



ALBA Synchrotron Light Source

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Introduction to ALBA

Accelerators Developments

Accelerators Commissioning

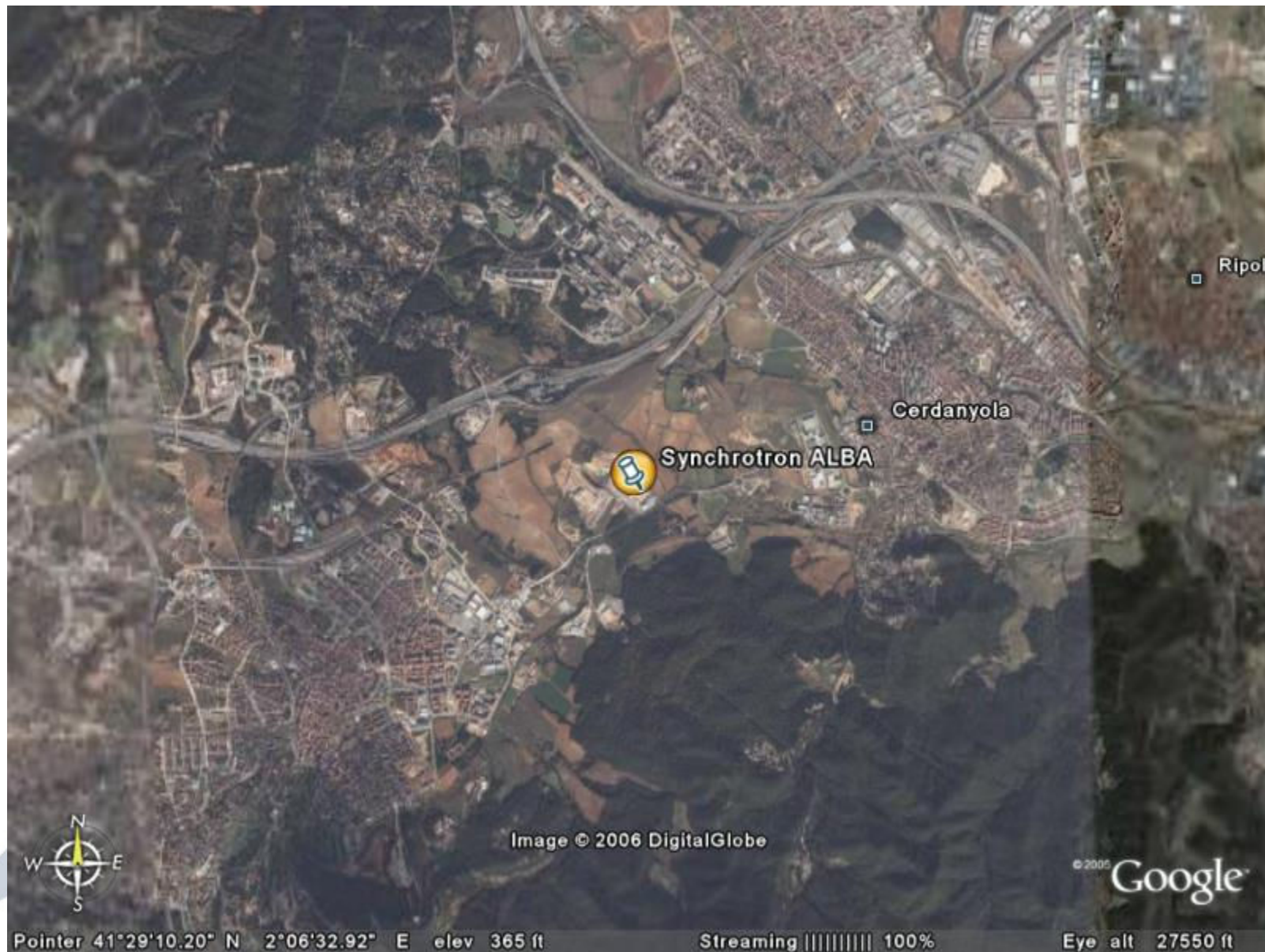
The ALBA Team
We are today ~150



ALBA Synchrotron Light Source

- ✓ 3 GeV electron accelerator
- ✓ 30 beamlines (7 on day one)
- ✓ Funding is 50% Spanish – 50% Catalan Governments
- ✓ First beam for users 2011





Back to 2006



July 27th, 2006: Official start of the building work

ALBA Schedule

ALBA founded	April 03
ALBA 1st worker	Dec 03
...	
Start main building works	July 06
Start Linac installation	Feb 08
Linac commissioning	Sept - Oct 08
Booster and SR installation	Feb 09 – Dec 09
Booster commissioning	Jan 10
SR Installation	Feb – June 10
Storage Ring commissioning	Sept – Nov 10
Beamlines commissioning	Nov 10 – Feb 11
Start of Users Operation	~ May 2011

Synchrotron Light Source in Cerdanyola (Barcelona, Spain)



December 2009



Warehouse

Offices

Workshop

Electricity

Main Building

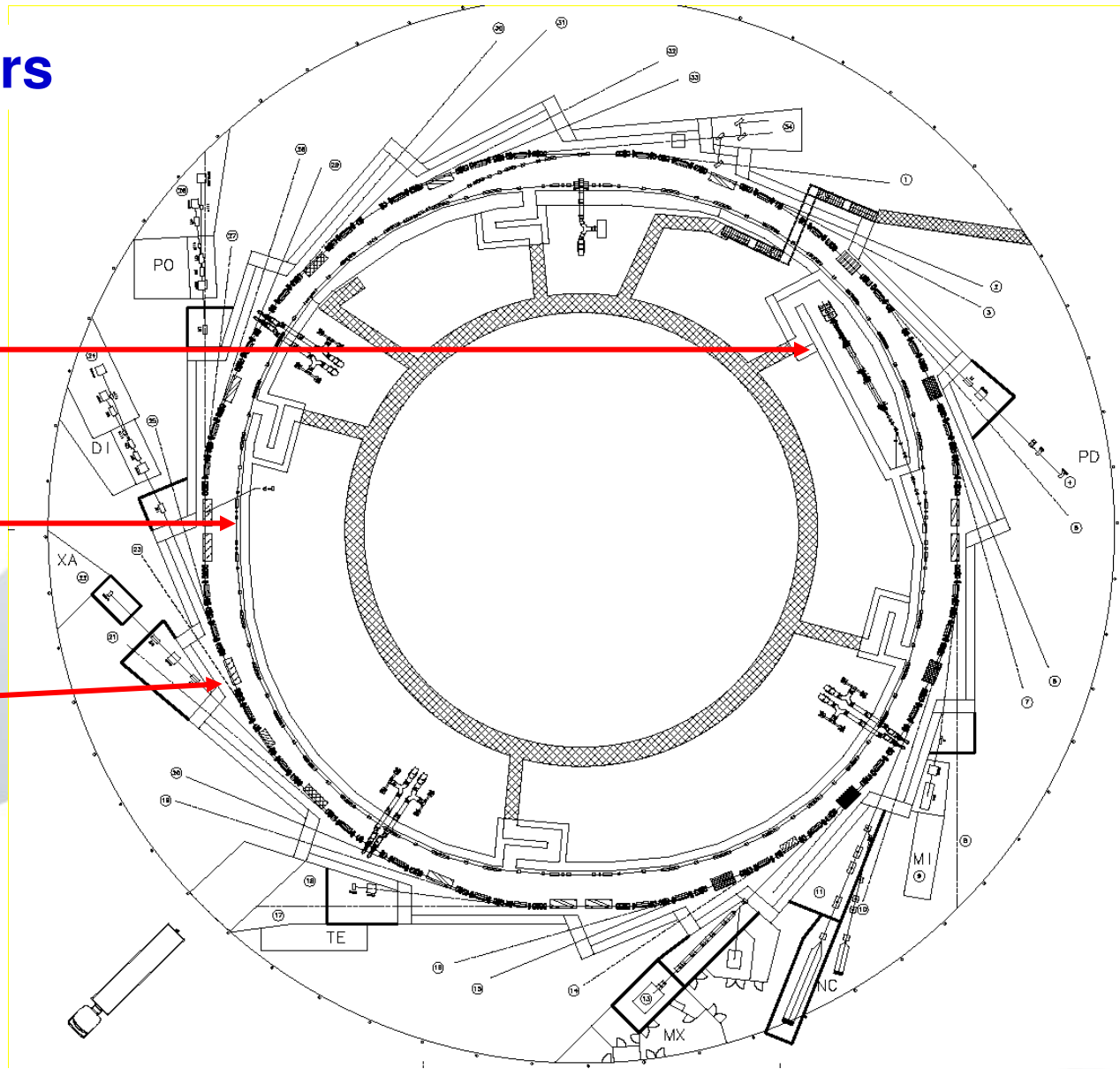
Cooling - HVAC

ALBA Accelerators

LINAC
100 MeV

BOOSTER
100 MeV - 3 GeV

STORAGE RING
3 GeV



Booster and Storage Ring sharing the same tunnel



May 2009

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 construction, open to users on day 1
6 ID's and 1 bending magnet port

