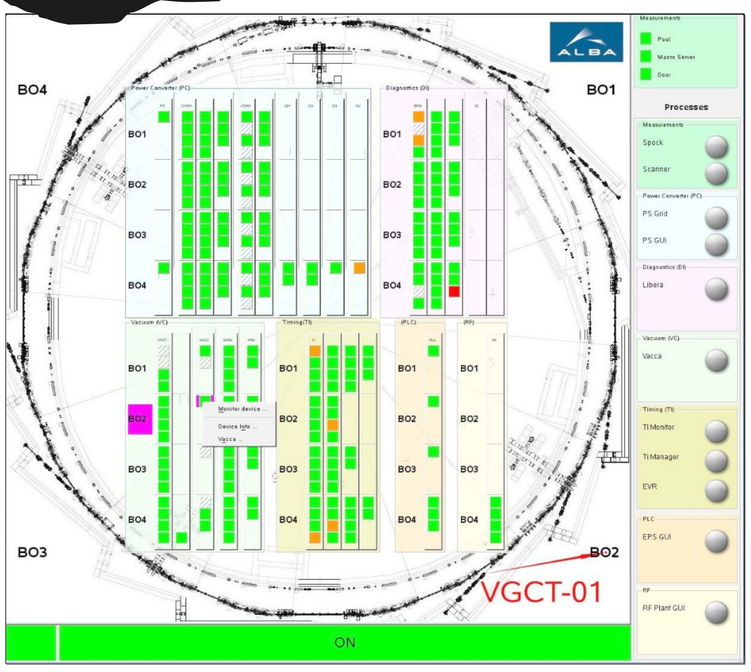
Status of ALBA Controls & DAQ

ICALEPCS'09. October 12 – 16 2009

D. Fernández-Carreiras-, on Behalf of control groups.

This 3 GeV third generation light source is planned to deliver the first X-rays beam to the users in 2010. The linac is operational since 2008. The Booster will be commissioned in december 2009



F. Becheri. Main GUI for the Booster control

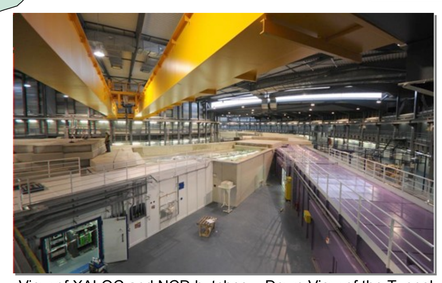
Python *is the central programming language of the control system. TAU is a tool based on python and Qt4 for building graphical interfaces. Also the main device servers for data collection have been developed in python (pyTango).*

The **Sardana device Pool** , with the macroserver handles the sequencing. **Procedures** (macros) can be edited and run from any client. They are reusable and can be created and edited online.

Many parts of the ***control system*** *components can be* ***shared between accelerators and beamlines****. The Sardana device pool designed to fit the beamline controls needs, is being very much used also in the accelerators controls.*
Ethernet *is widely used as the hardware communication layer and fieldbus. Power supplies, Liberas, CCD cameras, PLCs etc are interconnected by Ethernet.*

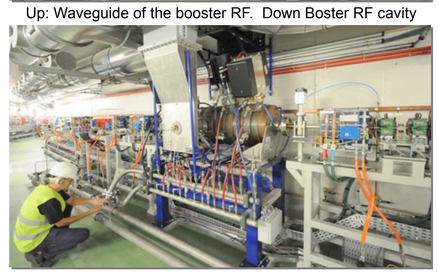
All the control system is built on **TANGO** running on Suse11.1 IOCs. There are very few tasks wich need real time and those are done with dedicated electronics: Timing, Fast interlocks, FOFB…

