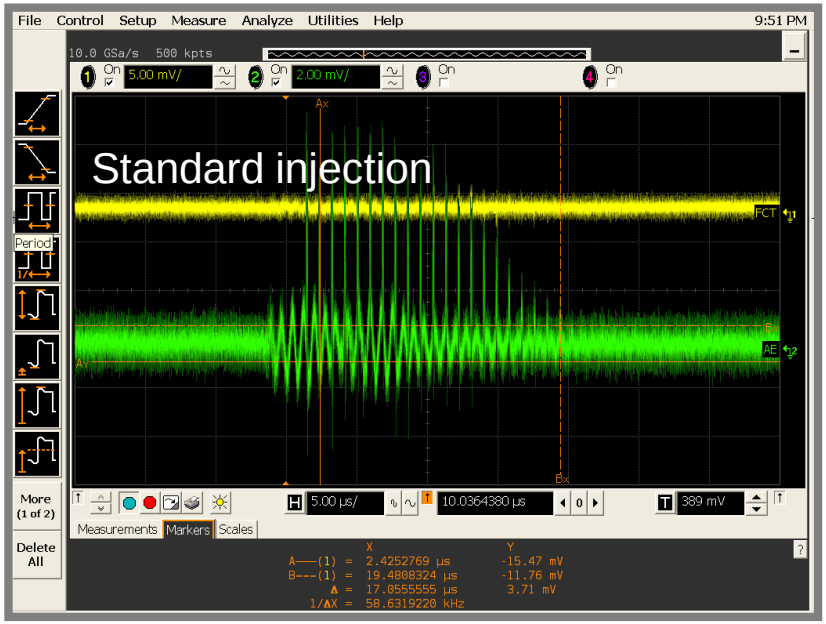
✓ Quadrant 1

✓ Quadrant 2

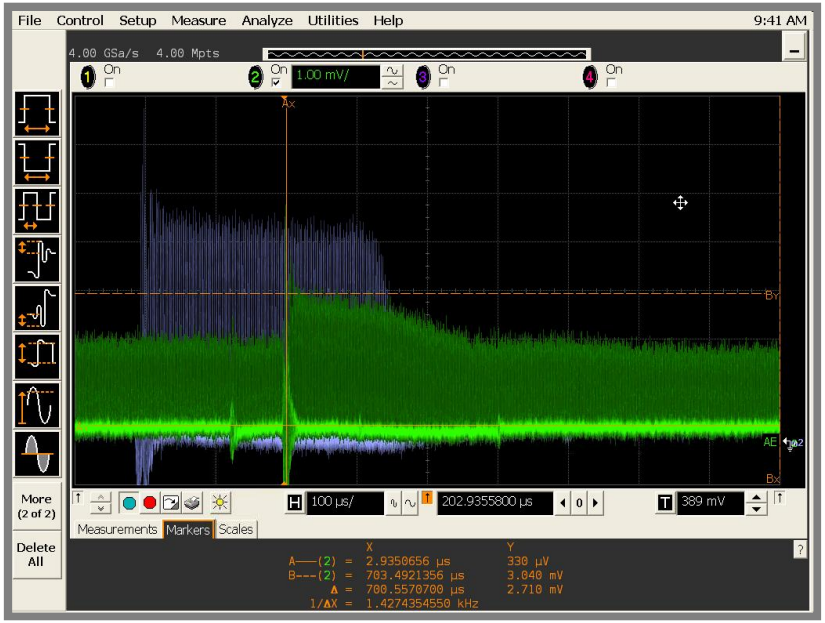
✓ Quadrants 3&4



19h35: 1st turn !

