Spiral2 OPEN XAL applications

WORKSHOP OPEN XAL
FRIBT/MSU, December 2012

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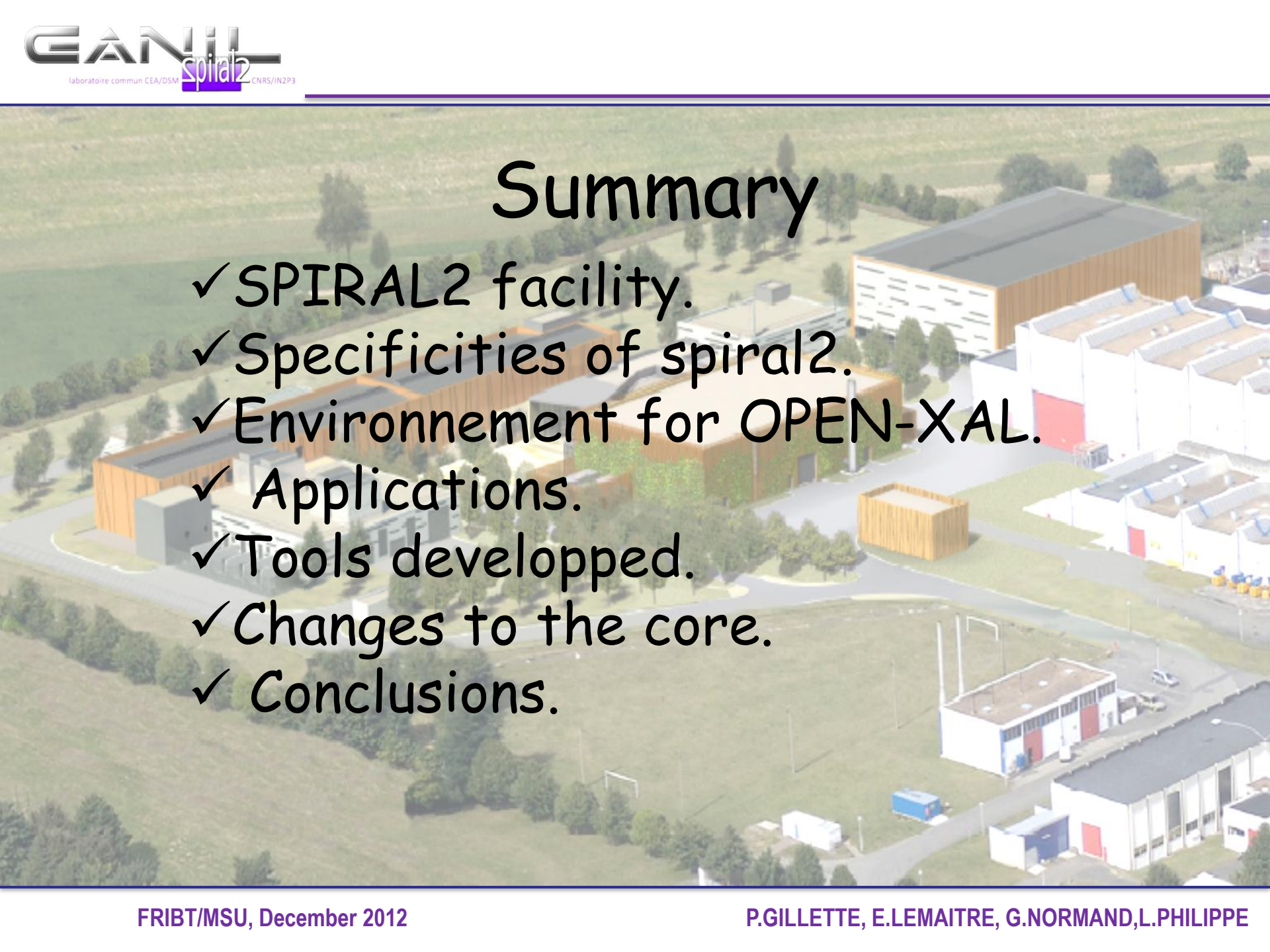
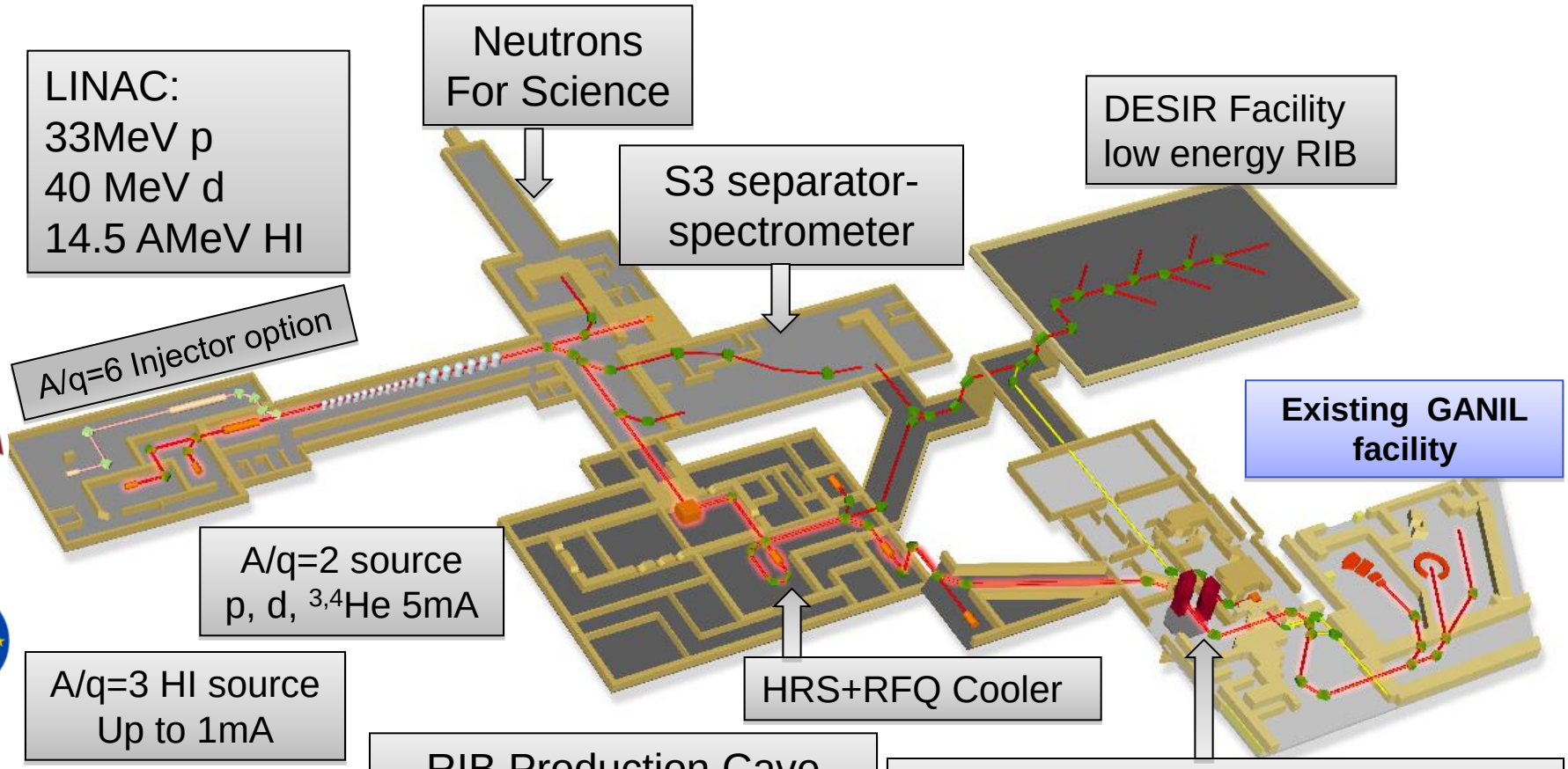


Summary

- ✓SPIRAL2 facility.
- ✓Specificities of spiral2.
- ✓Environnement for OPEN-XAL.
- ✓ Applications.
- ✓Tools developped.
- ✓Changes to the core.
- ✓ Conclusions.

The SPIRAL2 FACILITY



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Specificities of SPIRAL2.

- 1 injector , 2 sources (Q/A=1/2 & Q/A=1/3).
  - 1 injector (Q/A =1/6) planned.
- Multiple beams can be accelerated with multiple energy and intensity.

	Q/A	Intensity range mA	Energy range MeV/u	Cw max power kW
Protons	1	0 - 5	2 - 33	165
Deutons	1/2	0 - 5	2 - 20	200
Ions	1/3	0 - 1	2 - 14.5	43.5
Ions	1/6	0 - 1	2 - 8.5	51

→ many different tunings

Specificities of SPIRAL2

- We have to keep some compliance with the GANIL legacy control system (wrote in Ada/X11 Motif) .
- Implementation of graphical standards in accordance with CSS/EDM applications.
  - not done in all applications, for the moment.
- Tools outside of XAL for creation of parameters set**:**
  - Tracewin (3D maps. Envelope and multi particles simulations)
  - GenLinWin (for the LINAC cavities)
  - Toutatis (for the RFQ)
- Open-XAL used for control and command of equipments, not only for high-level applications.