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

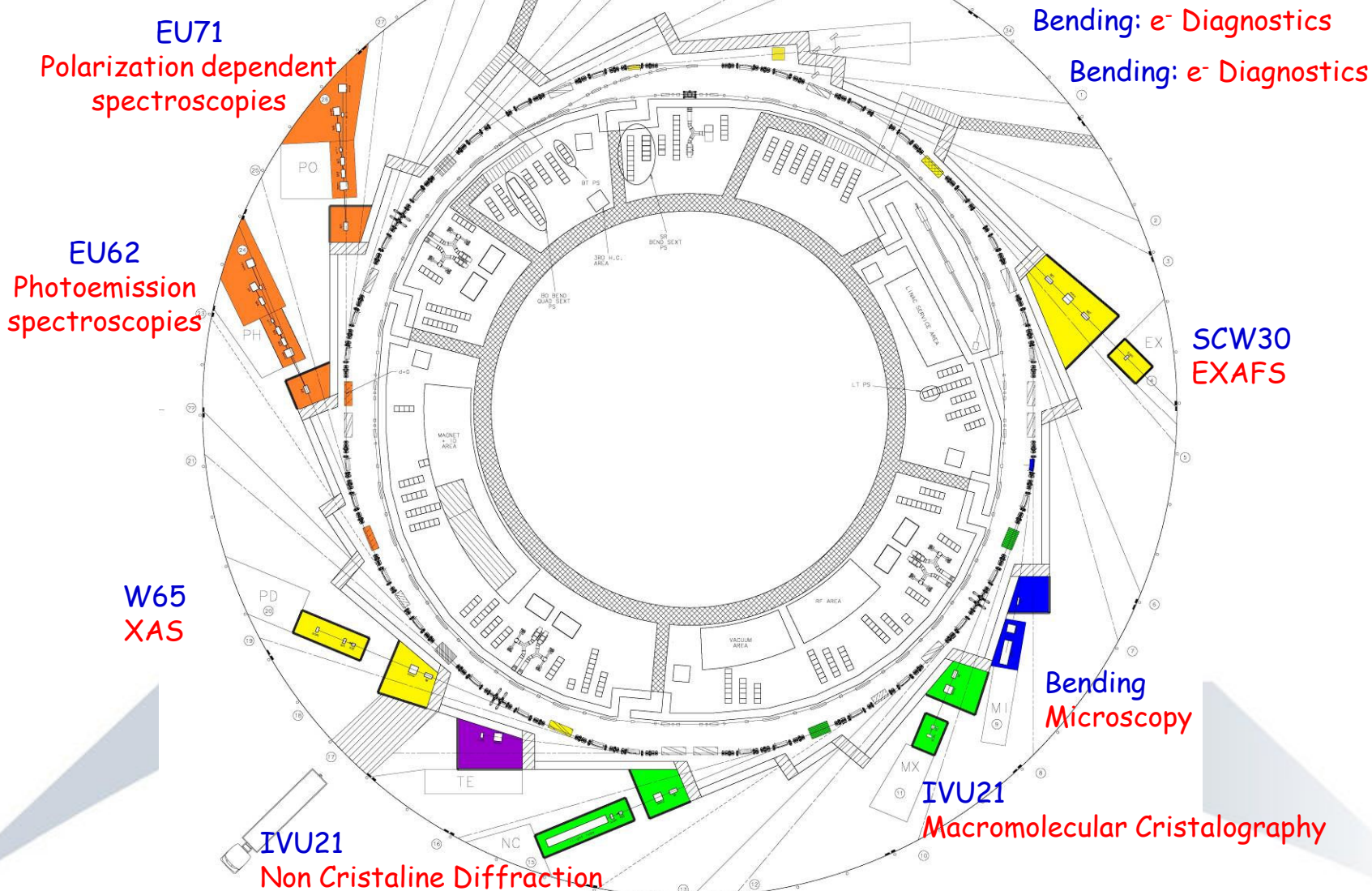
Phase 2:

8 proposal have been evaluated
Funding for 2 is being looking for

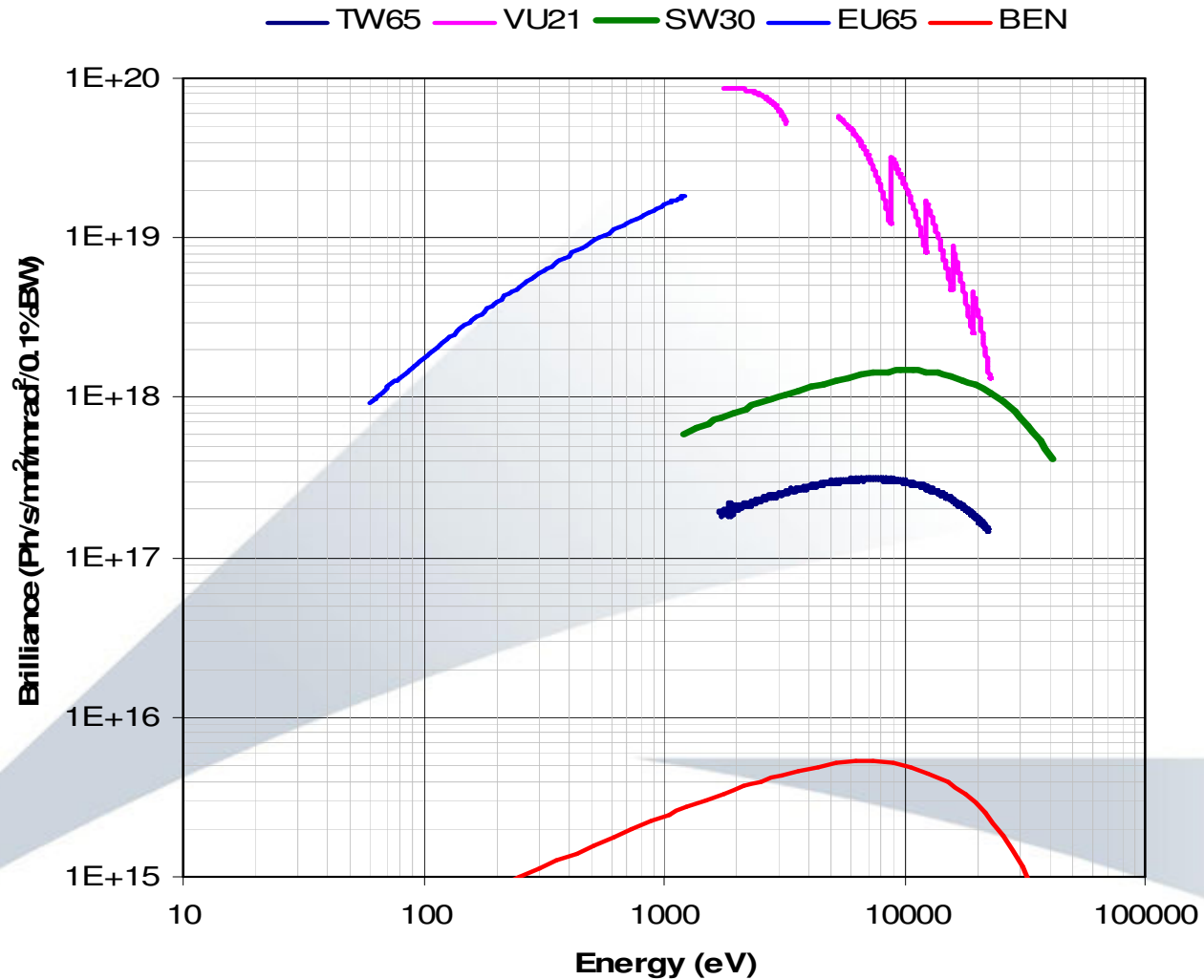
In total:

