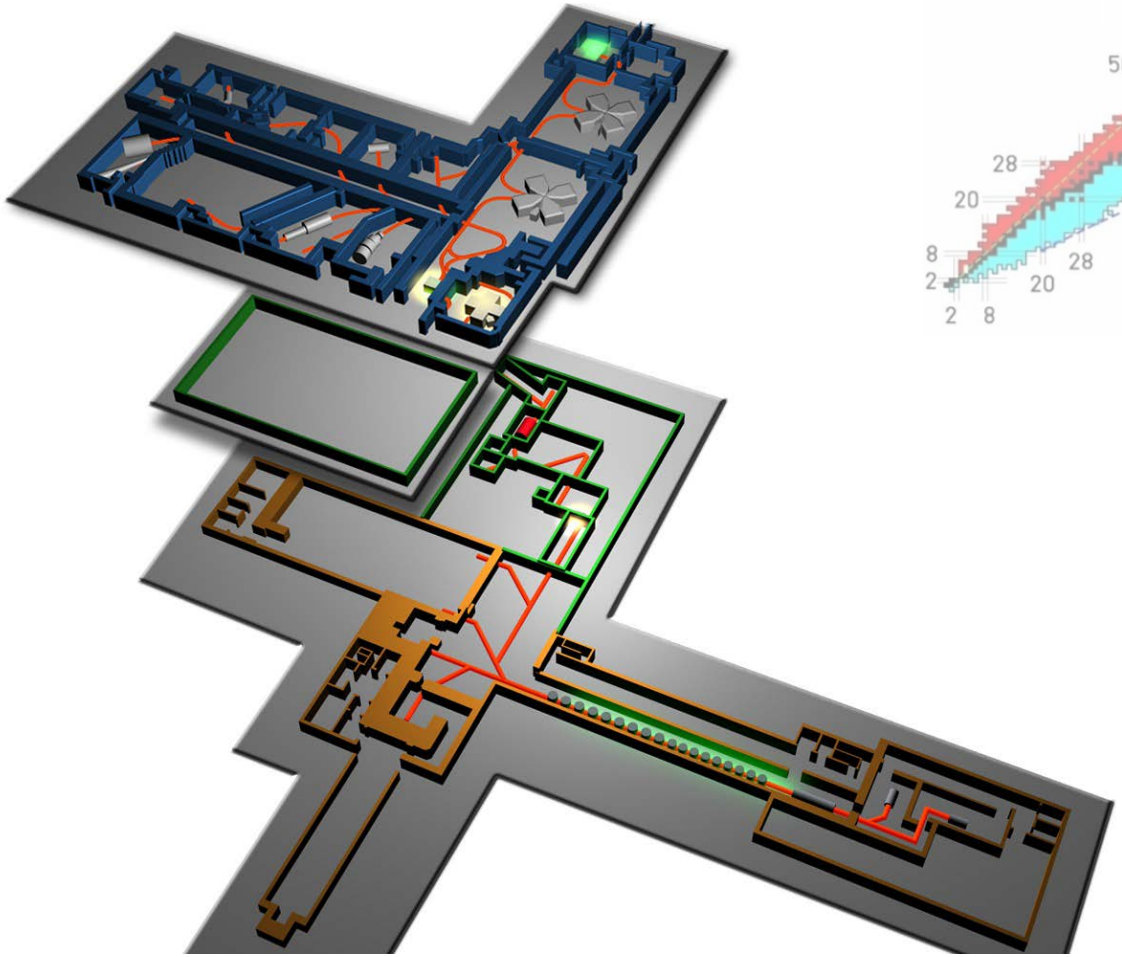
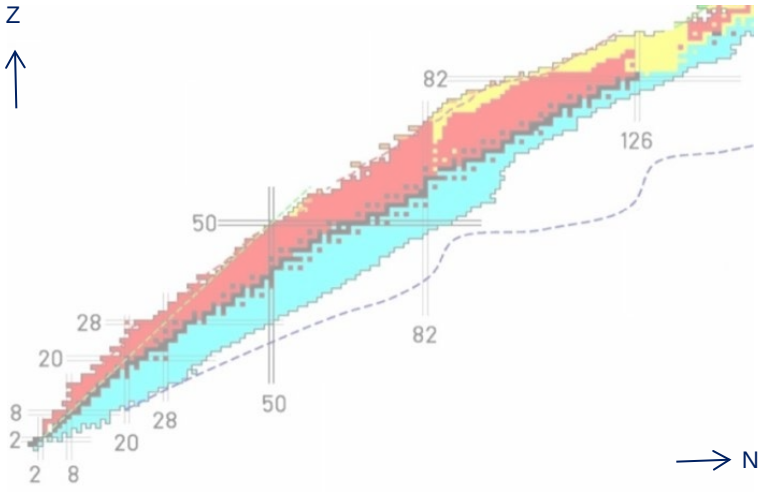
A small but EFFICIENT collaboration for the Spiral2 control system development

Outline

- Spiral2 reminder
- … The collaboration for its control system
  - Who ?
  - How ?
  - What ?
- … so ?
  - Some shared developments
  - People and management feedback
  - The end : not a conclusion !

Spiral2 : a new Rare Ion Beam facility





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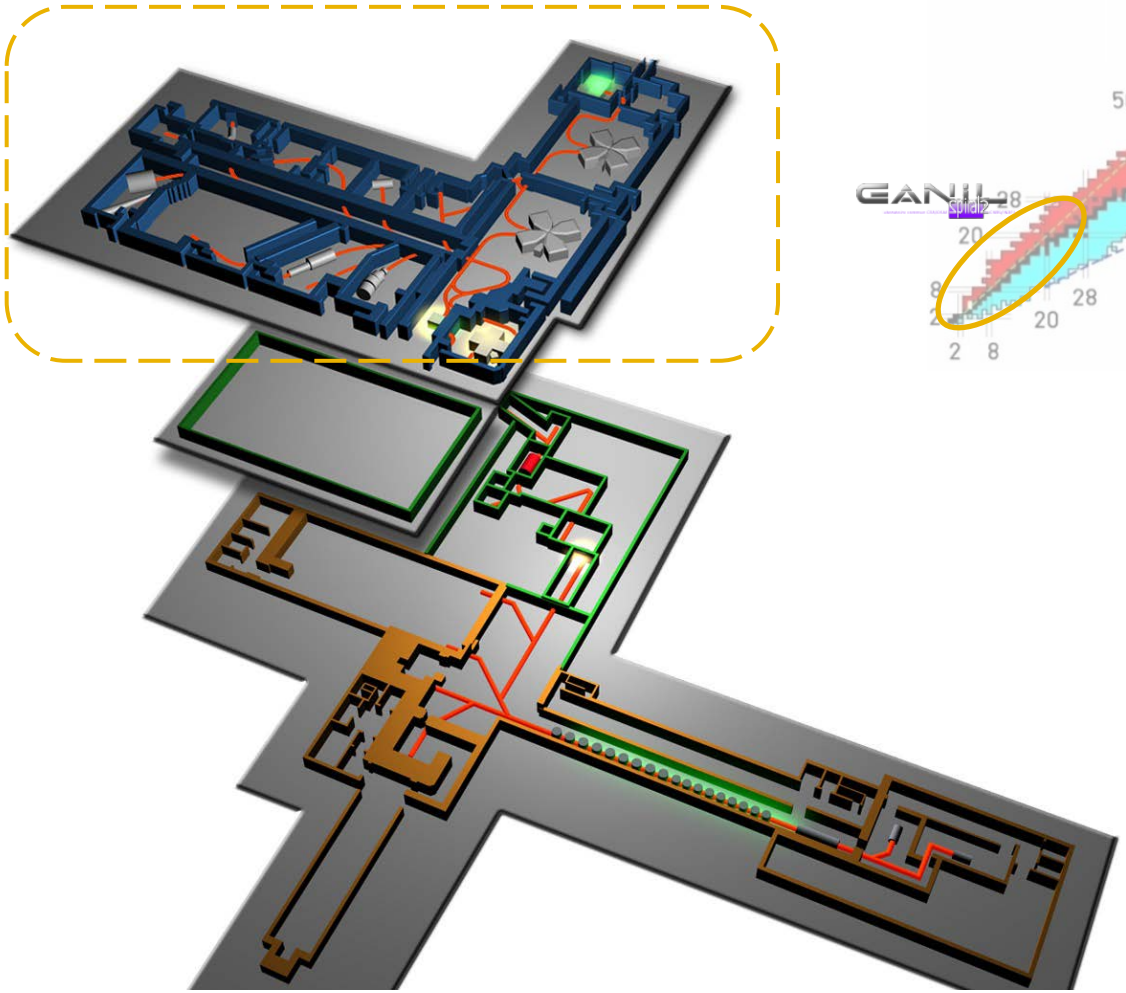

