Setting the Spiral2 control system for the on-going commissioning
Introduction

- The Spiral2 project
- Control system deliverables
- Collaborations for the control system

The Spiral2 control system

- Infrastructure
- Equipment configuration
- Sources and beam lines controls
- From RFQ to HEBT
- GUIs environment
- Software integration

And now?
Spiral2: a new Rare Ion Beam facility

DESIR experiment room

S3 experiment room

NFS experiment room

beam production & acceleration
Beam characteristics

<table>
<thead>
<tr>
<th></th>
<th>Q/A</th>
<th>I (mA)</th>
<th>Energy (Mev/u)</th>
<th>CW max beam power (KW)</th>
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</thead>
<tbody>
<tr>
<td>Protons</td>
<td>1/1</td>
<td>5</td>
<td>2 - 33</td>
<td>165</td>
</tr>
<tr>
<td>Deuterons</td>
<td>1/2</td>
<td>5</td>
<td>2 - 20</td>
<td>200</td>
</tr>
<tr>
<td>Ions</td>
<td>1/3</td>
<td>1</td>
<td>2 - 14.5</td>
<td>45</td>
</tr>
<tr>
<td>Ions (option)</td>
<td>1/6</td>
<td>1</td>
<td>2 - 8</td>
<td>48</td>
</tr>
</tbody>
</table>

Spiral2 : accelerator design

To RIB production

To DESIR room
Spiral2: building constructions...
Spiral2: ... along with the process installation

LEBT1

RFQ

Linac tunnel

Cryomodules waiting for installation
Spiral2: and what about the control system?

- Work project for the PCD control room
- Racks installation & cabling
- VME chassis installed waiting for the electrical switch-on and checks
Control system: ~70 man.years of collaboration (~8.5 FTW)

Injector controls
- Ion source control
- Deuteron source control
Epics distribution & repository
Equipment interfaces:
- CFs, slits, ACCTs-DCCTs
- TOF, FCT, CFR
- LLRF

Global coordination
Equipment interfaces:
- Power supplies
- Profilers, BLMs, BPMs
- RF
Central services
High level applications
Databases
CSS distribution
SVN server
Control system: deliverables

- 35 Synoptics
- 30 Tuning applications
- 10 Services

Channel Access
- 20 IOCs
- 10 Drivers

IOC: VME (VxWorks)
IOC: Linux

Modbus/TCP
- Power supplies
- PLCs
- Profilers
- RF amplifiers

~1500 equipment
Control system: shared platform

- Common Spiral2 development platform ("topSp2"):
  - Provided and maintained by Irfu
  - Shared by the three labs
  - Spiral2 version of the EPICS environment (development, operation)

- Rules and formalization
  - Interfaces between IOCs and GUIs
  - Files naming
  - Repository organization
  - For on-site integration

- Development hosted on a shared SVN server @Ganil
Infrastructure: central services

Alarms handling
(in-house development shared Ganil/Spiral2)

Archiving system
(CSS)

E-logbook
(commercial j5 product in use at Ganil)
Infrastructure: equipment configuration principles

GenIOC Software

- Genioc generation utility
- Genauto generation utility
- GUI

IOC Configuration

Module APP

Module APP « PLC »

Generates
- substitutions
- connections

Generates module APP

«Device configuration» database

Developer module using VDCT

Developer

End user

- Add
- Remove
- Inhibit
- Configure Equipement

Equipement configuration

Developper

Developper
Infrastructure: equipment configuration phases

- Non Epics fields
  - IP, builder ...

Monitoring (by IP, ...)
Value for non Epics fields
PLC address ...
Infrastructure: machine settings management

Off-line run preparation

- TraceWin
- TraceWin2BD
- Database
  - Machine description
    - (Ingres)
  - .xml files
    - (Xaf compliant)

- Accelerator hierarchy description

On-line operation

- Beam selection
- Equipment interactions
  - (set, read, compare ...)
- Machine snapshots archives

Lattice machine configuration database
Sources and LEBTs: sources control

Deuterons & LBE2/C: Used and validated during production tests @Saclay

Ions & LBE1: Different from the @Grenoble control system ⇒ To be tested
Sources and LEBTs: integration of devices

- Power supplies
- Faraday Cups & ACCT-DCCT
- Slits
- Slow chopper
- Emittancemeters
- Profilers
- LEBTs
- Integration of devices
- Faraday Cups
- ACCT
- DCCT
- Emittancemeters
- Slits
- Slow chopper
- Power supplies
From RFQ to HEBT: Beam diagnostics

- **Fast Faraday Cup Stream device** (Agilent Oscilloscope)

- **Time Of Flight** Modbus-TCP & binary ADAS ICV 196

- **Beam Extension Monitor**
  NIM Multichannel Canberra Analyzer
  ⇒ Just starting

- **Beam Loss Monitor**
  Cosylab development for VME Caen 1495
  ⇒ June 2015

- **Beam Position Monitor**
  Specific VME 64 hardware and software
  ⇒ In progress
From RFQ to HEBT: beam dump activation monitoring

Objective

- EPS classified device
- FMEA required

Limitation of the Linac beam dump activation

Implementation

Labview cRIO device

EPICs IOC

CSS/BOY GUI
CSS/BOY suite adapted for Spiral2 (Ganil)