Capability for *17 ID* beamlines
And *14 bending magnet* beamlines

ALBA BEAMLINES



Brilliance of insertion devices of day 1



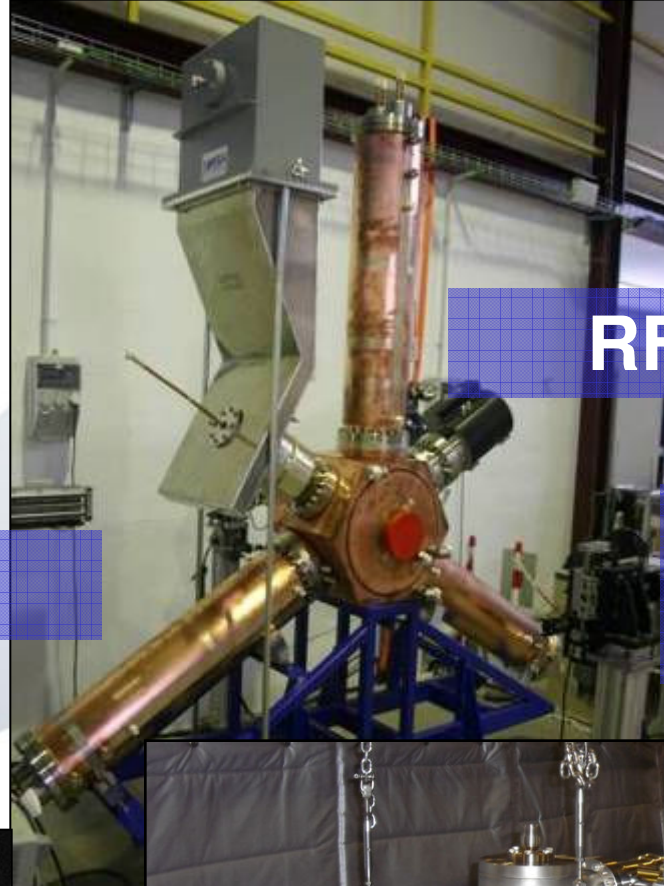
Accelerator Developments



Magnets



Diagnostics



RF Cavities

Control System

Timing

Digital Electronics



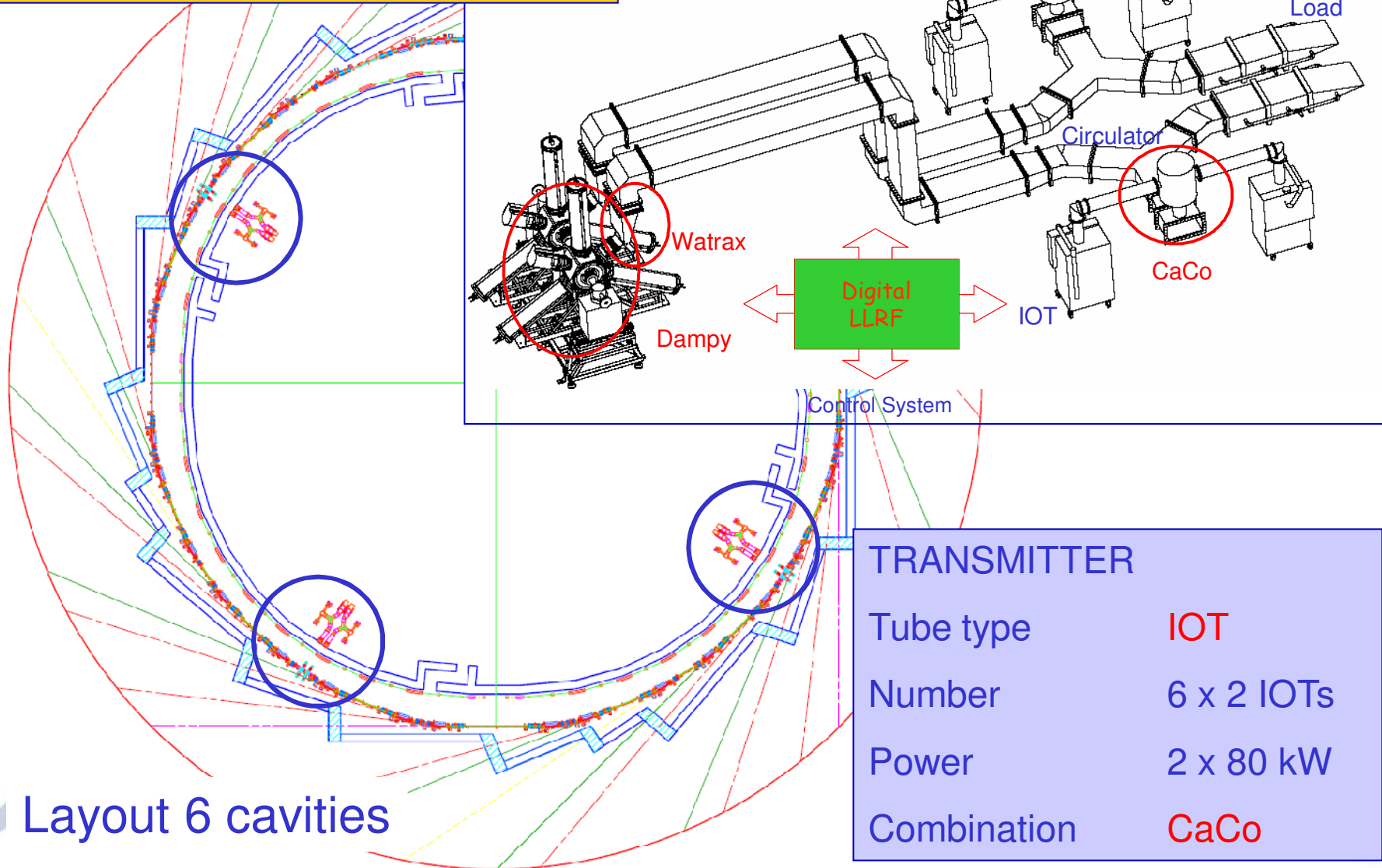
Vacuum

A close-up photograph of a radio-frequency (RF) system component, likely a cavity or waveguide, made of polished copper. The central part is a circular opening with a complex internal structure. Two rectangular copper blocks are attached to the sides, each featuring several small circular ports or screws. The lighting is dramatic, highlighting the metallic surfaces and creating a sense of depth and precision.

RF System

by ALBA RF group

RF Voltage 3600 kV

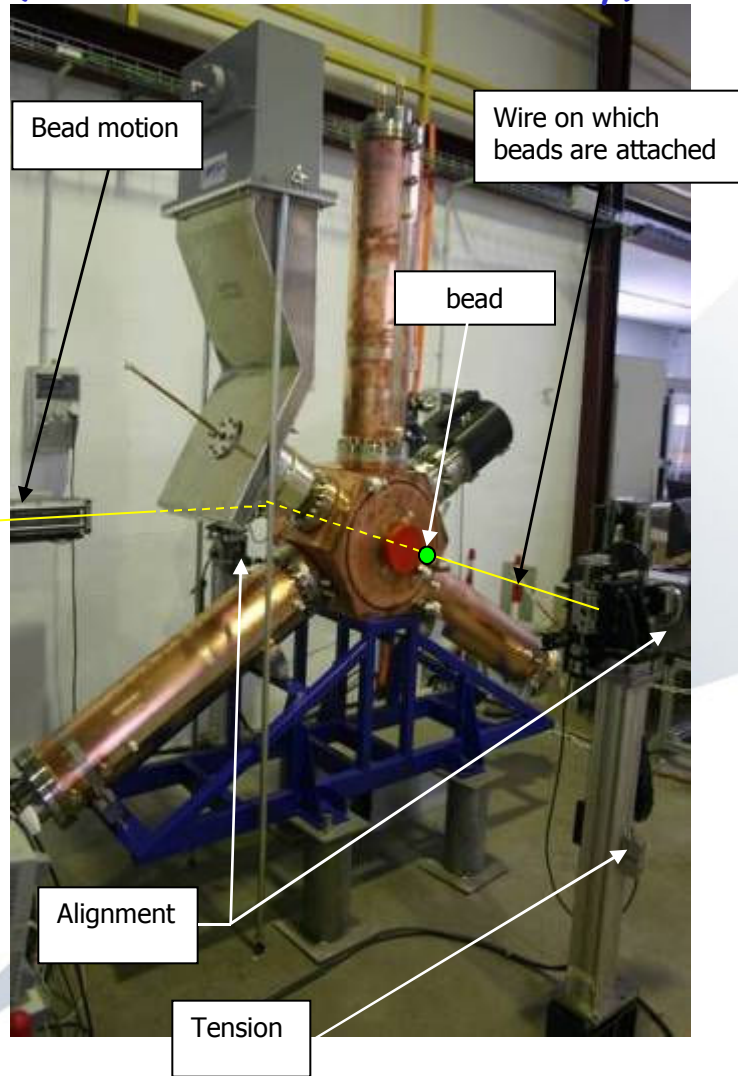


Layout 6 cavities

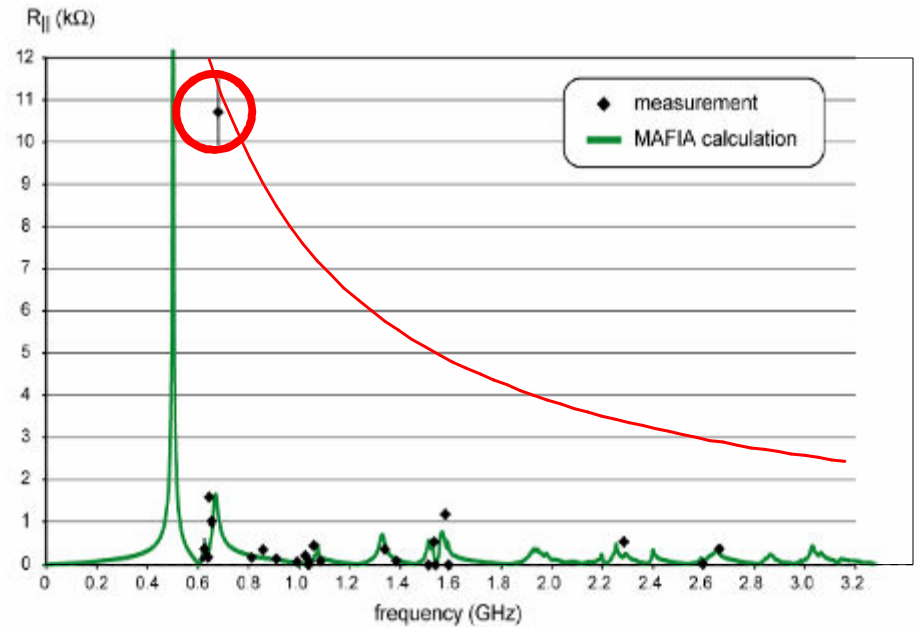
TRANSMITTER	
Tube type	IOT
Number	6 x 2 IOTs
Power	2 x 80 kW
Combination	CaCo

RF cavity: DAMPY

(in collaboration with Bessy)

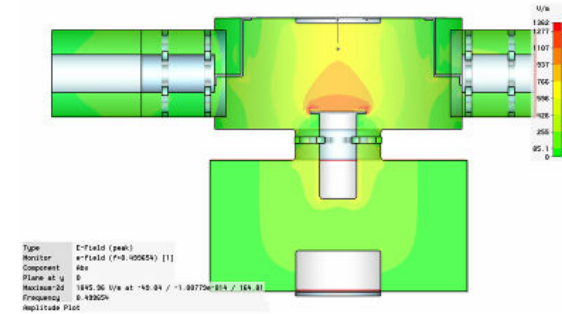
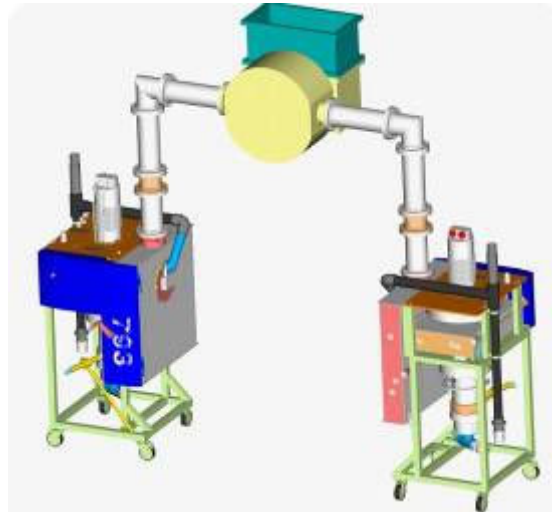
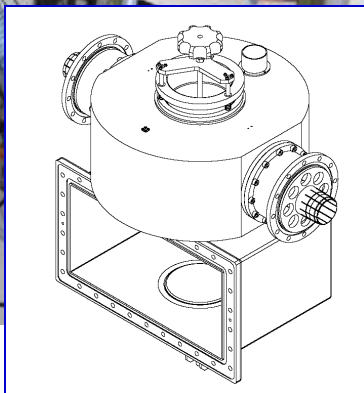
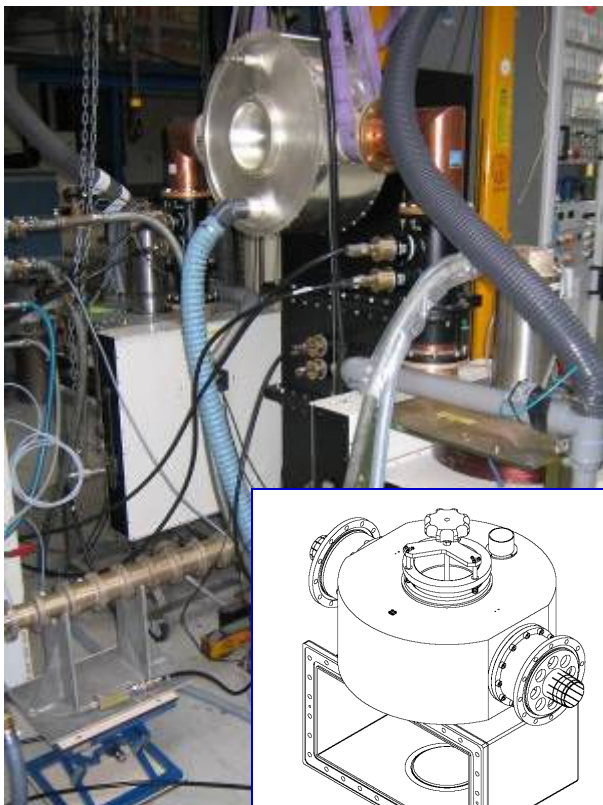


