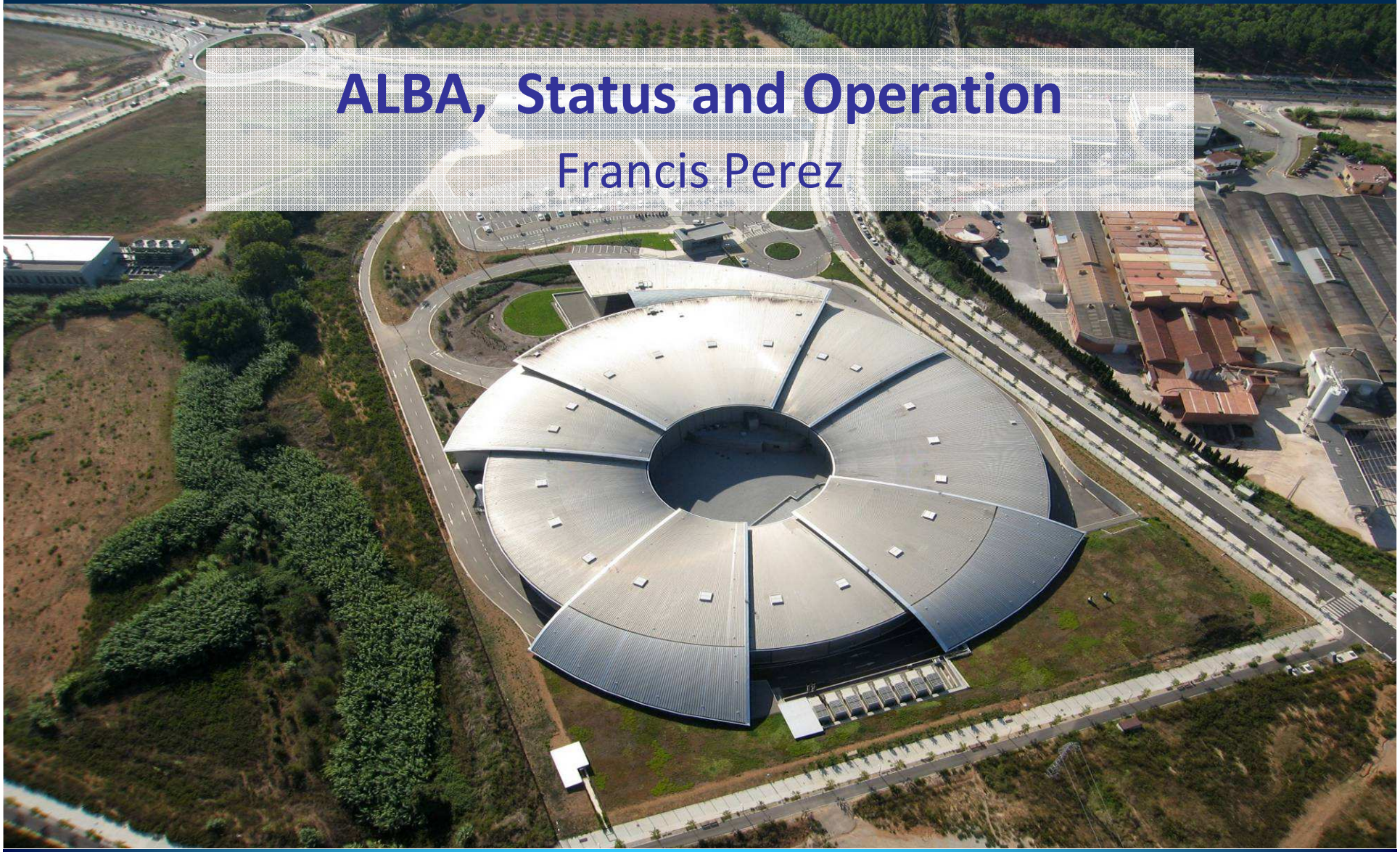
ALBA, Status and Operation

Francis Perez



Introduction to ALBA

Status

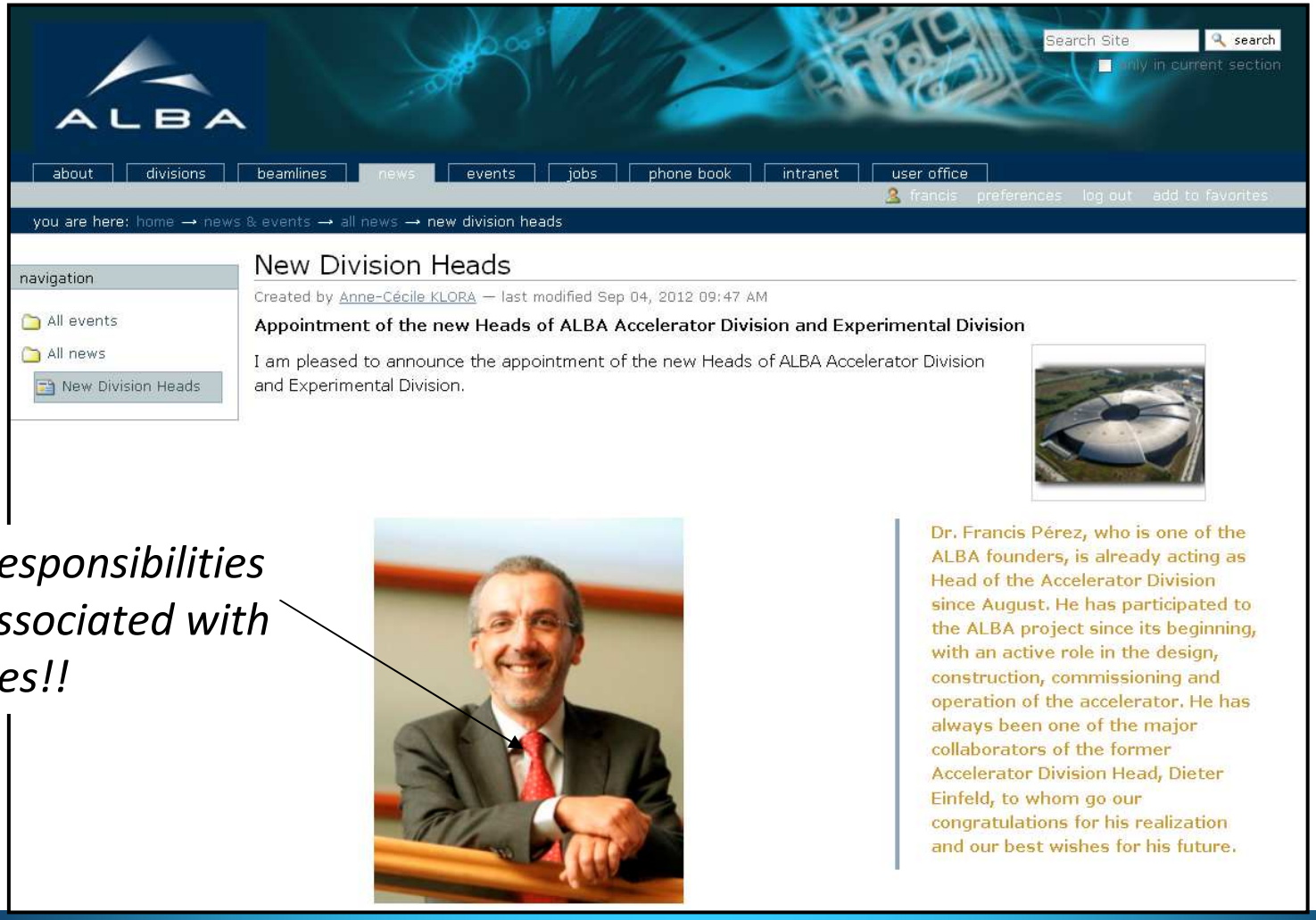
Operation

Introduction to ALBA

The ALBA Team

We are today ~150

and I got new responsibilities!



Responsibilities associated with ties!!