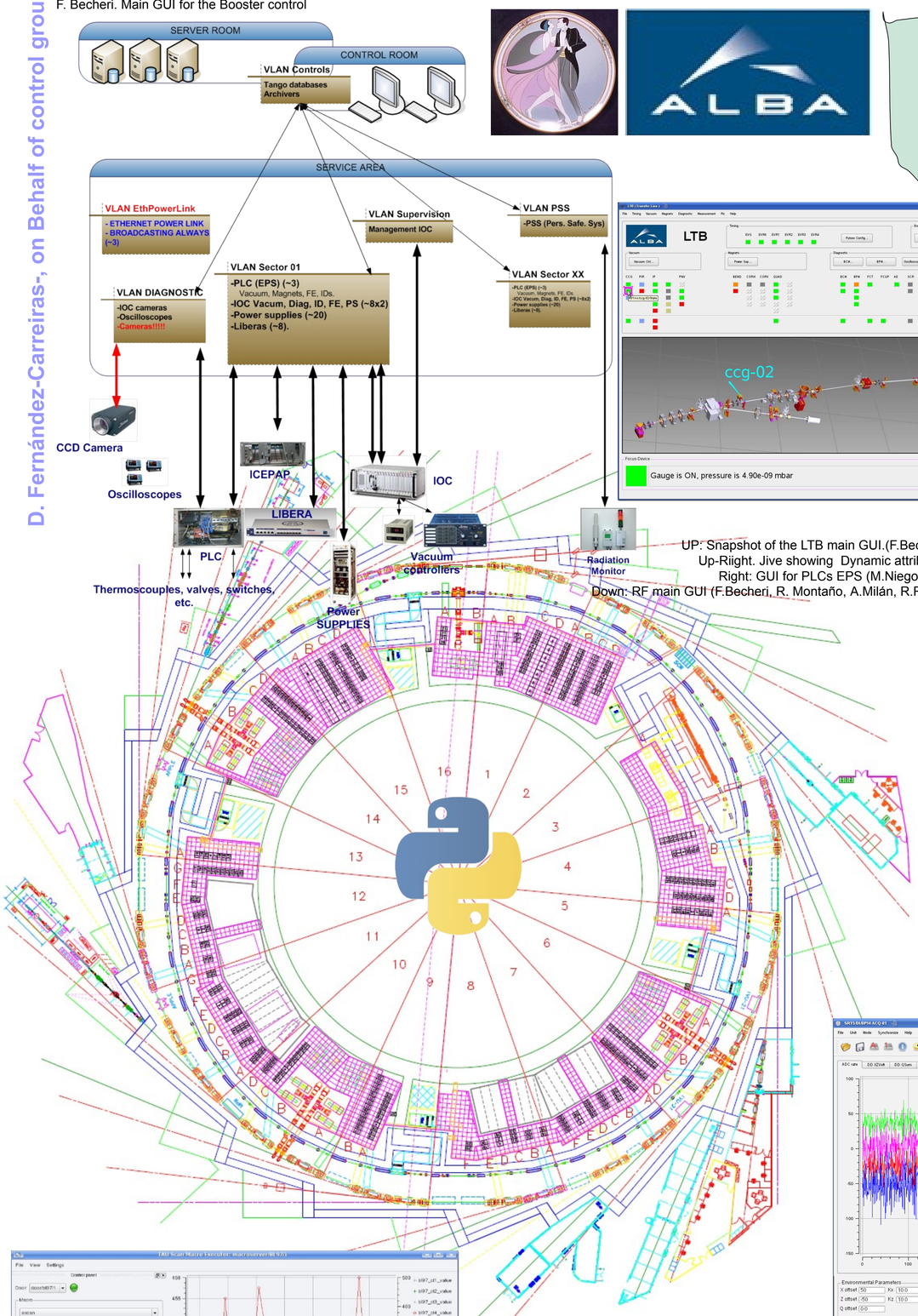
View of the accelerators tunnel. Left the storage ring. Right, the booster