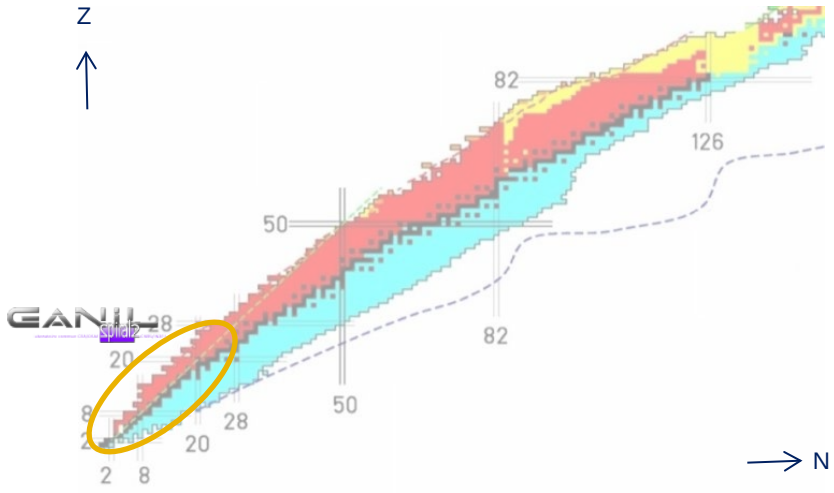

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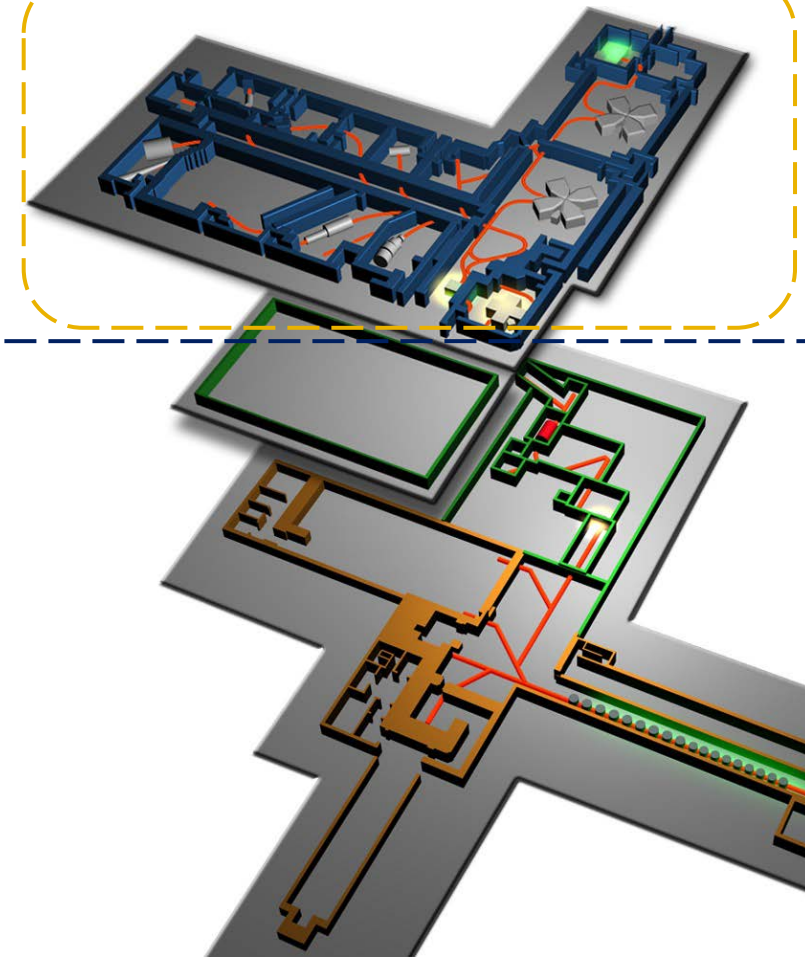

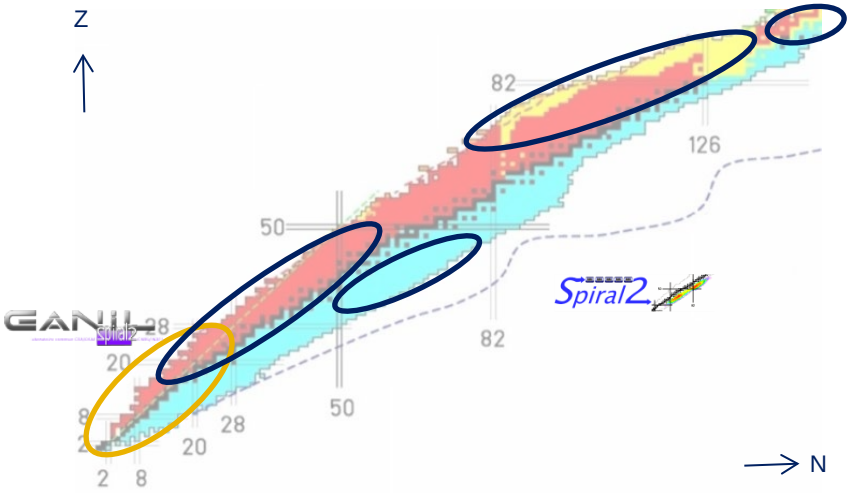

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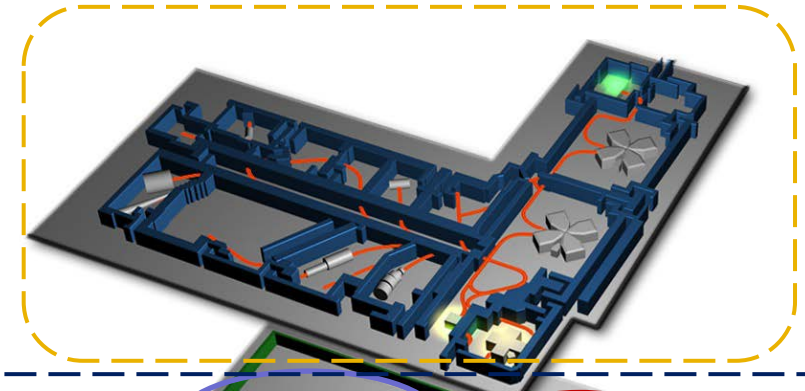

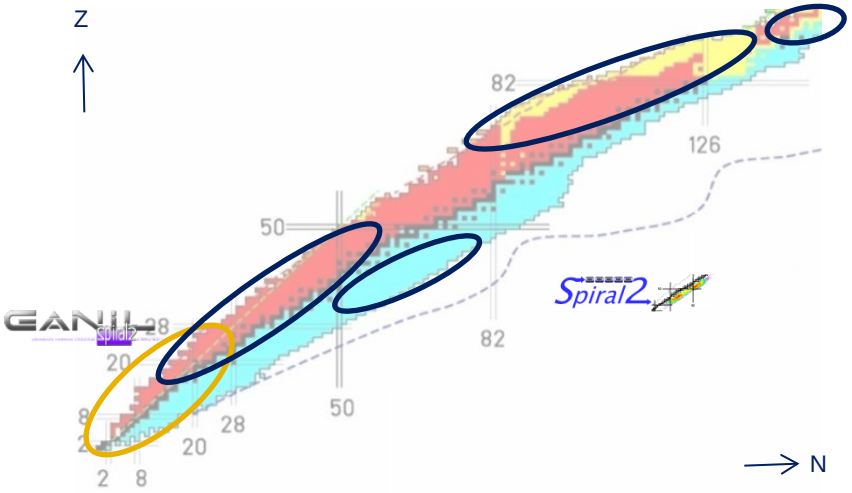

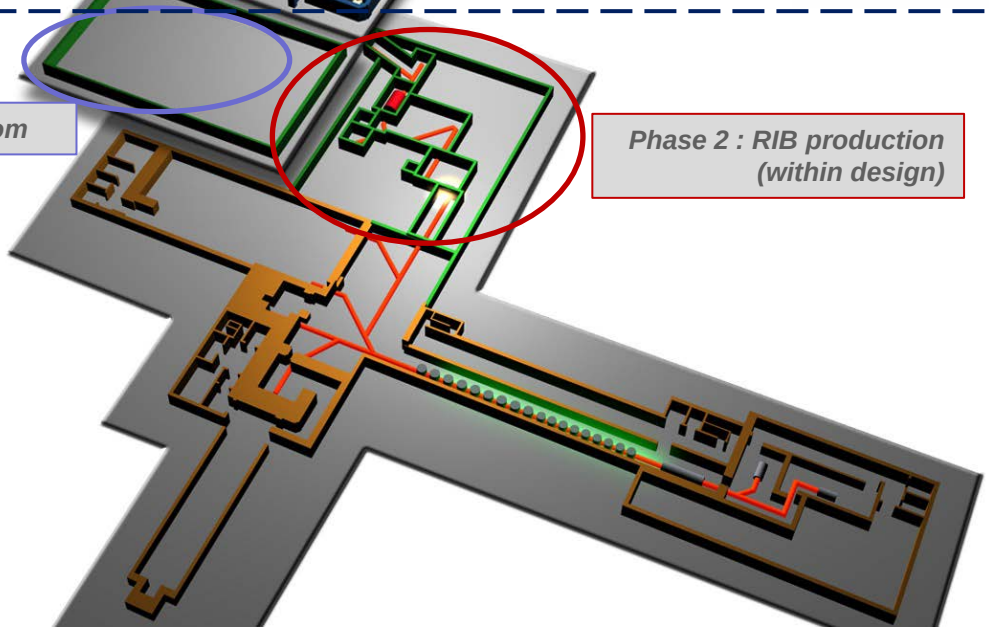

DESIR experiment room

Phase 2 : RIB production (within design)

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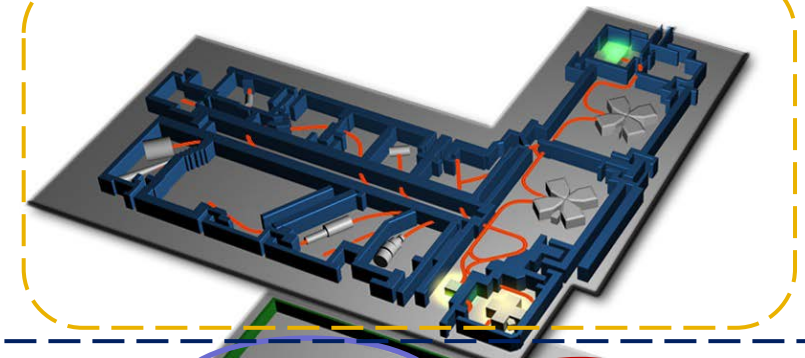

