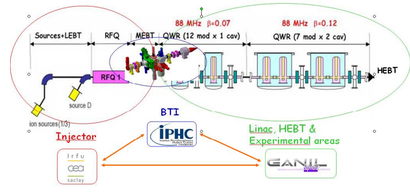


Overview of the Spiral2 control system progress

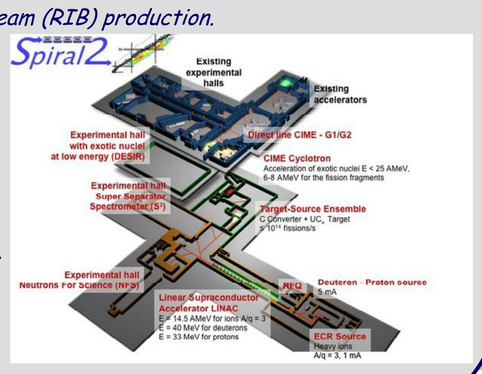
E. Lécorché, P. Gillette, C. Haquin, E. Lemaître, L. Philippe, G. Normand, C.H. Patard, D. Touchard and the Ganil control group (Ganil / Caen, France)
J.F. Denis, F. Gougnaud, J.F. Gournay, Y. Lussignol (CEA-IRFU / Saclay, France)
P. Graehling, J. Hosselet, C. Maazouzi (CNRS-IPHC / Strasbourg, France)

The Spiral2 project

The Spiral2 project aims at producing Rare Ion Beams (RIB) by ISOL and low-energy in-flight techniques and is coupled with the existing Ganil facility. The global project is seen within two phases :

Phase 1 concerns the beam acceleration.
It is based on a multi-beam driver composed or two ECR sources (for q/a=1/3 heavy ions or deuterons), then a RFQ followed by a superconducting linac, the whole accelerator operating at 88. 05 MHz. High energy beam transfer lines distribute the beam to a beam dump or to the experimental stable ion beam areas S3 and NFS or to the 200 kW target ion source system (10^{14} fission/s).

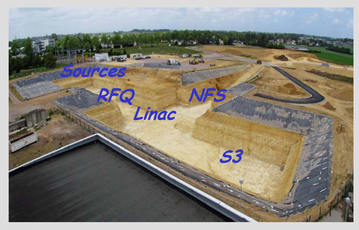
Phase 2 is the rare ion beam (RIB) production.
The RIB so produced is either sent to the new DESIR low energy experimental hall or post accelerated by the existing CIME cyclotron before being transported to the Ganil experimental switchyard.



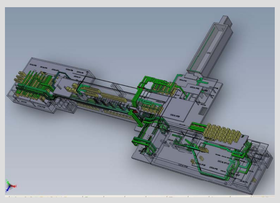
Spiral2 general layout

Accelerator construction

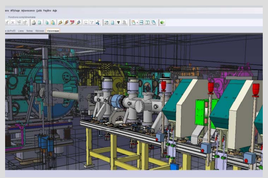
After the design period for the whole process, the building construction started by the beginning of this year to be achieved in 2012.



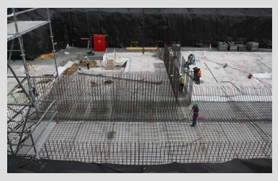
Machine implantation



3D design



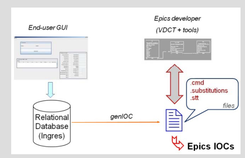
Underground excavation at -10m (June 2011)



First concrete (September 2011)

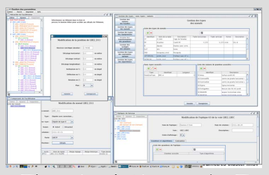
Machine integration into the control system

Equipment configuration



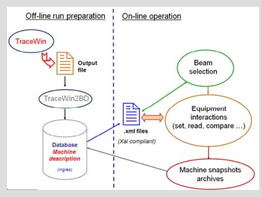
To provide end users, even not Epics aware, the ability to manage their own equipment, a specific environment is under prototyping :
VDCT is used by developers to generate standard .substitutions template files.
The genIOC program extracts data from the equipment database and generates the .cmd, and .stt files according to the standard Epics rules.

Machine modelisation



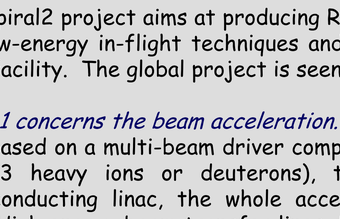
As a reference for high level applications , the machine is described within a database adopting a tree decomposition , both adopting existing Ganil standards and being Xal compliant.

The simulation code TraceWin is used for providing theoretical values as well as for specific on-line optimization. Machine configuration is stored in the database for off-line analysis and beam parameters definition.



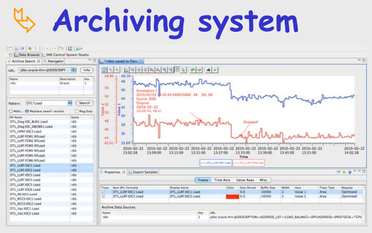
Control system implementation

Alarms server



Specific Java home made development to process both :
- the Ganil alarms from the legacy Ganiciel Ada based control system
- the new Spiral2 Epics based control system
Peak value throughput measured is ~ 330/second.

Archiving system



Archiving system based on the RDB archiver and the CSS data browser (benchmark test with MySql currently with 400 values monitored at 10 Hz.