Environnement for OPEN-XAL

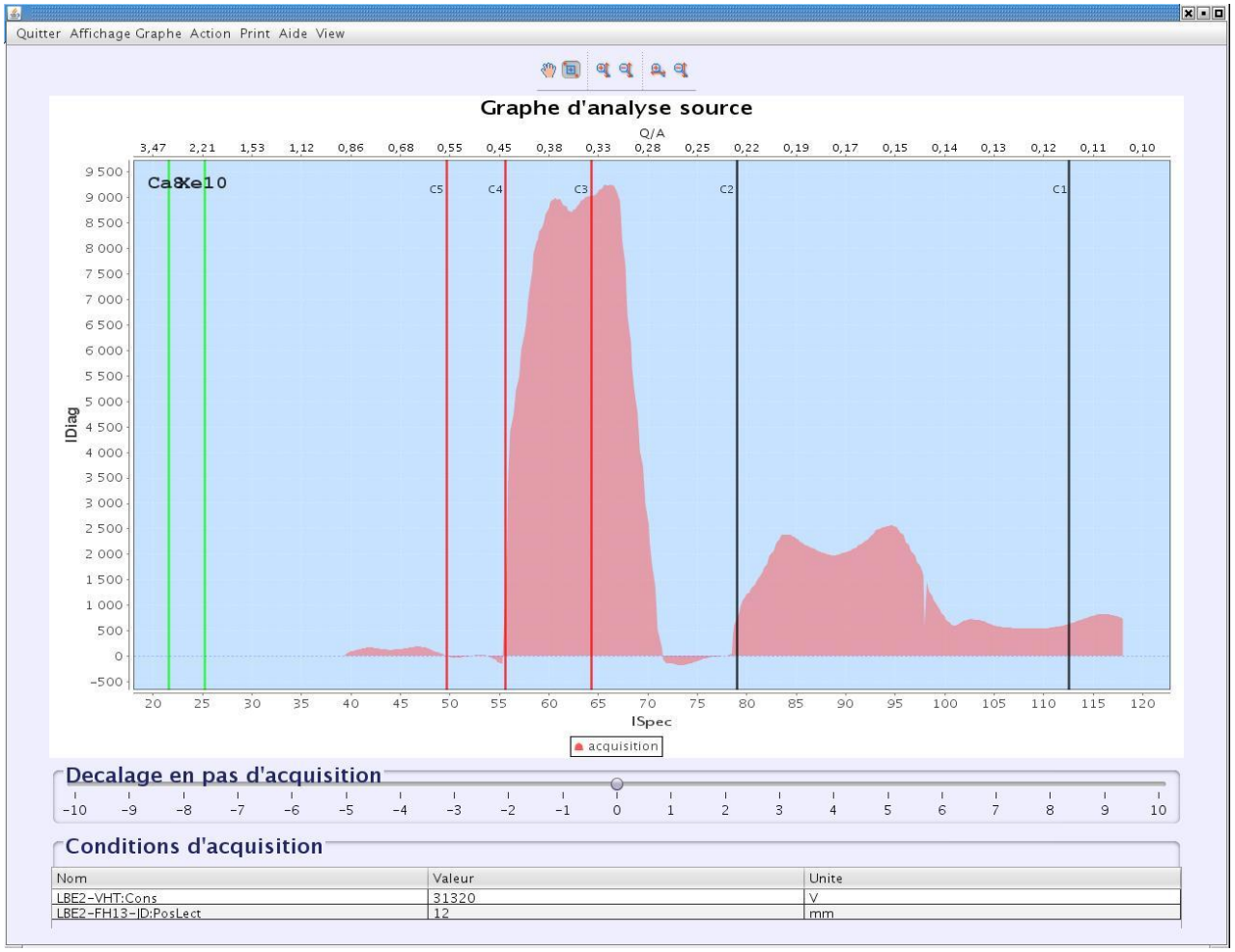
- Linux REDHAT ENTREPRISE 5.1.19.
  - Tests for CentOS planned in December 2012
- Java 1.7 JDK-1.7.0_05.
- CAJ.
- Eclipse Juno.
- Nimbus look and Feel.
- SVN 1.7.4.
- DataBase => INGRES.
- Until 11/2012 : XAL SNS version,
  => Almost all applications on OpenXal now.

Applications: SourceAnalysis

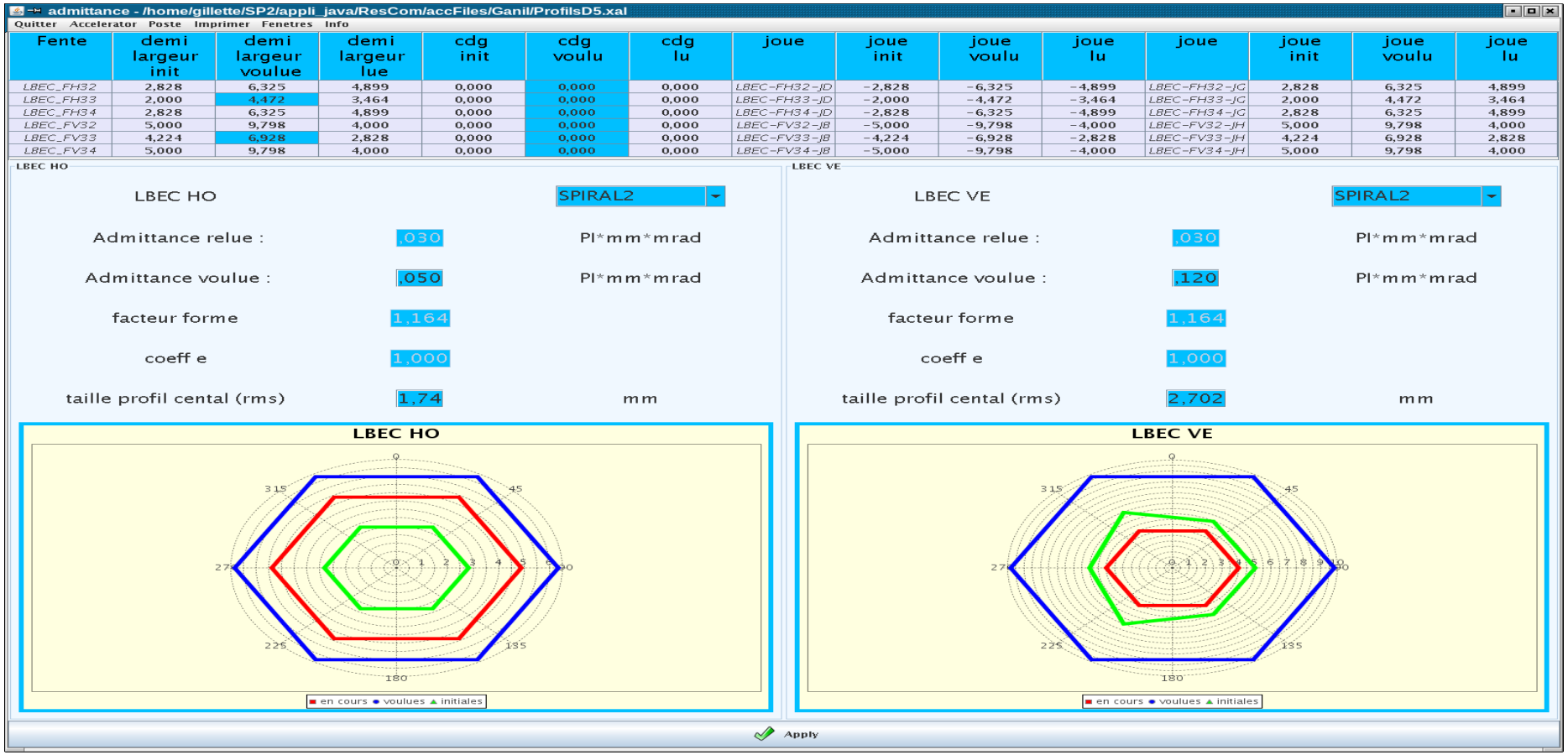
Mass Spectroscopy of species at the output from ions sources.

- Peaks identification
- Tagging of species.
- Total efficiency calculation or by peaks.

Firsts steps.



Applications: Admittance



Adjust the admittance reduction with 3 sets of slits (6 motors).

