



The Spiral2 Control System Status just before the first beam



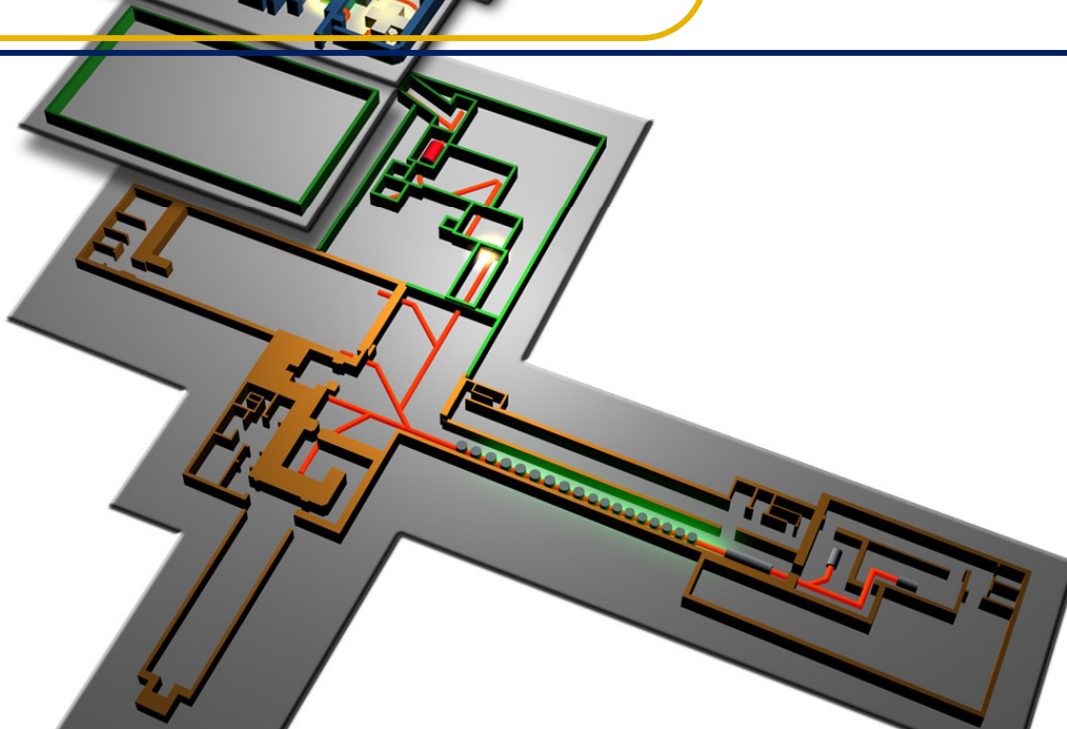
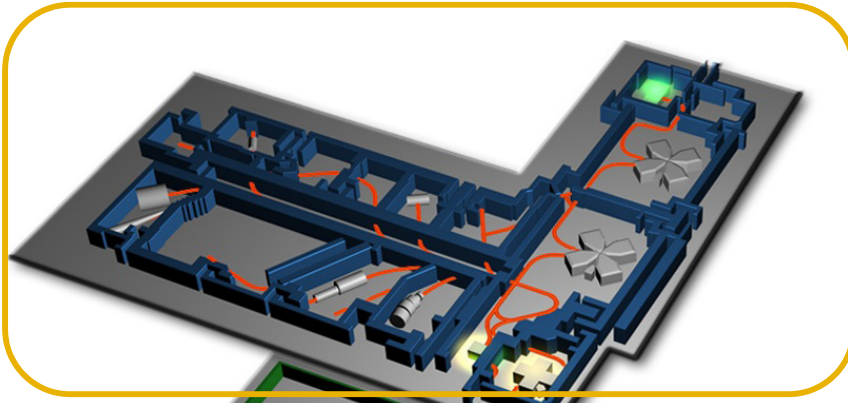


Outline

- Presentation of the SPIRAL2 facility
- Control system technical choices
- Commissioning strategy
- 2014 2018 Key milestones
- Latest Achievements
- Deliverable status
- On going and coming soon