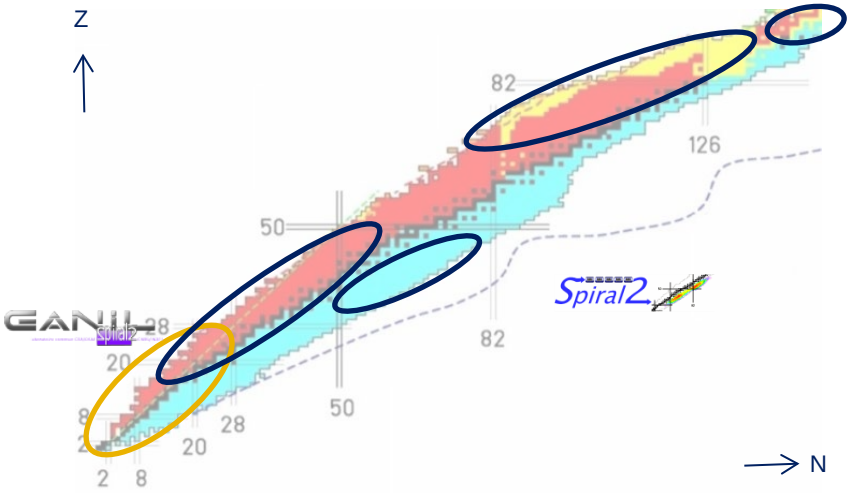

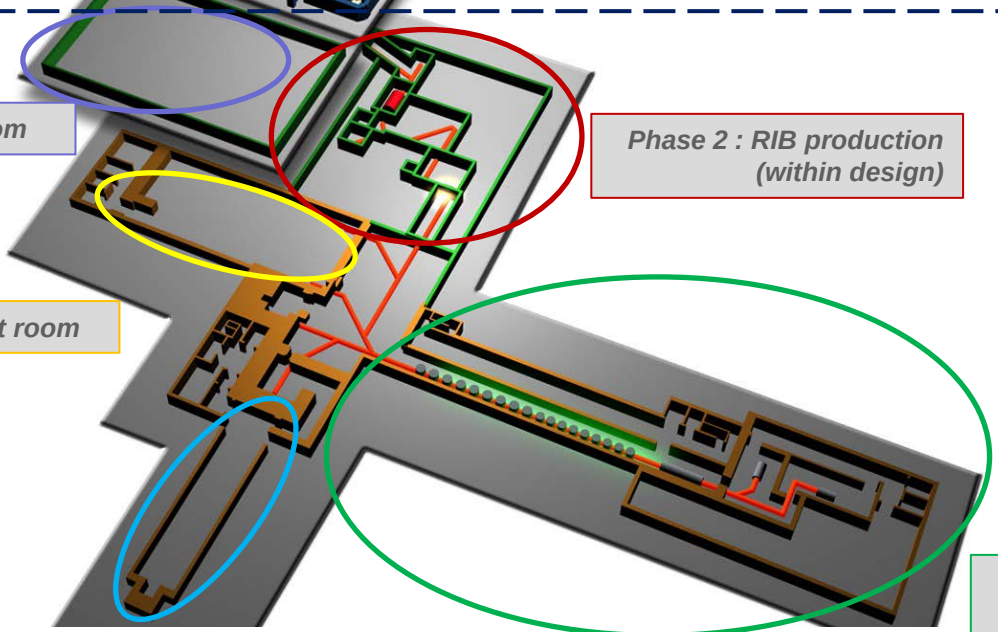

DESIR experiment room

Phase 2 : RIB production (within design)

S3 experiment room

Phase 1 : primary beam acceleration (under construction)

NFS experiment room

And what about the control system ?

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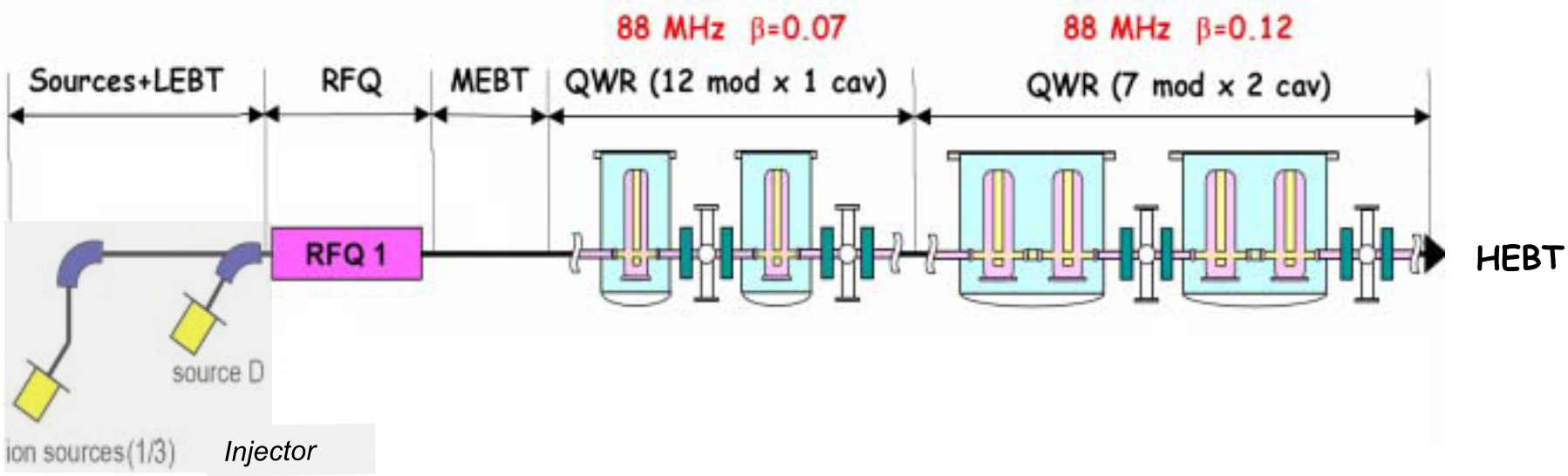
Collaborations for the control system



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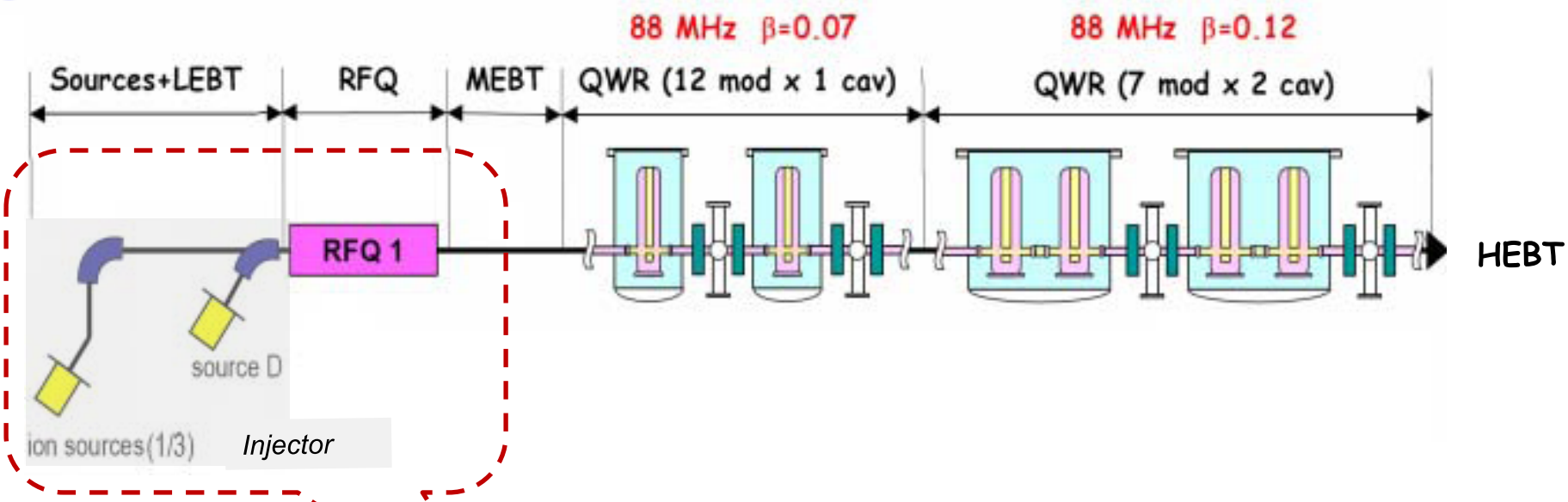
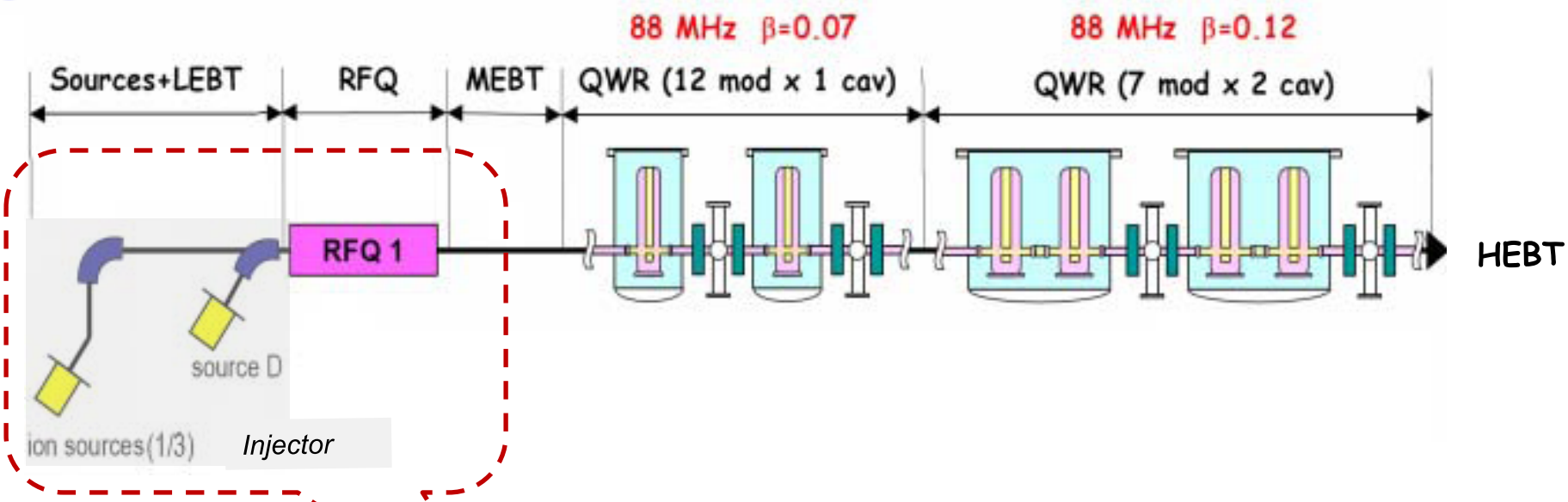