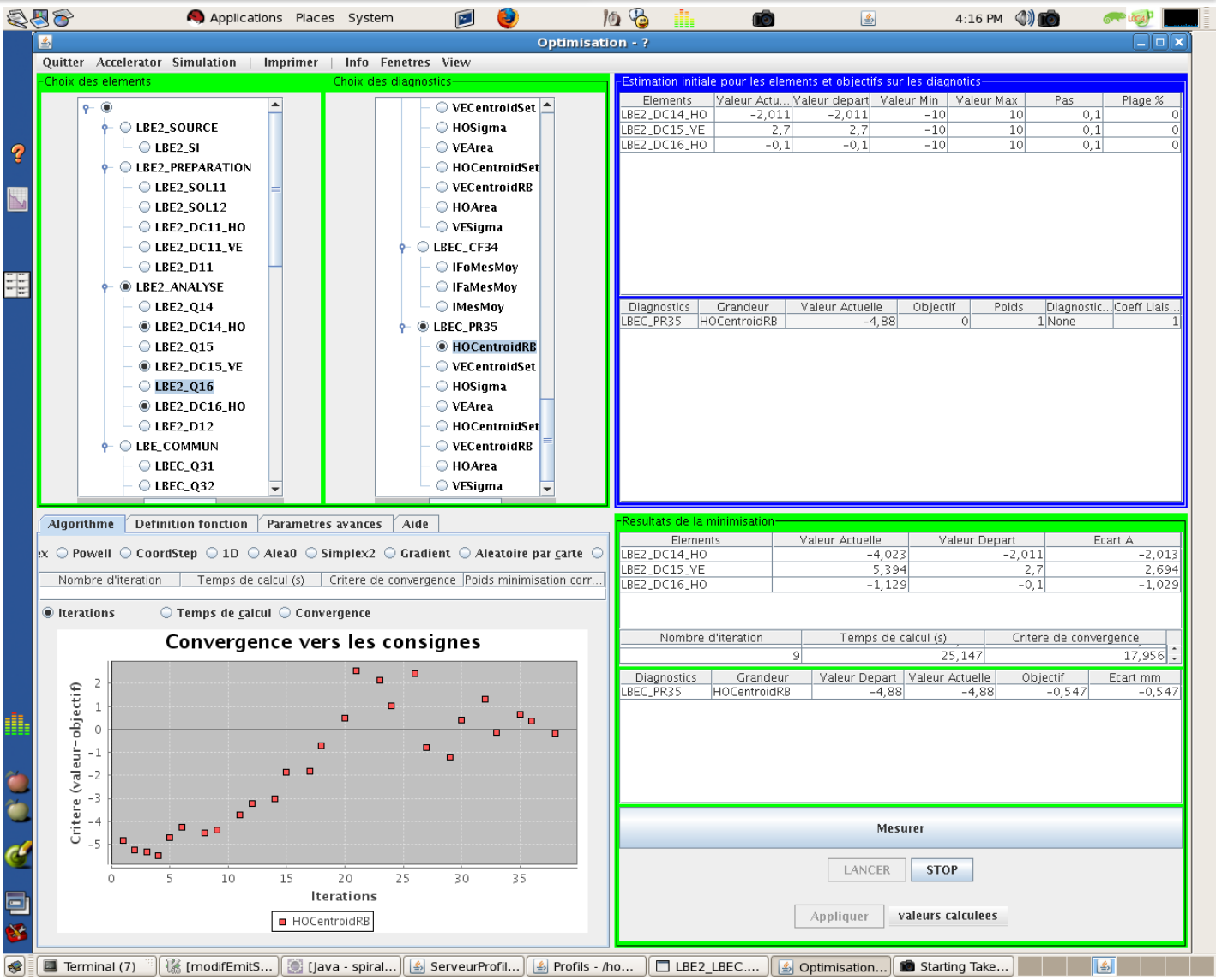
The user gives the admittance wanted or the FWHM on the control beam profiler.

Successful tests with real beam line in Saclay in the second quarter 2012.

Applications : Optimisation

Achievement of the minimization of objectives on a set of diagnostics.

Successful tests with real beam line in Saclay in the second quarter 2012 on deuteron beam in injector faraday cup.



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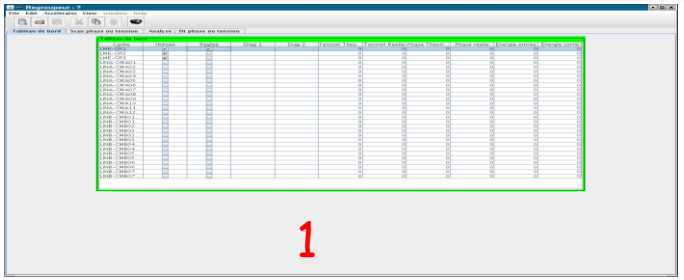
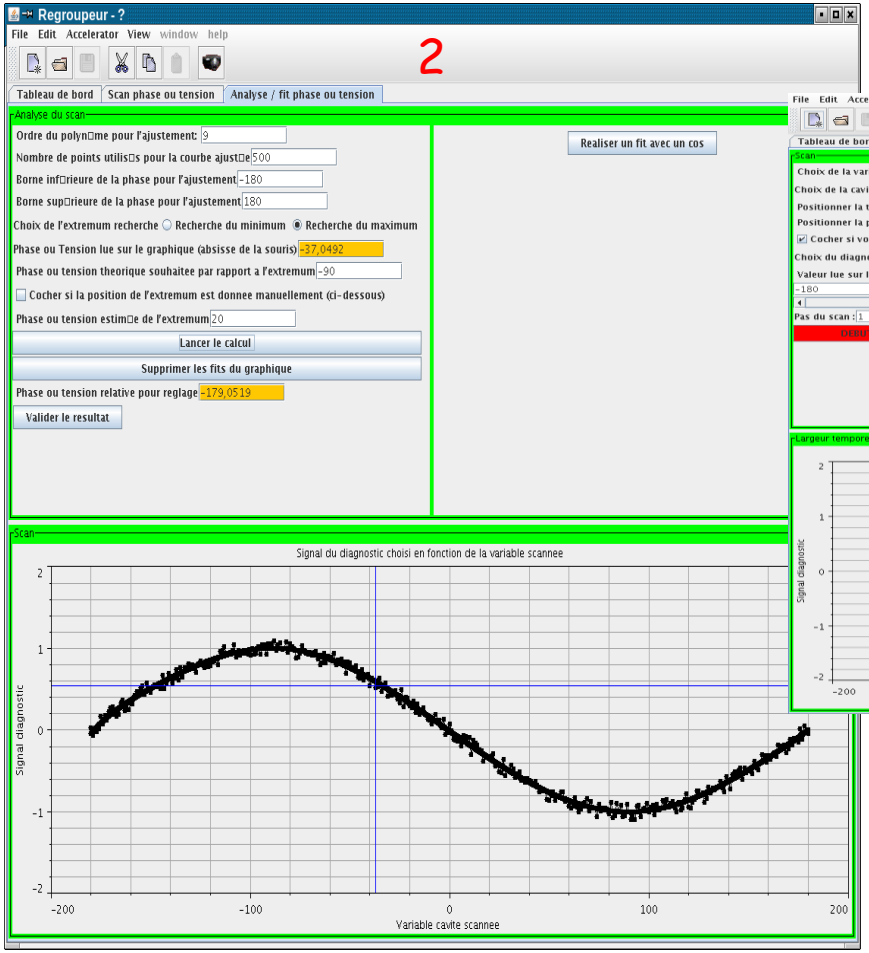
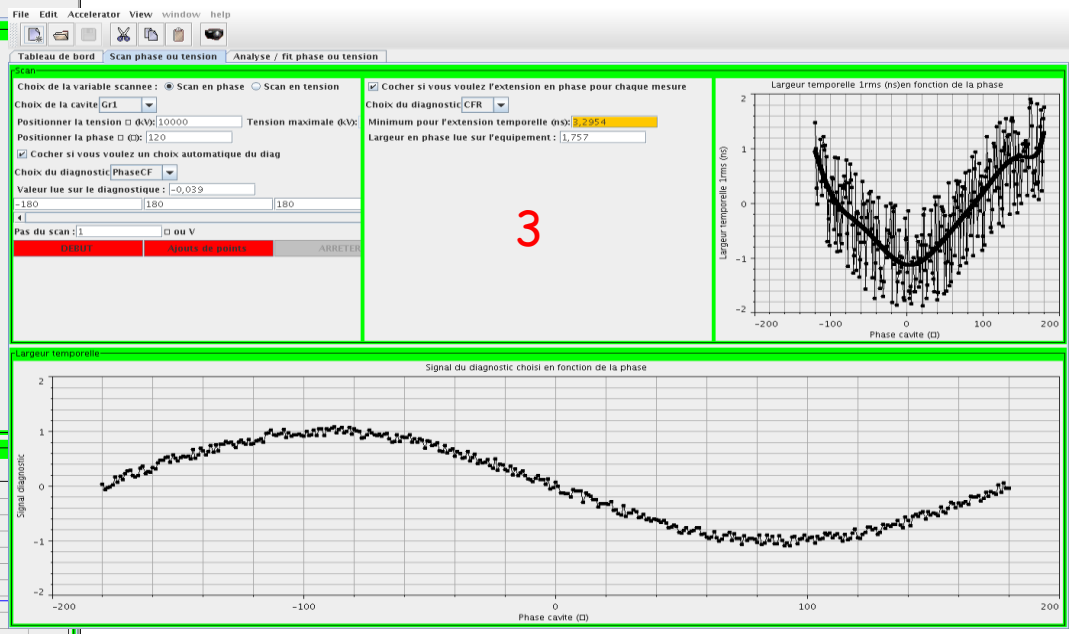
Applications : Cavities tuning