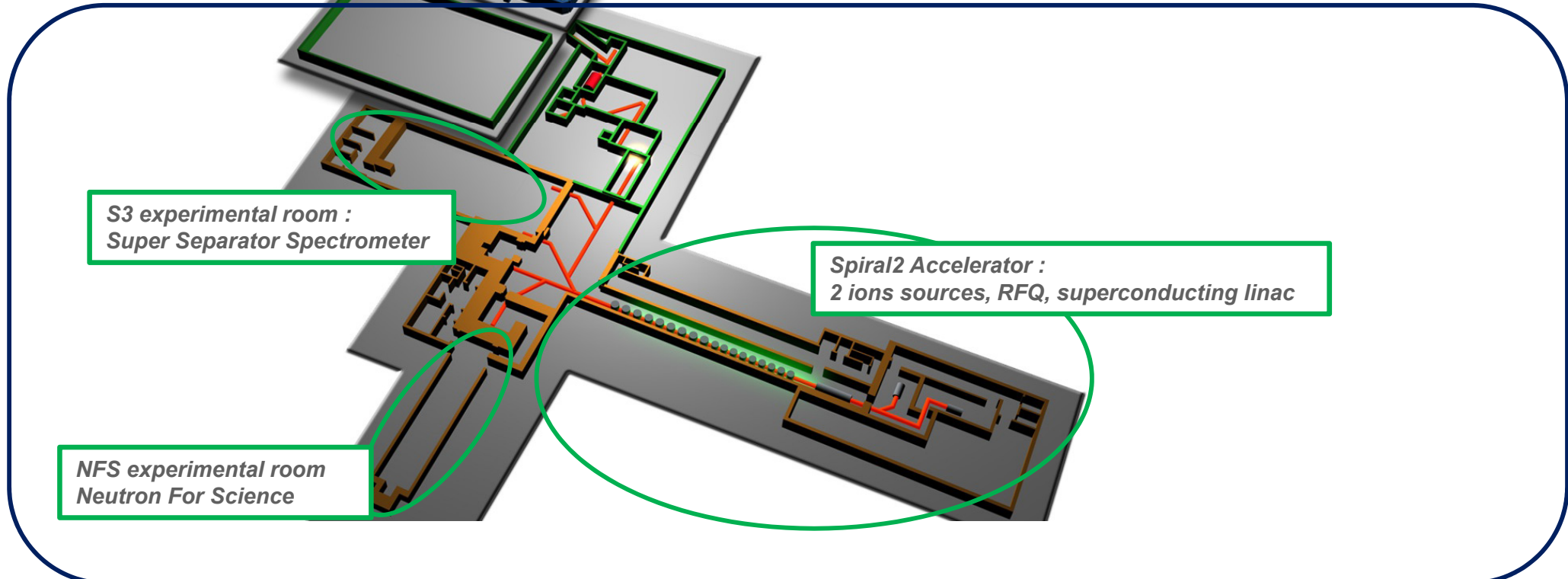
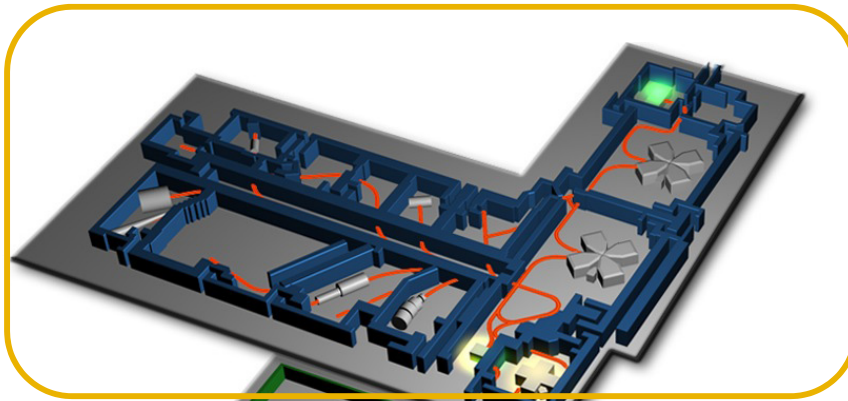


The new Spiral2 facility





The new Spiral2 facility



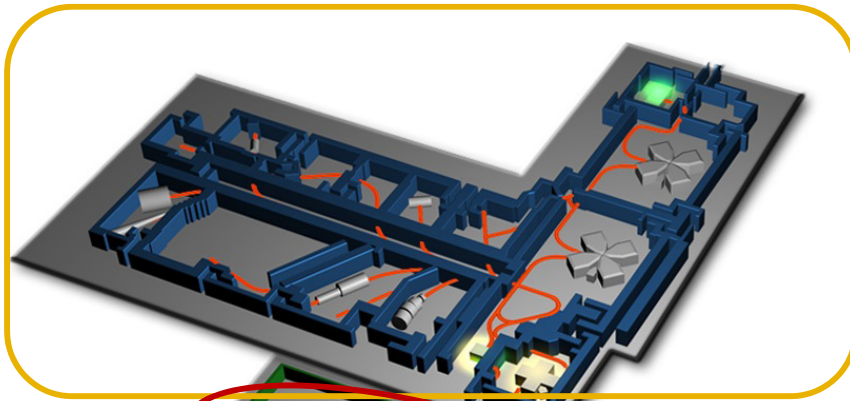
*S3 experimental room :
Super Separator Spectrometer*

*Spiral2 Accelerator :
2 ions sources, RFQ, superconducting linac*

*NFS experimental room
Neutron For Science*



The new Spiral2 facility



DESIR experimental room

RIB production

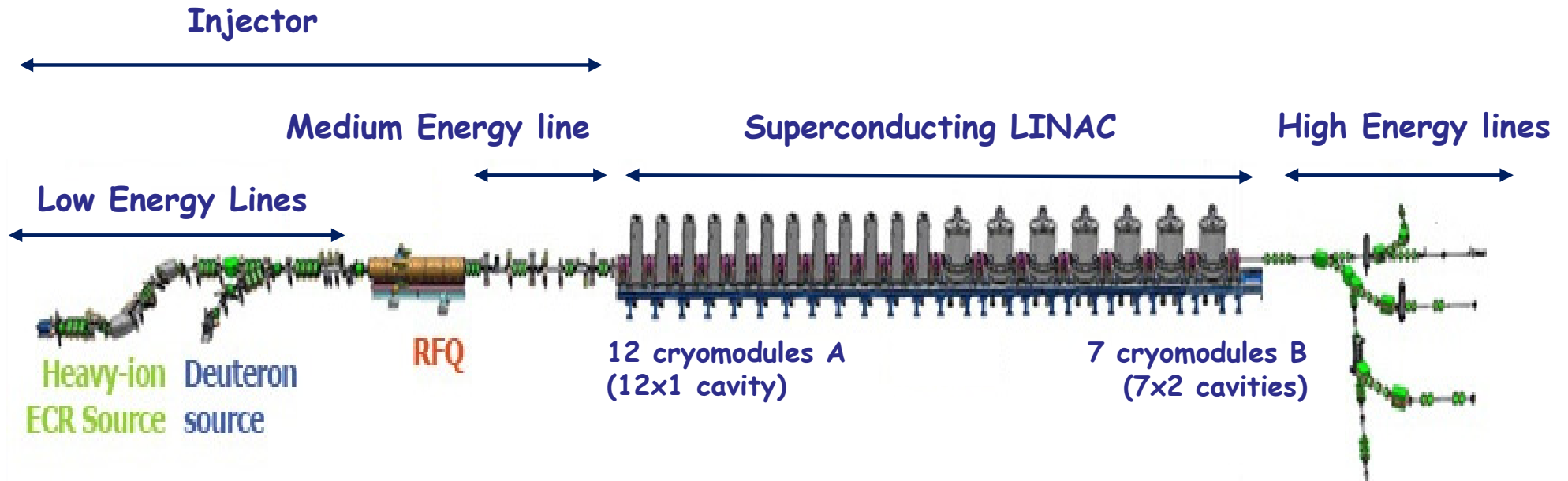
S3 experimental room :
Super Separator Spectrometer