ALBA Synchrotron Light Source

- ✓ 3 GeV electron Storage Ring
- ✓ 31 beamlines (7 on day one)
- ✓ Funding is 50% Spanish – 50% Catalan Governments
- ✓ Designed for sub-micron stability and top-up operation

ALBA History

ALBA founded	April 2003
ALBA 1st worker	Dec 2003
Design work	2004-2005
Start main building works	July 2006
Start Linac installation	Feb 2008
Linac commissioning	Sept - Oct 2008
Booster and SR installation	Feb – Dec 2009
Booster commissioning	Jan – Oct 2010
SR Installation	Feb – Dec 2010
Storage Ring commissioning	March – Nov 2011
Beamlines commissioning	Oct 2011 – Dec 2012
Start of Users Operation	**May 2012**

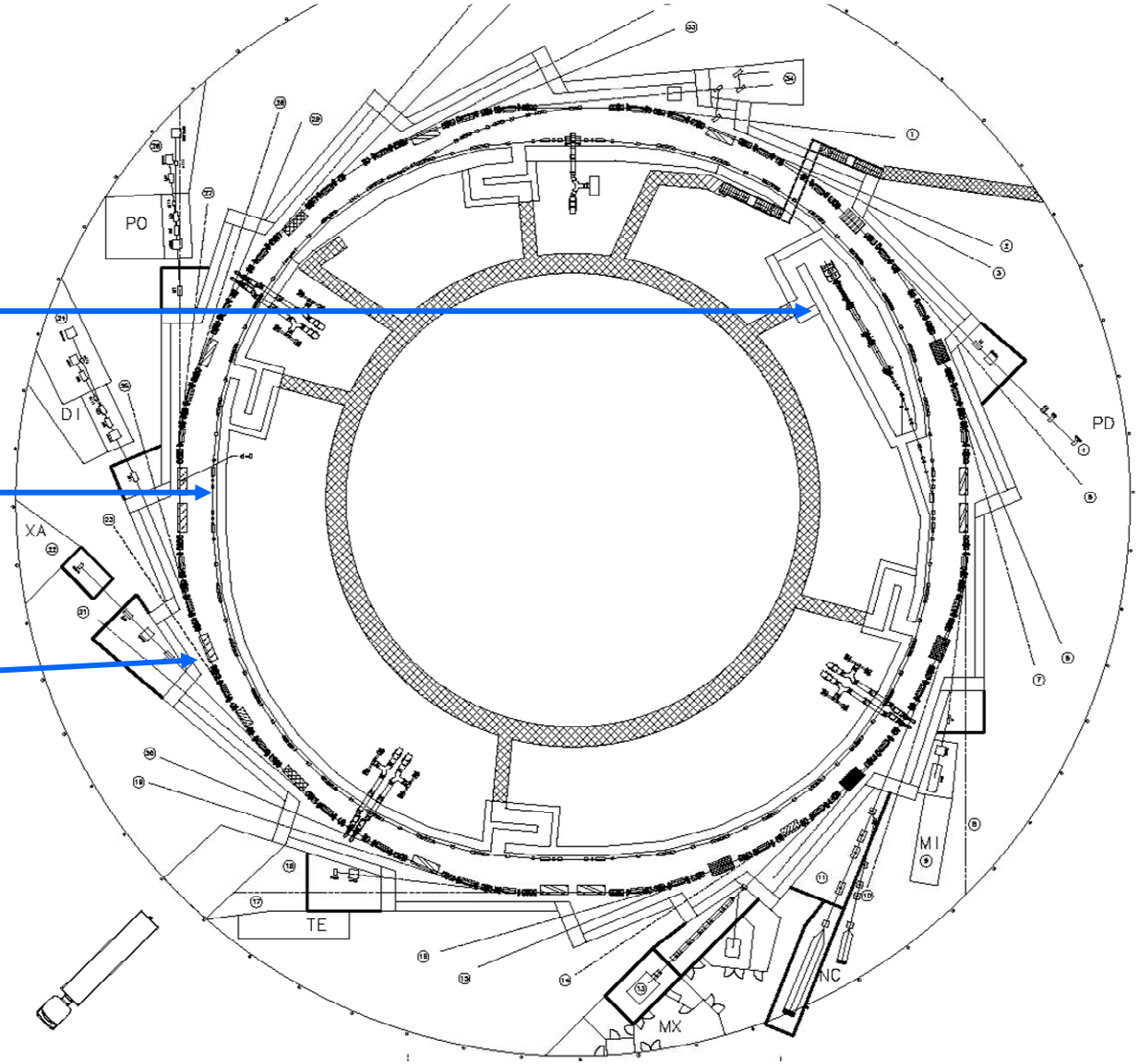

Warehouse
Offices
Parking
Workshop
Electricity
Main Building
Cooling - HVAC

ALBA Accelerators

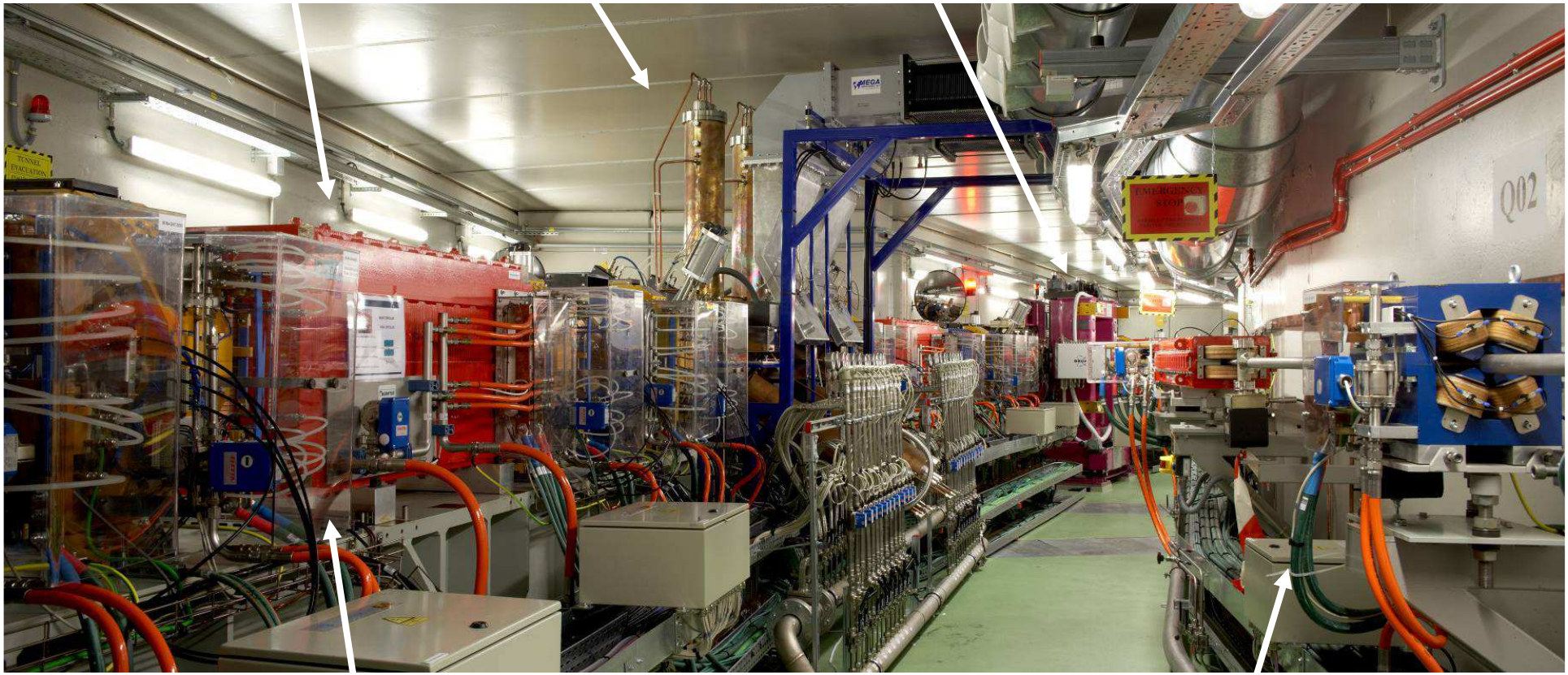
LINAC
100 Mev

BOOSTER
100 MeV – 3 GeV

STORAGE RING
3 GeV



SR and BOOSTER sharing the tunnel



Storage Ring: Main Parameters

Electron beam energy	3.0 GeV
Storage Ring Circumference	268.8 m
Number of cells	16
Symmetry	4