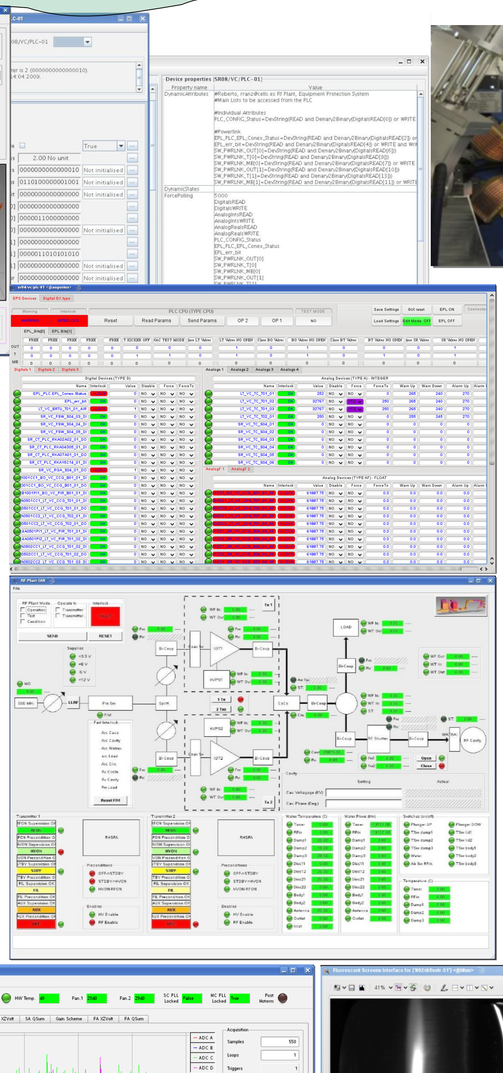


View of XALOC and NCD hutches. Down View of the Tunnel

Up: Waveguide of the booster RF. Down Boster RF cavity



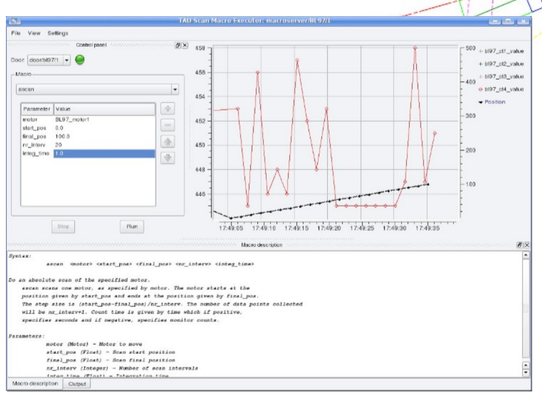


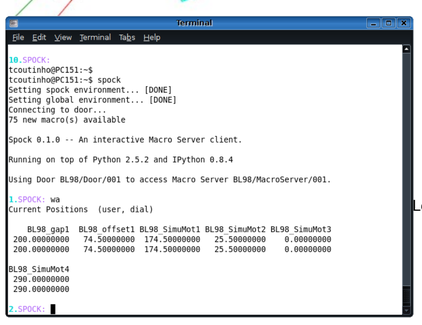


UP: Snapshot of the LTB main GUI.(F.Becheri)
Up-Riight. Jive showing Dynamic attributes
Right: GUI for PLCs EPS (M.Niegowski)
Down: RF main GUI (F.Becheri, R. Montaño, A.Milán, R.Ranz)

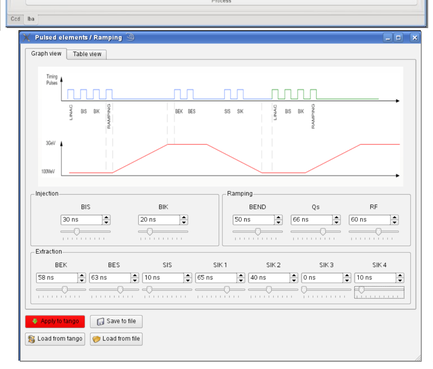
Equipment Protection System(EPS). *B&R PLCs manage interlocks, temperature readouts, actuators for shutters fluorescence screens, etc. Vacuum devices, Radiofrequency plants, and power supplies interlocks are also managed by the EPS. They are intercomunicated by a deterministic LAN PowerLink Ethernet*
Vacuum*. MKS gauge controllers and Varian Dual Ion Pump controllers combined with high voltage splitters are the main electronics for vacuum. Both gauges and pumps controllers are interfaced by serial lines. Python device servers for all of them exist*
The ***archiver*** *system is built on a mysql databases using the configuration tools and the database design developed at Soleil. Various stress tests have been successfully performed, storing 6000 attributes every 10 seconds in the historical database and every 1 second for the temporal database.*

RadioFrequency: The storage ring has six radio frequency plants with a power of 160 kW (two transmitters of 80 kW each). The booster has an additional 80 kW RF plant. The Digital Low Level RF system regulates both phase and amplitude (I/Q loops), Tango Servers and Clients manage the access to the FPGA based DLLRF.