HOM damped RF cavity



CAVITY	DAMPY	
Type	single-cell	
Number	6	
Frequency	500	MHz
Rsh	3.3	Mohm

RF Power Combiner: CaCo



both IOTs
on

IOT 2 off

IOT 1 off

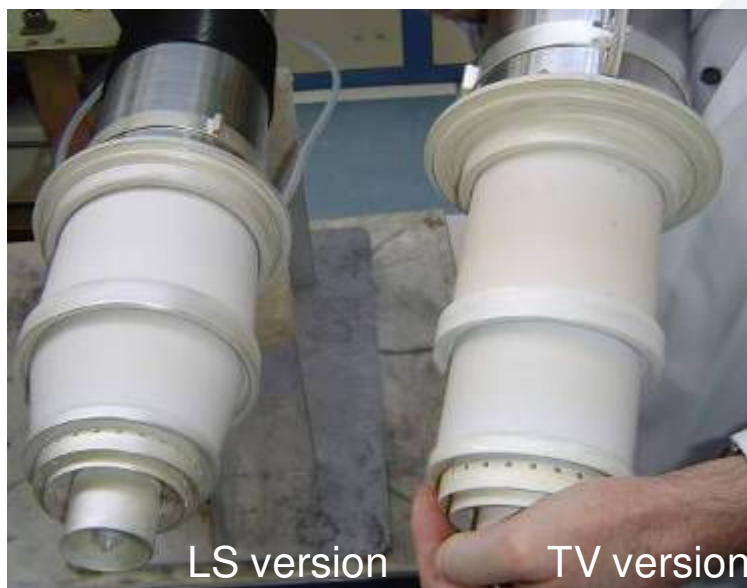
	IOT1		OUTPUT	IOT2		
	efficiency	reflected	calorimetric	calorimetric	reflected	efficiency
	%	kW	kW	kW	kW	%
both IOTs on	72,0	3,5	82,8	154,2	71,4	67,0
IOT 2 off	48,8	5,6	54,2	52,2	-2	10
IOT 1 off	0	6	-0,1	31,0	31,1	33,7

New **IOT** (in collaboration with *Thales*)