Injector control coordination
Epics distribution & repository
LLRF
Equipment interfaces :
- *CFs, slits, ACCTs-DCCTs*
- *TOF, FCT, BPMs*

Ion source control
Deuteron source control
PLCs :
- *Injector interlock & vacuum*
- *RFQ water cooling*

Irfu

Collaborations for the control system



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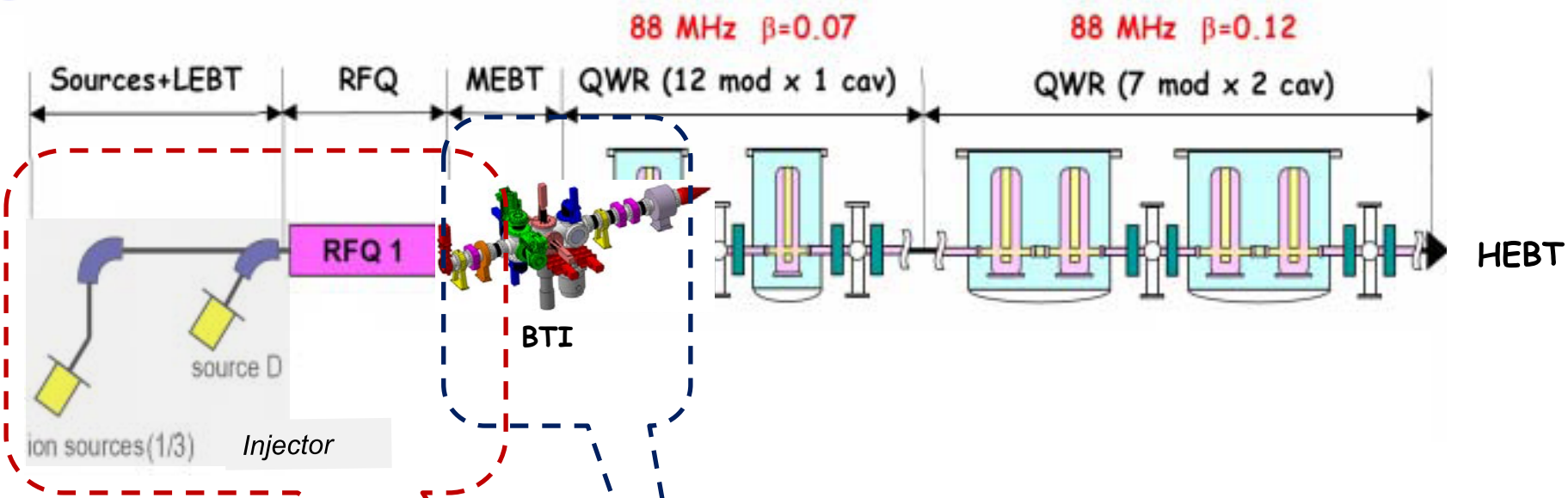

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IPHC Institut Pluridisciplinaire Hubert Curien Strasbourg

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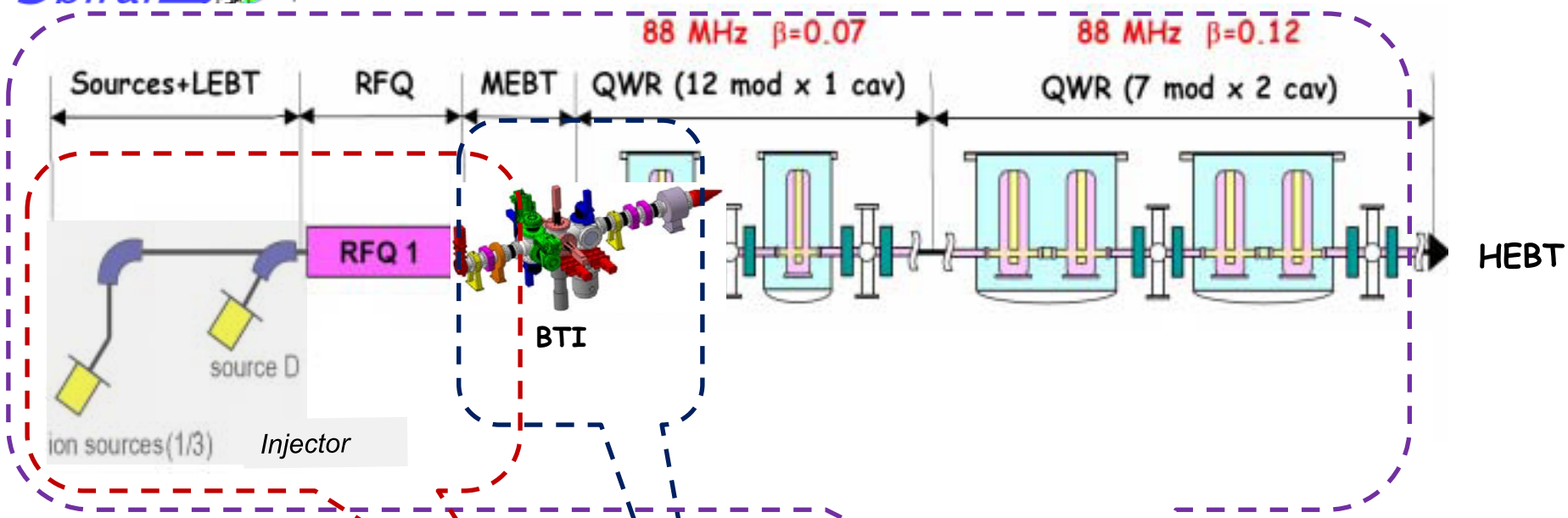

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BTI

GANIL Spiral2

Global coordination
Equipment interfaces :
- *Power supplies*
- *Profilers, BLMs, BEMs*
- *RF*

PLCs :
- *RF, MPS,Vacuum*

Central services
High level applications
Databases
CSS distribution
SVN server

Milestones

Time	Phases	Technical options
2001	Preliminary study	Epics proposed by Irfu
Mid 2006	Start of the collaboration	Epics + tools VME/VxWorks Linux
End 2006	Epics course for Ganil & IPHC First developments	VME CPU & I/Os boards Modbus-TCP
2007	XAL evaluation Java training for Ganil Work for a shared platform and environment ("topSp2")	Java
2008	Developments and preparation for the ions beam tests	topSp2 first delivery
2009	Ions beam tests at Grenoble (+LabView)	Eclipse + XAL SVN server at Ganil
2010	CSS evaluation Deuterons beam tests at Saclay	
2011	Feedback from the ions and deuterons beams tests CSS class External audit	CSS
2012-…	LLRF integration Specific diagnostics and RF devices interfaces High level applications and databases	

- Involved in numerous physics projects and in the building of instruments for large physics experiments, accelerators or telescopes

Previous skills prior to Spiral2 :

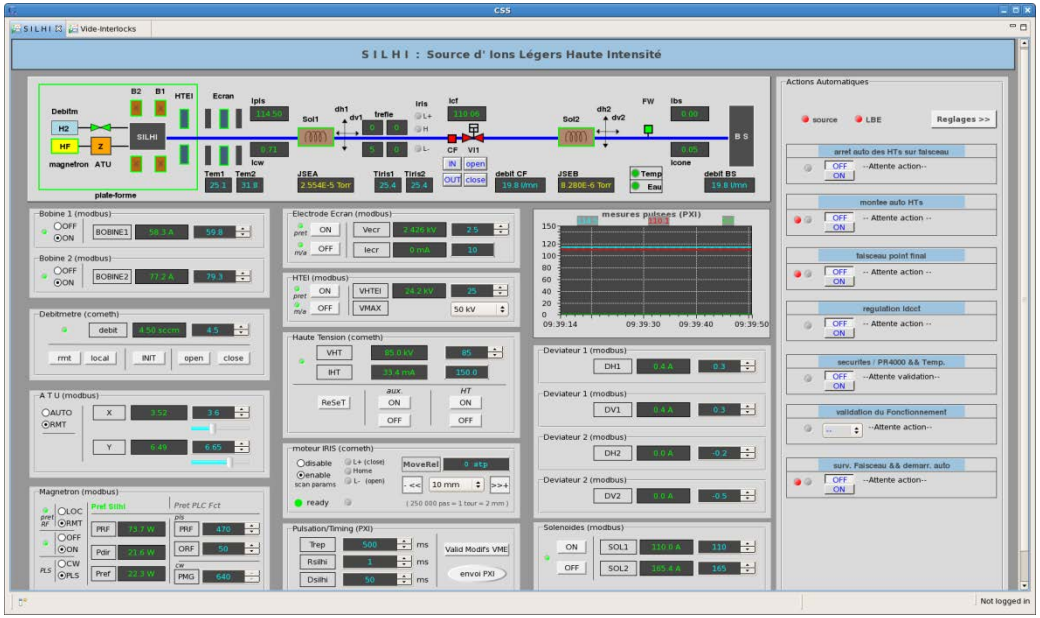
Linux (RHEL)