Firsts steps (simulations) : - Cavities choice 1
- Measure 2
- Calculation and Analysis 3







Phase or voltage scan to optimize tuning on extension phase diagnostics.
Use XAL PLOT and an adaptation of XAL scan

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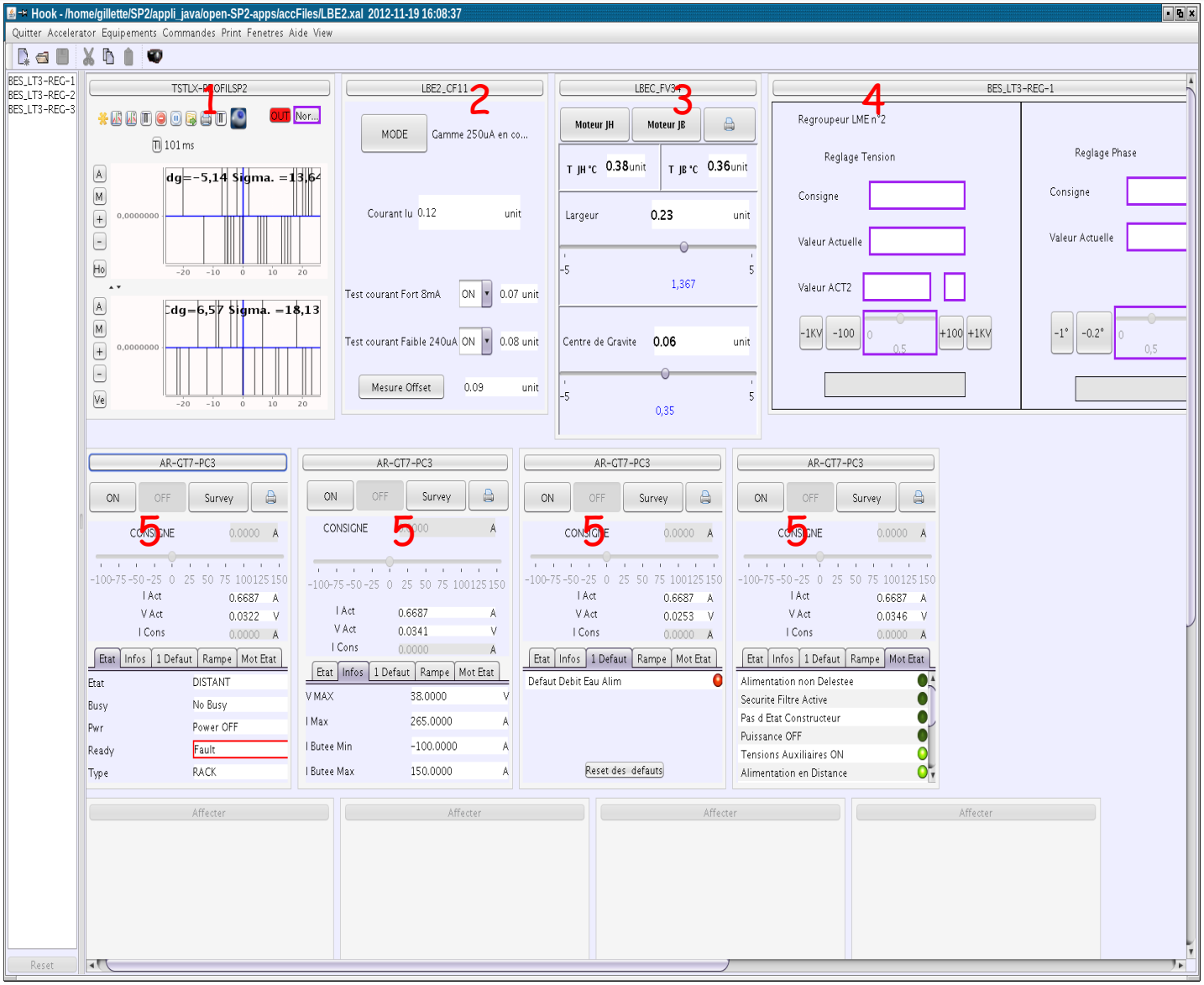
Applications : Hook

Generic command and control of equipments

Successful tests with real beam line in Saclay in the second quarter 2012:

- Profil 1
- Faraday Cup 2
- Slit + Motors 3
- Buncher 4
- MagnetSupply 5
  - state tab.
  - Info tab
  - Default tab
  - State word tab



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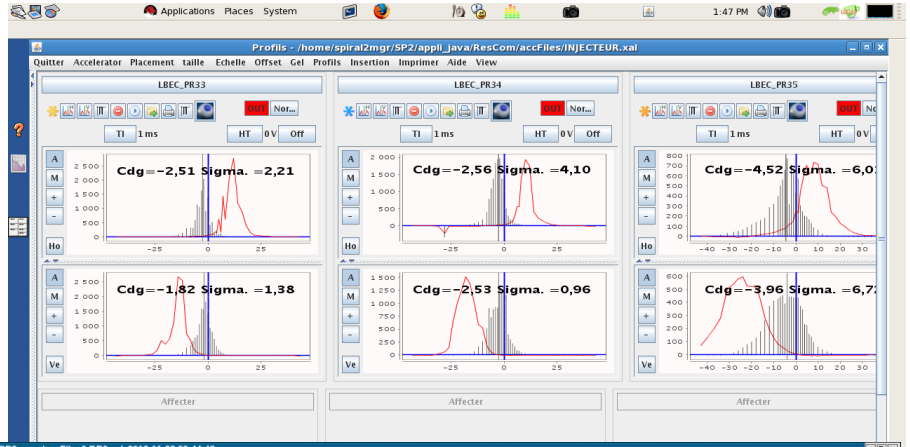
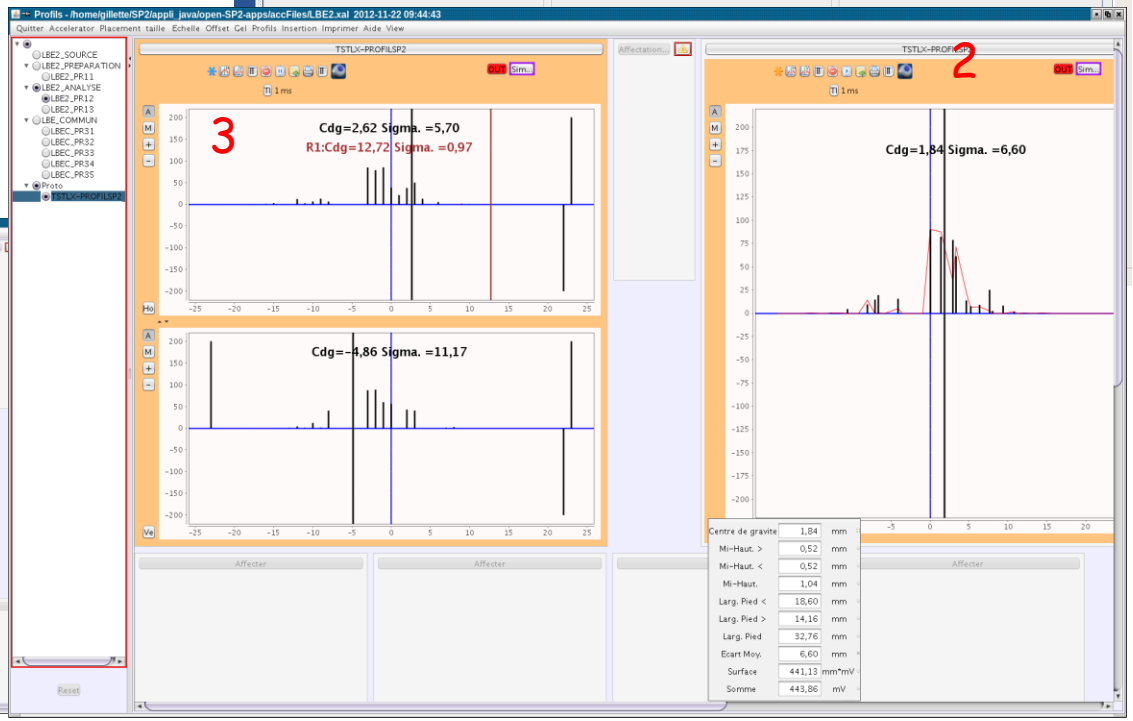
Applications: Profiles

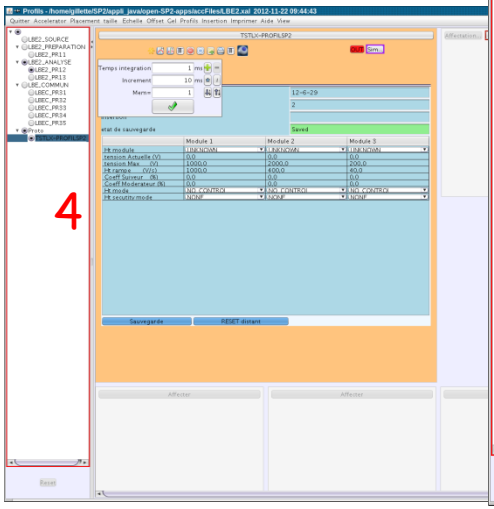
-Beam wire harps display and control 1

Successful tests with real beam line in Saclay in the second quarter 2012.