Spiral2 Accelerator :
2 ions sources, RFQ, superconducting linac

NFS experimental room
Neutron For Science



Spiral2 accelerator



12 cavities with $\beta = 0.07$
 07 cavities with $\beta = 0.12$
 Nominal field 6,5 MV/m

Liquid Helium bath at 4 K
 Pressure 1200 mbar +/- 5mbar

RFQ, rebuncher and LINAC;
 Total of 26 RF cavities QWR - 88 Mhz

	Q/A	I (mA)	Energy (Mev/u)	CW max beam power (KW)
Protons	1/1	5	2 - 33	165
Deuterons	1/2	5	2 - 20	200
Ions	1/3	1	2 - 14.5	45

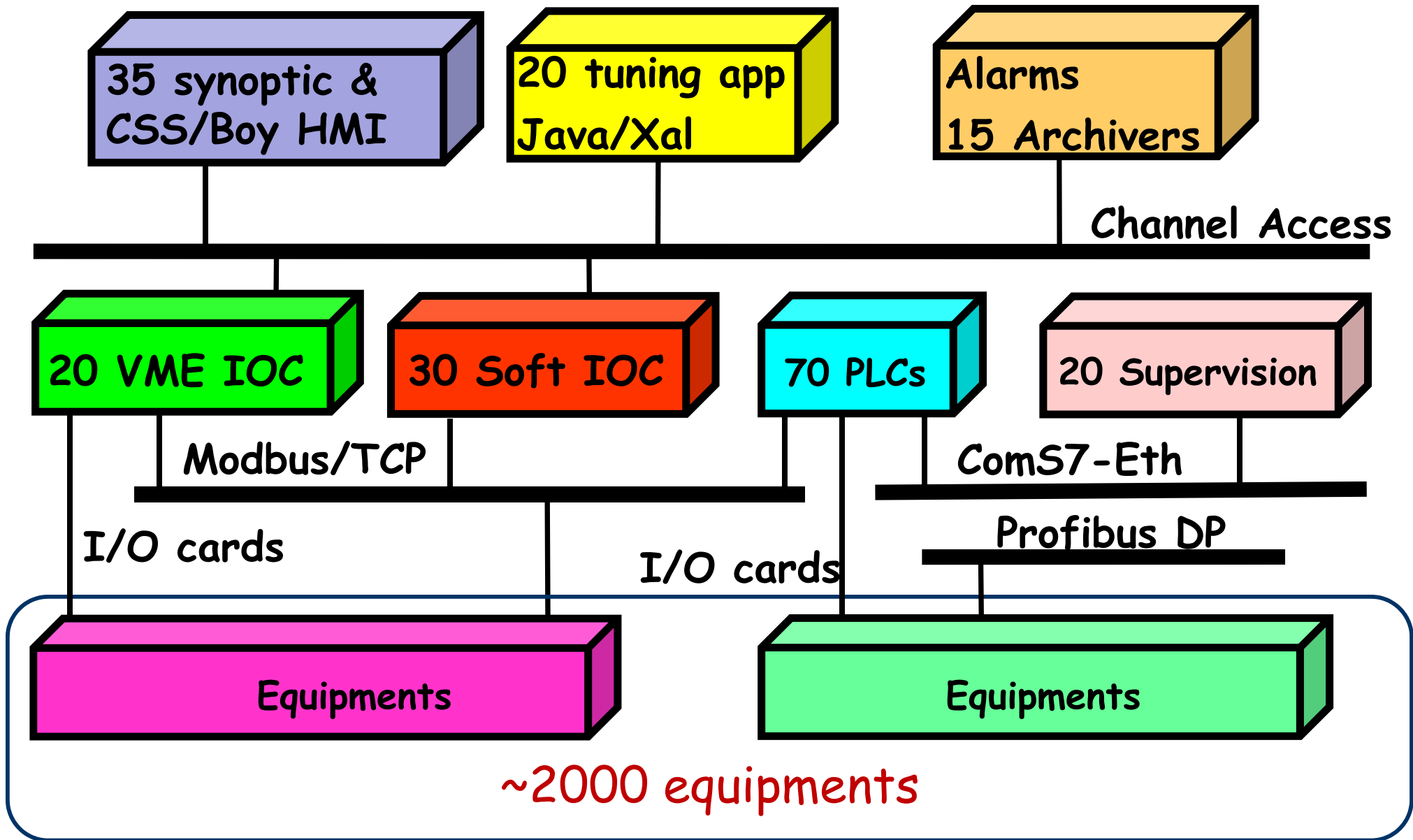


Control System Architecture

- Hardwired, safety relays and ambivalent redundancy for safety classified systems
- Siemens S7PLC for Interlock, Vacuum, Cryogenics, RF frequency tuning, personal protection, interface with classified systems
- EPICS framework
 - VME & Linux IOCs
 - ✓ MVME 5500 CPU
 - ✓ NEXEYA I/O cards
 - HMI developed in CSS/Boy or JAVA
 - Alarms and Archivers