EPICS

VME/VxWorks

ESO software

Siemens PLCs



High Intensity Proton Injector IPHI at Saclay

Specificities:

- Epics experience
- No high level application programming
- No use of RDBMS

Working habits

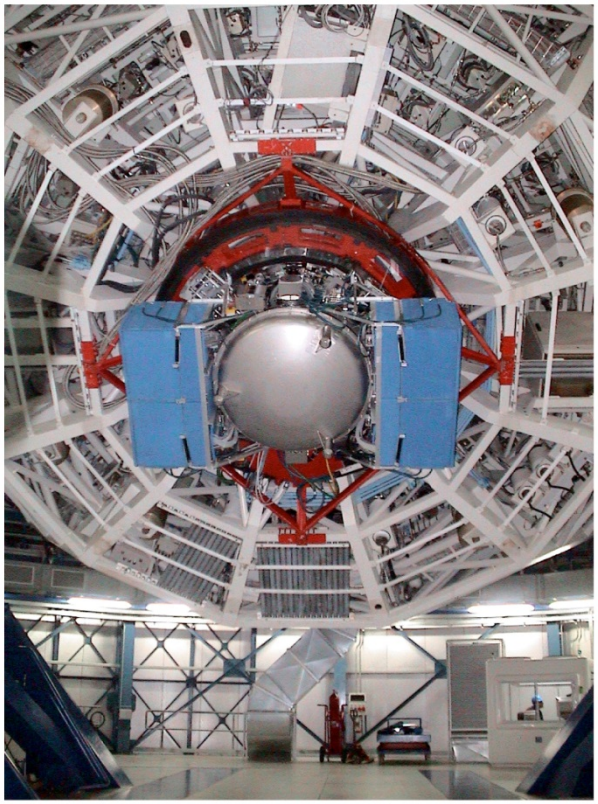
GUIs

Real time

Infrastructure & network

Electronics PLCs

EPICS supervision for a Magnet Safety System based on VME64X

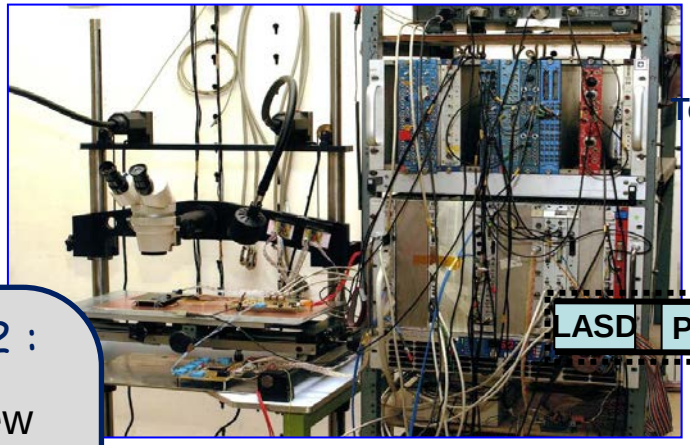


VISIR Mounted behind the 8.2-m Mirror of Melipal

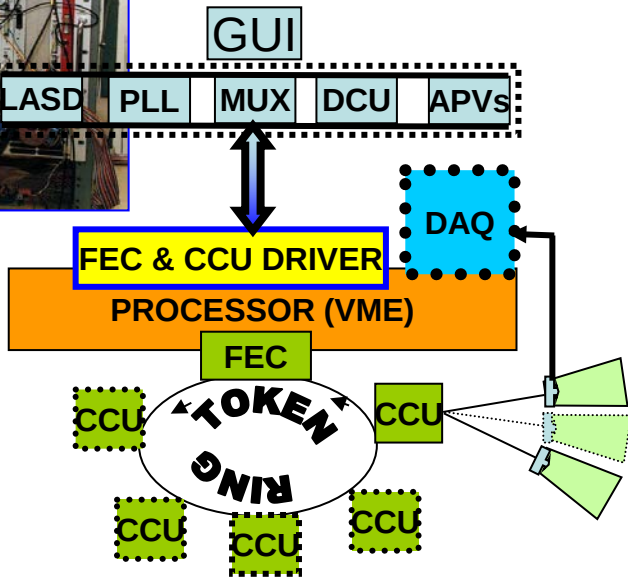
ESO PR Photo 16b/04 (12 May 2004) © European Southern Observatory

VISIR with its both VMEs (VLT)

IPHC background



Test bench of hybrid electronics for CMS tracker



Previous skills prior to Spiral2 :

C
Bash
LabView
JAVA
OS9
VME
MySQL
X motif/ Xt
Visual Basic
LynxOs
TCP-IP
PHP
Fortran

Specificities:

- No Epics experience
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Electronics PLCs

Ganil background

People (for Spiral2) :
~5 Full Time People / year

Previous skills prior to Spiral2 :

Ada
X-Window/Motif
Linux (RHEL)
VxWorks
VME
RDBMS (Ingres)
VMS
TCP-IP
Camac
Siemens PLCs

Specificities:

- No prior Epics experience
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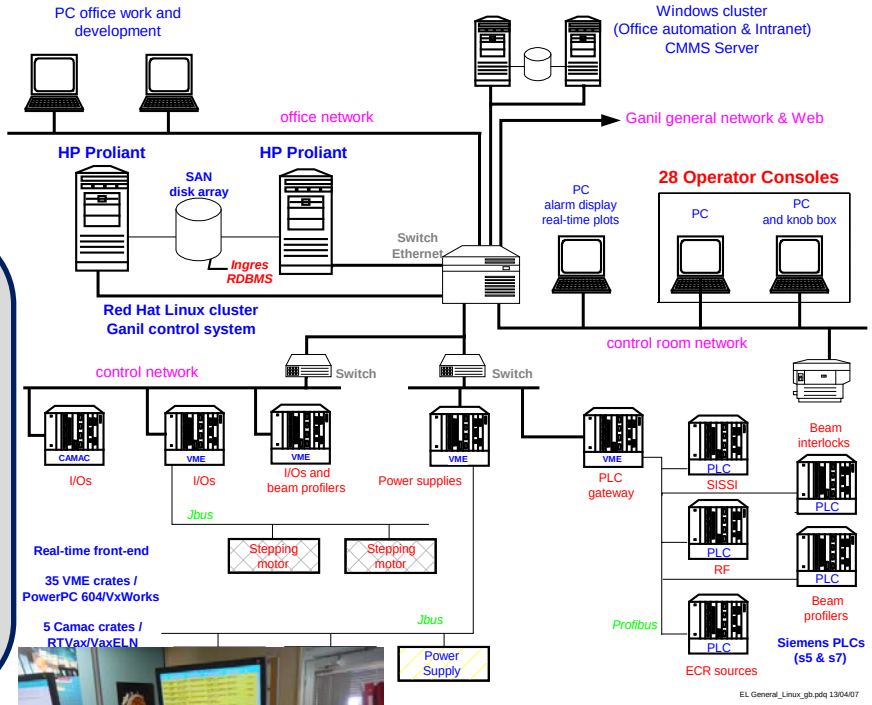
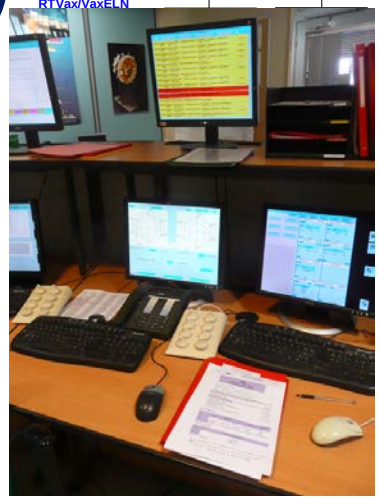
- Use of RDBMS
  - ✓equipment configuration
  - ✓machine lattice description
  - ✓parameters settings