- Simulation and test mode 2
- Multiple areas calculation 3
- Broken wires selection. 3
- Full control on the diagnostic 4
  - Expert panel.
  - Integration time, high voltage.







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Applications : ParaSpiral2

Beam Parameters Management

- Accelerator Setup.
  - Optics choices.
  - Setup values selection.
- Write/read accelerator values.
- Comparison between
  - Theoretical
  - Live
  - Stored values
- Save and restore functions.
- Magnetic rigidity calculation for the lines.

READ pour LIVE

Nom	Equipement	Nature	Signal	LIVE	Unite	Defaut
LBE2_PREPARATION						
LBE2_SOL11		fieldRB	LBE2-SOL11:IAct T	0,001	T	
	LBE2-SOL11	I	LBE2-SOL11:IAct	0,05	A	
	LBE2-SOL11	psFieldRB	LBE2-SOL11:IAct T	0,001	T	
	LBE2-SOL11	I_Set	LBE2-SOL11:ICons	0,14	A	
	LBE2-SOL11	fieldSet	LBE2-SOL11:ICons T	0,0024	T	
LBE2_SOL12		fieldRB	LBE2-SOL12:IAct T	0,001	T	
	LBE2-SOL12	I	LBE2-SOL12:IAct	0,05	A	
	LBE2-SOL12	psFieldRB	LBE2-SOL12:IAct	0,05	T	
	LBE2-SOL12	I_Set	LBE2-SOL12:ICons	0,14	A	
	LBE2-SOL12	fieldSet	LBE2-SOL12:ICons T	0,0024	T	
LBE2_DC11_HO		fieldRB	LBE2-DC11-HO:IAct T	0	T	
	LBE2-DC11-HO	I	LBE2-DC11-HO:IAct	0,05	A	
	LBE2-DC11-HO	psFieldRB	LBE2-DC11-HO:IAct T	0	T	
	LBE2-DC11-HO	I_Set	LBE2-DC11-HO:ICons	0,14	A	
	LBE2-DC11-HO	fieldSet	LBE2-DC11-HO:ICons T	0	T	
LBE2_DC11_VE		fieldRB	LBE2-DC11-VE:IAct T	0	T	
	LBE2-DC11-VE	I	LBE2-DC11-VE:IAct	0,05	A	
	LBE2-DC11-VE	psFieldRB	LBE2-DC11-VE:IAct T	0	T	
	LBE2-DC11-VE	I_Set	LBE2-DC11-VE:ICons	0,14	A	
	LBE2-DC11-VE	fieldSet	LBE2-DC11-VE:ICons T	0	T	
LBE2_PR11		VEArea	LBE2-PR11:VEArea	0,12	?	
		HOArea	LBE2-PR11:HOArea	0,25	?	
LBE2_D11		fieldRB	LBE2-D11:fieldRB	0,02	T	
	LBE2-D11	I	LBE2-D11:IAct	0,05	A	
	LBE2-D11	psFieldRB	LBE2-D11:IAct T	0,0001	T	
	LBE2-D11	I_Set	LBE2-D11:ICons	0,14	A	
	LBE2-D11	fieldSet	LBE2-D11:ICons T	0,0002	T	
LBE2_ANALYSE						
LBE2_PR12		VEArea	LBE2-PR12:VEArea	0,12	?	
		HOArea	LBE2-PR12:HOArea	0,25	?	
LBE2_Q14		fieldRB	LBE2-Q14:IAct T	0,0047	T.m	
	LBE2-Q14	I	LBE2-Q14:IAct	0,05	A	
	LBE2-Q14	psFieldRB	LBE2-Q14:IAct T	0,0047	T.m	
	LBE2-Q14	I_Set	LBE2-Q14:ICons	0,14	A	
	LBE2-Q14	fieldSet	LBE2-Q14:ICons T	0,0082	T.m	
LBE2_DC14_HO		fieldRB	LBE2-DC14-HO:IAct T	0	T	
	LBE2-DC14-HO	I	LBE2-DC14-HO:IAct	0,05	A	
	LBE2-DC14-HO	psFieldRB	LBE2-DC14-HO:IAct T	0	T	
	LBE2-DC14-HO	I_Set	LBE2-DC14-HO:ICons	0,14	A	
	LBE2-DC14-HO	fieldSet	LBE2-DC14-HO:ICons T	0	T	
LBE2_DC15_VE		fieldRB	LBE2-DC15-VE:IAct T	0	T	
	LBE2-DC15-VE	I	LBE2-DC15-VE:IAct	0,05	A	
	LBE2-DC15-VE	psFieldRB	LBE2-DC15-VE:IAct T	0	T	
	LBE2-DC15-VE	I_Set	LBE2-DC15-VE:ICons	0,14	A	
	LBE2-DC15-VE	fieldSet	LBE2-DC15-VE:ICons T	0	T	
LBE2_Q15		fieldRB	LBE2-Q15:IAct T	0,0047	T.m	
	LBE2-Q15	I	LBE2-Q15:IAct	0,05	A	
	LBE2-Q15	psFieldRB	LBE2-Q15:IAct T	0,0047	T.m	
	LBE2-Q15	I_Set	LBE2-Q15:ICons	0,14	A	
	LBE2-Q15	fieldSet	LBE2-Q15:ICons T	0,0082	T.m	
LBE2_Q16		fieldRB	LBE2-Q16:IAct T	0,0047	T.m	
	LBE2-Q16	I	LBE2-Q16:IAct	0,05	A	
	LBE2-Q16	psFieldRB	LBE2-Q16:IAct T	0,0047	T.m	
	LBE2-Q16	I_Set	LBE2-Q16:ICons	0,14	A	
	LBE2-Q16	fieldSet	LBE2-Q16:ICons T	0,0082	T.m	
LBE2_DC16_HO		fieldRB	LBE2-DC16-HO:IAct T	0	T	
	LBE2-DC16-HO	I	LBE2-DC16-HO:IAct	0,05	A	
	LBE2-DC16-HO	psFieldRB	LBE2-DC16-HO:IAct T	0	T	
	LBE2-DC16-HO	I_Set	LBE2-DC16-HO:ICons	0,14	A	
	LBE2-DC16-HO	fieldSet	LBE2-DC16-HO:ICons T	0	T	

