Contribution ID: **84** Type: **Oral**

Development of DAQ Software for CULTASK Experiment

Wednesday, 12 October 2016 11:30 (15 minutes)

Axion is a candidate of dark matter and is believed to be a breakthrough of strong CP problem in QCD [1]. CULTASK (CAPP Ultra-Low Temperature Axion Search in Korea) experiment is an axion search experiment which is being performed at Center for Axion and Precision Physics Research (CAPP), Institute for Basic Science (IBS) in Korea. Based on Sikivie's method [2], CULTASK uses a resonant cavity to discover axion signal. To get higher axion conversion power and better signal sensitivity, quality factor of the cavity, system temperature, cavity volume, and external magnetic field are important. To maximize those factors, the experiment is in research and development stage to date.

As a part of the research and development, CULDAQ, the DAQ software for CULTASK, is being developed. It controls related equipments such as network analyzer, signal analyzer, Piezo actuator, and so on through various interfaces like GPIB and USB. It also acquires data from those devices, reprocess it to convenient format, and store them to storage. The lowest layer of the software is written in C++, and higher level is written in Python, so the run sequence can be defined in runtime.

Online monitoring is also a feature of it. Online variables are all stored and shared in a database, and the monitoring and controlling are available by using an usual web browser. For this user interface part, PHP, HTML5, and jquery are employed. It is implemented as Model-View-Controller (MVC) scheme to make the framework much flexible and responsive.

In this presentation, the details of CULDAQ will be introduced, and real running experiences in engineering runs are shared as well.

[1] R. D. Peccei and H. R. Quinn, Phys. Rev. Lett. 38, 1440 (1977).

[2] P. Sikivie, Phys. Rev. Lett. 51, 1415 (1983).

Tertiary Keyword (Optional)

Monitoring

Primary Keyword (Mandatory)

DAQ

Secondary Keyword (Optional)

Control systems

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Session Classification: Track 1: Online Computing

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