Control System Architecture



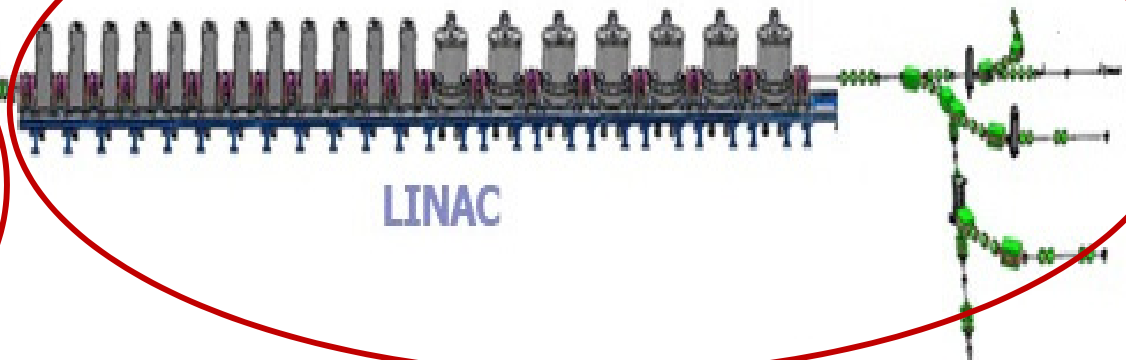


Commissioning Strategy

- **Almost 20 safety classified systems**
 - More time needed
 - ✓ to develop the systems
 - ✓ to have test procedures approved
 - ✓ to perform the tests

Partial authorization
→ start the injector

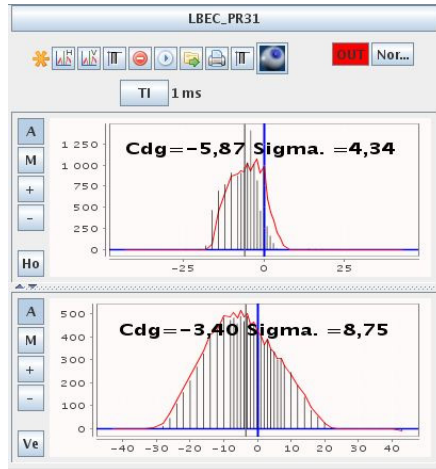
Complete authorization
→ start the LINAC



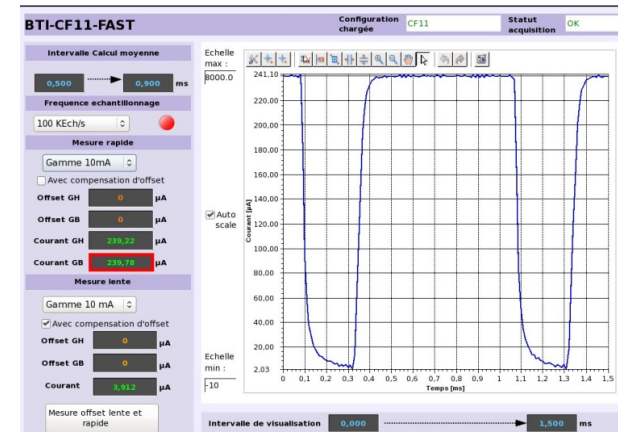
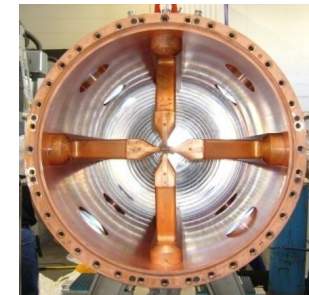