Tested in factory at 80 kW for more than 24 h

Tested in factory for 1/2 h at 90 kW

Operational at RF lab since December 2007

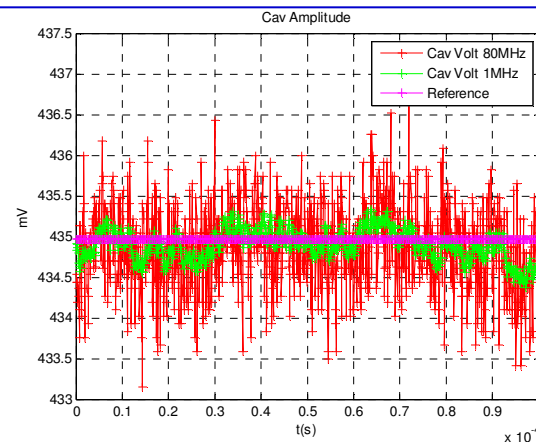


Digital Low Level RF



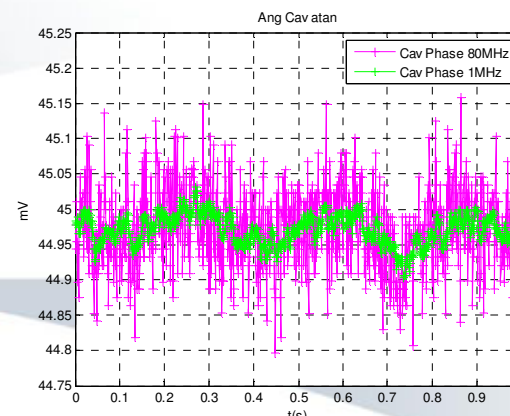
Using a **commercial board**

Tests at 75 kW



Amplitude RMS Errors: 0.11% @ 80MHz

0.03% @ 1MHz

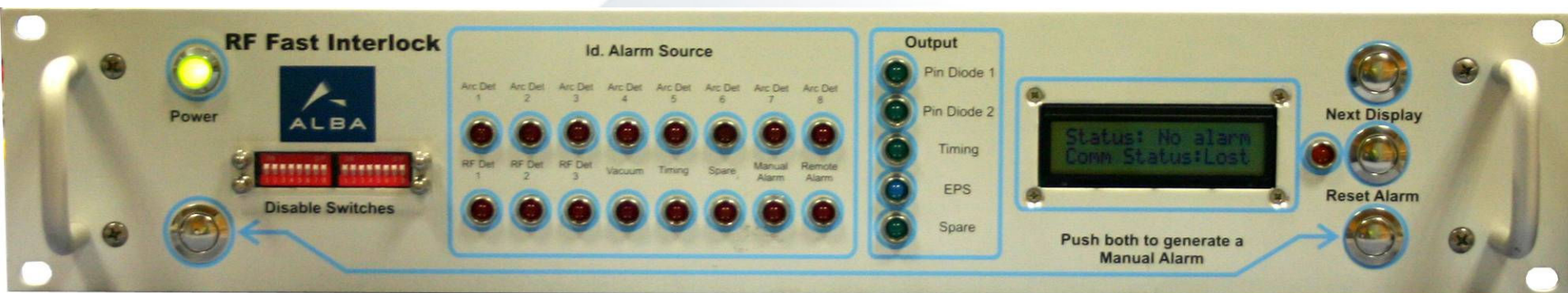


Phase RMS Errors: 0.05° @ 80MHz

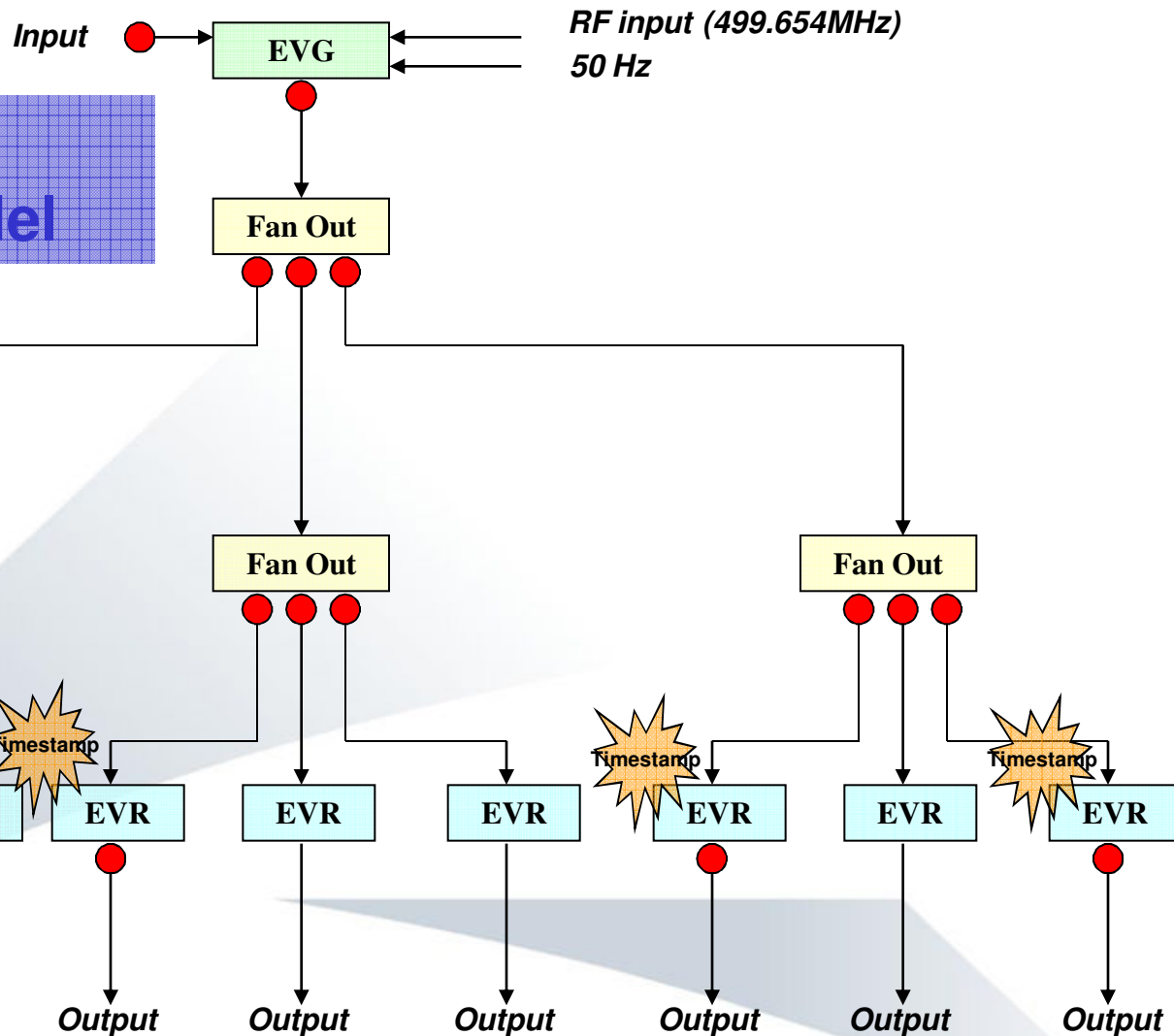
0.02° @ 1MHz

Timing and Machine Protection System

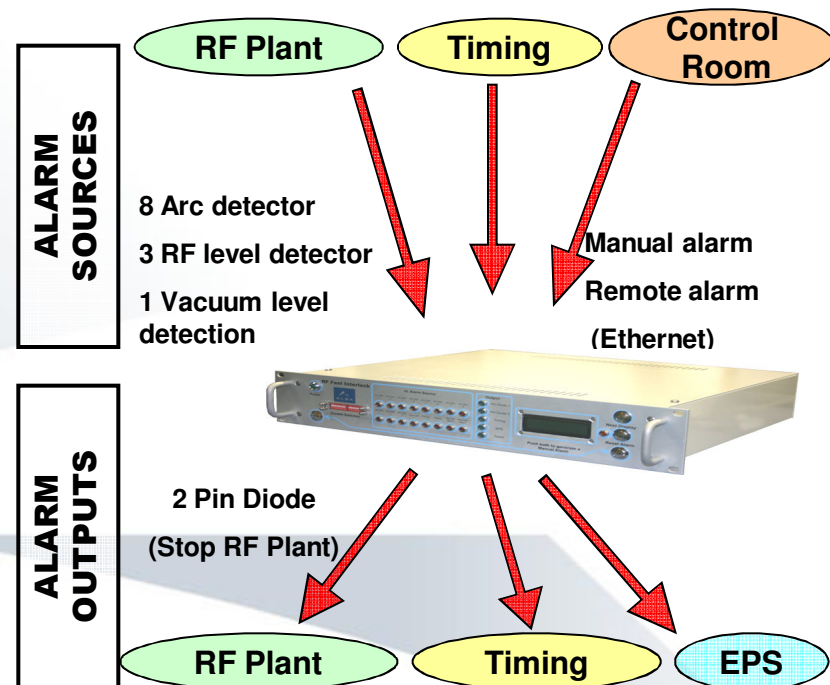
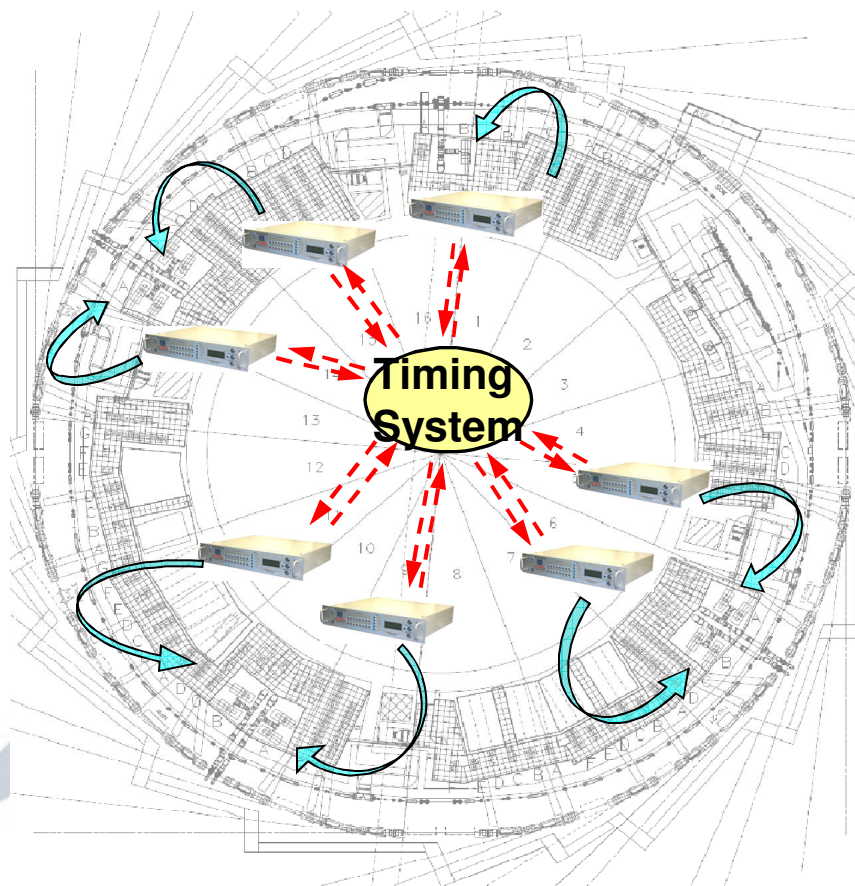
by ALBA Electronics Group