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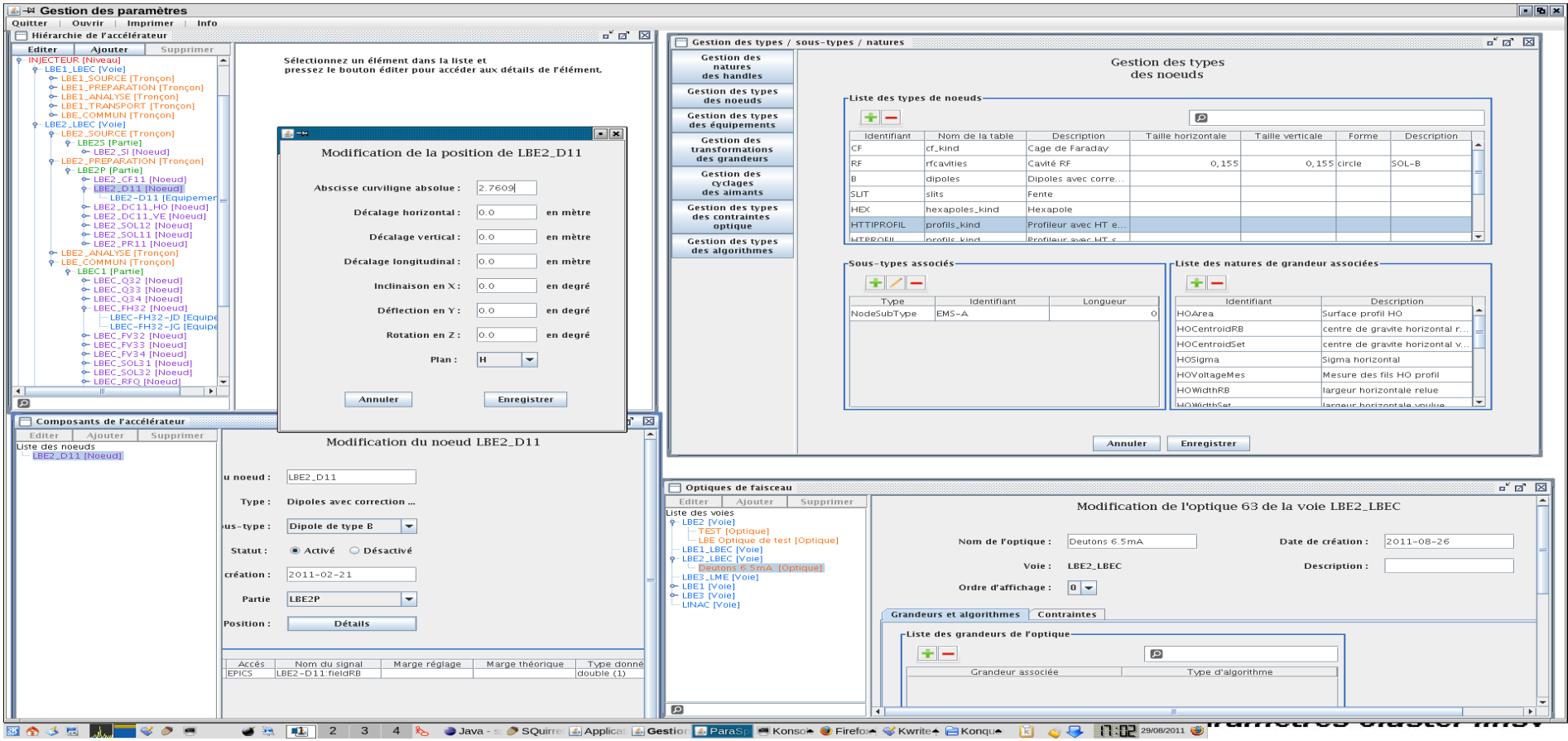
Services : database

- BD2XDXF : Generation of xdxf files from data base Ingres using Spiral2AcceleratorNodeFactory.
- TraceWin2BD : insertion of theoretical values in data base Ingres
- GESTPARAM : management of the Spiral2 XAL data base (value Sets, hierarchy, nodes , optics).



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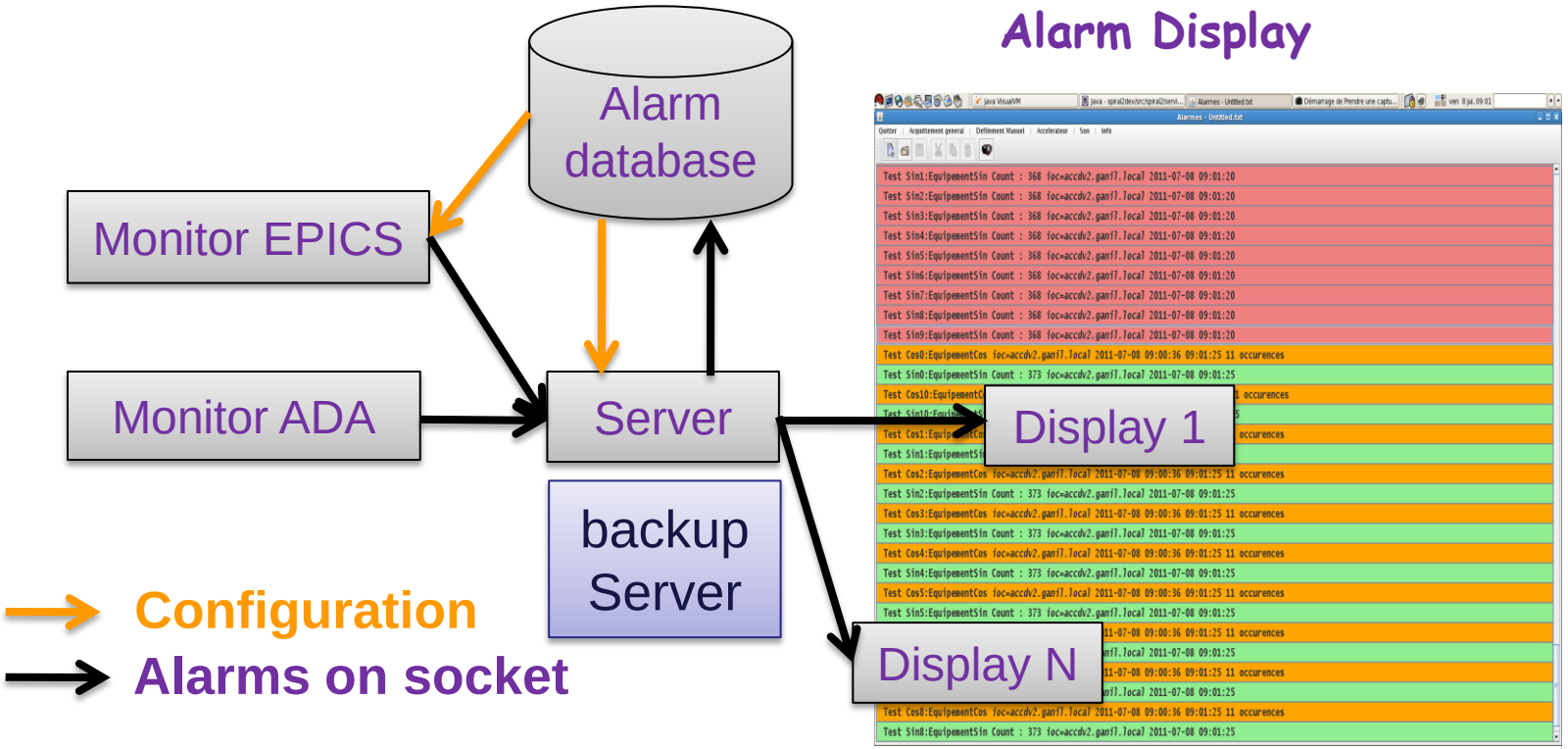
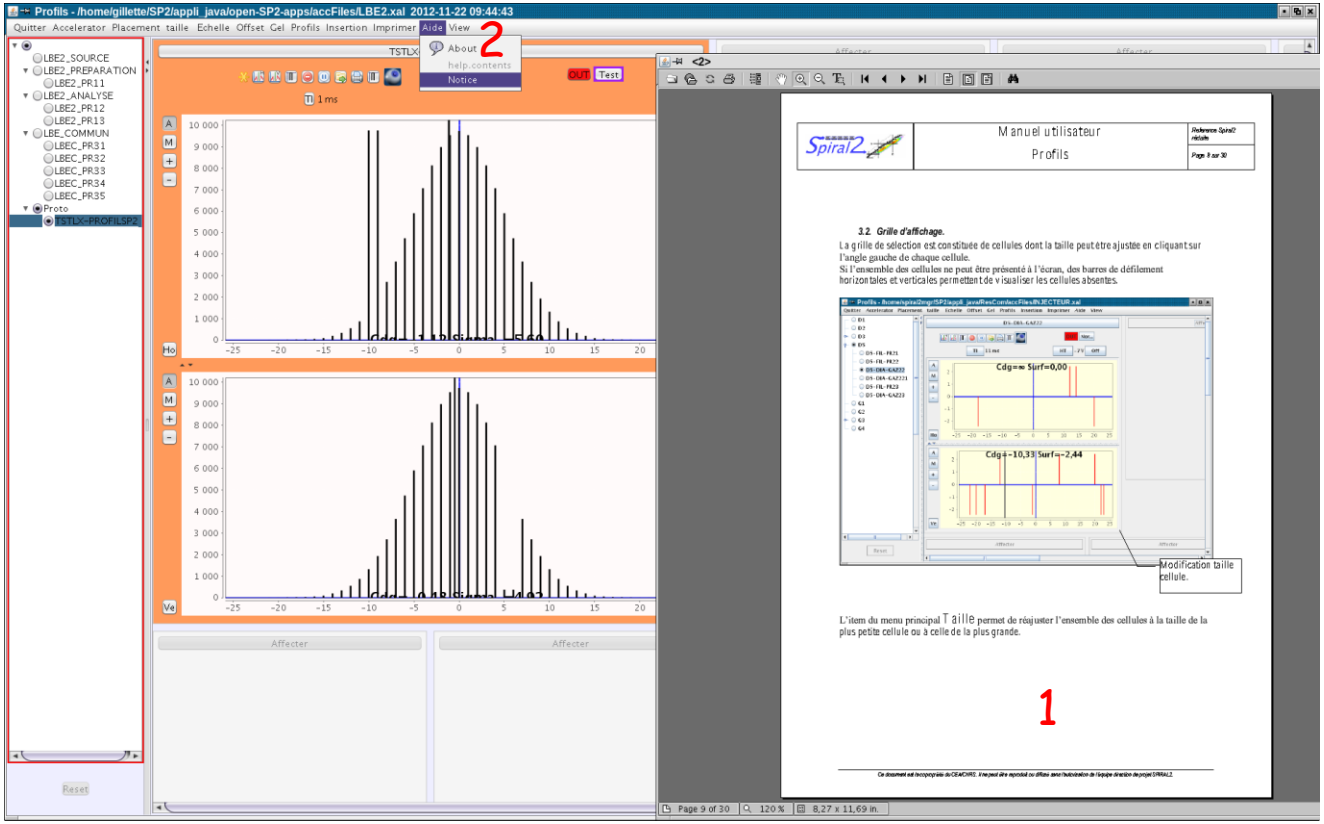
Services : Alarms