Key milestones

2015
 Q/A=1/3 source commissioning
 First beam accelerated by RFQ



2014
 Building reception
 Partial Authorization
 Q/A=1/2 source commissioning

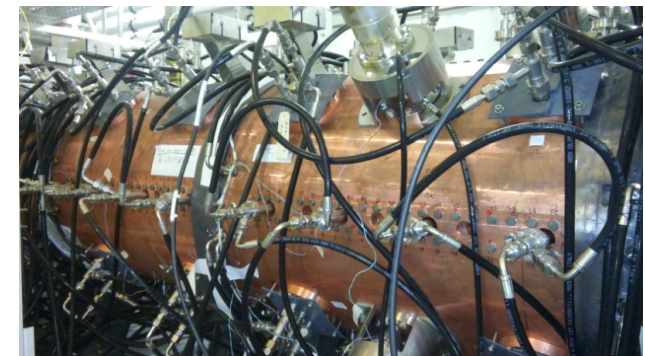
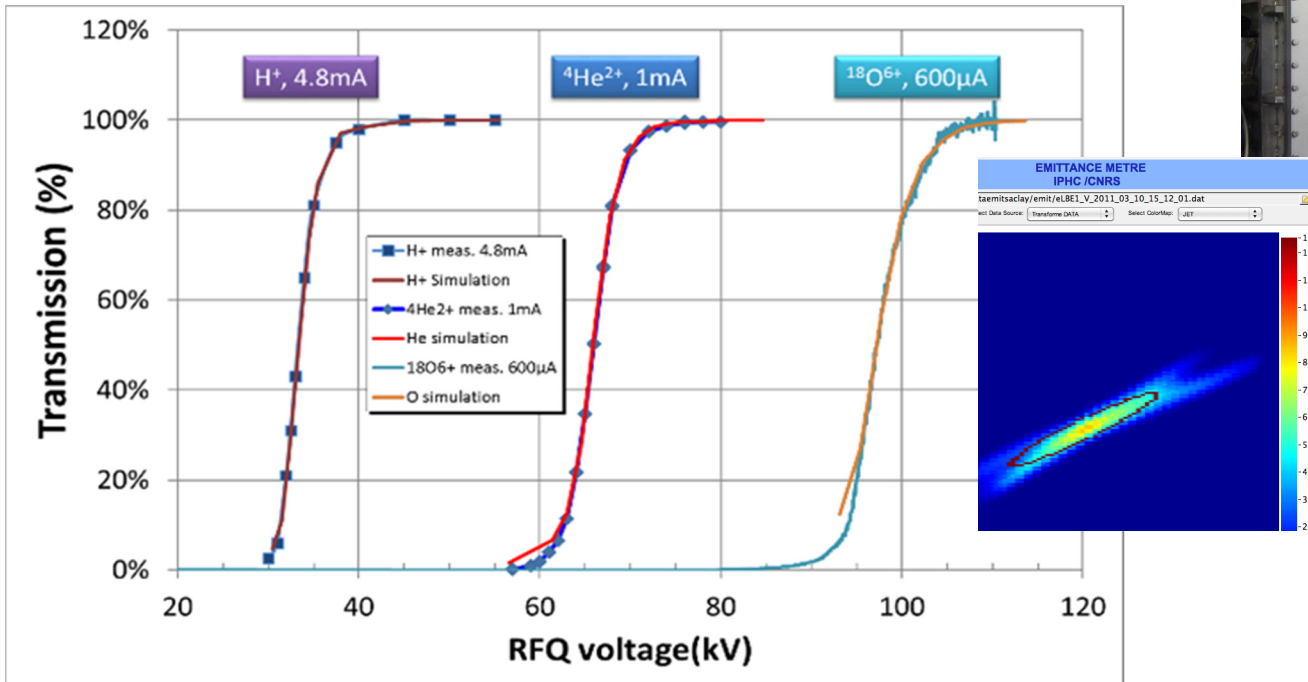




Key milestones

2016 - 2018

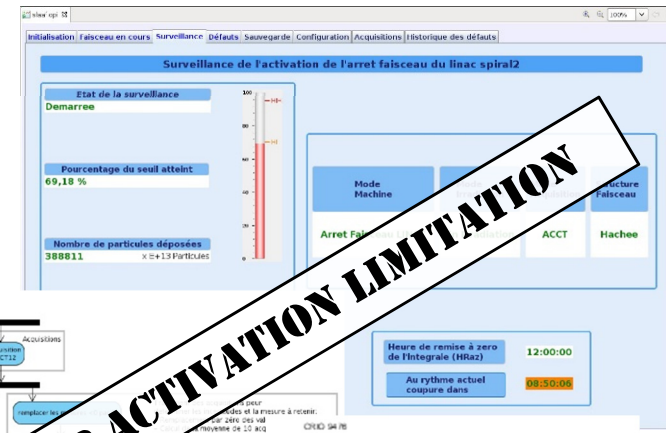
Whole LINAC cooled down twice => process optimized
 Qualification of reference Beams with intermediate test bench
 BTI removal - Installation of the Medium Energy Beam Line