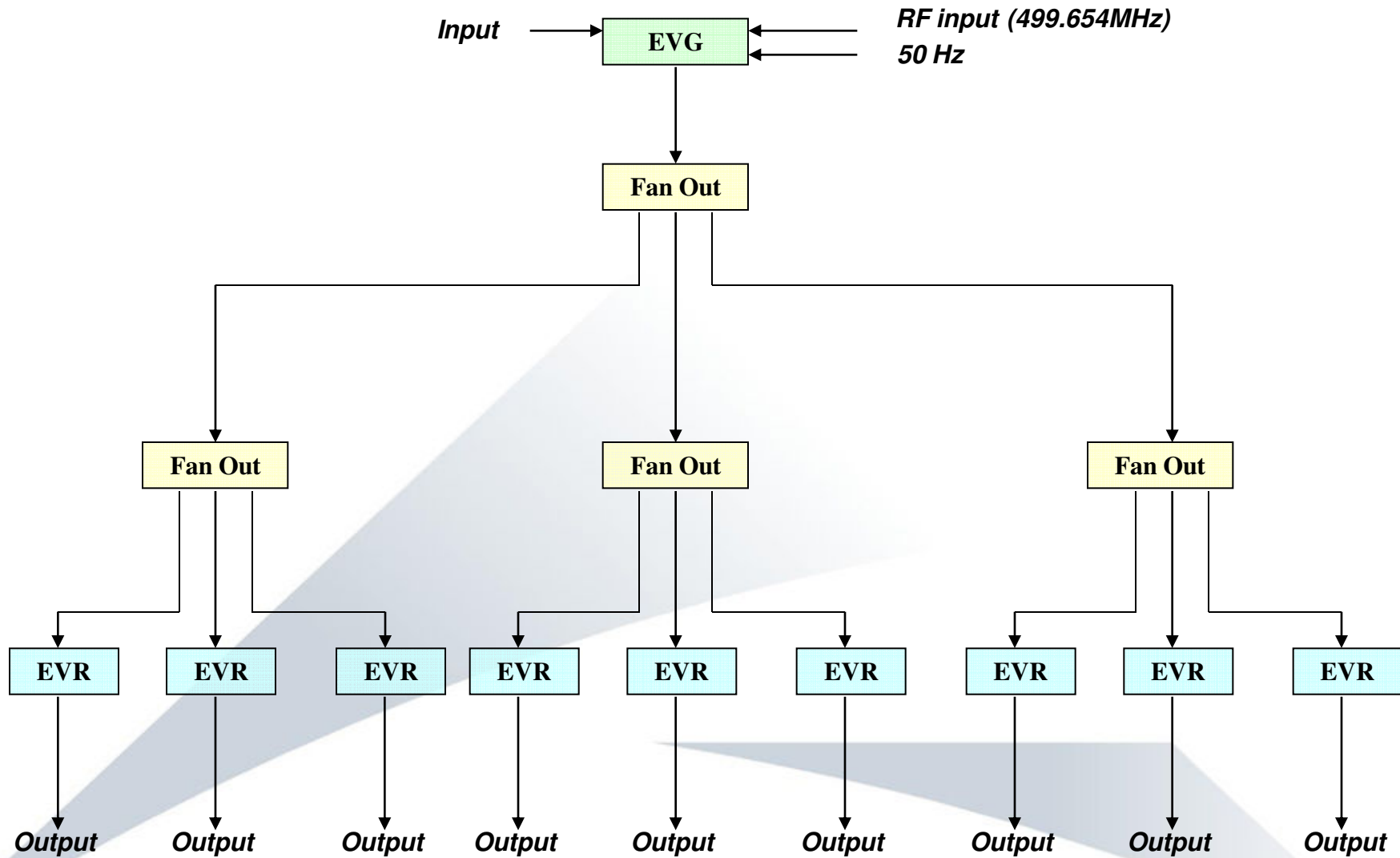


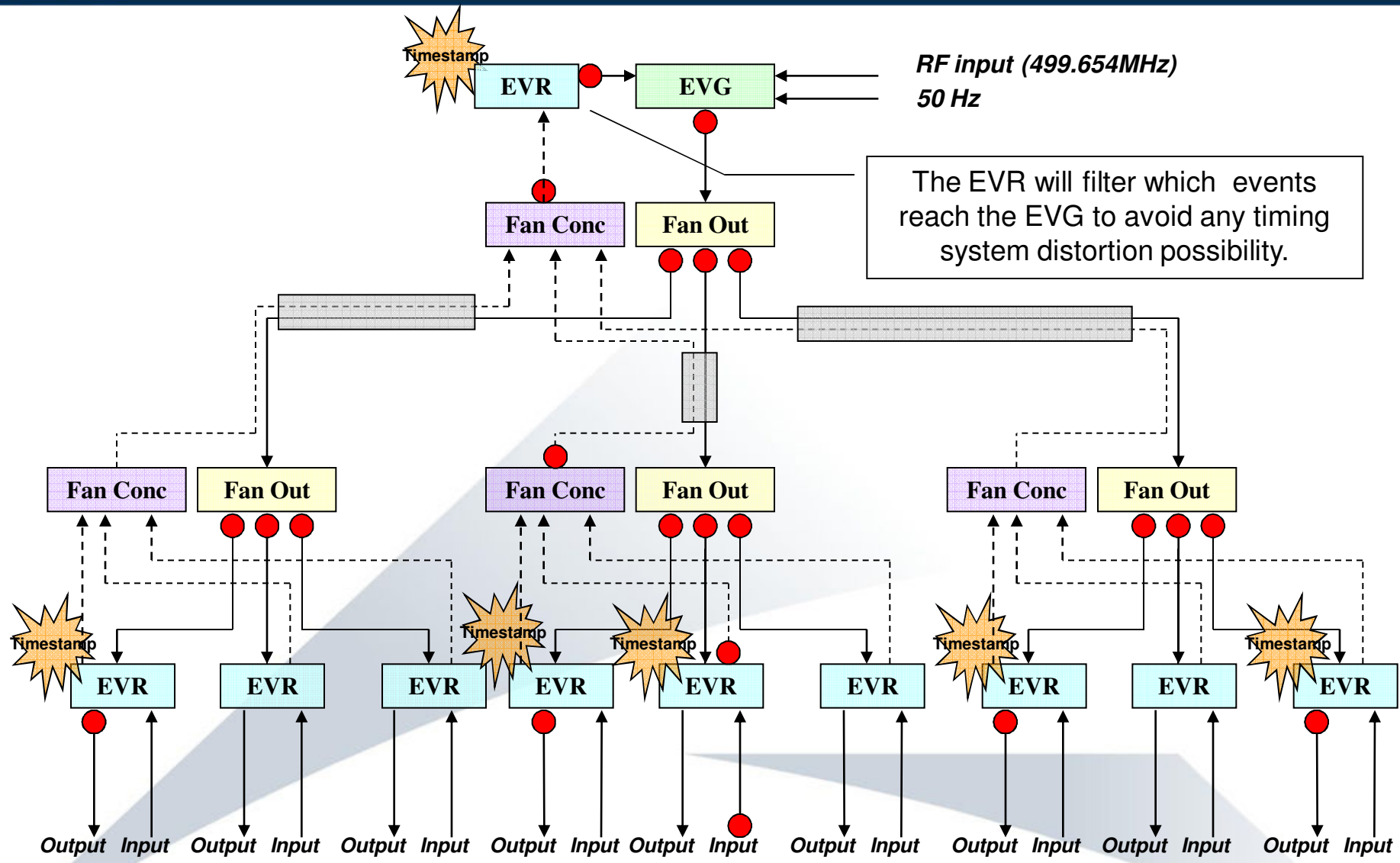
Timing System: Event Based Model



Upgrade the timing system to add a *second* and *faster* redundancy to the standard Machine Protection System (PLC based)





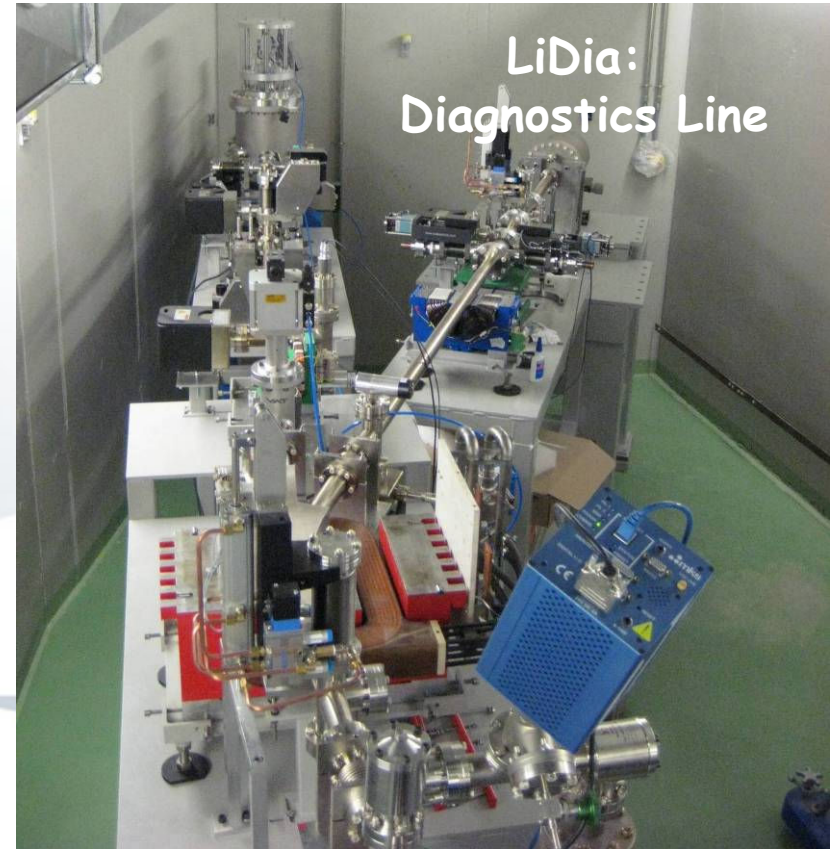


5 microseconds!

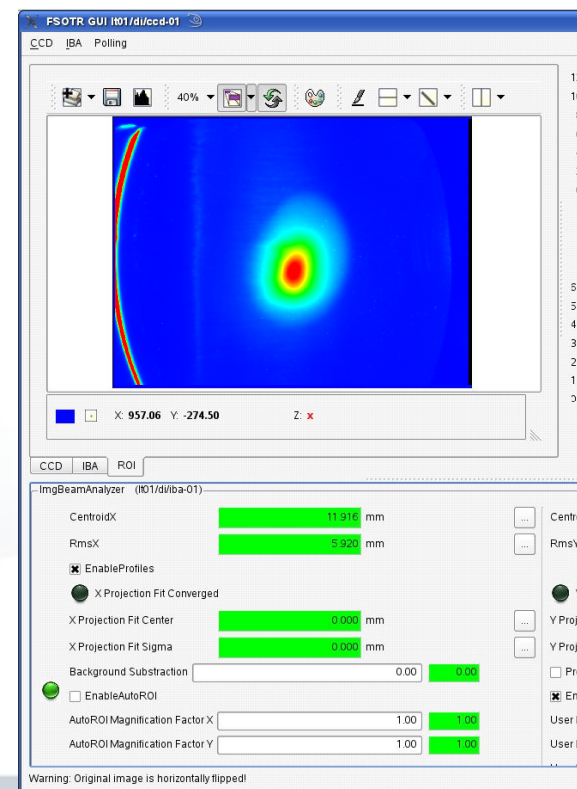
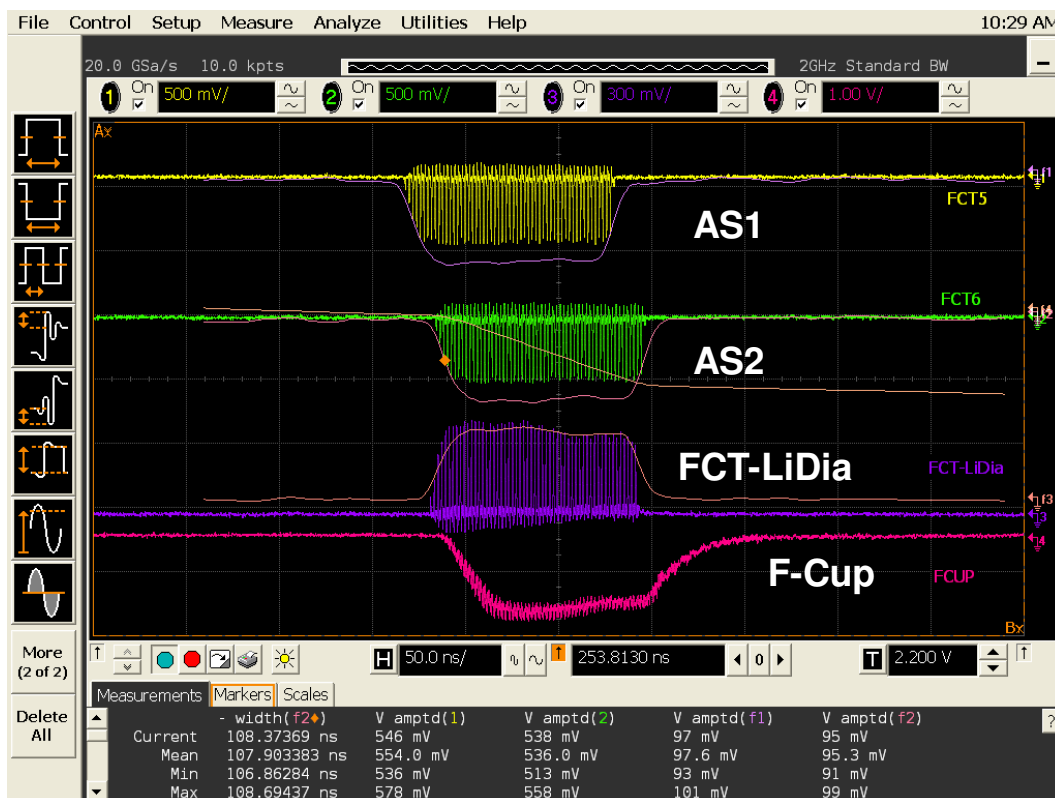
Accelerator Commissioning



