A MONITORING SYSTEM FOR CSR POWER SUPPLY

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Abstract

This article elaborated the monitoring system which has applied in the CSR power supply. This system is composed of the hardware and the software. The hardware is composed of PS6040-PXI-18 PXI engine case +PXI-3800 the master controller +PXI-6133 the ADC card. The software uses NI Corporation's LABVIEW to carry on the data demonstration and the analysis. This monitoring system in the CSR debugging, in the acceptance and the running has played the influential role. At the same time, it provided the data for the physical person. This monitoring system has run four years in the CSR.

OVERVIEW

CSR, a new ion Cooler-Storage-Ring (CSR) project, is the post-acceleration system of the Heavy Ion Research Facility in Lanzhou (HIRFL). Figure 1 show an Overall Layout of HIRFL-CSR. CSR is a multi-purpose CSR system that consists of a main ring (CSRm), an experimental ring (CSRe), and a radioactive beam line (RIBLL II) to connect the two rings. The two existing cyclotrons SFC (K = 69) and SSC (K = 450) of the HIRFL will be used as its injector system. The heavy ion beams with the energy range of 8–30 MeV/u from the HIRFL will be accumulated, cooled and accelerated to the high-energy range of 100–400 MeV/u in the main ring, and then extracted fast to produce RIB or highly charged heavy ions. The secondary beams (RIB or highly charged heavy ions) will be accepted and stored by the experimental ring for many internal-target experiments or high-precision spectroscopy with beam cooling. On the other hand, the beams with the energy range of 100–900 MeV/u will also be extracted from CSRm by using slow extraction or fast extraction for many external-target experiments.

SYSTEM STRUCTURE

The system mainly consists of hardware and software. Hardware is system foundation. It provides the basis for data processing data and hardware support platform. Software is the core of the system. It is responsible for collecting the data for the corresponding processing, analysis and display. Its whole structure as shown in figure 2.

HARDWARE COMPOSITION

The hardware is composed of PS6040-PXI-18 PXI engine case +PXI-3800 the master controller +PXI-6133 the ADC card. PS6040-PXI-18 PXI engine case provides power supply, PXI backplane bus. PXI-3800 the master controller is a computer, the main operating systems and monitoring program are the operation. PXI-6133 the ADC card is responsible for the power output signals into digital signal input PXI-3800 the master controller.

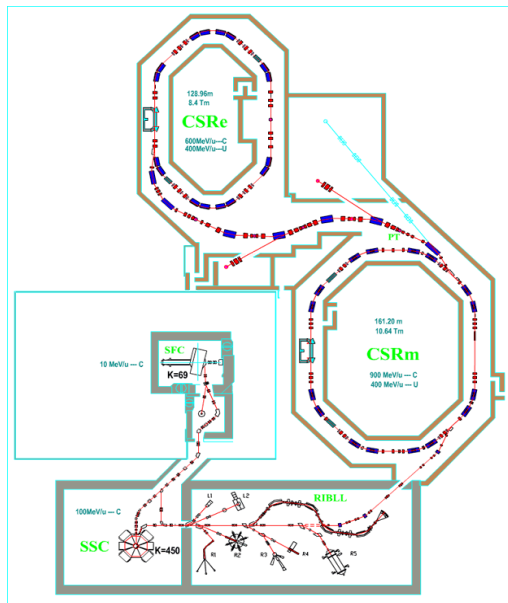

Figure 1: Overall layout of HIRFL-CSR.

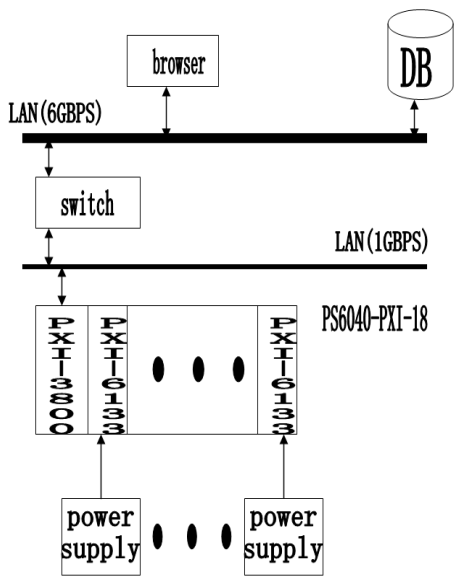

Figure 2: Whole structure of hardware.