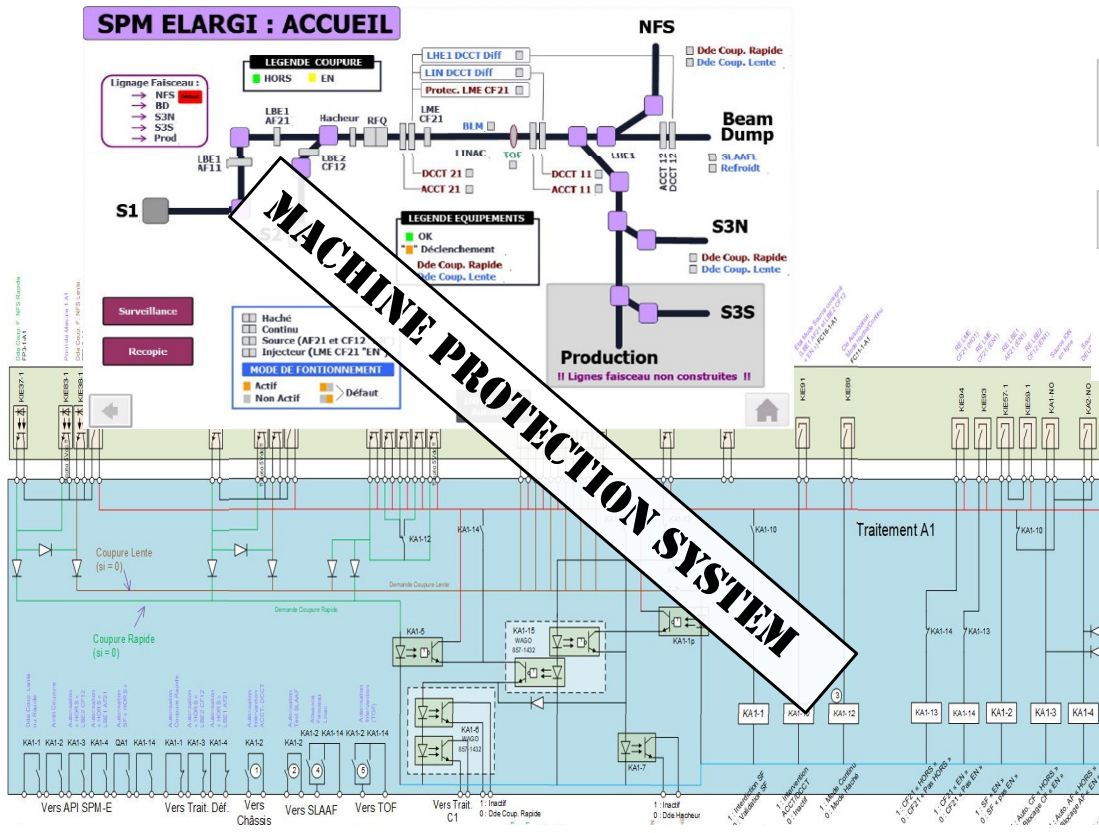


Latest Achievements

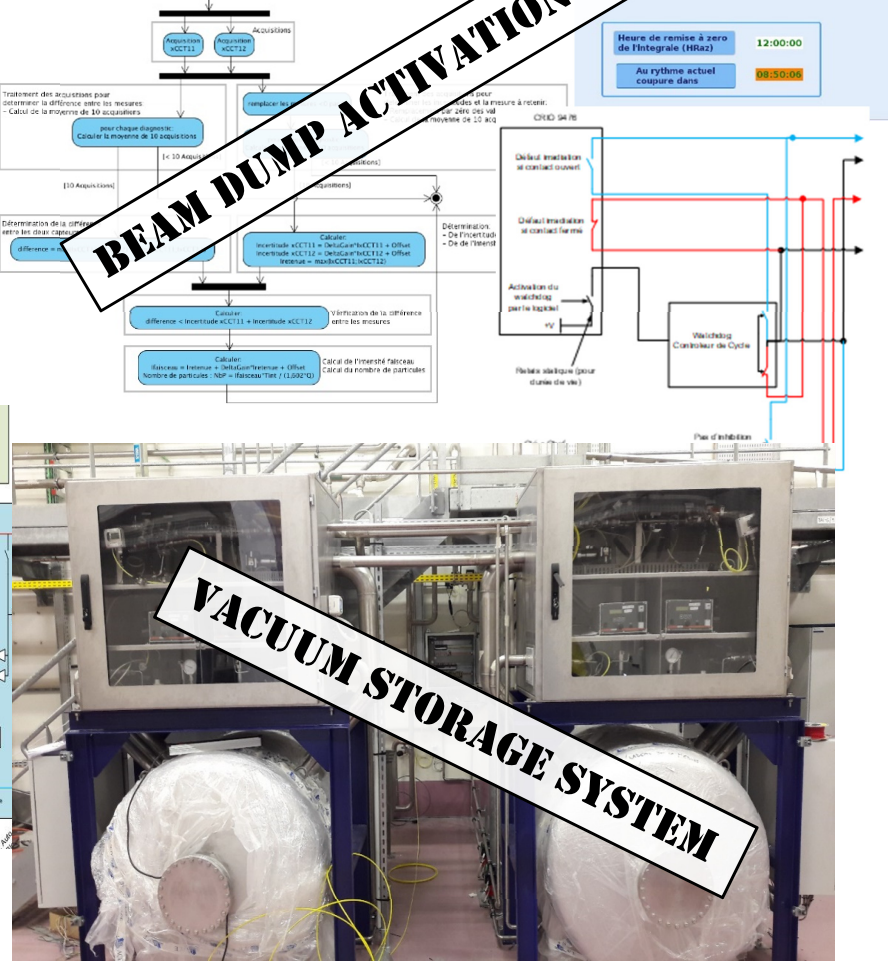
Safety classified systems Validated
 Authorization from French Nuclear Safety



