Safety Control System and its Interface to EPICS for the Off-Line Front-End of the SPES Project

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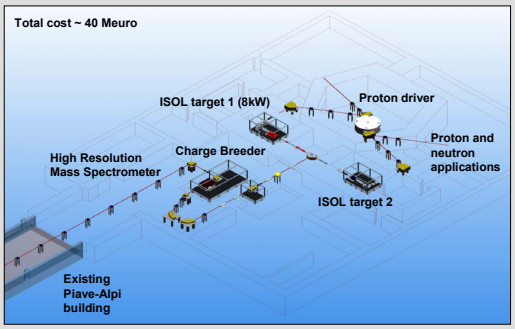
The SPES Project

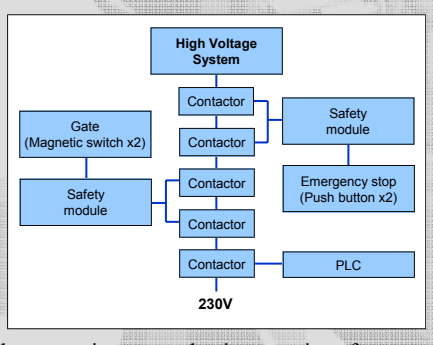
SPES (Selective Production of Exotic Species) is an *Istituto Nazionale di Fisica Nucleare* (INFN) project to develop a Radioactive Ion Beam (RIB) facility as an intermediate step toward EURISOL. The *Laboratori Nazionali di Legnaro* (LNL) was chosen as site for the facility due to the presence of the PIAVE-ALPI superconductive linac accelerator, which will be used as re-accelerator for the RIBs. The SPES project is based on the ISOL method with an UCx Direct Target and makes use of a proton driver of energy 40 MeV and current 200 μA.

Neutron-rich radioactive beams will be produced by Uranium fission at an expected fission rate in the target in the order of 10^{13} fission/s. The key feature of SPES is to provide high intensity and high-quality beams of neutron-rich nuclei to perform forefront research in nuclear structure, reaction dynamics and interdisciplinary fields.
The exotic isotopes will be re-accelerated at energies higher than 10 AMeV for mass region of A=130. The expected beam-on-target is on the order of 10^8 pps for ^{132}Sn, ^{90}Kr, and about 10^5 -10^6 pps for ^{134}Sn, ^{95}Kr considering a total efficiency of 2% from the +1 source to the experimental target.

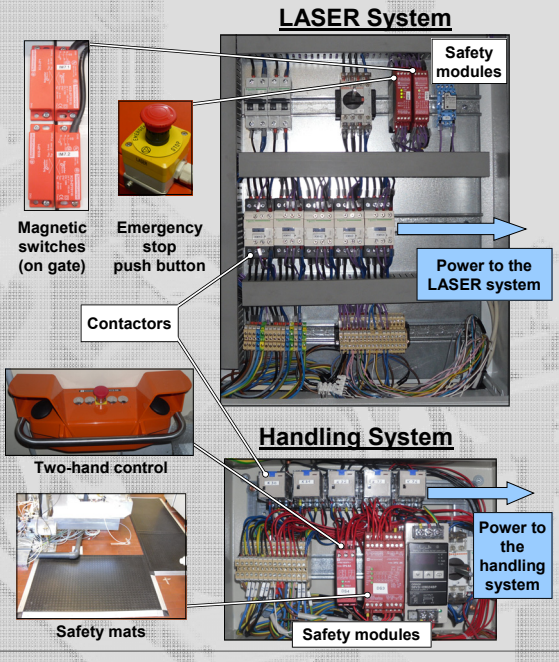


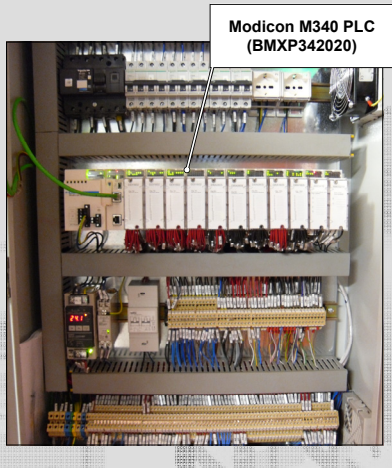
The Safety Control System

The safety control system have been designed using self-controlled devices and applying redundancy for achieving a PL e/Cat. 4 (EN/ISO 13849-1) and a SIL3 (EN/IEC 62061) safety level. It controls: (1) the high voltage, (2) the target complex heating, (3) the pneumatic chamber handling, and (4) the LASER systems.



Each system is powered using a series of contactors controlled by the safety modules and a PLC.



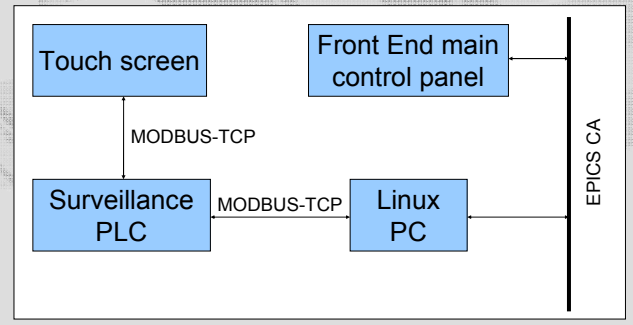


A PLC is used to monitor the status of the system, to allow the user to power on/off each system (when possible) and to control the sequence of pre-established automatic operations

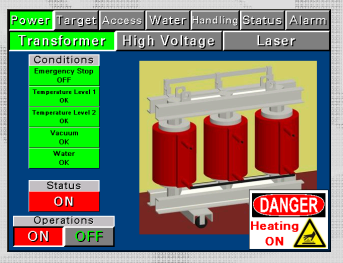
Surveillance and User Interface

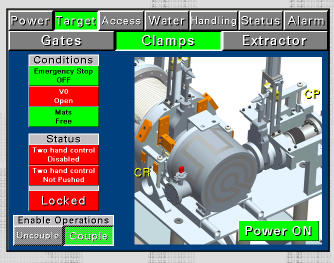
The safety system surveillance is carry out by a PLC. Locally, the user is able to control and see the status of the system using a touch screen interface (Magelis XBTGT533).

Additionally, an EPICS IOC (Input Output Controller) implementing a home-made MODBUS-TCP driver was developed in order to interconnect the system to the Front End control system (based on EPICS). The IOC was implemented on a Linux PC using two Ethernet interfaces: one is used for the PLC communication (MODBUS-TCP) and the other one is used for the EPICS communication (Channel Access). On the other hand, the MODBUS-TCP driver was developed using the "StreamDevice" device support for EPICS.

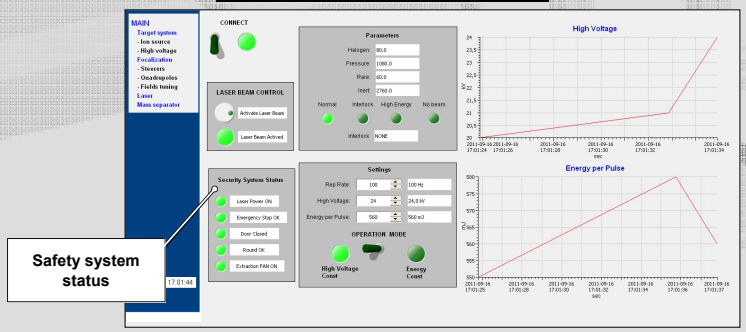


Touch screen interface





Front End main control panel



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