SOFTWARE COMPONENT

We adopt NI company LABVIEW (Laboratory Virtual Instrumentation Engineering Workbench) software write data collection and analysis program. Software is mainly divided into three sections. The first part is hardware Settings. It mainly completed on PXI - 6133 the ADC card function parameter setting, to the required data collection. Main parameters have acquisition card choices, acquisition channel choice, acquisition range of choice, delay Settings, sampling number Settings, sampling rate Settings, triggered choice, trigger channel choice, counter choice. Its Settings interface as shown in figure 3. The second part is data processing. It is mainly for the collected data mathematical analysis and processing, to meet the required data obtained. We adopt the mathematical method has averaged, maximum, at a minimum, error ($\frac{Max- Min}{Mean}\times 100\%$), and the theoretical ones error (average - theoretical), FFT, filtering. The third part is the figures show. It basically is the important data through reasonable way shown, so that the physical personnel real-time monitor situation of power supply, find that the problem. There are two kinds of showing the way. One kind is digital display, Such as power supply output current, error, etc. It can provide physical personnel numerical. In CSR injection platform, accelerate the complete platform, it can provide the basis of power output value cognizance and error analysis. As shown in figure 4.Another kind is the graphic display, Such as delay, status, FFT output waveform, etc. It can provide physical personnel the whole output waveform real-time shape of power supply, the noise distribution, the power of the real-time situation and delay. As shown in figure 5. In order to provide more users and networking functions, we adopt the LABVIEW DATASOCKET function of web page display. We are compiling the web interface allows physical personnel can in any one browser LAN monitoring output of CSR power supply. As shown in figure 6

Figure 3: Settings interface of ADC card.

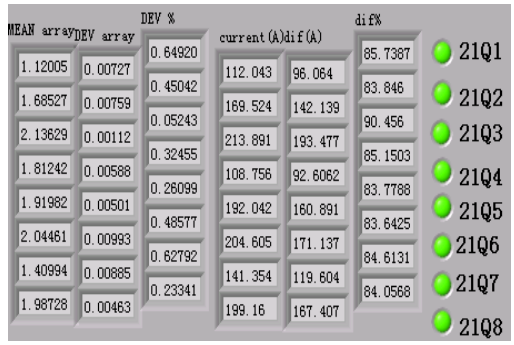

Figure 4: Digital display of important data.

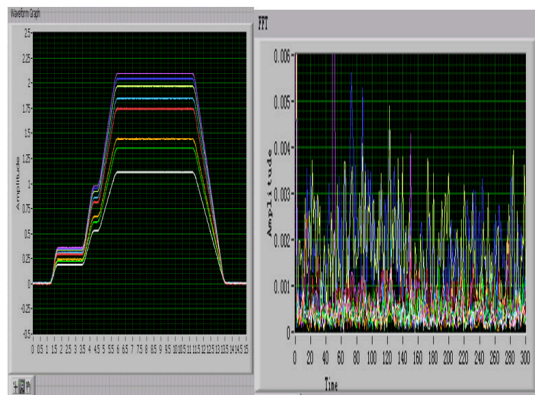

Figure 5: Graphic display of important data.

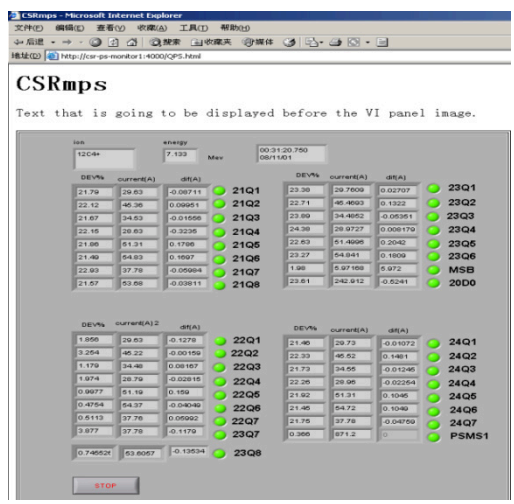

Figure 6: Web interface display.

CONCLUSION

This monitoring system has been put into operation in 2006. In the early, middle CSR debugging operation and final acceptance plays an important role. In 2008, CSR input formally after the operation, this system has been working normally. It provided protection for CSR experiments.

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