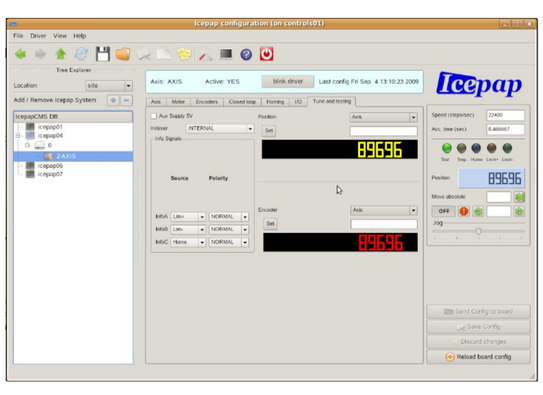


Up: A Libera GUI (J. Moldes)
Up-Right: FSOTR GUI (S. Blanch)
Right: Timing for Booster (J. Moldes, R. Suñé)
Left: Spock CLI. MacroExecutor. (Z.Reszela, T.Coutinho. C.Pascual-Izarra)
Left-Down: Icepapcms GUI. (G. Cuní, J.Ribas)



Diagnostics*:BPMs are interfaced with Liberas. A tango server for every* ***Libera*** *box runs in the Compact PCI crate and is accessible from the control system for the slow orbit correction, displays, archiving etc... This so called slow control goes over the normal Ethernet link. Furthermore, 30* ***Basler CCD*** *cameras (SCA1000-30GM 1034x779 pixels 12 bits 30 fps) for fluorescence screens are interfaced using the E-Giga protocol, whereas other signals like Beam Charge Monitors are read by analogue input cards in the cPCI crates.*
Oscilloscope*s are used for Fast Current Transformers, Faraday cups, annular electrodes, among others, and are accessed over VNC or NX connections. Beam Lost Monitors are read through RS485 link by a Tango device server.*

The **Timing system** manufactured by Microresearch Finland is based on events. A new bidirectional link has been added. Consequently, the timing system, besides synchronizing the different elements of the machine, is the base of the fast interlock system



Beamlines*. Two phase stepper motors are standardized and all of them controlled by the* ***Icepap*** *(developed at the ESRF). In the few cases where the design of a particular component requires a DC motor (like the direct drive Monochromator provided by FMB Oxford), Delta-Tau controllers are used. Data acquisition is very much dependent on the detector, however step scans, continuous scans, sequences, and rapid integration of new hardware for a particular experiment are common requirements shared by all of them. Classic scans and plotting are managed by the* ***Sardana Device Pool,*** *whereas data acquisition systems are being developed following particular requirements of the different beamlines.*

Power Supplies*: Most power supplies are interfaced by Ethernet (Bruker for Booster and Transfer Lines, Hazemeyer for SR, PPT for Pulsed magnets). The correctors for the Storage ring are the exception. They have a PSI interface for needed Fast Orbit Feedback.*

PSS. The system is based on Pilz **Safety PLCs,** and the system is designed for being SIL3 compliant (IEC/EN 61508), following the golden rule of **redundancy and diversity**.

Equipment types, cables types with related documentation, equipments and cables with the final position, and finally preinstalation tests are logged into the controls ***Equipment and cabling database****. All cPCI and Indistrial PC are mounted and configured (boot server, drivers, DHCP, etc) in a dedicated Variables for the PLC programs, cabling reports, and attribute names are automatically generated from the Cabling database. Furthermore, dynamic declaration of PLC variables and Input/Outputs (attributes of the PyPLC Tango Device, written in python) allows the expert view of our graphical user interfaces (TAU) to be generated automatically from the cabling database.*

Many developers are working on this project: The Director of the computing division, J. Klora, the controls group, T. Coutinho (PyTango, TAU, Device Pool), S. Rubio (Vacuum, Archiver, DAQ), G. Cuní (Motion, beamlines), S. Blanch (CCDs, diagnostics, beamlines), F. Becheri (IDs, GUIs), R. Suñé(RF, DAQ, Timing, Drivers), L. Krause (Power Supplies, Linac), Z. Reszela (Tau widgets, beamlines), J. Moldes (Libera BPMs, beamlines), A. Milán (RF, beamlines), M. Niegowski (Radiation Monitors, GUIs), C. Pascual-Izara (Data analysis and Visualization), R. Ranz (EPS, cabling, PLCs), A. Rubio (PSS, PLCs), R. Montaño(PLCs). The electronics group, headed by D. Beltran, and in particular O. Matilla, J.V.Gigante, A Camps and J. Lidón who are among other duties responsible for cabling, fast interlock units, vacuum splitters, etc. The system administrators, in particular S. Pusó and the head of the group, J. Metge. The MIS group headed by V. Prat, who developed and maintain the cabling database. We would like to thank the Tango collaborators who have written most of the standard Tango Applications and Tools available for the community: ESRF, Soleil, Elettra and DESY, and in particular E. Taurel, A. Homs, V. Rey and M. Guijarro (ESRF), N. Leclercq (Soleil) for their great collaboration.

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