Straight section lengths	4 x 8.0 m (3 ID's+Inj)
	12 x 4.4 m (12 ID's)
	8 x 2.6 m (2 ID's+RF+Diagn)

Beam current	400 mA
Emittance	4 nm.rad
Lifetime	> 10 h

ALBA BEAMLINES

Phase 1:

7 Beamlines under commissioning

6 ID's and 1 bending magnet port

In addition, *2 bending magnet* ports for Electron Beam Diagnostic

Phase 2:

8 proposal have been evaluated

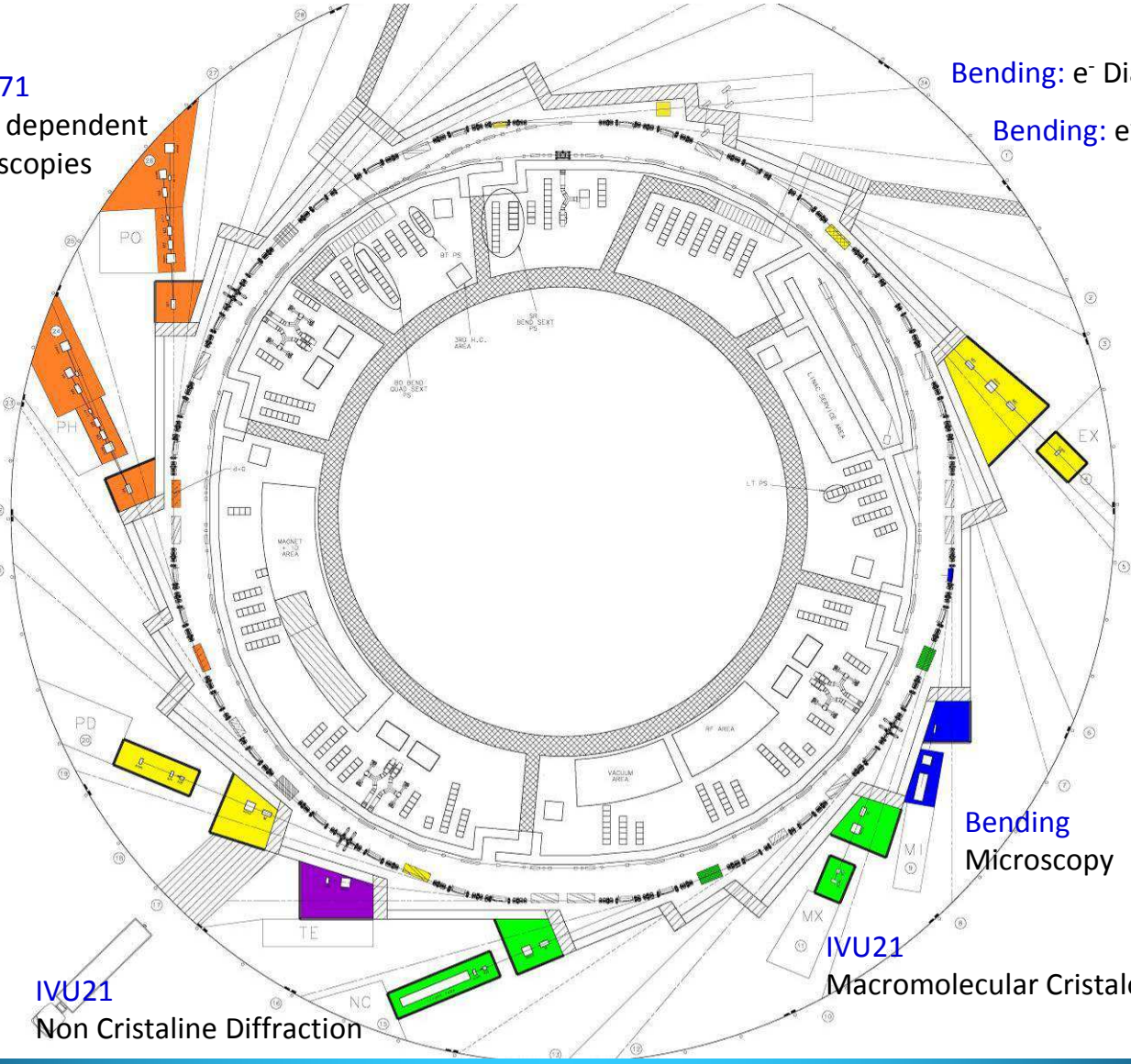
2 new beamlines are approved but pending financial budget

In total:

Capability for *17 ID* beamlines

And *14 bending magnet* beamlines

ALBA BEAMLINES



EU71
Polarization dependent spectroscopies

EU62
Photoemission spectroscopies

W65
XAS

IVU21
Non Cristaline Diffraction

Bending: e⁻ Diagnostics

Bending: e⁻ Diagnostics

SCW30
EXAFS

Bending
Microscopy

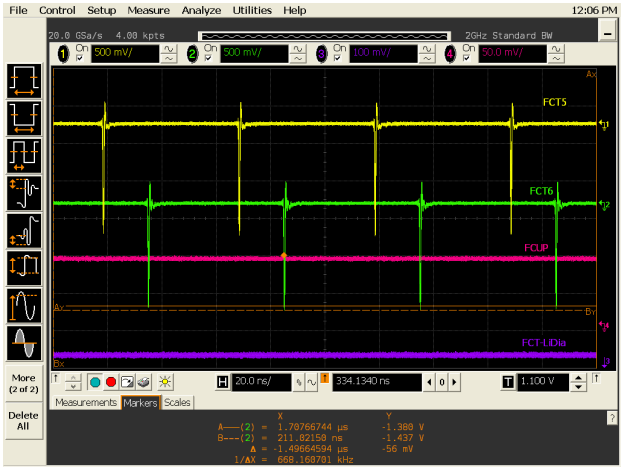
IVU21
Macromolecular Cristalography

Status

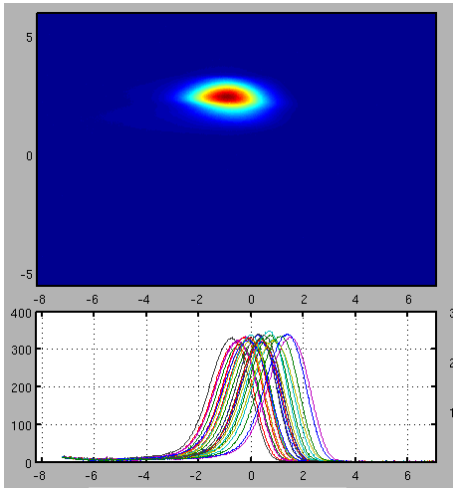
Main linac parameters:

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

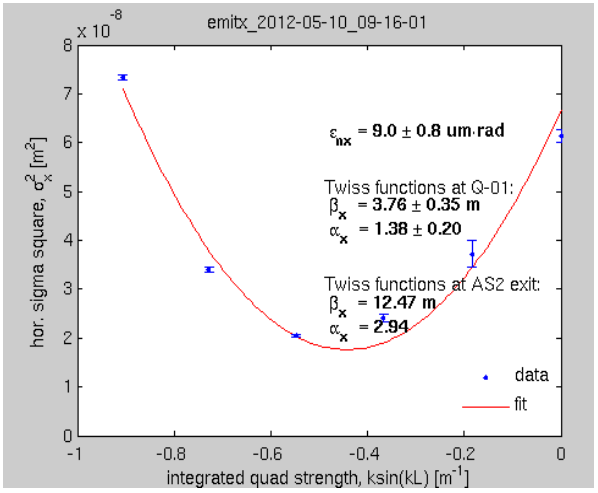
- All parameters within specs
- Operation modes: single bunch & multibunch