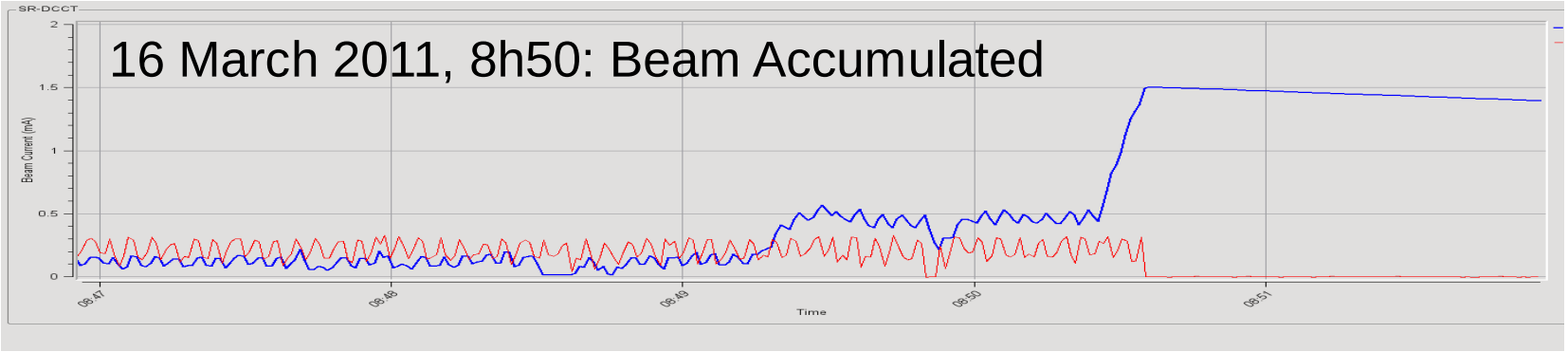


On the same day: 20 turns



13 March 2011, 9h38: 1 second stored beam

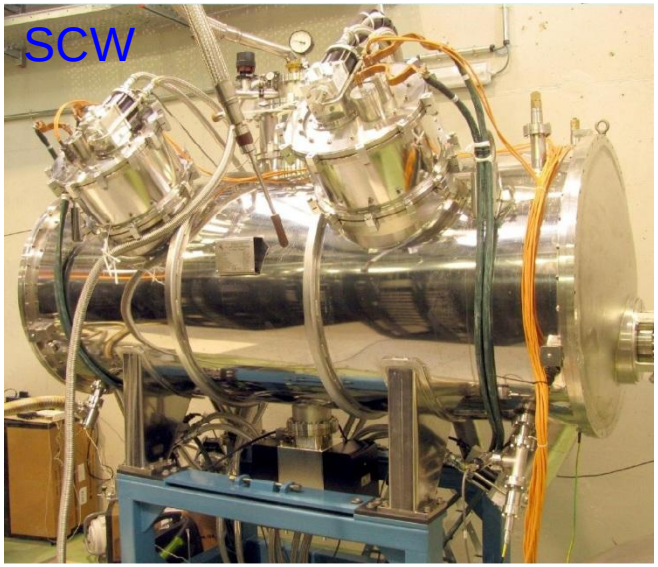

CURRENT
20.163 mA
Life Time
0h 06m
Status
I*L = 2.04
Filling Mode
56 bunches
CURRENT
Wednesday 16-Mar-2011 19:28:49
ID
Gap (mm)
Shutter
MPW80
298.0
CLAESS
Closed
SCW30
MSPD
Closed
IVU21
XALOC
Closed
IVU21
NCD
Closed
EU62
275.5
CIRCE
Closed
EU71
273.0
BOREAS
BEND
MISTRAL
Closed
H
V
Orbit (RMS)
82.20
82.20
Orbit (Peak)
82.20
82.20
Emittance
5.64
5.64
Tune
0.358
Avg. Pressure (mbar)
5.25e-10
Integ. Doses (Ah)
247.50

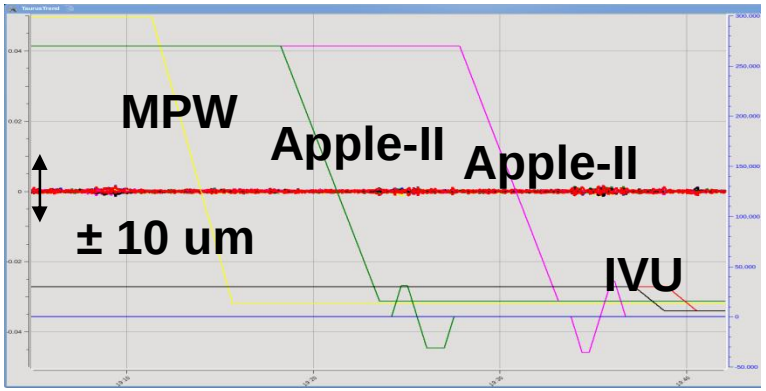

SR-DCCT
16 March 2011, 8h50: Beam Accumulated
Beam Current (mA)
Time

SR COMMISSIONING

- ✓ Beam based alignment
- ✓ Feed forward table for IDs
- ✓ Looking for hot spots or high pressure

