THE SPIRAL2 RADIOFREQUENCY COMMAND CONTROL

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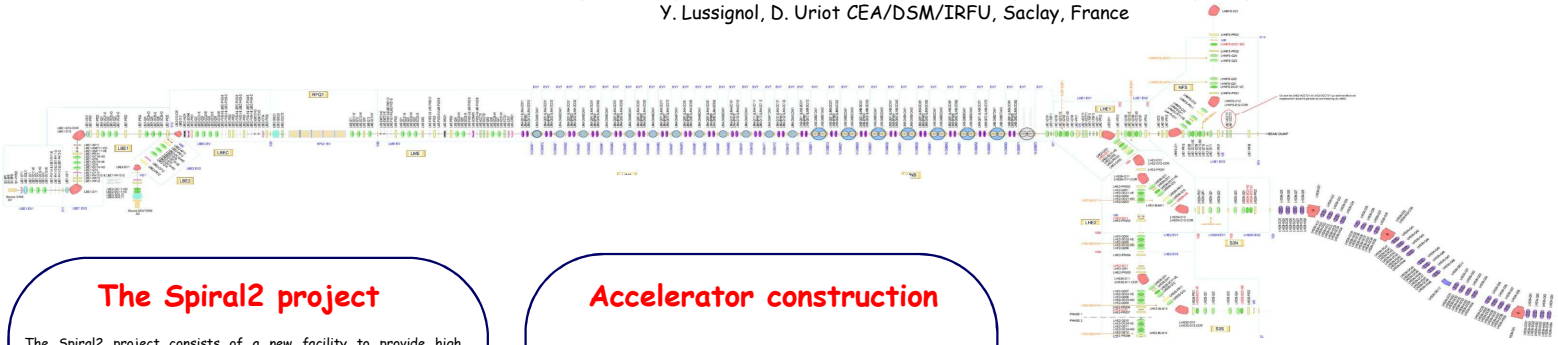
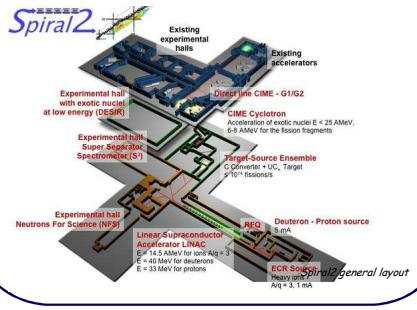


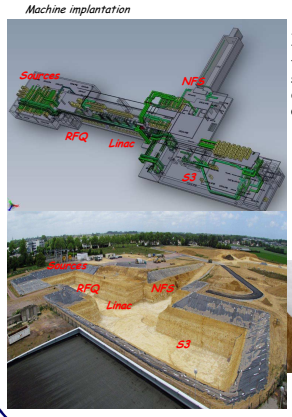
The Spiral2 project

The Spiral2 project consists of a new facility to provide high intensity RIB (Rare Ions Beams). Deuterons or Heavy Ions will be pre-accelerated in a RFQ (Radio Frequency Quadrupole) and then in a Linac (Superconducting Linear Accelerator). This primary beam will bombard target/source assemblies producing several rare ions which will be selected on the fly. They will be sent to the existing GANIL facility to be post-accelerated with the CIME cyclotron and transported to the experiment areas.



Accelerator construction

Machine implantation

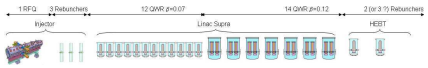


After the design period for the whole process, the building construction started by the beginning of this year to be achieved in 2012.

Underground excavation at -10m (June 2011)

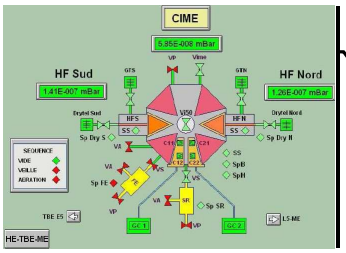
Radio frequency cavities

The driver accelerator facility composed by sources, followed by a Radio Frequency Quadrupole (RFQ), 3 bunchers, and a superconducting linear accelerator (LINAC) will be able to accelerate also proton, deuteron or heavy ion beams. The LINAC will be composed of 26 quarter wave superconducting resonators closed into 19 cryo modules. All cavities will be driven by independently power amplifiers at 88.0525 MHz.