Ganil control system ⇨ ~4000 pieces of equipment





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- GUIs
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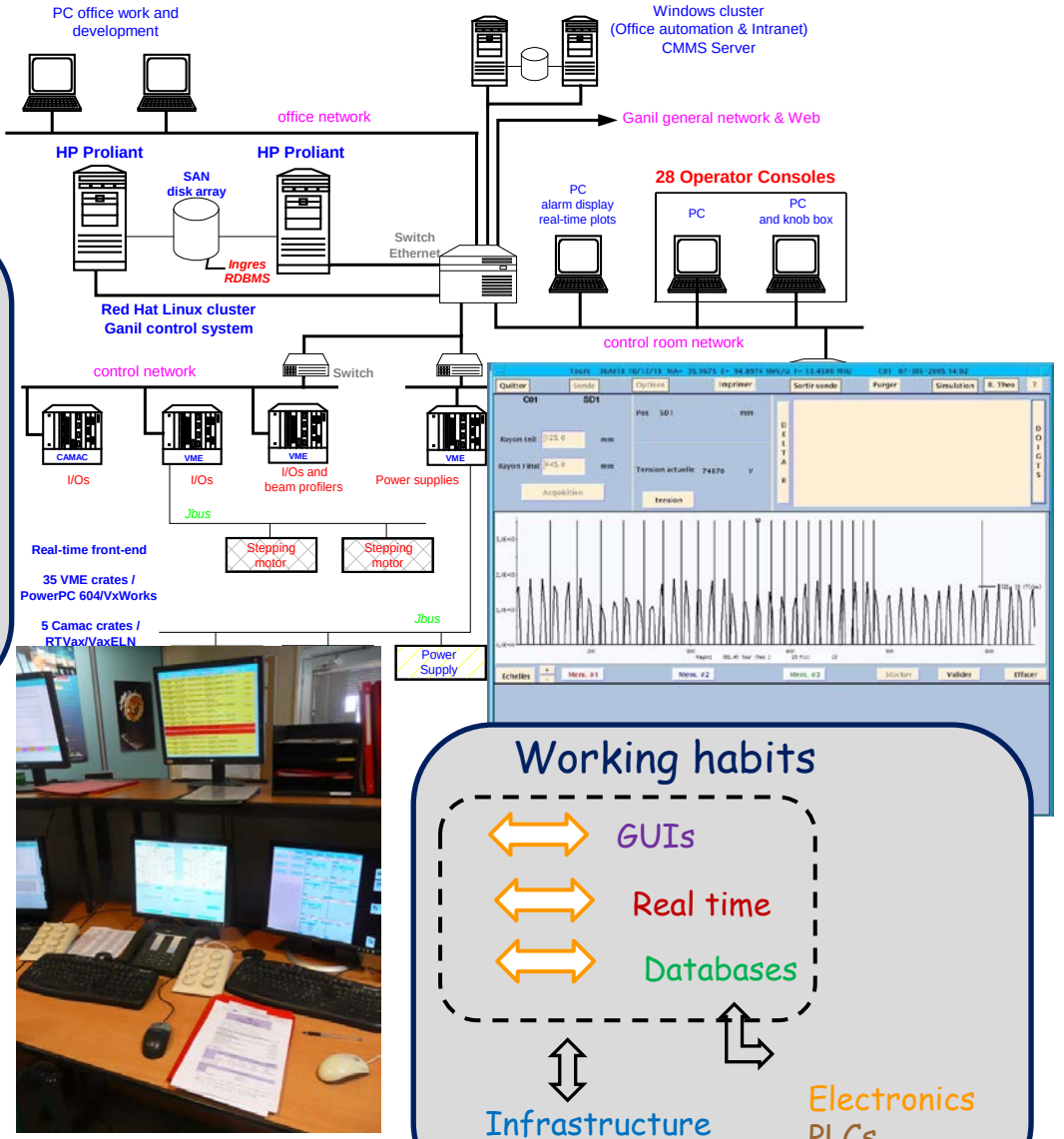
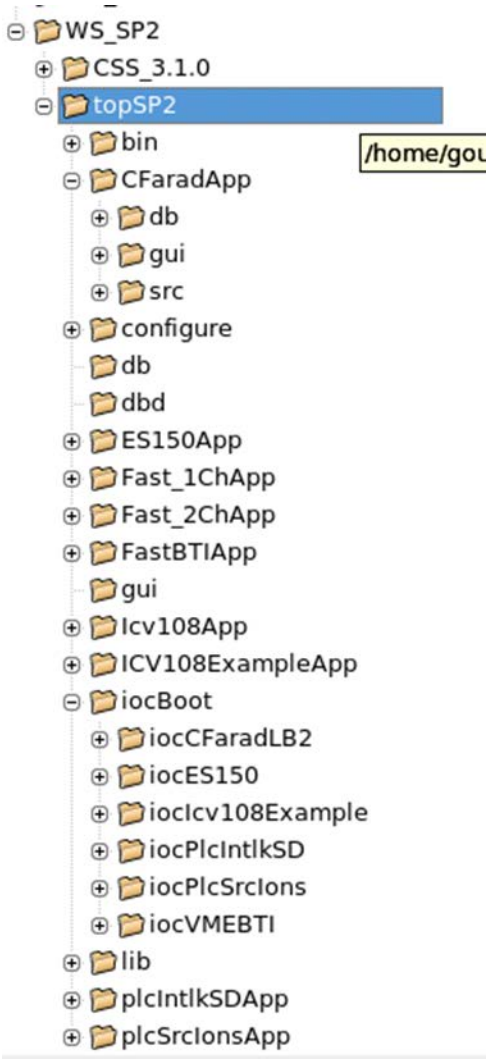


Working habits

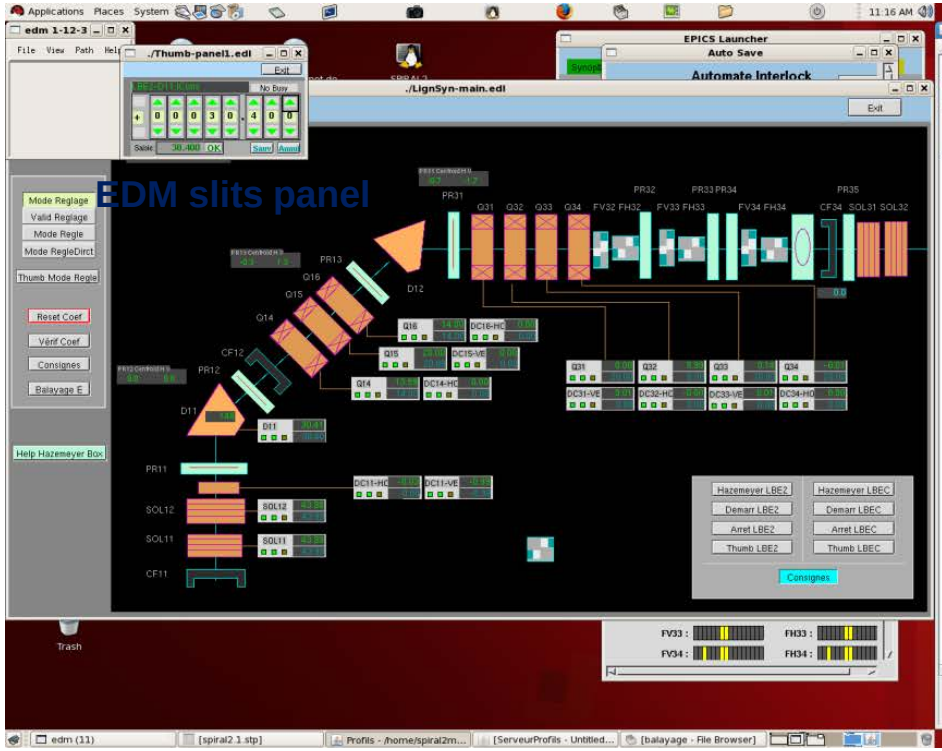
- GUIs
- Real time
- Databases
- Infrastructure & network
- Electronics PLCs

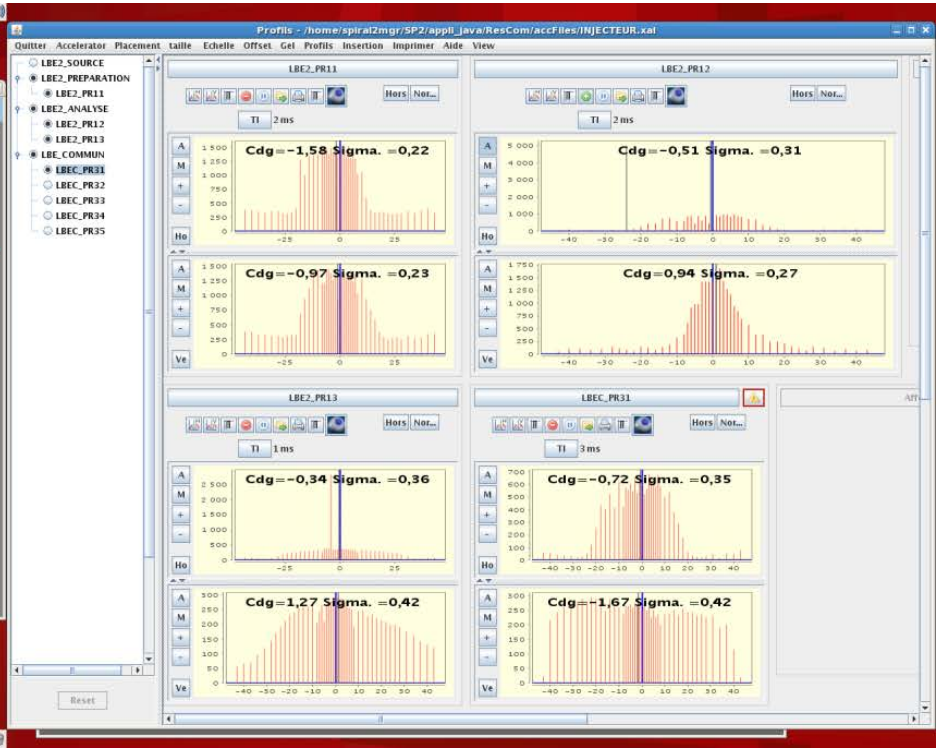
Shared organisational basis : topSp2 repository

- EPICS software platform designed by Irfu is the result of a strong consensus between the developers of the 3 labs
  - Inspired from ESO software
  - Based on a standardized hardware platform
  - Automatic installation of VxWorks tools and EPICS distribution
  - A generic model of development used by each developer with naming rules and in-house architecture
  - An automatic building of final and elaborate IOCs



- LEBTs integrate control components developed by the 3 labs not only on displays but also on the VME IOCs