  Changes on some absorbers
- ✓ Use of LOCO for online calibration of the machine

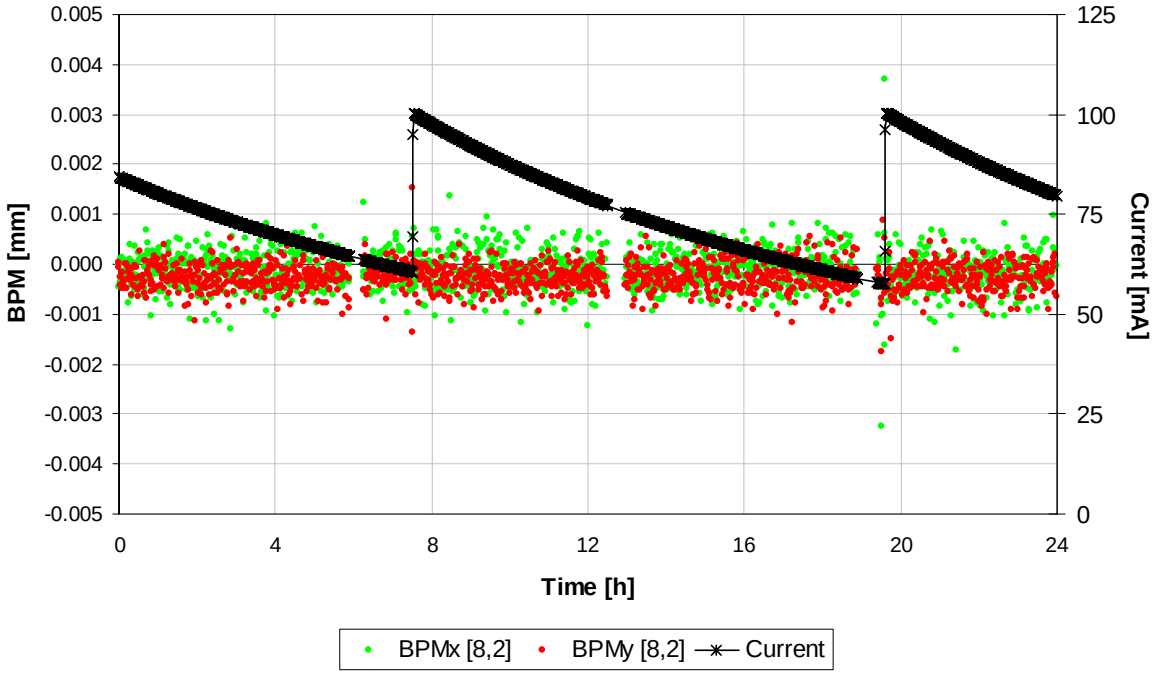




SOFB

- Running every 3 s
- With RF frequency included on SOFB

Beam Stability over 24 h



RMS-Values:

σ_x = 0.5 µm

σ_y = 0.2 µm

OPERATION IN 2012

4300 h of operation

3200 h for Beamlines

1100 h for accelerators development

Beamtime Calender, January 2012-December 2012

BL operation	BL	BL commissioning
SR operation	SR	SR machine studies, developments, improvements
Stand-by	Sy	Standby at night
Start-up	St	Start up of accelerators with beam
Warm-up	wu	warm-up time for magnets & Linac & RF and sub-systems optimisation
		Public holidays and CELLS off