- Rely on A Ingres database for configuration and storage issues
- Don’t use EPICS Alarm Handler
- Supports a throughput of 330 alarms per seconds

Tools : general use (1/5)



- Pdf Viewer
- Can be used with a call to an external application or an internalViewer. 1 (com.acrobat.viewer)
- Added to the help menu in the spiral2ApplicationAdaptor. 2

Tools : general use (2/5)

Ion selection

- using standalone Mendeleiev XML file

or

- database Mendeleiev Table.

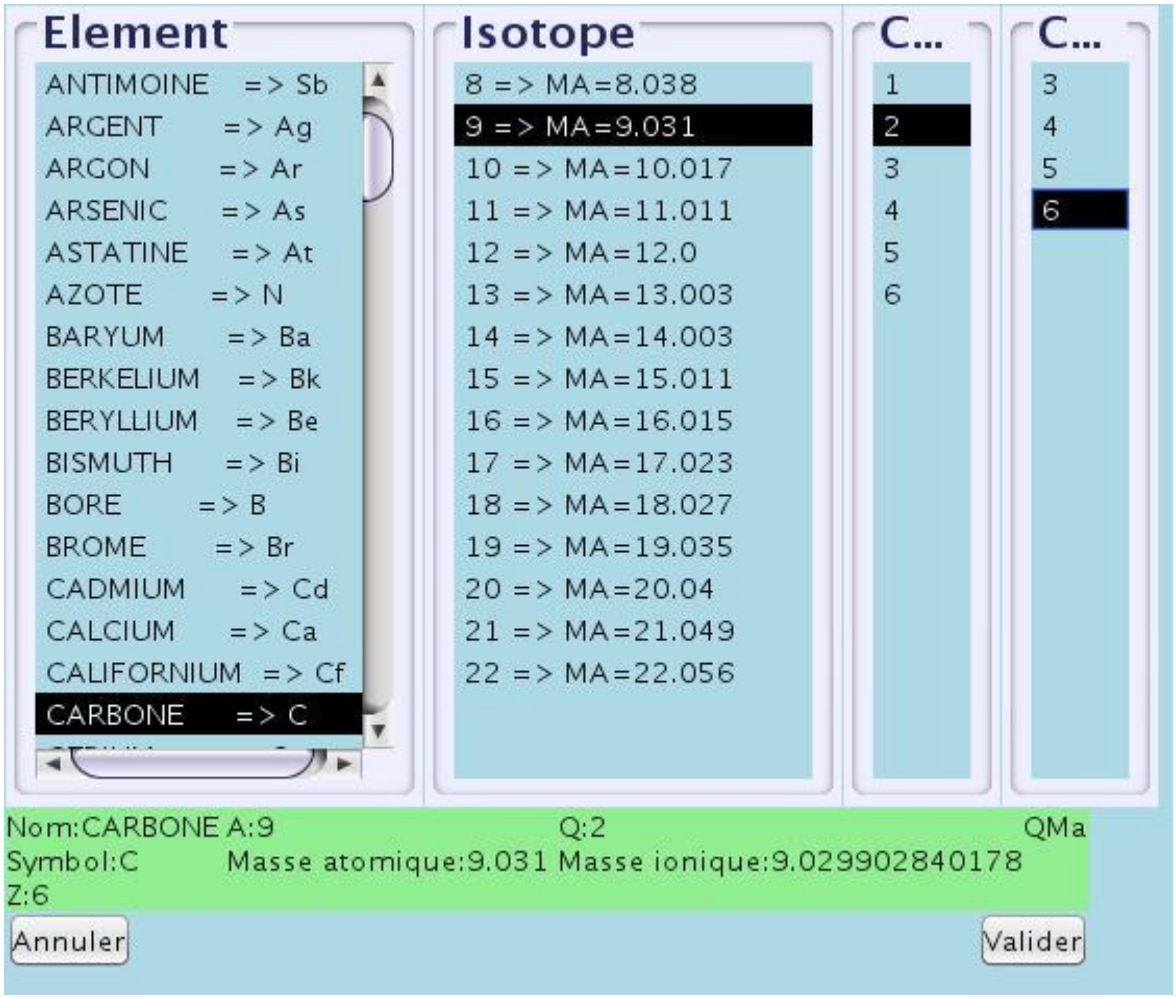
Returns

- a single ion

or

- ions with

  Qmin <= Q <= Qmax



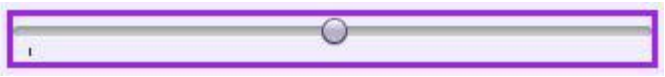
Tools : general use (3/5)

- CA TOOLS: Swing components associated with a Channel Name

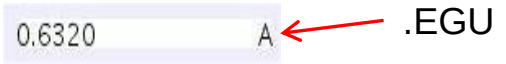
Autonomous, manage PV connection & update, easy to use : creation in 1 line only.

JSliderCA

alarm sensitive border



JTexfieldCA



JToggleButtonCA

And also JButtonCmdCA,JCheckBoxCA,JTableCA, JSimpleLabelImageCA …

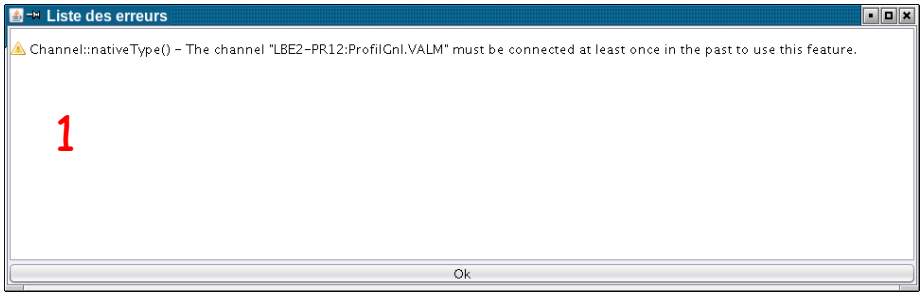
See Hook application

Tools : general use (4/5)

ExceptionNotifier 1

Each time an exception occurred the panel can be opened.

The list of exceptions are update in real time.