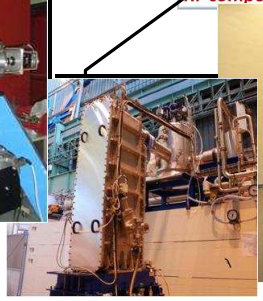


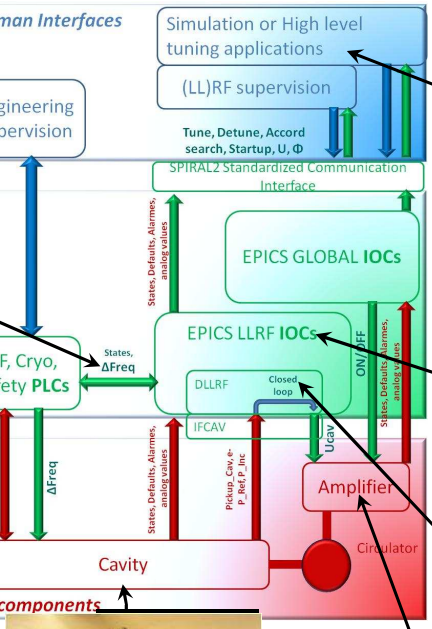
Radiofrequency command control

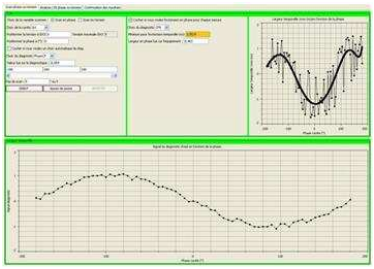
For the command control room, and control process associated, EPICS was early chosen to ease development and integration of software components developed by all laboratories involved in the SPIRAL2 collaboration. Industrial PC Linux or VME Vxworks crates will host EPICS input output controllers (IOCs) To control Radio Frequency (RF) equipment, a dedicated command control (CC) sub system is identified. The main piece of this sub system is a low level radio frequency (LLRF) control process



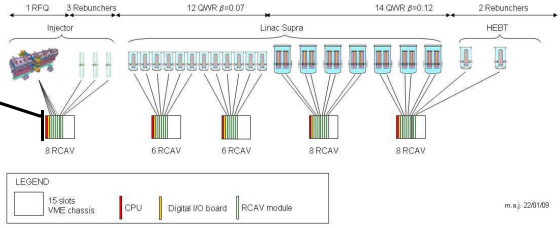
Siemens S7 programmable logic controllers (PLCs) will be dedicated to slow control material protection, safety and local engineering applications. In addition to general functions described above, PLCs take a particular place for RF command control. Amplifiers will be interfaced via dedicated PLCs solution. In the same way, a well tuned and regulated cavity which drifts in frequency should be adjusted by mechanical or thermal constraint. For the special case of mechanical according cavity delta frequency, dedicated brushless motors driven by PLC are under prototyping.



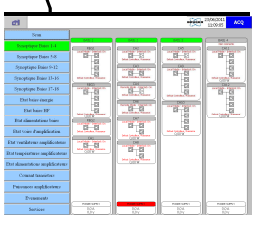




To drive a machine like the SPIRAL2 facility, a set of high level and supervision applications are going to be developed. After configuring equipment, conditioning dedicated sub systems like RF equipment, and setting theoretical beam values, RF equipment can be tuned and optimized for different kind of beams.



The LLRF will mainly provide the control analogue signal to each cavity's amplifier and regulate the accelerating field of each cavity with a fast automatic closed loop . Among others, it will also control the frequency, the start-up in an automated way, and will monitor the electric arc phenomenon. In order to fulfil these functionalities, the first digital subsystem (DLLRF) will acquire and process data from the second subsystem (IFCAV) which will host RF components to interface cavities.



Amplifiers foreseen to drive RF cavities will be able to deliver up to 20 kW for solid state amplifier and up to 60kW for tube amplifiers. Both are provided by industrial companies and a special care has been taken on prototyping and testing. To ease engineering support, supervising PLCs applications are delivered with. A special care is going to be taken for putting the tests with EPICS components that will be used for the final command control

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