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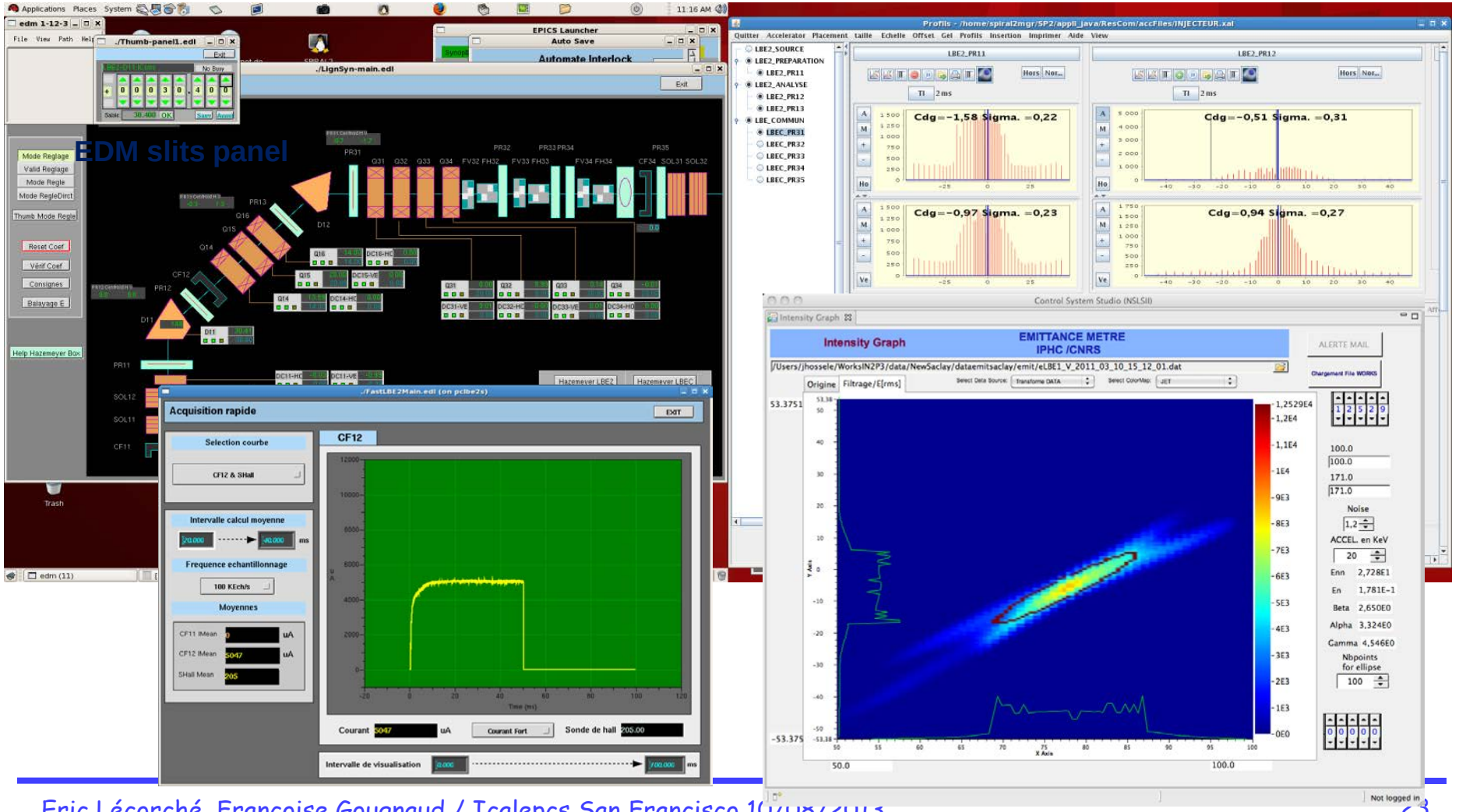
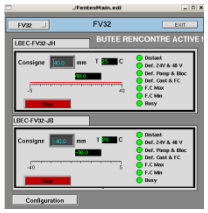
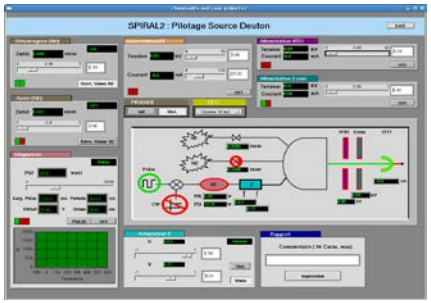


Shared organisational basis : from EDM to CSS

2007 ⇨ 2010

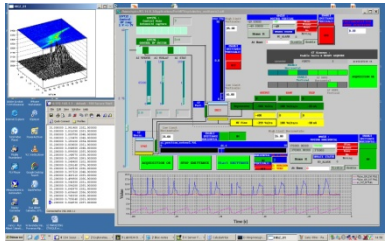


EDM slits panel



EDM deuterons source control

+ many others



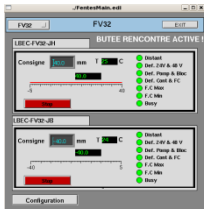
EDM transverse emittance system configuration

EDM power supply panel

Shared organisational basis : from EDM to CSS

2007 ⇨ 2010

2011



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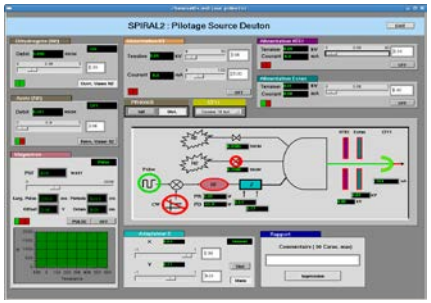

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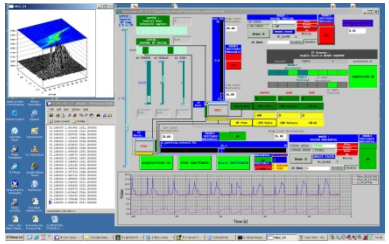

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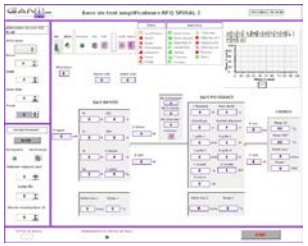
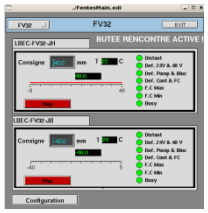


CSS/BOY evaluation (RFQ amplifier test bench)

Shared organisational basis : from EDM to CSS

2007 ⇨ 2010

2011



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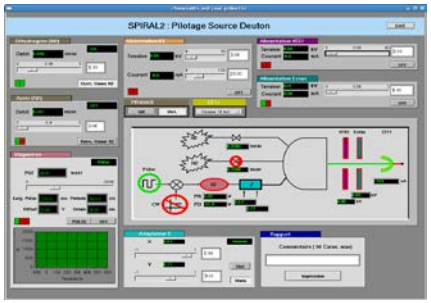

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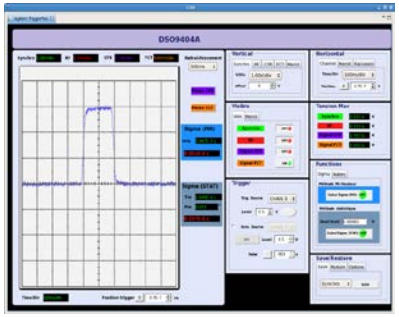
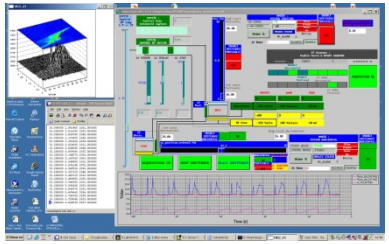
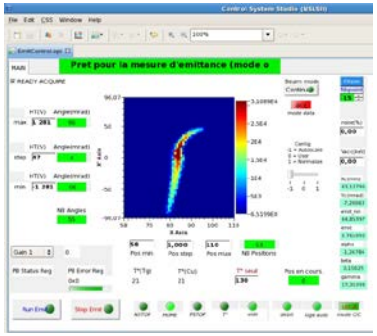


CSS/BOY Agilent oscilloscope panel for Fast Faraday cup

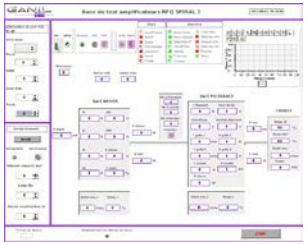


EDM transverse emittance system configuration



CSS/BOY transverse emittance system configuration and visualization (rewritten)

EDM power supply panel



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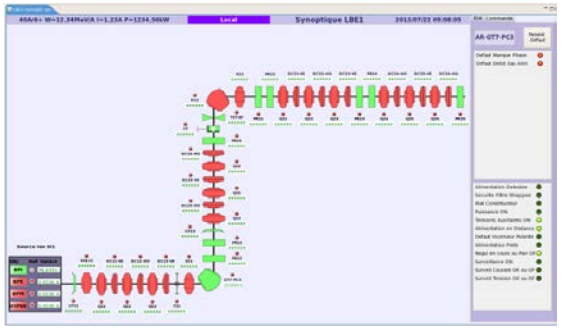
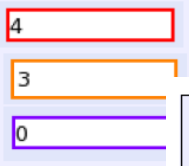


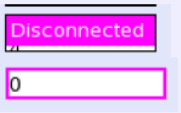
CSS/BOY LEBT1 synoptic display

PV related data display

- Units : EPICS EGU field
- Precision : EPICS PREC field
- Alarms : sensitive borders
  - Major : Red/Orange
  - Minor : Orange/Yellow
  - Invalid : Purple



- Disconnected PV : Pink
  - CSS
  - JAVA/XAL



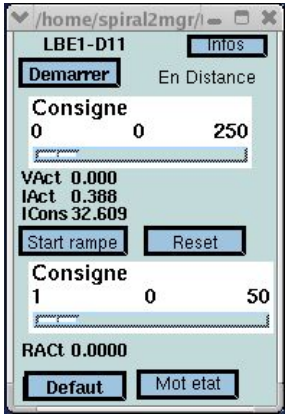
Laurent PHILIPPE – SDA/GIM – 23/08/2012

Etats & Défauts

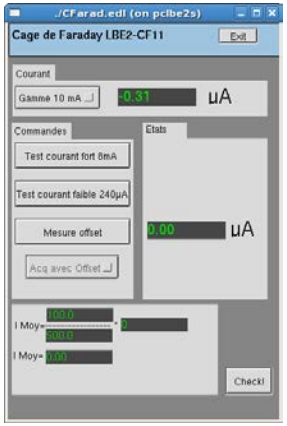
- Etats
  - Liste de tous les états
  - Présent / Non présent
- Défauts
  - Lister tous les défauts
  - Ou uniquement les défauts en cours
  - En défaut / OK
  - Mémorisé et non acquitté