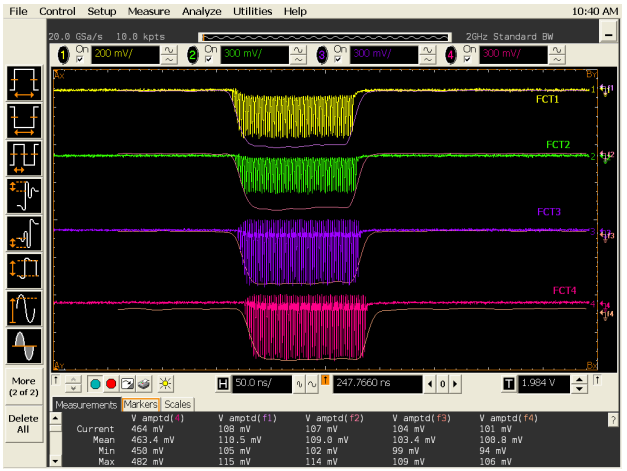
Few bunches mode
0.25 nC/bunch at linac exit



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



ε_x (norm.) ≈ 9 mm·mrad

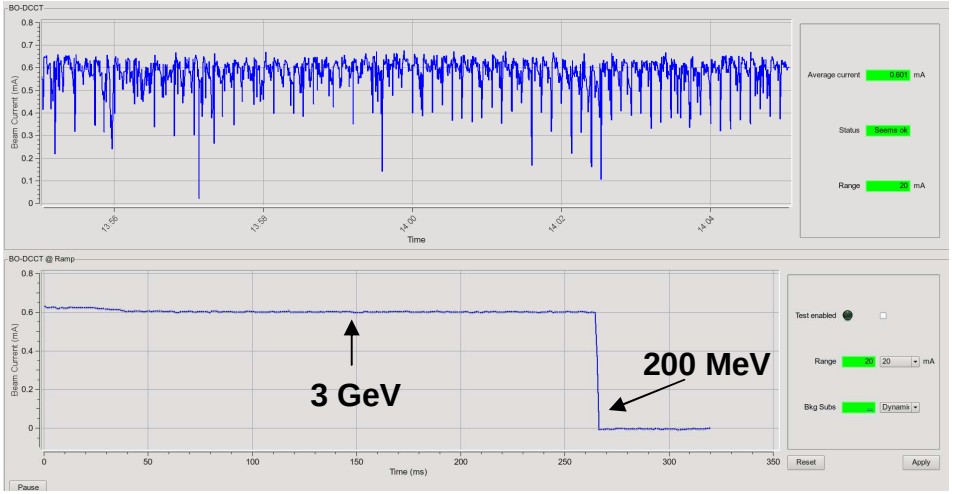


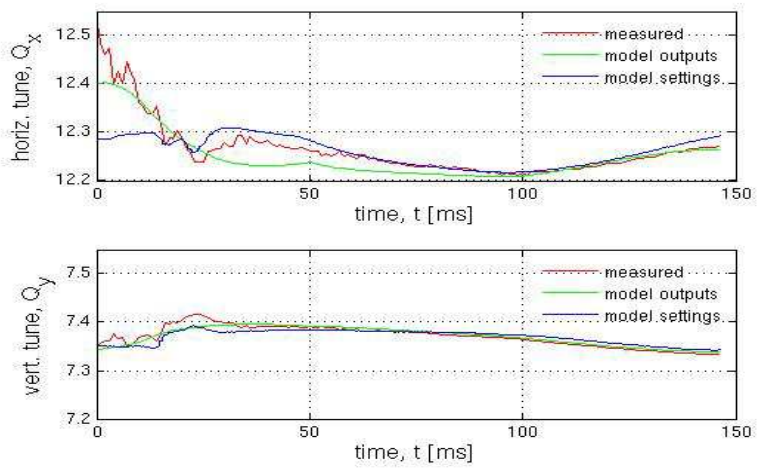
Multibunch mode
4 nC at linac exit

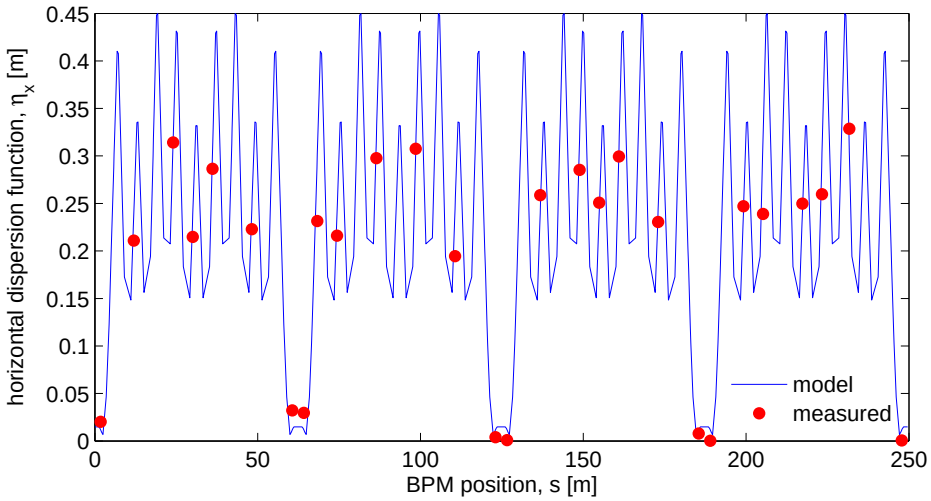
BOOSTER

Main BO parameters:

- C = 249.6 m, shares tunnel with SR
- E = 110 MeV to 3.0 GeV
- $\varepsilon_x \approx 10$ nm·mrad
- Repetition rate: 1 Hz for comm.
  3.125 Hz for operation
- Good agreement with the model







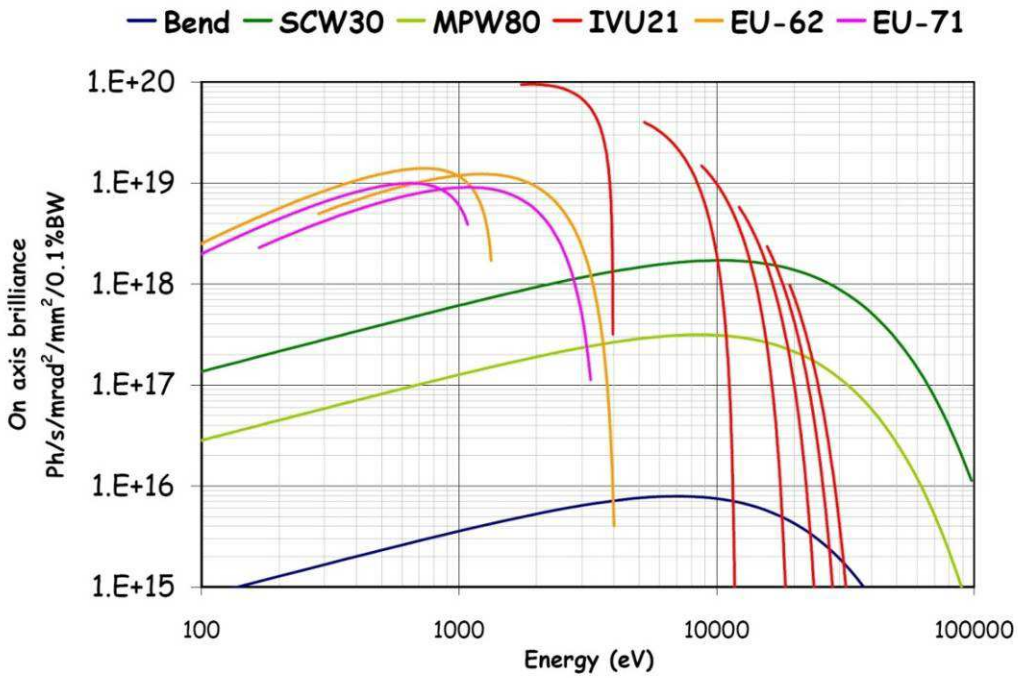
STORAGE RING

	Nominal	Achieved
Energy	3 GeV	3 GeV
Max. Current	400 mA	200 mA
Tunes	18.18, 8.37	18.15, 8.37
Emittance	4.3 nm·rad	4.4 ± 0.4 nm·rad
Energy spread	$1.05 \cdot 10^{-3}$	$1.00 \cdot 10^{-3}$
Coupling	< 1 %	0.5 %
Lifetime @ 100 mA	>10 h	10 h
Ah accumulated		>100