	January					February					March					April					May					June					July					August					September					October					November					December				
			Shift					Shift					Shift					Shift					Shift					Shift					Shift					Shift					Shift					Shift					Shift					Shift				
Week	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N	Day	Week	M	A	N
Mo																																																										
Tu																					1		SR	SR	Sy																																				
We						1		BL	BL	RU											2		SR	SR	Sy										1		OFF	OFF	OFF																						
Th						2		BL	BL	RU	1		BL	BL	RU						3		BL	BL	Sy										2		OFF	OFF	OFF																						
Fr						3		BL	BL	RU	2		BL	BL	RU						4		BL	BL	Sy	1		BL	BL	Sy						3		OFF	OFF	OFF																						
Sa						4		COO	COO	COO	3		COO	COO	COO						5		BL	BL	Sy	2		BL	BL	Sy						4		OFF	OFF	OFF	1		OFF	OFF	OFF	6		SR	SR	Sy	3		COO	COO	COO	1		BL	BL	Sy
Su	1		OFF	OFF	OFF	5		COO	COO	COO	4		COO	COO	COO	1		COO	COO	COO	6		BL	BL	Sy	3		BL	BL	Sy	1		BL	BL	Sy	5		OFF	OFF	OFF	2		OFF	OFF	OFF	7		SR	SR	Sy	4		COO	COO	COO	2		BL	BL	Sy
Mo	2	1	OFF	OFF	OFF	6	6	RU	WM	WM	5	10	RU	WM	WM	2	14	OFF	OFF	OFF	7	19	HW	St	Sy	4	23	HW	St	Sy	2	27	HW	St	Sy	6	32	OFF	OFF	OFF	3	36	OFF	OFF	OFF	8	41	RU	WM	WM	5	45	RU	WM	WM	3	49	BL	BL	Sy
Tu	3		OFF	OFF	OFF	7		RU	WM	WM	6		RU	WM	WM	3		OFF	OFF	OFF	8		BL	BL	Sy	5		SR	SR	Sy	3		BL	BL	Sy	7		OFF	OFF	OFF	4		OFF	OFF	OFF	9		RU	WM	WM	6		RU	WM	WM	4		SR	SR	Sy
We	4		OFF	OFF	OFF	8		RU	WM	WM	7		RU	WM	WM	4		OFF	OFF	OFF	9		BL	BL	Sy	6		BL	BL	Sy	4		BL	BL	Sy	8		OFF	OFF	OFF	5		OFF	OFF	OFF	10		RU	WM	WM	7		RU	WM	WM	5		RU	WM	WM
Th	5		OFF	OFF	OFF	9		RU	WM	WM	8		RU	WM	WM	5		OFF	OFF	OFF	10		BL	BL	Sy	7		BL	BL	Sy	5		BL	BL	Sy	9		OFF	OFF	OFF	6		OFF	OFF	OFF	11		RU	WM	WM	8		RU	WM	WM	6		WM	WM	WM
Fr	6		OFF	OFF	OFF	10		RU	WM	WM	9		RU	WM	WM	6		OFF	OFF	OFF	11		BL	BL	Sy	8		BL	BL	Sy	6		BL	BL	Sy	10		OFF	OFF	OFF	7		OFF	OFF	OFF	12		WM	WM	WM	9		RU	WM	WM	7		RU	WM	WM
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Tu	10		OFF	OFF	OFF	14		St	St	RU	13		St	St	Sy	10		wu	wu	wu	15		RU	WM	WM	12		BL	BL	Sy	10		BL	BL	Sy	14		OFF	OFF	OFF	11		OFF	OFF	OFF	16		St	St	Sy	13		St	St	Sy	11		RU	WM	WM
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Fr	13		OFF	OFF	OFF	17		BL	BL	RU	16		BL	BL	Sy	13		St	St	RU	18		RU	WM	WM	15		BL	BL	Sy	13		BL	BL	Sy	17		OFF	OFF	OFF	14		St	St	RU	19		BL	BL	Sy	16		BL	BL	Sy	14		RU	WM	WM
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Fr	20		St	St	RU	24		BL	BL	RU	23		BL	BL	Sy	20		BL	BL	Sy	25		BL	BL	Sy	22		RU	WM	WM	20		BL	BL	Sy	24		OFF	OFF	OFF	21		BL	BL	Sy	26		BL	BL	Sy	23		BL	BL	Sy	21		OFF	OFF	OFF
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Th	26		BL	BL	RU						29		BL	BL	Sy	26		BL	BL	Sy	31		BL	BL	Sy	28		BL	BL	Sy	26		OFF	OFF	OFF	30		OFF	OFF	OFF	27		BL	BL	Sy						29		BL	BL	Sy	27		OFF	OFF	OFF
Fr	27		BL	BL	RU						30		BL	BL	Sy	27		BL	BL	Sy						29		BL	BL	Sy	27		OFF	OFF	OFF	31		OFF	OFF	OFF	28		BL	BL	Sy						30		BL	BL	Sy	28		OFF	OFF	OFF
Sa	28		BL	BL	RU						31		COO	COO	COO	28		BL	BL	Sy						30		BL	BL	Sy	28		OFF	OFF	OFF											29		BL	BL	Sy						29		OFF	OFF	OFF
Su	29		BL	BL	RU											29		BL	BL	Sy											29		OFF	OFF	OFF											30		BL	BL	Sy						30		OFF	OFF	OFF
Mo	30	5	HW	St	RU											30	18	HW	St	Sy											30	31	OFF	OFF	OFF																					31		OFF	OFF	OFF
Tu	31		BL	BL	RU																										31		OFF	OFF	OFF																								

