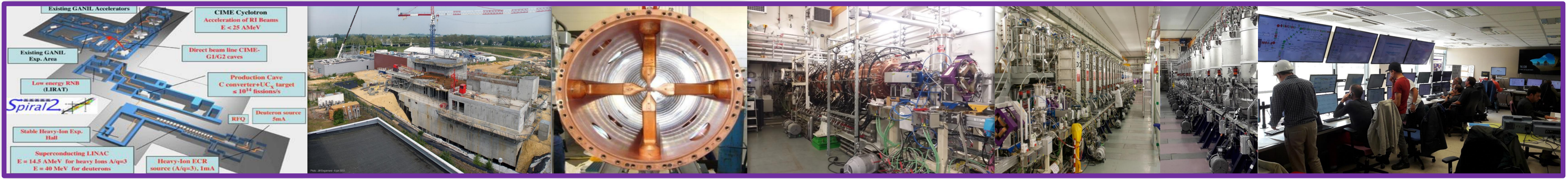# Programmable Logic Controller Systems For SPIRAL2

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The SPIRAL2 Facility at GANIL is based on the construction of a superconducting ion CW LINAC (up to 5 mA - 40 MeV deuteron and 33 MeV proton beams, up to 1 mA - 14.5 MeV/u heavy ion beams) with two experimental areas named S3 ("Super Separator Spectrometer" for very heavy and super heavy element production) and NFS ("Neutron For Science"). The low energy experimental hall DESIR, under construction, will further increase the possibility for physics experiments.
Programmable logic controllers play a major role in controlling this linear accelerator. They also accompany the operation of hard-wired devices providing safety functions.

Programmable logic controllers manage the control of the following systems:
- Cryogenics
- Machine Protection System
- Vacuum
- RF (for interlocks)
- Building services
- Personnel Protection System
- Control of equipment performing safety functions (in combination with wiring systems):
  - Control of the radioactive gas storage.
  - Machine protection systems.
  - Cooling of the main beam stop.

Siemens:
S7-1200 (3)
S7- 300 (22)
S7- 300F (4)
S7- 400 (3)
S7-1500 F (1)
ET 200 S CPU (22)
TP-1200 (11)
TP-1500 (1)
MP 277 (4)

10 700 e/s on-off
Epics / Win CC Pro
Modbus TCP
Profibus DP
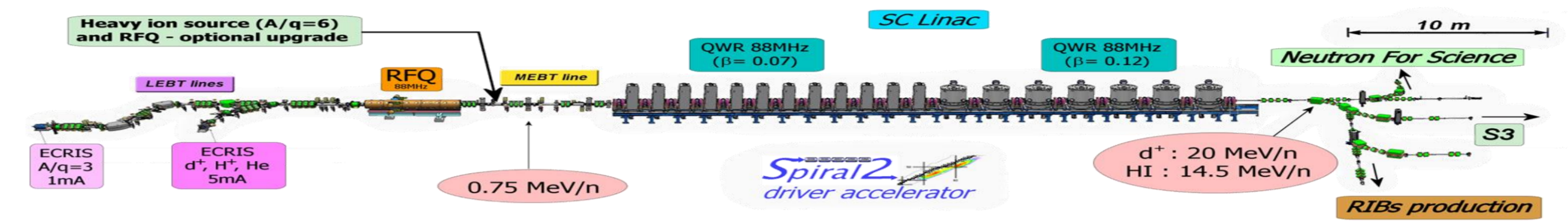
The Classified Protection systems are based on the association of a PLC with two redundant hard wired systems. To respect the requirements of IEC 61508 standard, a Failure Mode and Effects Analysis (FMEA) was made to eliminate dangerous failures. The single failure criterion was selected as reliability criterion.

Summary Diagram of the SPIRAL2 PLCs

Cryogénics

Vaccum

Machine Protection System

Beam Dump

Racks

Services

Safety Systems

RF

Personal Safety System