

Implementation of alarm system for vibration monitoring of KOMAC facility

Jae-Ha Kim*, Tae-Sung Ahn, Young-Gi Song, Hyeok-Jung Kwon, Yong-Sub Cho
KOMAC, Korea Atomic Energy Research Institute
*Corresponding author : jhkim1@kaeri.re.kr

1. Introduction

Koera Multi-purpose Accelerator Complex (KOMAC) has been operating 100 MeV proton linear accelerator [1]. For operating 100 MeV linac, Devices have to be operated in certain order. Thus malfunction of a device cause damage to linac and related devices. To protect linac, machine protect system (MPS) has been developed. The MPS protects the components by monitoring hardwired signals. When values of operating parameters go beyond or below limit, alarm will be generated and interlock system which stops related devices in certain sequence will run. Other factor, giving damage to linac is disaster. A strong vibration such as earthquake causes malfunction of devices and damage to linac. Against disaster, the monitoring system based on Experimental Physics and Industrial Control System (EPICS) was implemented. Configuration and Implementation of the monitoring system are presented and some preliminary results are reported.

2. Monitoring system

It is important to protect linac from disaster. As prepared for disaster, the monitoring system was established. Following Fig. 1 shows the structure of monitoring and alarm system.

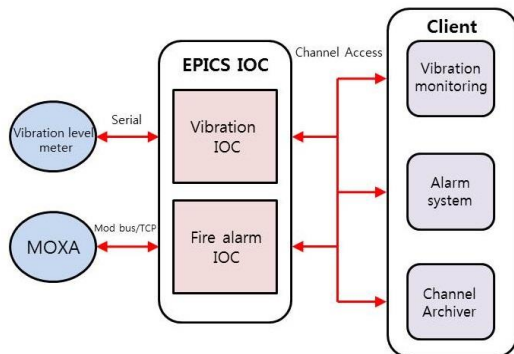


Fig. 1. The structure of monitoring and alarm system

EPICS IOCs receive components from measuring devices. Data stored in EPICS IOCs are passed to clients via Channel Access. Data transmitted are handled according to purpose using UI tool.

2.1 Vibration monitoring system

The vibration level meter VM-1220E and vibration pickup VP-1220E were installed in measuring chamber to measure the vibration. Fig. 2 shows the devices.



Fig. 2. Vibration level meter

The devices can measure vibration in x, y and z axis every second. PC can be connected with vibration level meter using serial protocol. If the RS232 cable for serial protocol is long, there will be noise on the signal strength. Serial to optical converters were used to reduce noise. To monitoring vibration status, EPICS based monitoring system was implemented [2]. EPICS Input/Output Controller (IOC) was configured with base3.14.12.2, asyn4-25 and streamdevice2-6. Configuring serial protocol on EPICS IOC with StreamDevices, EPICS IOC can access vibration level meter. Status of vibration levels is delivered to EPICS IOC via Channel Access (CA) protocol. The data are stored in Process Variable (PV). Control System Studio (CSS), User Interface can retrieve data from EPICS IOC and can output data. Figure 3 shows CSS user interface.

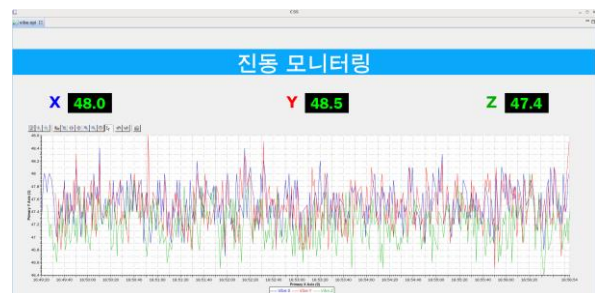


Fig. 3. Vibration level meter

Data has been archived using Channel archiver. Archive Viewer can load the stored data. Current vibration status can be compared with past data. Range of vibration levels is from 45 dB to 55 dB in usual. When vibration levels are reached to 60 dB, alarm is generated. Alarm system was configured using Alarm handler and fields which configure PV. PV can set point of alarm using HIHI and HHSV fields. HIHI fields decide set point and HHSV field determines importance of alarm, major or minor. Alarm Handler causes alarm to check PV value, HIHI and HHSV value. Figure 4 shows alarm system.

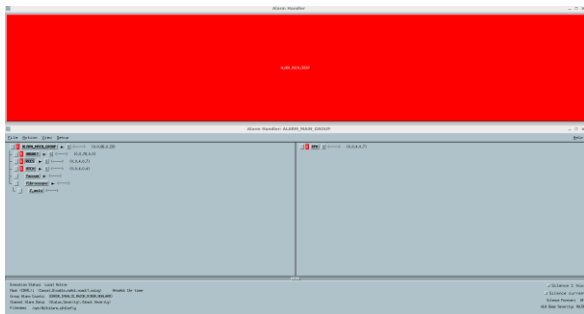


Figure 4 : Vibration alarm system

2.2 Fire monitoring system

Purpose of fire monitoring system is to take proper action about fire. To implement fire monitoring, ADC device, MOXA ioLogik E2240 Active Ethernet I/O has been installed [3]. The device can receive from 0 V to 10 V analog data. When fire is detected, fire alarm will output 5 V analog signal. Figure 5 shows Hardware of fire alarm system.



Figure 2 : Hardware of fire alarm system

MOXA converts analog signal to digital and deliver signal to EPICS IOC. EPICS IOC was configured using base3.14.12.2. EPICS IOC can communicate with MOXA device using Modbus/TCP. Modbus/TCP can apply to EPICS IOC compiling Modbus/TCP source on

EPICS driver. MOXA commands are linked with EPICS record. Fire alarm signal is stored in EPICS IOC PV. When PV receive 5 V signal, the alarm sounds. Figure 5 shows fire alarm system.

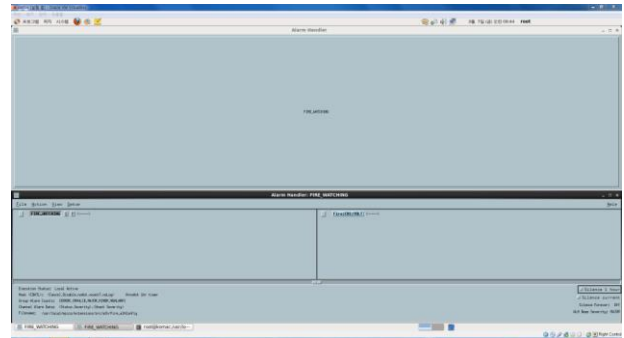


Figure 4 : Fire alarm system

3. Conclusions

KOMAC implemented alarm system for a strong vibration and fire. Alarm is generated in unusual situation. Coping rapidly with situation, damages for Linac and related devices can be reduced. In the future, Interlock system which stops linac and related devices against a strong vibration such as earthquake will be implemented.

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