Linac Commissioning



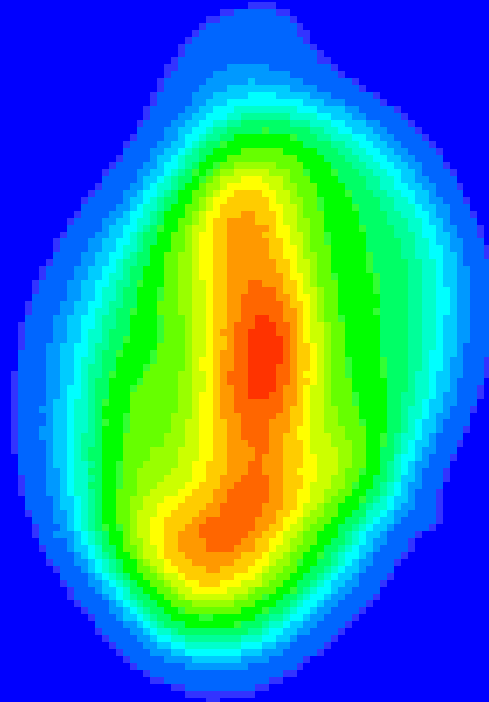
Linac Commissioning (Oct 2008)

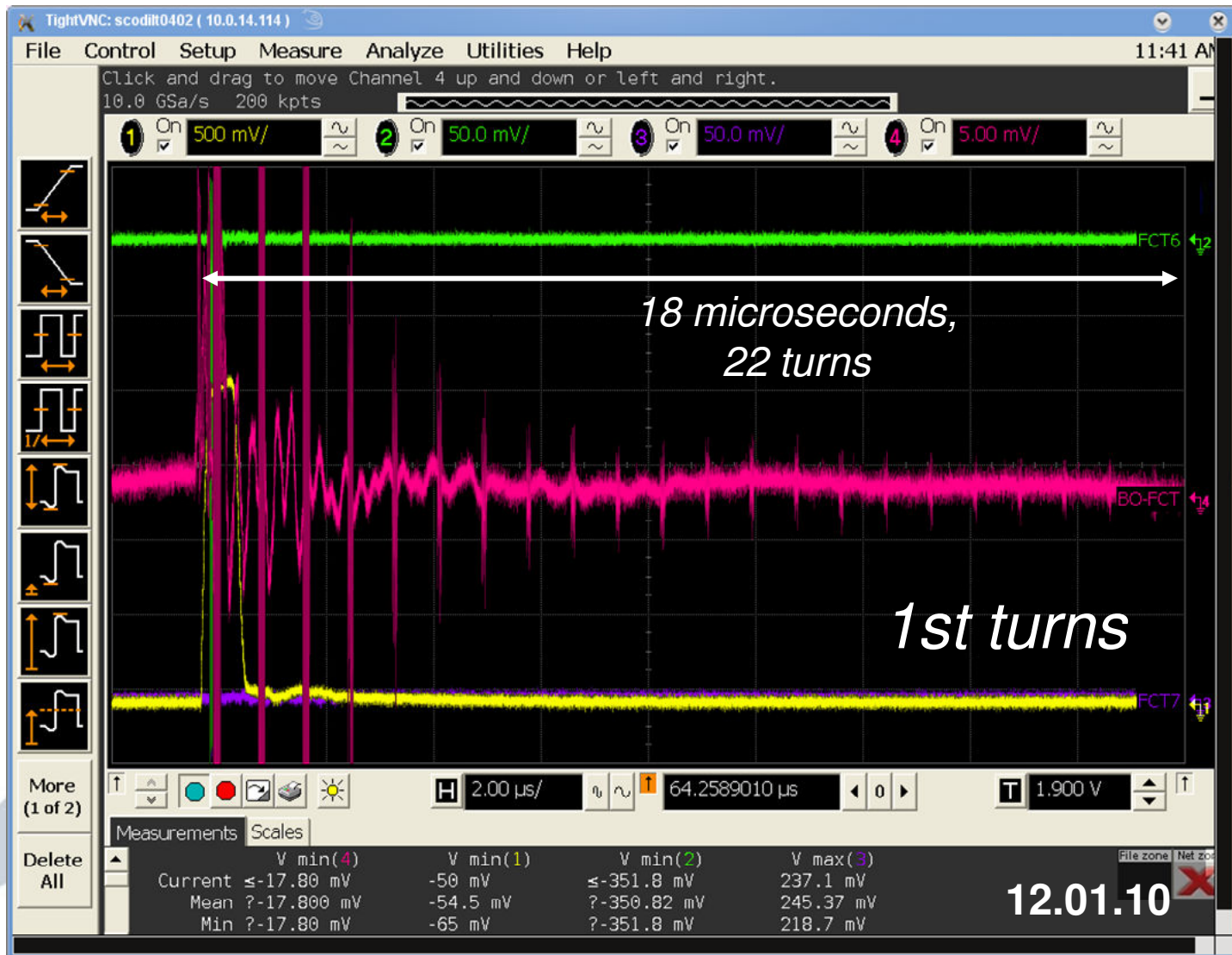


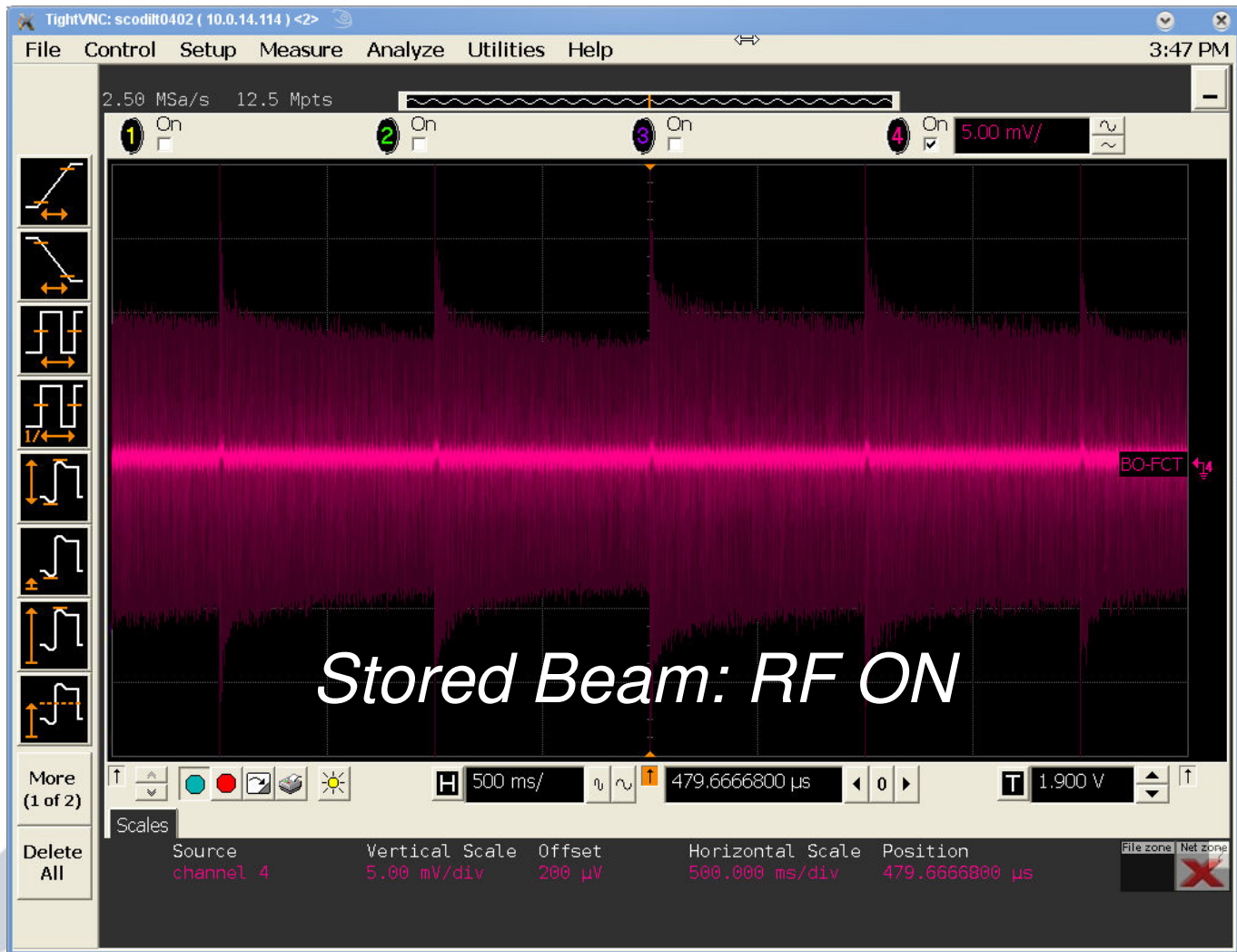
4 nC in 112 ns (56 pulses)
 Emittance $\sim 30 \pi$ mm mrad