Laurent PHILIPPE – SDA/GIM – 23/08/2012

Shared developments: General purpose Hook application

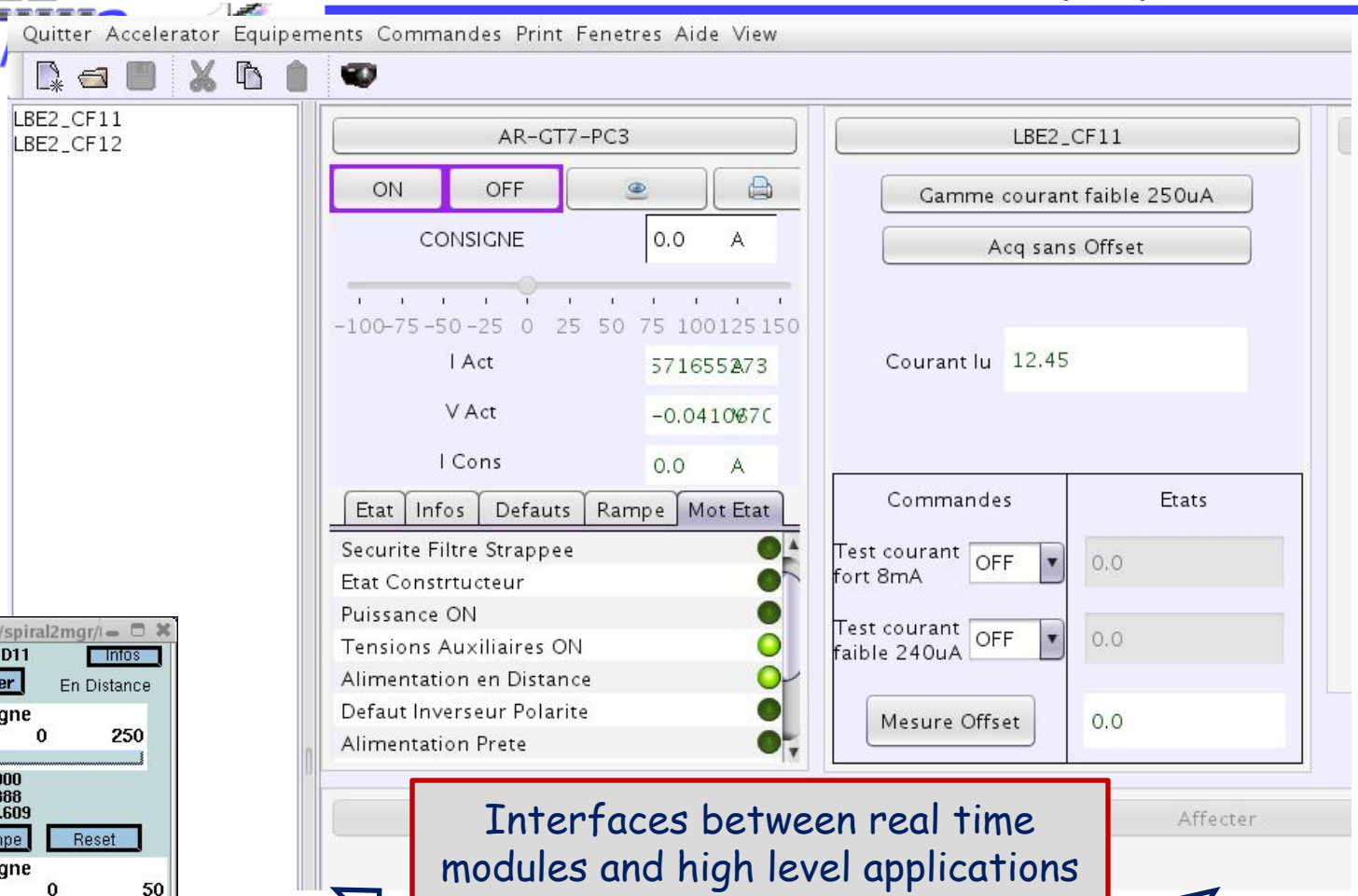


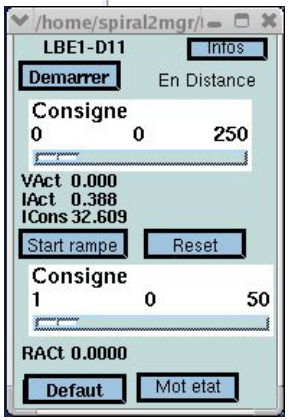
Power supply control
GUI and module

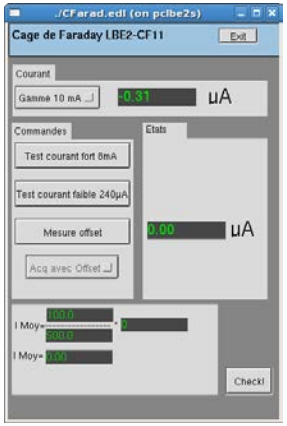


Faraday Cup
beam intensity measurement
GUI and module

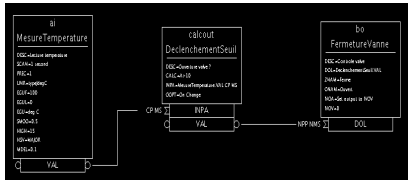
Shared developments: General purpose Hook application







Interfaces between real time modules and high level applications

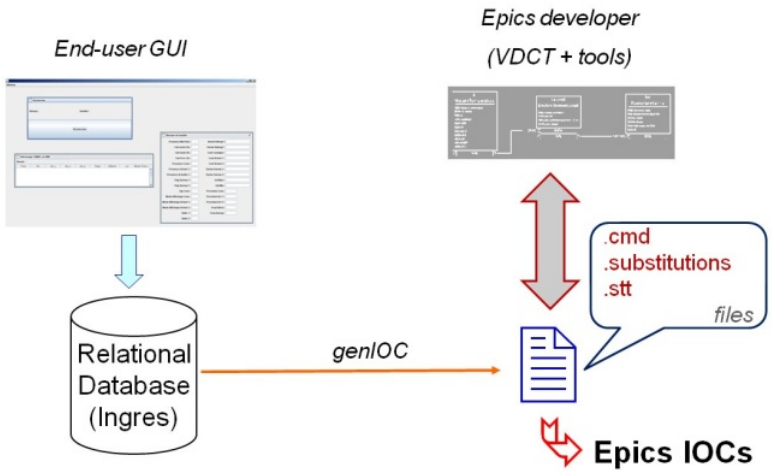


Power supply control
GUI and module

Faraday Cup
beam intensity measurement
GUI and module

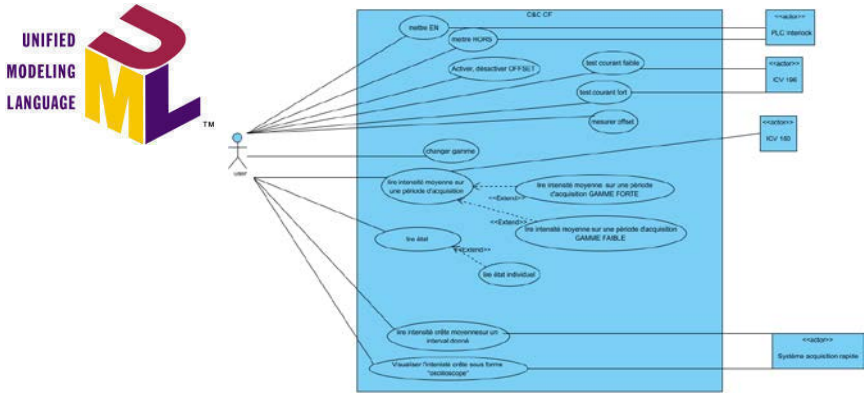
- Siemens PLC/Epics communication : Modbus-TCP or s7plc ?
  - s7plc : widely used in the community and by Irfu
  - Modbus-TCP :
    - ✓ Standard fieldbus within Spiral2 (power supplies, diagnostics)
    - ✓ Retained by Ganil for PLC integration

- High level applications and database tools
  - Ganil tasks but bring add-ons and complexity for the collaboration (real time level and interfaces)
    - ✓ *Rules, specific Epics records and links, db design …*



- Some issues
  - Hetereogenity of technical knowledge at the beginning
    - ⇨ *Misunderstandings and management difficulty*
  - Skills, habits and contexts
    - ⇨ *Different working approaches for considering problems*
  - Lack of time/ressources
    - ⇨ *Specification documents delayed, some mismatches*
    - ⇨ *Following emerging solutions while developing*
- But a lot of willingness and involvement…
  - Fruitful exchanges
  - Beam tests performed to gain time for the final commissioning
    - ⇨ *Common field work and evaluation of the first components*
  - Shared work
    - ⇨ *topSp2, CSS, software interfaces & many others*
  - Mutual comprehension
    - ⇨ *Collaborative work*
    - ⇨ *Operation of a large installlation*

This is not the end !



- Use of UML (but late) …
- Yet > 50 man.years
- Installation & commissioning :
  - LEBTs : 06/2014
  - then MEBT and Linac …

- Organisation for installing, support still in discussion
  - Installation procedures are in evaluation
  - Irfu & IPHC moving to other projects but support required
  - Ganil : two different control systems to operate :
    - ✓ Ganil (Ada)
    - ✓ Spiral2 (Epics)
  - Knowledge transfer for the deliveries from the collaboration

Thanks a lot to the communities for their help and support (Epics, XAL, CSS …)

Thanks for your attention !