- Nb: former EDM screens developed at the beginning still there
- Contexts:
  - CSSdev: development
  - CSSop: operation
- Widget library

Available:
- TOF / FCT-CFR interfaces, Emittance control & display, AES interface

Under development:
- BTI GUI, Machine synoptics

To be developed:
- Interlocks, Beam pulse control, Beam losses

And many others to come …
• Operator control environment: CSSop
  • Implementation:
    ✓ Perspectives limited to CSS runtime and data-browser
    ✓ One unique workspace NFS mounted for all stations (Eclipse lock suppressed)
  • For operation:
    ✓ No editing capability for no hazardous modifications
    ✓ Light view: unused menus suppressed
    ✓ One central and unique launcher for all applications: CSS, Java/XAL, EDM (+Ganil/Ada ones).
GUIs: CSSop synoptic

- Alarms (java)
- Beam characteristics
- e-logbook (j5)
- Equipment (CSS)
- Tuning (java)
- Data Browser (CSS)
- Launcher

Spiral2
Optional displays

Alignment

Font size

Rotation

**GUIs: CSS widget library**

- **CSS**
  - **widget library**
  - **Syntopique view**

**Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Name</td>
<td>CageFaraday</td>
</tr>
<tr>
<td>Nom Court</td>
<td>no</td>
</tr>
<tr>
<td>Widget Type</td>
<td>CageFaraday</td>
</tr>
<tr>
<td>Behavior</td>
<td></td>
</tr>
<tr>
<td>Actions</td>
<td>no action</td>
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<tr>
<td>Enable</td>
<td></td>
</tr>
<tr>
<td>Rules</td>
<td></td>
</tr>
<tr>
<td>Scripts</td>
<td>no script attached</td>
</tr>
<tr>
<td>Visible</td>
<td>yes</td>
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</table>

**Specifics Properties**

<table>
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<tr>
<td>Alignement Horizontal Nom</td>
<td>Center</td>
</tr>
<tr>
<td>Alignement Vertical Nom</td>
<td>Middle</td>
</tr>
<tr>
<td>Background Color</td>
<td>(240,240,240)</td>
</tr>
<tr>
<td>Fond Transparent Partie Info</td>
<td>no</td>
</tr>
<tr>
<td>Montrer Partie Info</td>
<td>yes</td>
</tr>
<tr>
<td>Montrer Valeur</td>
<td>yes</td>
</tr>
<tr>
<td>Position Partie Info</td>
<td>Droite</td>
</tr>
<tr>
<td>Rotation Image</td>
<td>Verticale</td>
</tr>
<tr>
<td>Taille de police</td>
<td>7</td>
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<tr>
<td>Tooltip</td>
<td>${pv_name}/${pv_value}</td>
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**Position**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Height</td>
<td>100</td>
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<tr>
<td>Width</td>
<td>164</td>
</tr>
<tr>
<td>X</td>
<td>588</td>
</tr>
<tr>
<td>Y</td>
<td>222</td>
</tr>
</tbody>
</table>
- Development environment: CSSdev
  - SPIRAL2 accelerator widget library
  - SPIRAL2 OPI templates automatically added in user's workspace:
    ✓ Beam characteristics header
    ✓ Launcher
    ✓ Pydev added
    ✓ SVN access added ...
  - Common icons and pictures
  - Graphical common usage template
- CSSdev & CSSop distribs' link:
  - [https://u.ganil-spiral2.eu/csssp2/](https://u.ganil-spiral2.eu/csssp2/)
**Environment**
- Java programmation
- Derived from XAL framework (SNS)

**Available**
- Parameter management
- Optimization
- Emittance limitation
- Beam analysis
- Hook
- Beam profilers display

**Under development**
- Power raise

**To be developed**
- Cavity tuning
- MPS

**GUIs**: high level applications
- Optimization (tested @ Saclay)
- Emittance limitation (tested @ Saclay)
- Cavity tuning (simulation mode)
- Power raise (graphical design)
- **Integration mechanism**
  - Coherency check between
    - ✔ Software deliveries (through SVN)
    - ✔ Conventions & rules
  - genIOC environment

- **Control system evolutions**
  - Identified items:
    - ✔ topSp2 repositories
      - Modules
      - Equipment
      - Alarms
    - ✔ CSS GUIs
    - ✔ Java applications
  - Operation & maintenance modes
  - Procedures
  - Software tools & utilities

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Eric Lécorché/ Epics meeting 21/10/2014
### Control system

- **Software:**
  - Infrastructure: ~ready for use
  - Integration of external developments on Ganil site: in progress

- **Testing & commissioning**
  - Sources & LEBTs:
    - Prior to software: installation, cabling and wiring tests
    - Control system tests possible when equipment declared available
  - From RFQ to HEBT:
    - ~expect to provide basic functionalities

- **Knowledge transfer:** ?

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**Conclusion:** and now?

**Milestones**
- Sources + LEBTx 12/2014
- RFQ + MEBT 05/2015
- Linac + HEBT 09/2015

**Spiral2 project**

**Ganil Accelerator Division**
- Operation
- Technical groups
  - Control group

**WORK IN PROGRESS**
- SORRY FOR ANY INCONVENIENCE CAUSED
Thanks for your attention!

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