Updated 01.03.2012

OPERATION IN 2012

- ✓ Running 24/7 during runs
- ✓ Running 3 shifts/day

  8 h / shift with 15 min overlap
- ✓ Monday: Accelerators start-up
- ✓ Tuesday 07h00 – Monday 07h00 Beam for users
- ✓ 2 long shut downs,
- ✓ 5 short (1 w) shut downs

SHIFT ISSUES

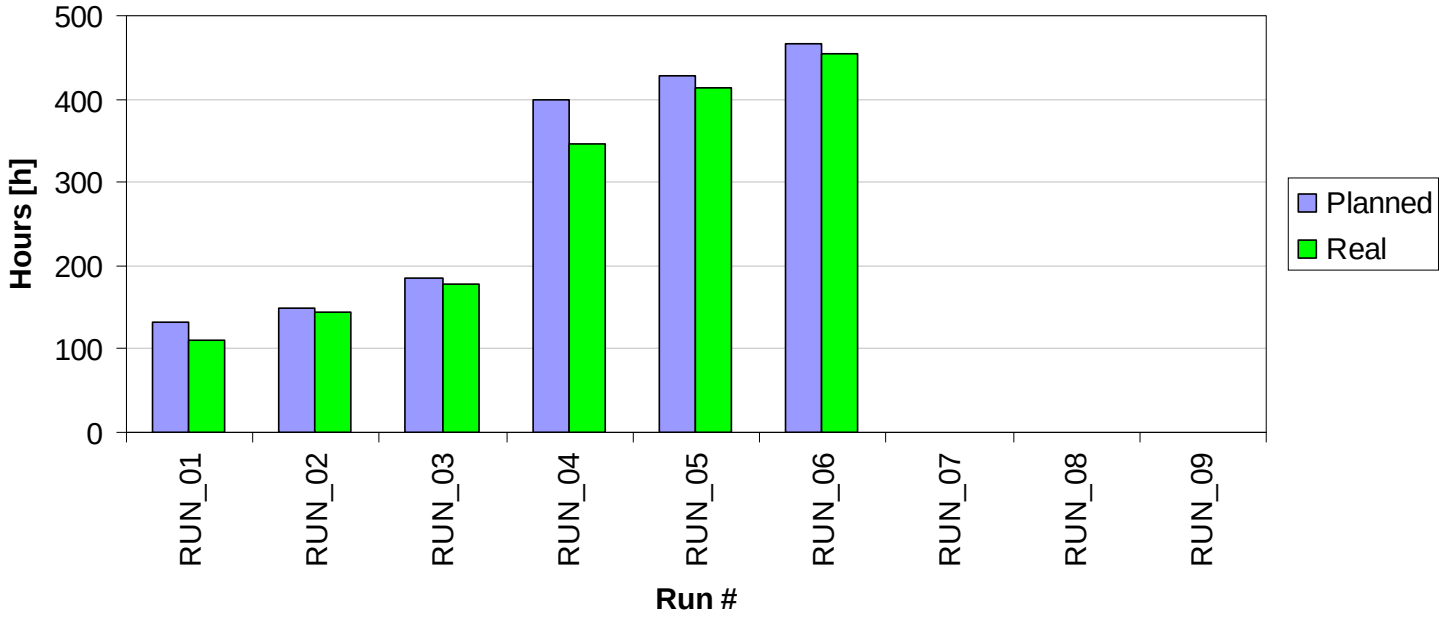
- ✓ Need 2 people on shift
- ✓ Crew of 5 operators with additional support from the Accelerator Div. (14 pax)
- ✓ Always 1 operator on the shift
- ✓ Fast rotation cycle. Proposed by the operators
- ✓ M-A-N-(rest)-Normal-M-A-N-(rest)-Normal

OPERATORS EXPERIENCES

- ✓ Operators have been with us since 2009
- ✓ Have gained experience by participating in installation and commissioning
- ✓ Each one is assigned to a technical group (PS, RF, Diagnostics)
- ✓ Encourage to develop small projects:
  - ✓ Looking after beam statistics
  - ✓ Writing procedures
  - ✓ Preparing troubleshooting guides

Statistics Jan-Jun 2012

- 1760 hours for BLs
- 93.9 % beam availability (injection not included)



SUMMARY and OUTLOOK

- ✓ Since May 2012 ALBA is open to external users

- ✓ Operate ALBA for 5000 h in 2013
- ✓ Develop training for new operators
- ✓ From commissioning to operation: Challenge to keep motivation

Thanks for your attention

Questions?