BEAM DUMP ACTIVATION LIMITATION



MACHINE PROTECTION SYSTEM



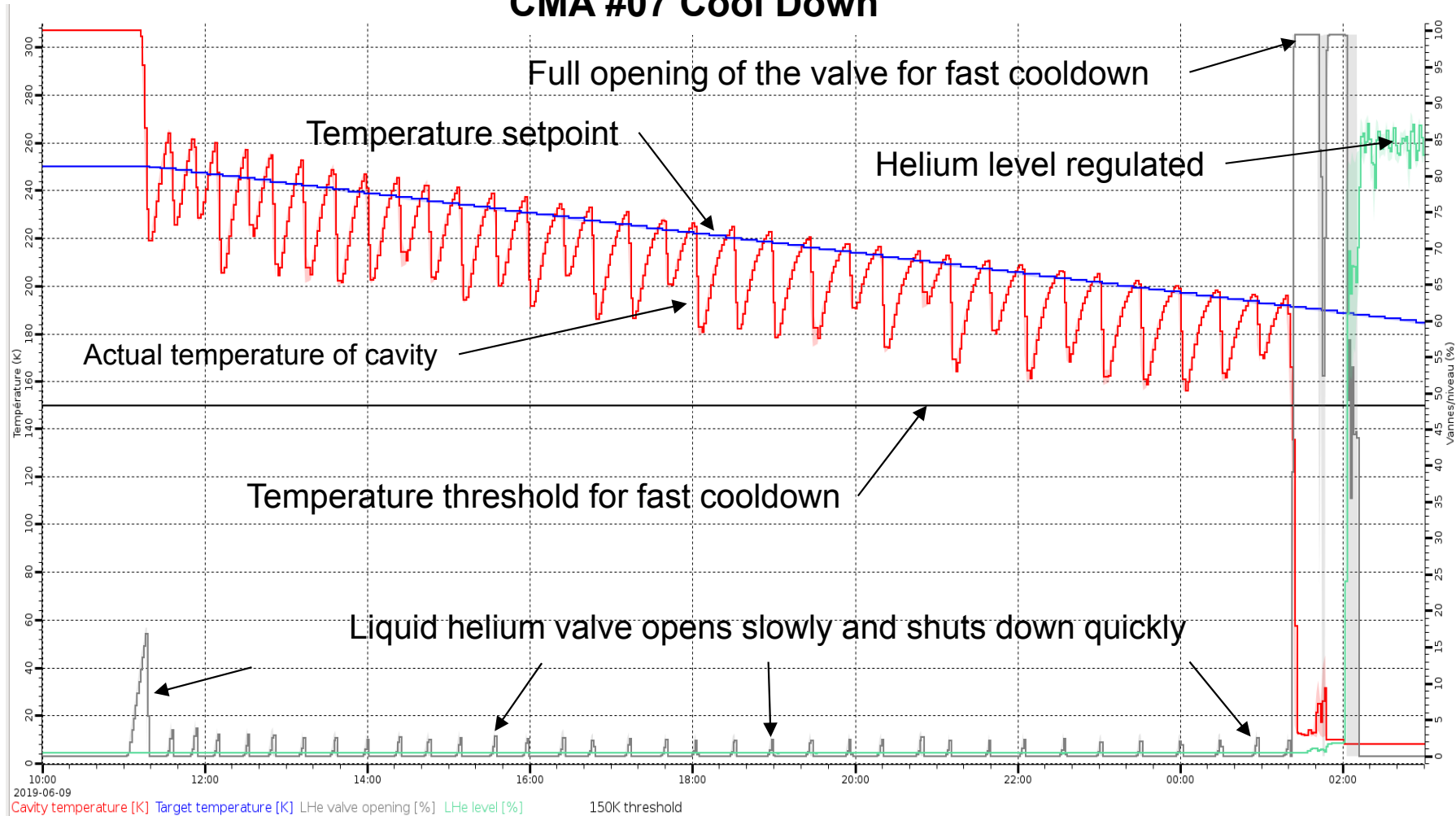
VACUUM STORAGE SYSTEM



Latest Achievements

Optimized LINAC cool down of the whole LINAC
Helium level and pressure regulation optimized