INSERTION DEVICES

Phase I beamlines: **6 x IDs** **All IDs fully operational**

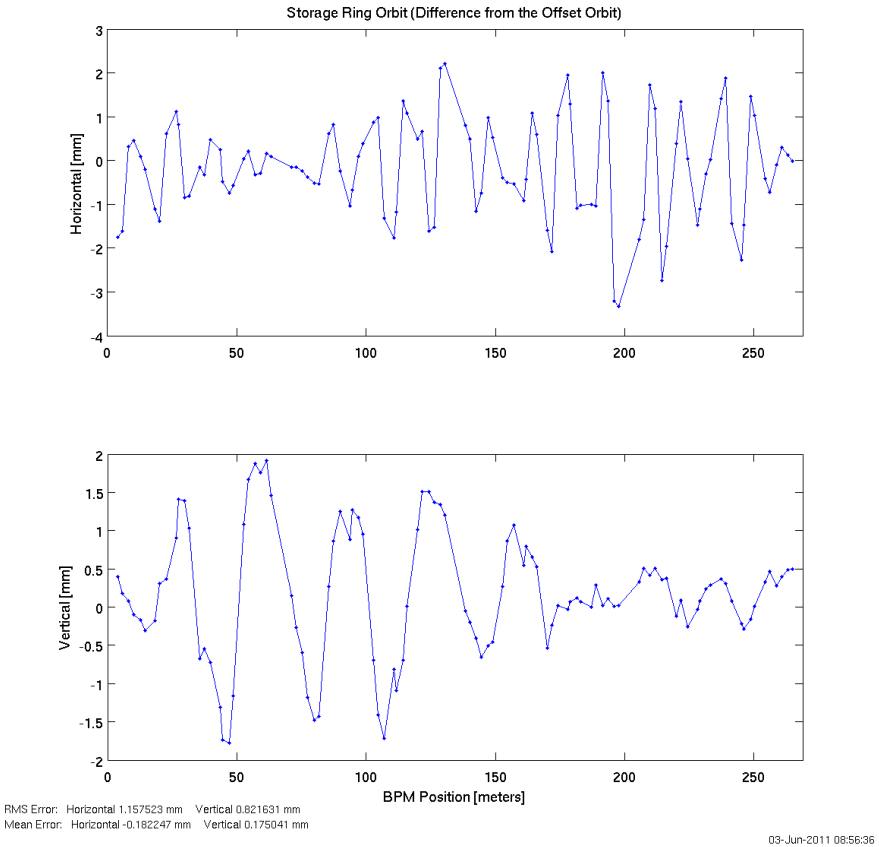
1 x Bending



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

CLOSED ORBIT

Raw orbit without correctors after BBA



BBA: Beam based alignment.

→ align BPM to center of quad

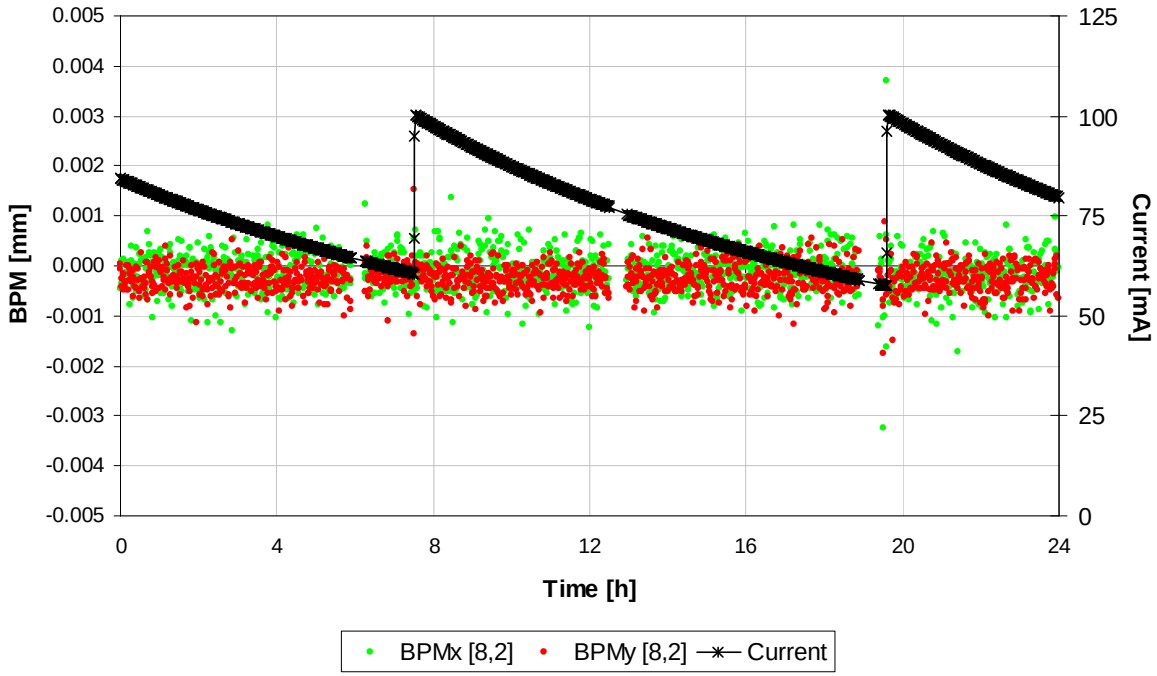
Horizontal orbit < 3mm

Vertical orbit < 2 mm

Good alignment

ORBIT STABILITY

Beam Stability over 24 h



RMS-Values:

σ_x = 0.5 µm

σ_y = 0.2 µm

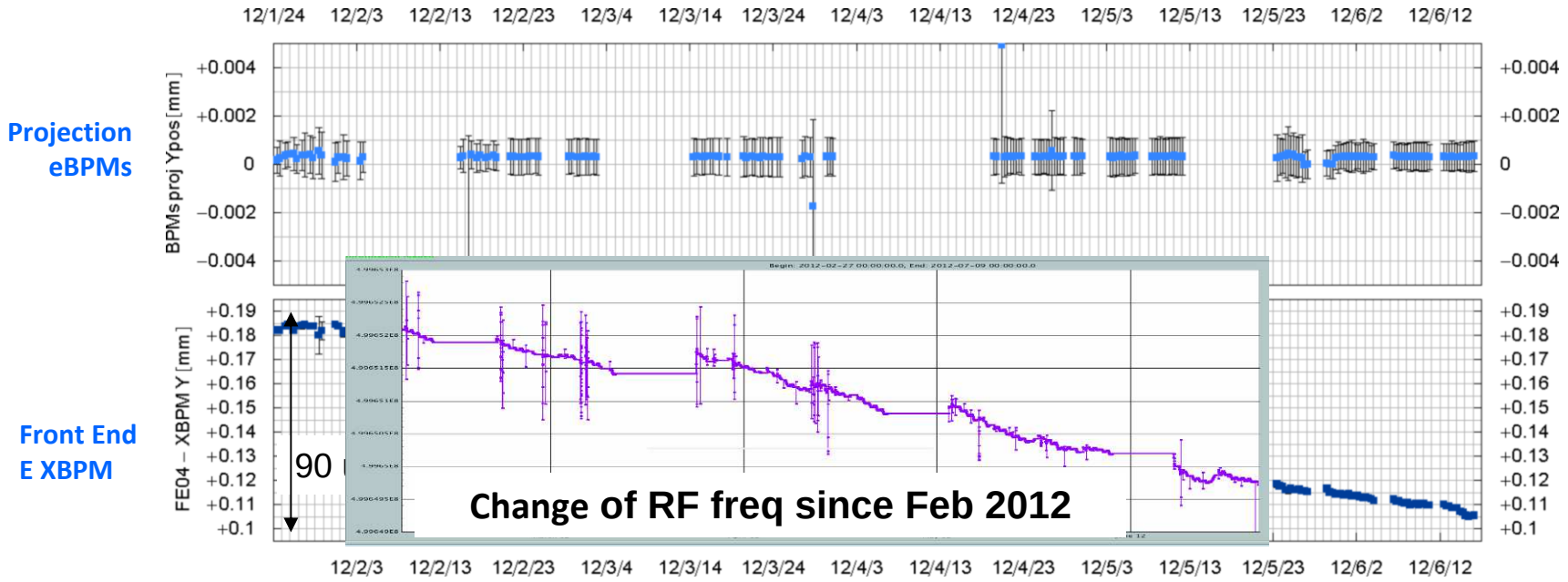
SOFB (Slow Orbit FeedBack)