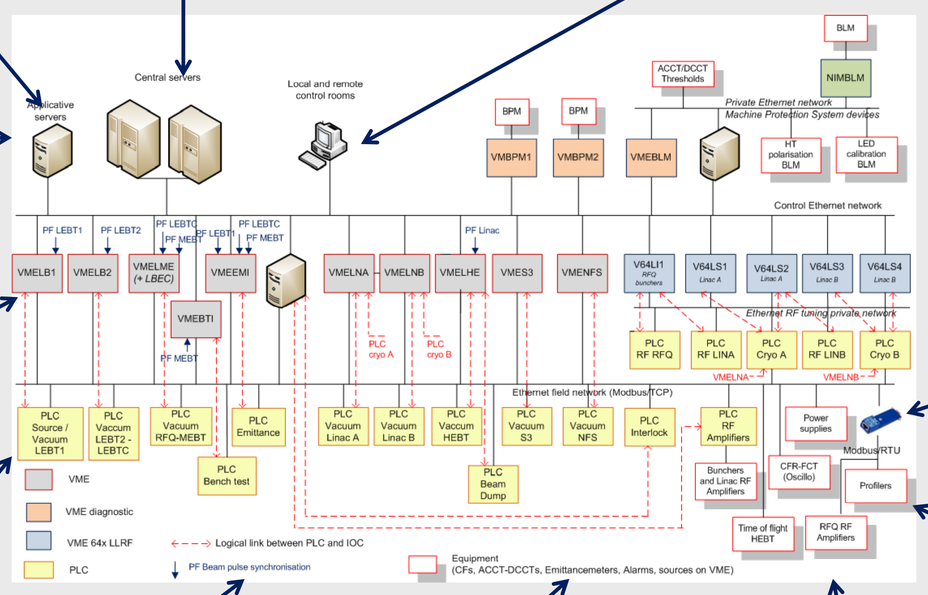
VME IOCs

IOCs	VME / VxWorks 6.8
CPU	Emerson MVME 5500 (PPC 7457@1 GHz, 512 Mo)
ADC	Adas ICV 150 32 channels * 16 bits
DAC	Adas ICV 714 16 channels * 12 bits
Binary I/Os	Adas ICV 196 96 channels

Siemens S7 PLCs

Central servers

Two Dell Power Edge servers
(Intel Xeon E5620) @2.4 GHz
- iSCSI SAN Raid10 (3Tb) & Raid 5 (4 Tb) disks
- Red Hat Linux 6 with Cluster suite
- Central services & Ingres and MySql relational databases



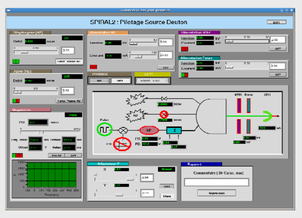
Operator interfaces design

Environment : PCs / Linux Red Hat Linux Enterprise 5

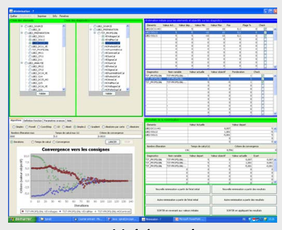
GUI interfaces are developed with several environments according to the specific user needs :

Supervision
- EDM is used for the supervision needs
- CSS/BOY is under evaluation for latest developments

High level applications
- Java is used as the programming language
- A based Xal framework implements the specific Spiral2 needs

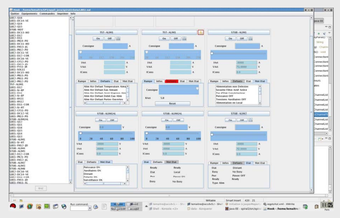


EDM *deuteron source supervision*



Xal based *Optimization high level application*

Power supplies handling



Xal based *general purpose Handling application*

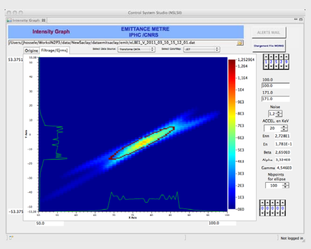
Emittance measurement

A specific system (VME based IOC) is devoted to the transverse emittance measurement system.

Specific hardware interfaces are
- Oregon OMS MaxV 4000s boards to move the scanner pods via Brushless motors
- ISEG 202 M board to handle the high voltage ramp inside the Allison scanner chamber

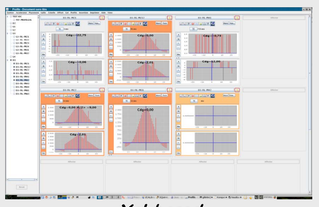
Beam current measurement is achieved using a Faraday cup accessed either by a standard ADC or the fast synchronized beam pulse acquisition system.

GUIs formerly developed in EDM and Java are evaluated within the CSS/BOY environment.



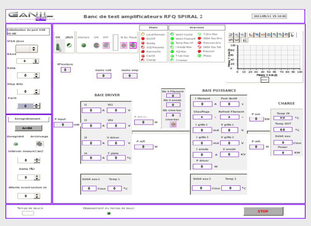
CSS/BOY *(evaluation) emittance visualization*

Beam profilers interface



Xal based *deuteron source supervision*

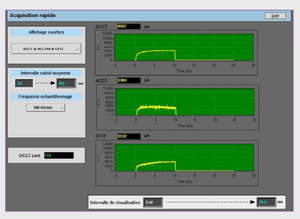
RF amplifiers integration



CSS/BOY *(evaluation) RFQ amplifier qualification bench*

Synchronized beam pulse acquisition system

To perform acquisitions synchronized with the beam pulse (from 100 µs at 1Hz up to the CW mode), a dedicated system was tested. The system is based on a set of VME Adas boards :
- ICV 178 for the fast acquisition (8 inputs up to 1,M Samples/sec.)
- ICV 108 to synchronize the acquisition and perform the DMA data transfer



EDM *beam pulse display*