Implementation of EPICS based Control System for Radio Isotope Beam line

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1. Introduction

Korea Mult-purpose Accelerator Complex (KOMAC) has been operating 100 MeV proton linear accelerator . For operating 100 MeV linac, various control system has been implemented such as vacuum, power supply, RCCS and etc. KOMAC is operating two beam lines so that clients can use 100 MeV proton beam for their experiment. KOMAC sends beam to beam line and target room using two dipole magnets and several quadrupole magnets. As demand for experiments and Radius Isotope using beam is increased, another beam line is under construction and RI beam line control system is need. To synchronize with KOMAC control system, RI beam line control system is based on Experimental Physics and Industrial control System (EPICS) software. The beam is transported to RI beam line to control magnet power supply and vacuum. Implementation of RI beam line control system is presented and some preliminary results are reported

2. Control System of KOMAC 100Mev LINAC

KOMAC has been operating 100 MeV proton linac, using EPICS based control system. Following Fig. 1 shows the block diagram of KOMAC control system.

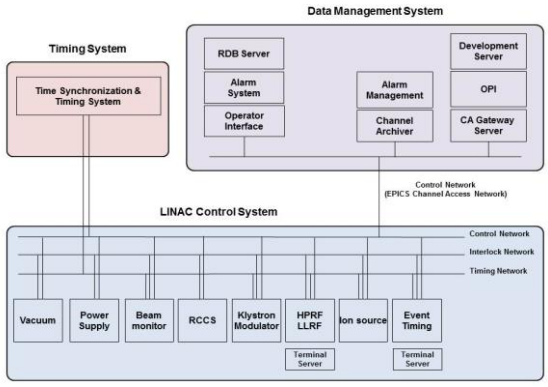

Fig. 1. The block diagram of KOMAC control system

EPICS IOCs has been implemented for control each sub systems. Using Channel Access protocol which is EPICS communication protocol, the data are sent and received and sub systems are controlled.

Following Fig. 2 shows the structure of KOMAC 100 MeV proton linac.

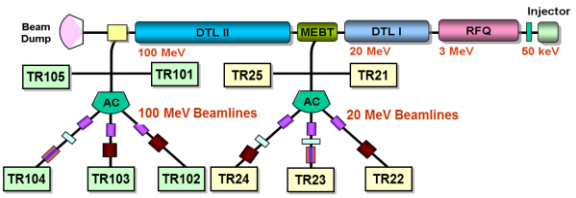

Fig. 2. The structure of KOMAC 100MeV Linac

The beam lines named TR 23, TR 103, are in operating and RI beam lines, called TR 101 are under construct with an increase in demand and RI beam line control system is implemented.

2.1 Magnet Power Supply control system

Quadrupole and dipole magnets are controlled by magnet power supplies. Following Fig. 3 shows the structure of RI beam line.

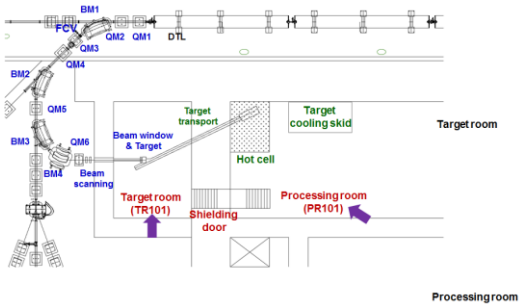

Fig. 3. The structure of KOMAC 100MeV Linac

Adjusting current of magnet, banding angle of beam is adjusted. The power supplies for magnets are installed in klystron gallery. Following Fig. 4 shows the power supply for RI beam line magnets.

Fig. 4. The power supply for RI beam line magnet

The power supply has an ethernet module and connected with KOMAC control system network. Using Transmission Control Protocol (TCP), the current

supplied to the magnet is controlled. To control power supply, EPICS IOC is implemented with EPICS base 3.14.14.12, asyn 4-25 and streamdevice2-6. Configuring TCP on EPICS Input Output Controller (IOC) with streamdevice and asyn modules, EPICS IOC accesses the magnet power supply. Synchronizing the SCPI commands which power supply has, with EPICS Database (db), the power supply is adjusted by adjusting Process variables (PV). Control System Studio tool base on EPICS is adopted for KOMAC user interface. CSS access EPICS IOC via CA protocol.

2.2 Vacuum control system

Purpose of vacuum control system is to maintain a constant vacuum level. The turbo molecular pumps (TMP) are installed in RI beam line TMP controllers are installed in klystron gallery to control vacuum level. TMP controllers communicate EPICS IOC with serial protocol. Using asyn and streamdevice , serial protocol is configured to communicate with EPICS IOC. Following Fig. 5 shows the vacuum controller and vacuum IOC.

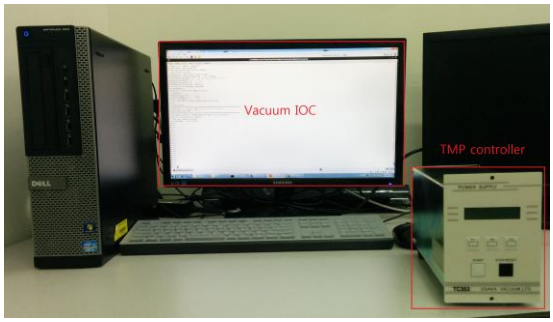

Fig. 5. The Vacuum controller and vacuum IOC

EPICS IOC reads TMP status and writes commands to operate or stop TMP.

2.2 Archiving system

The data which is related with operating linac are archived every second using channel archiver. CSS and Archive Viewer load the data stored in binary format. Following Fig. 6 shows GUI of Archive Viewer

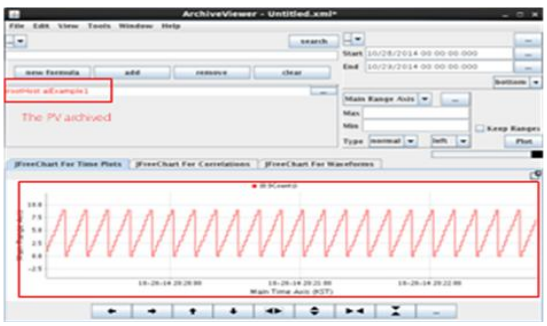

Fig. 6. GUI of Archive Viewer

3. Conclusions

The base RI beam line control system is implemented. It can control beam direction and vacuum. Comparing archived data and current data, RI beam line and control system will be improved.

In the future, scroll pump and gate control system will be implemented using programmable logic controller PLC). RI beam interlock sequence will be added to KOMAC interlock system to protect linac.

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REFERENCES

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