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

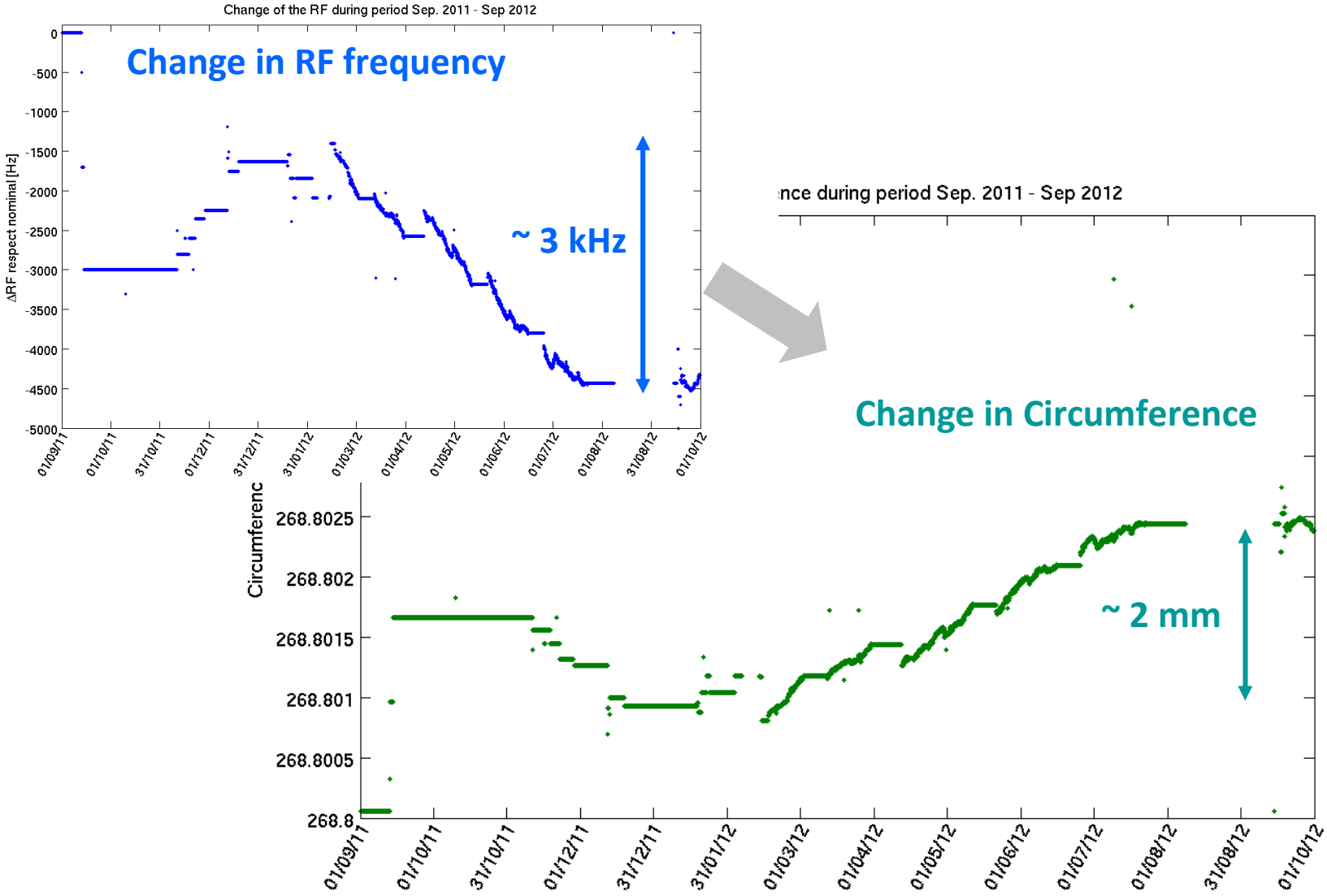
PHOTON BEAM STABILITY

Long term drift @ MSPD

Vertical plane

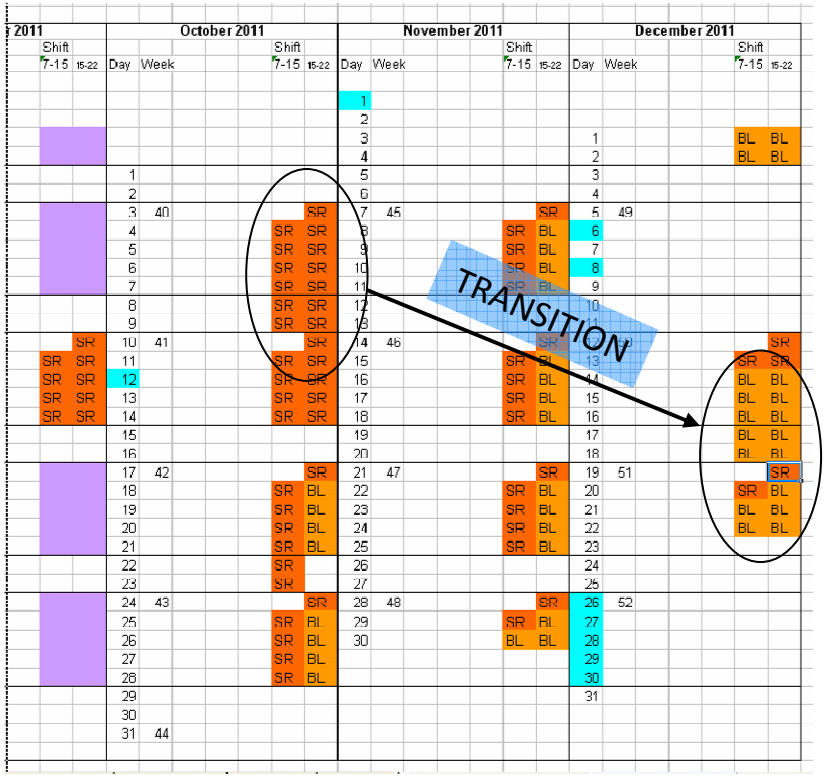


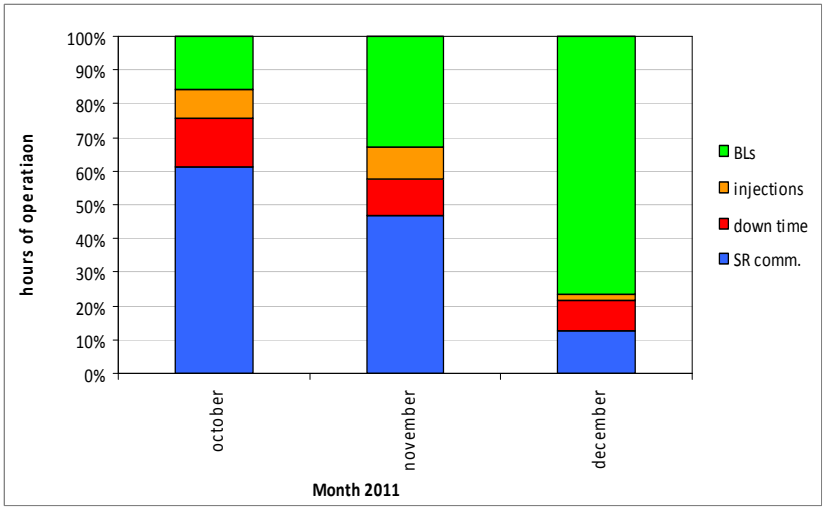
"BUILDING" STABILITY



Operation

End 2011: Transition to Operation



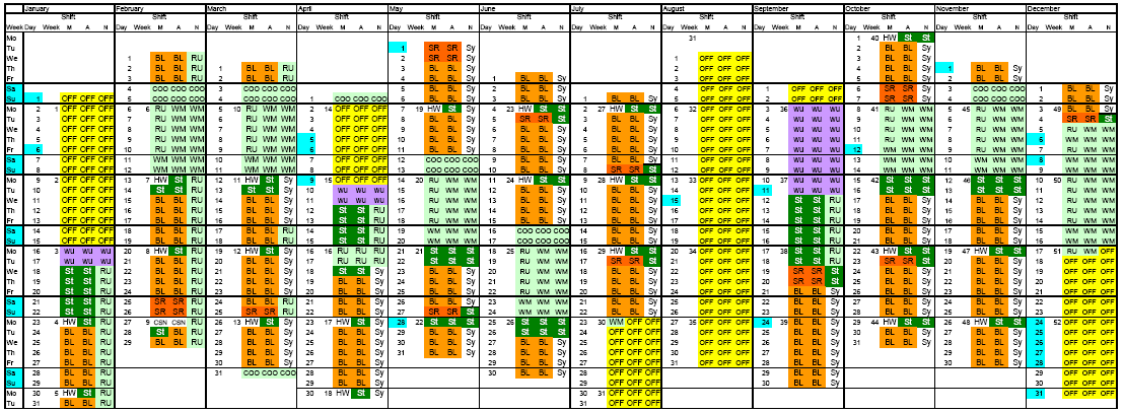


OPERATION 2012

4300 h of operation

3200 h for Beamlines

1100 h for accelerators development



- ✓ Running 3 shifts/day
- ✓ Runs of 24 days on average
- ✓ Monday: Accelerators start-up
- ✓ Tuesday 07h00 – Monday 07h00 Beam for users
- ✓ 2 long shut downs, 5 short (1 w) shut downs

7th May 2012: First users

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- All news
  - The first users have started their experiments at ALBA

The first users have started their experiments at ALBA

Created by Anne-Cécile KLORA — last modified May 17, 2012 12:52 PM

BOREAS is the first of ALBA 7 beamlines to be available to users.

The standard proposal 'Ferrite magnetic nanoparticles and hybrid superconducting layers: a XMCD spectroscopic study', granted with 18 shifts, started running experiments at ALBA on May 7th, 2012.

The aim of the experiment is to clarify and characterize the atomic origin of the magnetism in different ferrite nanoparticles, both in assynthetized form as well as embedded in high temperature superconductor (HTS) thin films.

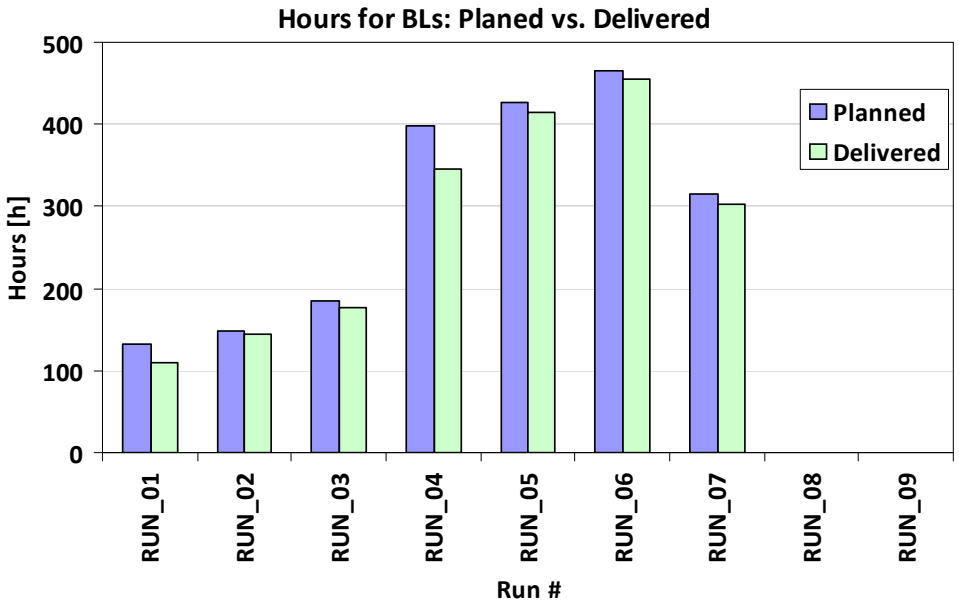
Alba would like to thank all participants in this call for proposals for their interest in our Facility and the high level of scientific proposals, as acknowledged by the Scientific Panel.

ALBA acting Director, the User Office team, the BOREAS beamline team and the first external users from Unidad de Química Inorgánica- Departamento de Química- UAB, Barcelona.