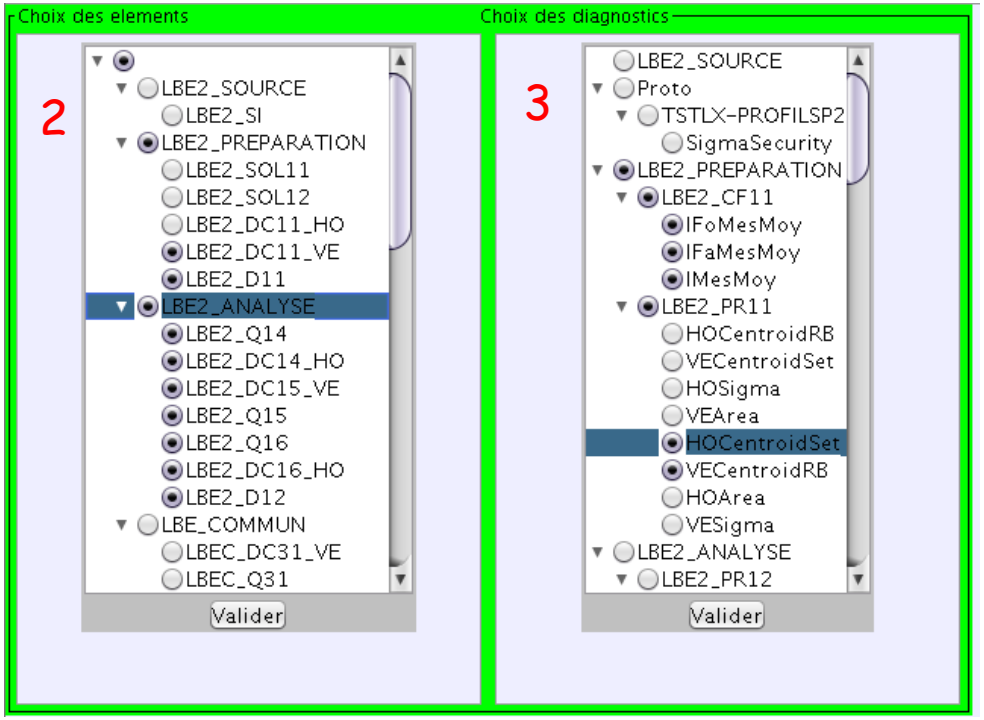
MultiNodes Selector 2

Based on labbib-checkboxtree

MultiHandles Selector 3

Based on labbib-checkboxtree

See Optimisation example



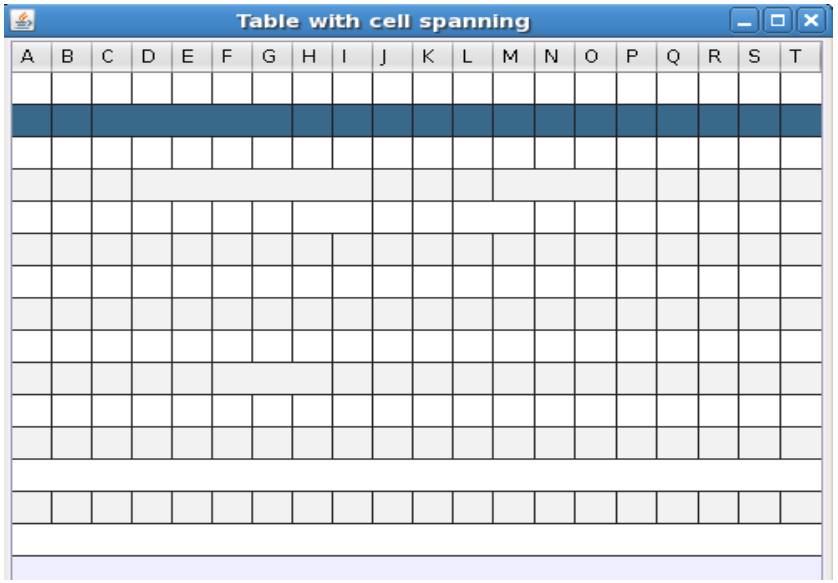
Tools : general use (5/5)

Swing utilities

Column Spanning Table.

Add line span support soon.

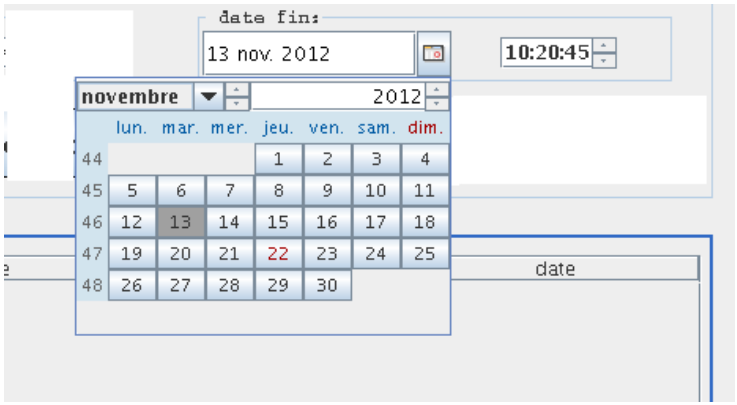
See Paraspiral2 example



JdateAndTimePicker

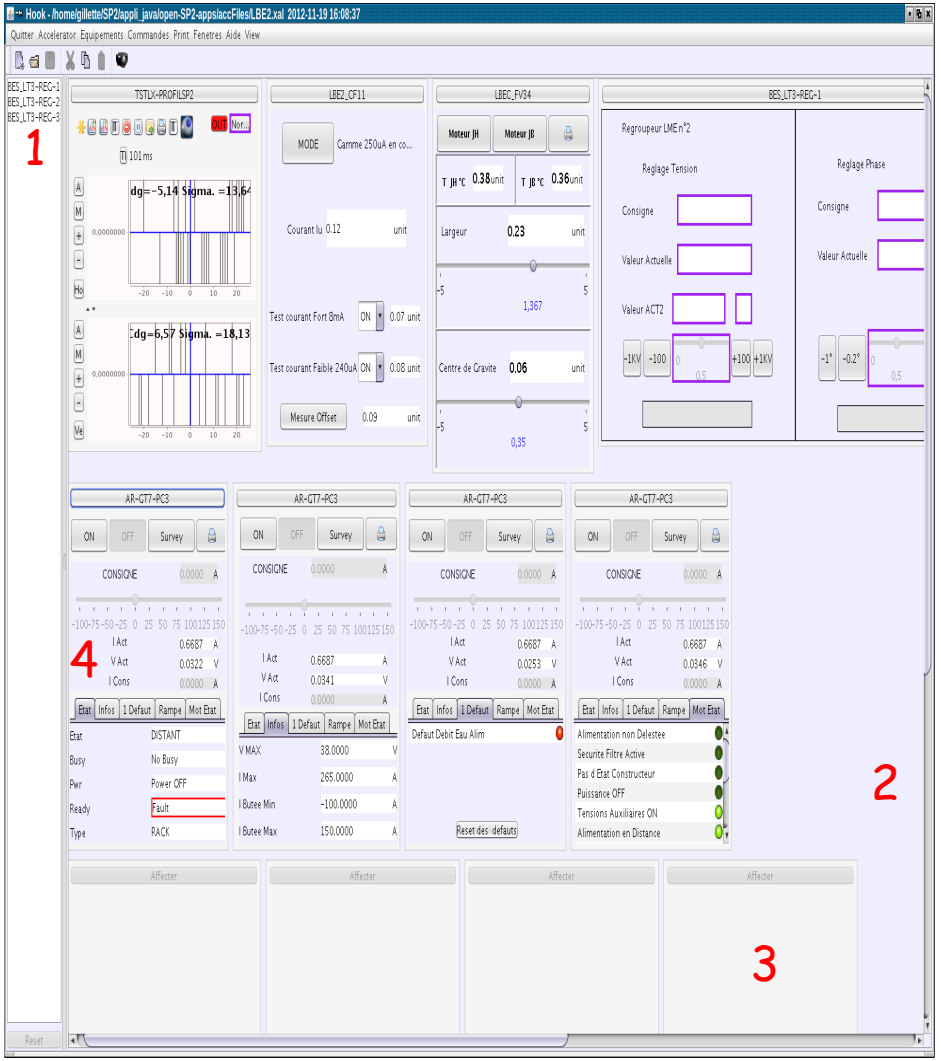
Based on Jcalendar (Kai Toedter)

(http://www.toedter.com/en/jcalendar/)



Tools : for spiral2 use (1/2)

- QueueAssignment 1:
  - Choice of the element to assign
- AssignmentAreaPanel 2:
  - Control list and size of panels assigned.
- ElementContainerPanel 3:
  - Resizable, reassignable.
- ElementPanelFactory 4:
  - Profil
  - MagnetSupply
  - Slit + Motor
  - Buncher
  - Faraday Cup



Tools : for spiral2 use (2/2)

- Loader for SPIRAL2 configuration file
  - Databases information
  - Surcharge locale
  - Log 4J configuration file path
- Initialization of SL4J/LOG4J log system
  - SL4J send XAL logs to LOG4J
- Look & Feel Initialization :
  - Set properties to customize Nimbus L&F
- Spiral2ApplicationAdaptor
  - Specific startup for SPIRAL2
  - Use ApplicationAdaptor

External librairies used by Spiral2Core

- org.apache.commons
  - .configurations+ Jxpath + collections => W/R configuration xml files
  - .lang
  - .logging. => logging
  - .dbutils. => Database

- org.jfree => graphic tools.
- com.acrobat.reader.viewer => pdfViewer
- It.cnr.irmaa.essi.lablib.gui.checkboxtree => tree selection.
- net.sf.jasperreports => report.
- org.sl4j => logging.
- ch.qos.cal10n => internationalisation.
- iijdcb.jar => Ingres Database
- org.hibernate.validator => Bean validation.
- Javax.validation => Bean validation

Changes to the XAL core.

- Use of a separate equipment file for powerSupplies and motors (extraOptic file).
- Add of an PolynomialTransform in the DataTransformFactory.
- Add functions to access ENUM in CA package
  - function equivalent to caget-d31 to list values
  - ChannelLabelEnumRecord in Channel.java (package CA)
  - Monitor added that return enum value like a string (ex : Ready instead of 1)

Conclusions

- Troubles with synchronous access to epics.
  - numerous pend_IO errors (CAJ Context).
- DataBase abstraction and Bricks not used.
- Specifics devices used:
  - beam wire profilers,
  - power supplies,
  - faraday cups,
  - slits.
- XAL has proved to be a very efficient tool.
- Evolution from XAL to Open Xal easy to refactor.
  - optimisation is the sole application not fully updated , because of algorithms parts.


Thank you for your attention