IFMIF/EVEDA RFQ LCS Status Report and Installation on Site
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INTRODUCTION

In the IFMIF-EVEDA project, normal conducting Radio Frequency Quadrupole (RFQ) is used to bunch and accelerate a 130 mA steady beam to 5 MeV [1]. During 2016 the RFQ and its ancillary, including Local Control System (LCS), were assembled at the Rokkasho site in Japan; the completion of installation works, the RFQ conditioning and commissioning of the accelerator are planned for 2017.

This paper will report the 2016 activity on RFQ LCS, with particular attention to installation and integration in the IFMIF-EVEDA Central Control System (CCS) at Rokkasho site.

LCS COMPLETION AND TEST AT LNL

In the first half of 2016 all the cubicles (RCU01-05) and junction boxes (RJB01-03) of the LCS was temporarily assembled and connected together in the 3rd experimental room at LNL for the last checks before the shipment (Fig.1) [2]. At the same time, the electrical schemes of the entire LCS, drawn with SABIK ELE v.18 [3], according to IEC61346-2, were finalized and ready for the check-up.

In mid-2016 an important part of the checkout test was executed by an external contractor entrusted to verify the congruency between the diagrams and the installed hardware, the correct design and execution of the cabling in relation to the electrical standards and regulations. During this phase, all the cables (included the once between junction boxes and final devices) were tested and checked about electrical continuity, lengths and labeling. At final stage all the LCS apparatus were connected and power supplied to verify the correspondence of the about 500 I/O connection to the PLC inputs outputs. Only few minor adjustments were necessary to correct the HW and the electrical schemes. At the end of the test a certificate of compliance was released for the cubicles, while junction boxes were already certified by the producer.

After the test all the part of the LCS cubicles were disconnected and prepared for the shipment.

ONSITE INSTALLATION

During 2016 all the parts of the LCS were delivered and installed in Rokkasho, excluded the connection between junction boxes and final devices on the RFQ. The whole installation including:

- connections between the cubicles, junction boxes and secondary board;
- installation of cable tray along the RFQ;
- installation of HMI console (Fig.4);
- first stage of LCS integration into CCS;
- preliminary check-up of the system;
- predisposal of the LCS set-up to perform the RFQ baking;

took only 3 people for 12 working days, thanks to the design choices and the work done at LNL to verify installation procedure in order to avoid as much as possible unforeseen problems. In particular the installation, power-up and networking of the 5 cubicles took only two days saving the maximum time for SW integration.

The major design choices which allowed these result were:

- the anchoring system for cubicles support which made possible the fix to the floor in a fast and safe way;
way without been an obstacle for the backside connection or for the people transit (Fig. 2).

- The choice of use connectorized cables for all the linkage between the LCS parts, with particular attention to cubicles connections which were concentrated inside boxes positioned in the bottom of the cubicles. This allowed us to perform the installation very quick, in a precise and reliable way.
- The foreseen of an uninterruptible power supply (UPS) inside the cubicles, which allowed us to power up part of LCS quite immediately, without wait for the connection to the secondary distribution board.
- The great job done for naming, labelling and documentation where extremely useful onsite and largely appreciate by Japanese contractors in charge of install all the long cable between LCS and other subsystem, or to the accelerator vault.

LCS INTEGRATION INTO CCS

The RFQ LCS was connected to temporary version of the machine protection system (MPS) and timing systems (TS) in order to verify the HW interfaces and the proper execution of the required functionality.

Regarding the high-level control part, LCS network was integrated into the CCS network: this included reconfiguration of all the machines (physical and virtual hosts) connected to the LCS network, while dedicated network for PLCs was maintained and verified. Furthermore each machine and the relative EPICS communication were reconfigured ad hoc and fully integrated in order to be in accordance with the standards adopted by the IFMIF project.

Additional network services provided by LCS were switched off and replaced by the Central Control System (CCS). In particular, dedicated configurations were applied for the VME such as the use of NFS servers for particular users and folders. At final stage the EPICS IOCs were properly configured and verified.

The whole tests and verifications executed at Rokkasho were finalized to complete the first part of acceptance test.

REFERENCES AND FINAL NOTES

During 2016 several activity were carried out on the RFQ LCS to aim the proper working of that. At the end of 2016 the LCS was assembled at Rokkasho and used to perform the RFQ baking.

The onsite installation and integration into CCS were carried out successfully and without delays on the schedule. At the same time the LCS passed the first part of the acceptance verifications without issues.

During 2017 the system installation will be completed with all the components placed on board of the RFQ and the operation of the various apparatus will be verified. After that, the system will be finely tuned for the accelerator conditioning and commissioning.