

Development of Interactive Monitoring System for Neutron Scattering Instrument

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1. Introduction

Neutron scattering instruments in HANARO research reactor have been contributed to various fields of basic science and material engineering. These instruments are open to publics and researchers can apply beam-time and do experiments with instrument scientists. In most cases, these instruments run for several weeks without stopping, and therefore instrument scientist wants to see the instrument status and receive information if the instruments have some problem. This is important for the safety. However, it is very hard to get instrument information outside of instruments. Access from external site is strongly forbidden in the institute due to the network safety, I developed another way to send instrument status information using commercial short messaging service(SMS). In this presentation, detailed features of this system will be shown. As a prototype, this system is being developed for the single instrument: Disk-chopper time-of-flight instruments (DC-TOF)

2. Instruments and System Description

2.1 Disk Chopper Time-of-Flight Spectrometer (DC-TOF)



Fig. 1. Photos of current DC-TOF. The white big structure is fight tank for DC-ToF. The two cylinders are detector tank for other instruments : 40M-SANS and 18M-SANS

DC-TOF is a recently developed inelastic and quasi-elastic neutron spectrometers. It will be used for various research area including magnetism, nano and bio science, metallurgy, etc. It is installed in HANARO guide hall and starts to operate since 2013.

The main instrument control program (ICP) controls and monitors almost parts of DC-TOF : Disk chopper, beam slit, low-efficiency monitor, sample environment, and 57 position sensitive detectors(PSDs). It has been

developed by author using python programming language[1]. The ICP has been successfully operate until now. Every information of DC-TOF is stored in ICP and I developed a code to decide whether the instrument operation is normal or not. If there is an abnormal signal, the ICP controls the SMS device to send message describing such an information to instrument scientists and users. Also it sends periodically instrument operation information in case of the instrument's normal operation to assure personals.

2.2 Interactive Monitoring Using SMS devices

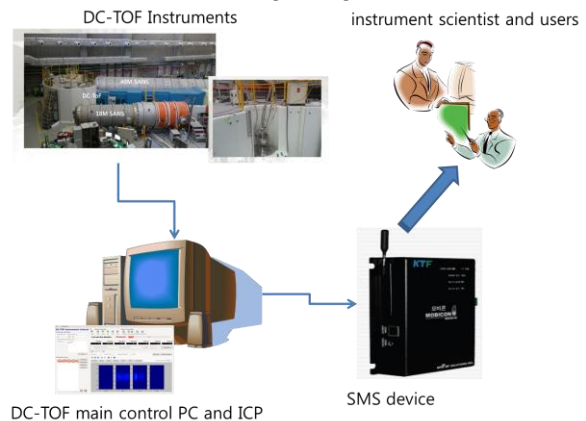


Fig. 2. Concept diagram of instruments, ICP and SMS device.

SMS device is connected to DC-TOF's main control PC in which the ICP runs. ICP communicates with SMS device via serial port. Main control PC and SMS device are powered from UPS which can provide electric power more than 15 minutes. ICP also monitors UPS and send message if UPS has a problem.

The ICP and SMS device report the brief status of DC-TOF instrument every 6 hours. If such a message is not coming more than 6 hours, one can check the instrument. This case can occur if the main control PC or ICP crashes abnormally.

The important case of problem which the SMS device send warning messages are :

- Chopper : abnormal stop, de-coherence of choppers' rotation, connection lost.
- Monitors : abrupt increase or decrease of neutron counts, connection lost.
- Sample environment : unstable operation, connection lost.

- PSDs : abrupt increase or decrease of neutron counts, connection lost, unstable operation,
- Slits : connection lost.
- ICP : abnormal data acquisition, sub program crush, connection lost.

I have to emphasize that not only hardware things such as SMS device or instruments, but also determination of abnormal status are important. The more tests and case studies are required to ensure its sound operation.

3. Conclusions

I have successfully developed instruments and operate for several years. This information messaging system can be used for other neutron scattering instruments. In addition, the integrated messaging and monitoring system to cover several instruments can be developed.

REFERENCES

- [1] <http://www.python.org>