LT_DI_FSOTR_T0103
21.12.09 19:00

Booster
(Pre-) Commissioning
11 – 24 January 2010

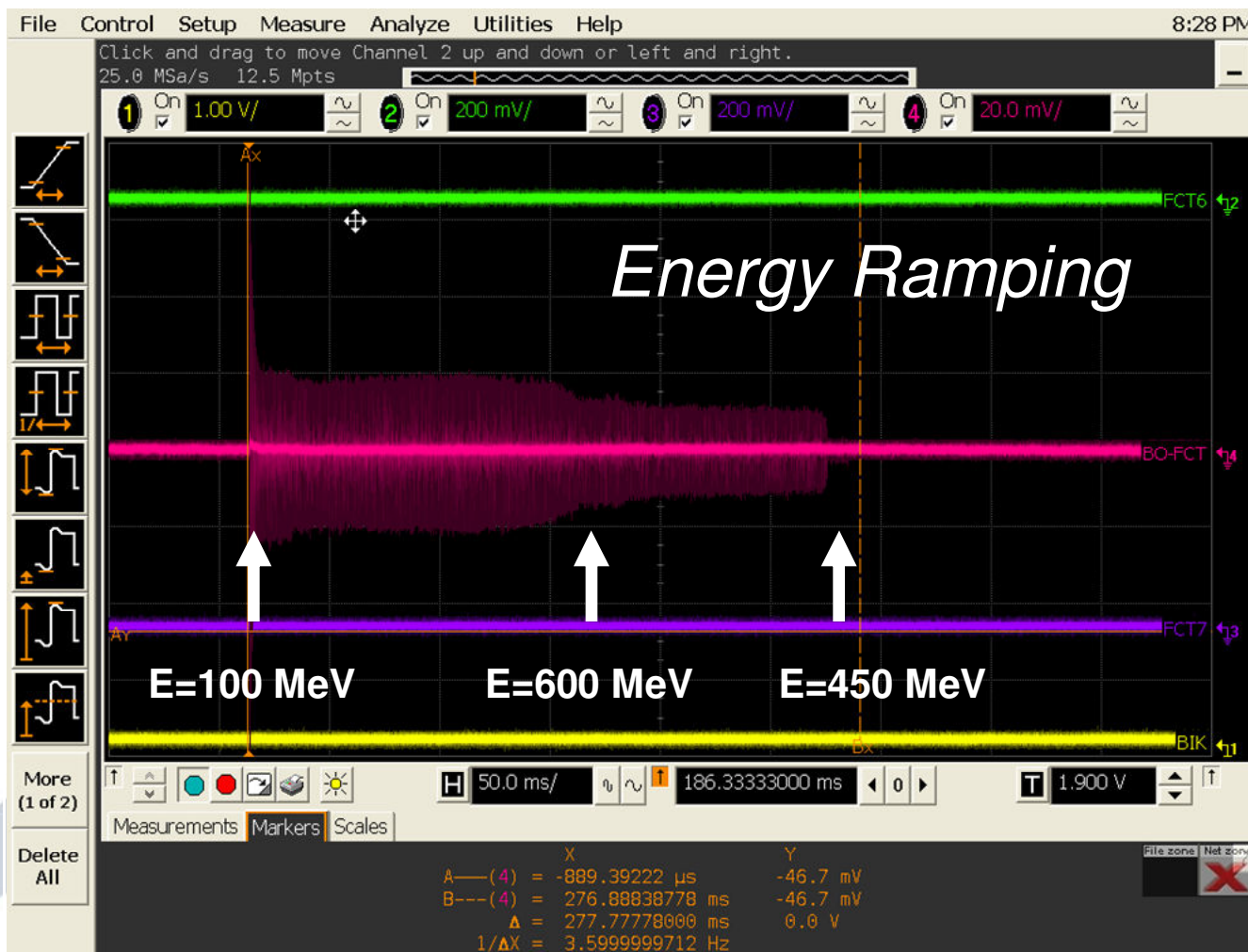




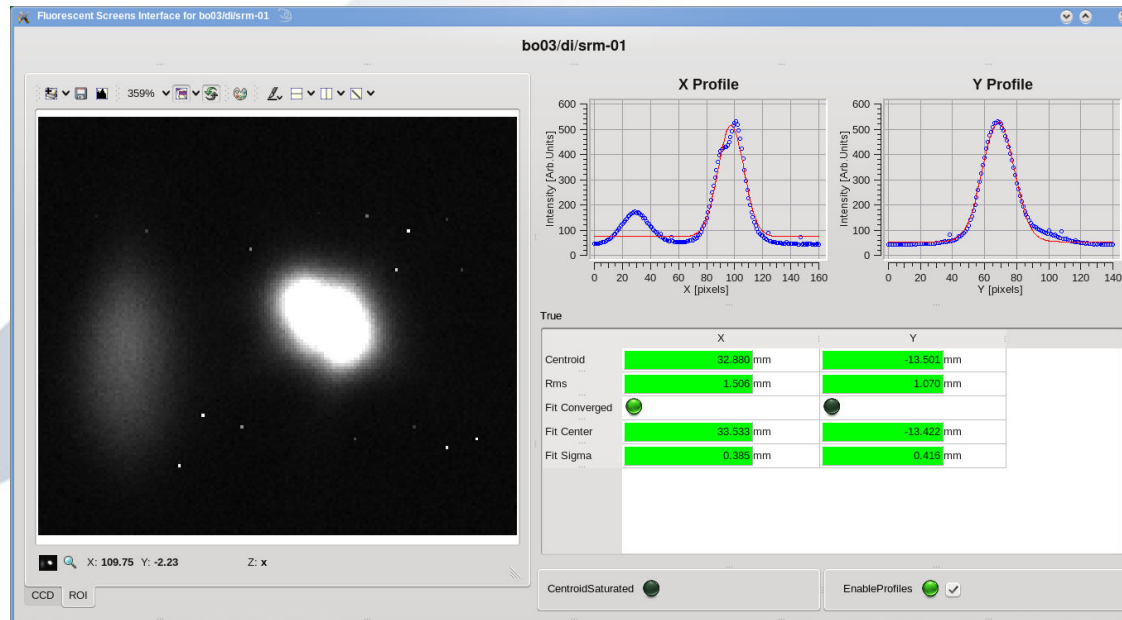
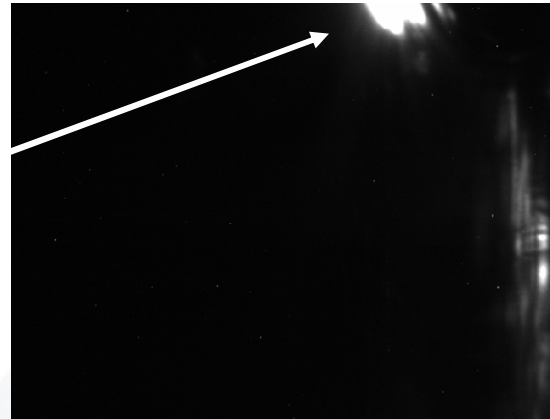


5 seconds,
5 injections

Bending, Quads and RF synchronized

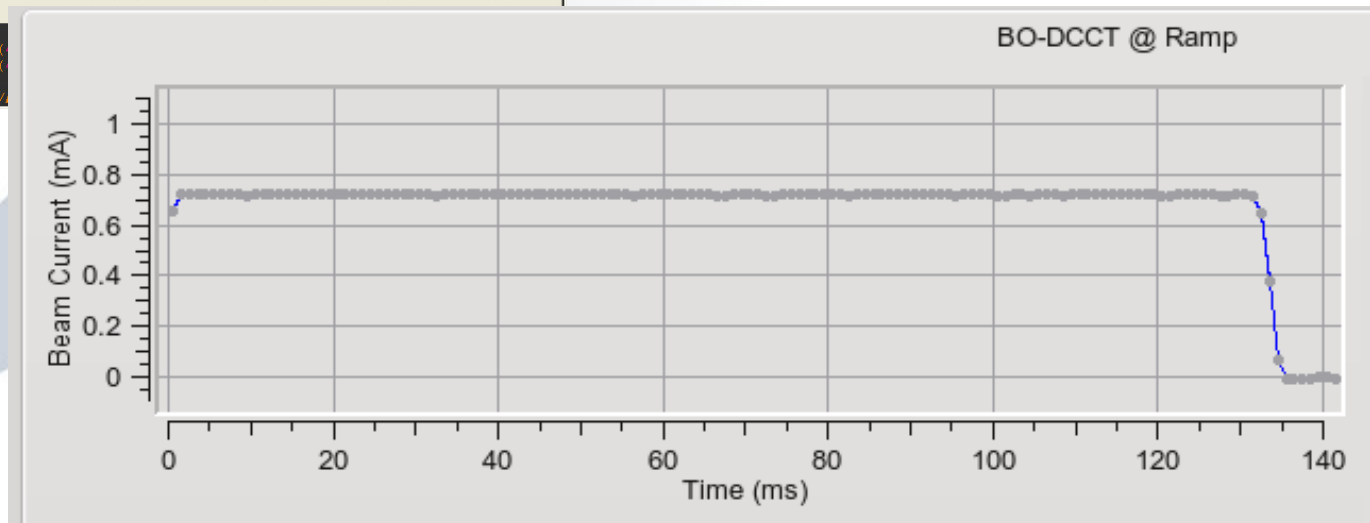
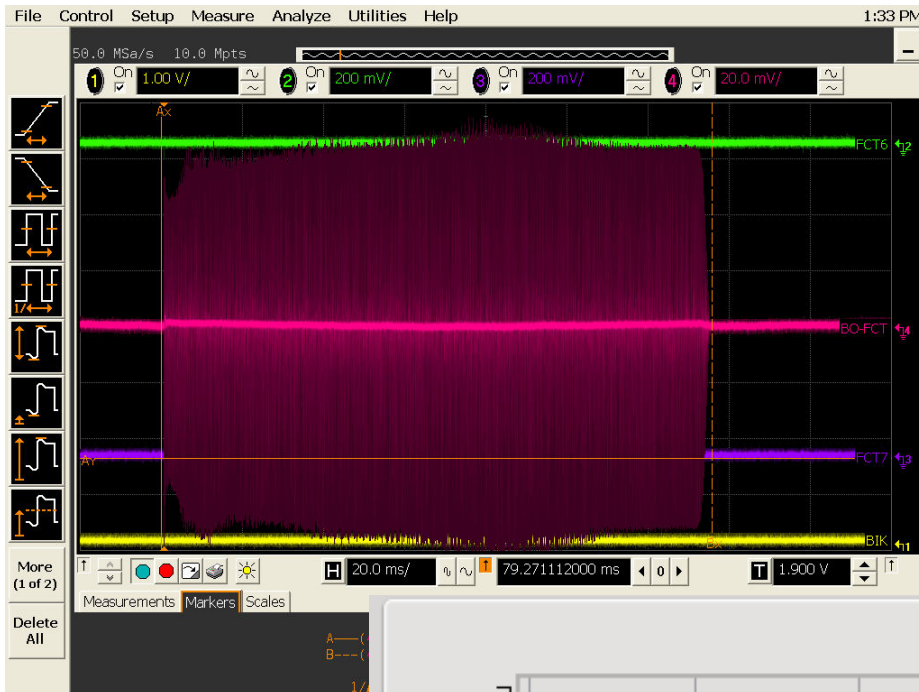


1st Synchrotron Light in Spain



2.7 GeV with 0.7 mA

90 % Energy
and
70% current
of nominal values



Thank you