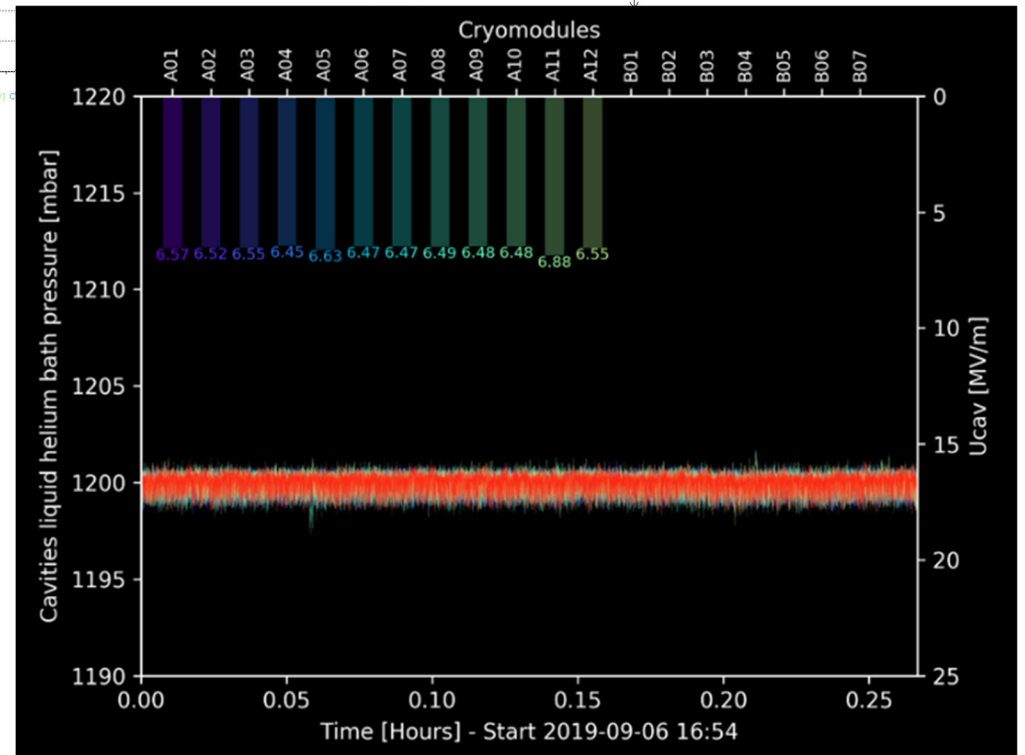
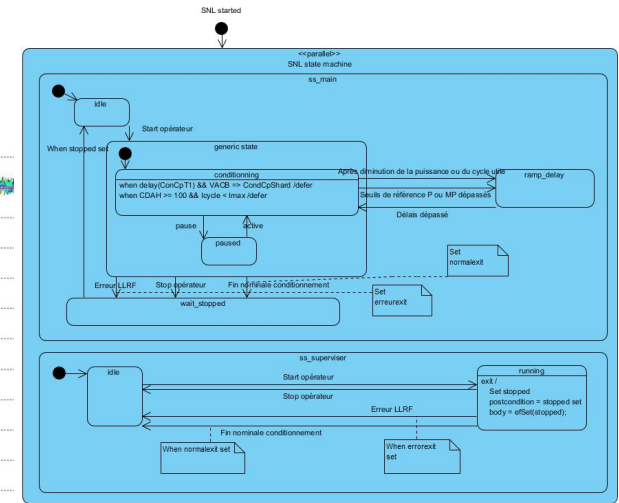
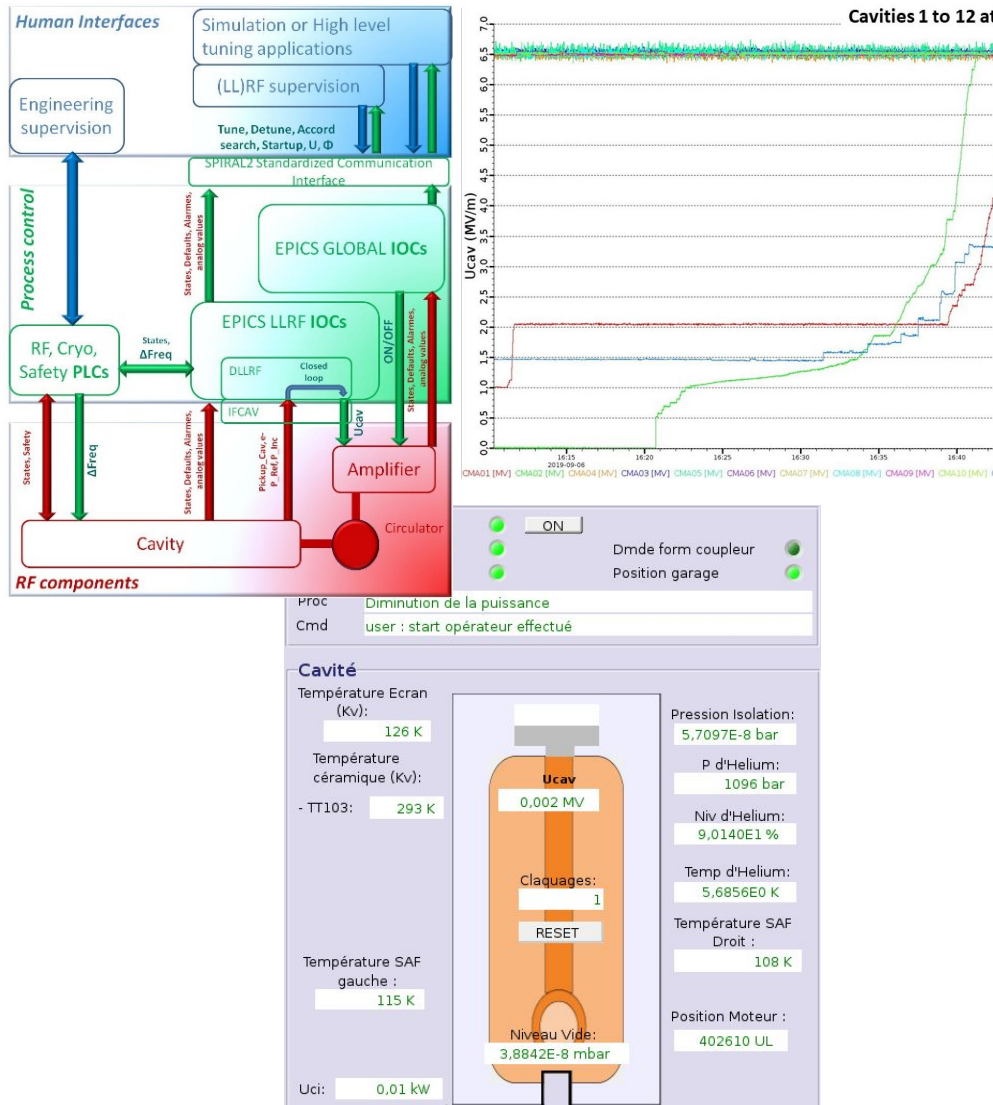
CMA #07 Cool Down





Latest Achievements

All LINAC RF cavities started at nominal field value





Control systems deliverables status



- **All developments finished**
 - Bug fixing, improvement, evolutions
- **PLCs**
 - ✓ Injector + LINAC Validated
 - High energy beam lines and NFS to be validated
- **IOCs, CSS HMI & synoptic**
 - ✓ Injector
 - LINAC, High energy beam lines and NFS to be validated
- **LINAC specific - Waiting for the beam to be tested**
 - Diagnostics control system
 - beam position, losses & extension to be validated
 - High level tuning application
 - Alignment, cavity tuning, power ramp-up control
transmission optimization, losses monitoring



Planning for the end of the year

- **On going till end of October**
 - Test in the Medium energy line
 - LINAC is cold with the 19 cavities at their nominal field
 - Frequency tuning and voltage regulation test

- **November**
 - LINAC tuning to accelerate the first beam

- **December (1st half)**
 - High energy line tuning to send the beam in NFS

Thank you for your attention !