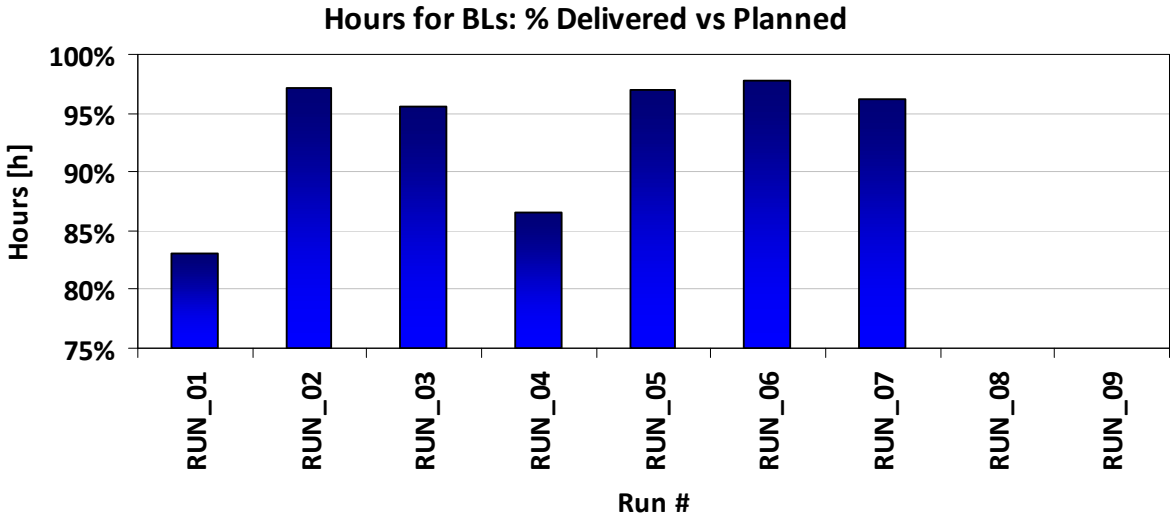
OPERATION 2012

Statistics Jan-Sept 2012

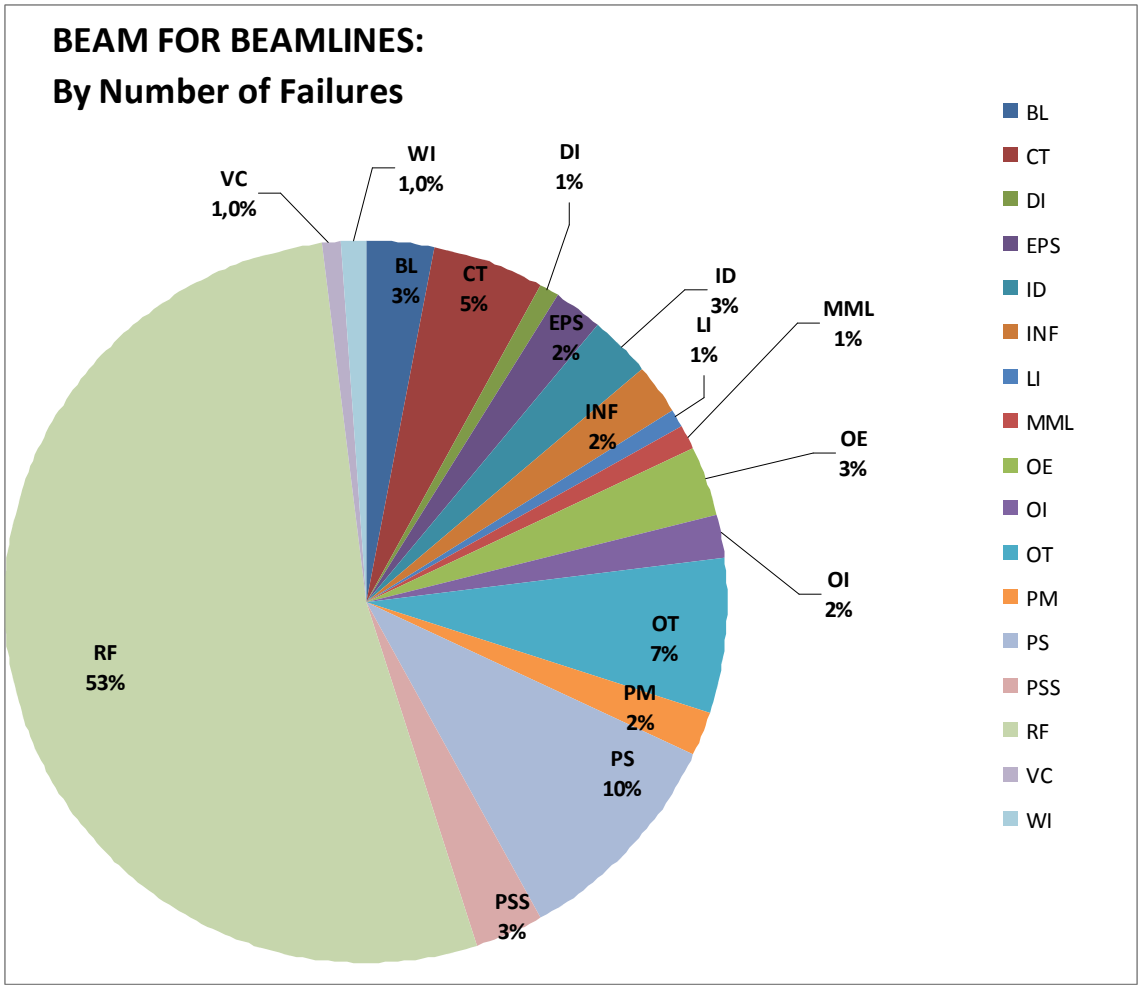
- Beamline operation:
  - 2073 planned
  - 1950 delivered



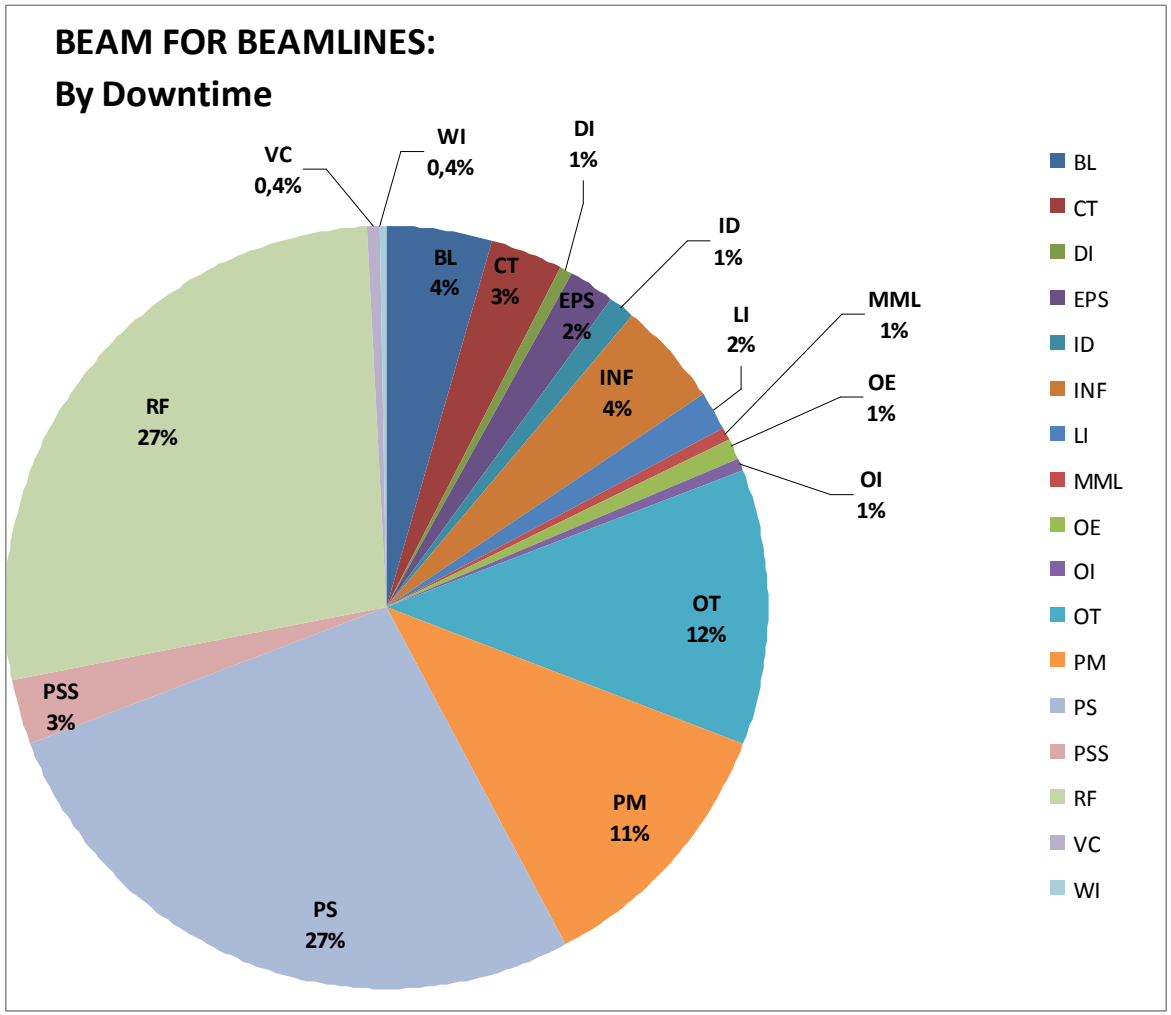
- 94 % beam availability:



OPERATION 2012



OPERATION 2012



SUMMARY

- Main specifications for ALBA have been reached
- ALBA is already open to users
  - 2013 will have:
    - 3600 hours for BLs (2800 for users)
    - 1400 hours for Accelerators
- Future work:
  - FOFB
  - Top-up
  - Fast Feedback system
  - Increase operation current

Thank you