pleted based on the servo motor, human-machine interface of which is shown in Fig. 3. Through this software, operators can remotely monitor and control whole equipment which is essential for LECR3 and LAPECR1 ion sources easily. During the period of the control system running, if any equipment goes wrong, it will automatically alarm and do the interlock protection. Alarm state will appear in the software interface with alarm information and flashing light. In the meantime, real audible and visual alarm will be triggered. It was proved in practice that the control system can monitor all the parameters and control most of them. Now, the control system is running well. With its assistance, heavy ion beams with various energy has been delivered successfully by LECR3 for HIRFL for hundreds of hours.

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5 - 6 Development of HIRFL-CSR Environment T/H Monitoring System

Li Yunjie, Wang Yanyu, Yin Jia, Pei Chengquan and Luo Jinfu

The accurate monitoring of the temperature and humidity of the accelerator environment is the prerequisite to guarantee the normal operation for HIRFL-CSR. So the environment temperature and humidity monitoring system of the HIRFL-CSR was developed and realized by the slow control group in IMP on 2012 to reach this target.

The T/H detect module based on MSP430F149 was designed for the hardware platform[1]. This module contains up to 8 temperature sensors and 1 humidity sensors. The resolution of temperature detection is low than 0.1℃ and the humidity is low than 5%. Over 25 T/H detect modules have been installed in corridor power room, SSC shimming power room, power room in 2# Building, CSRm, east and west platform of CSRm. It is shown in Fig. 1.

Fig. 1 T/H module installation places.

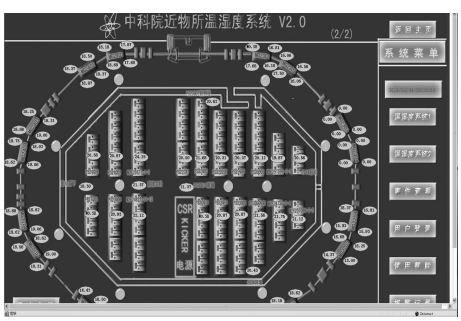

Fig. 2 The software interface for real time data and location.

The software interface based on Force Control configuration software of SUNWAY Corporation[2] has been running all the time in the central control room which can provide the real time data of T/H with the location information since the summer of 2012. And the history data curve of T/H is also been provided. It shown in Figs. 2, 3 and 4.

Once the temperature or humidity is abnormal, an audible and visual alarm information will be generated in the software interface. Also, the location where the abnormal temperature and humidity take place will be shown on this interface.

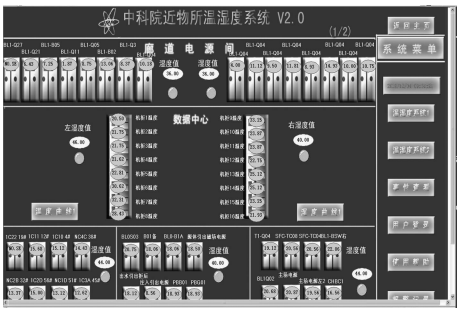

Fig. 3 The software interface for real time data and location.

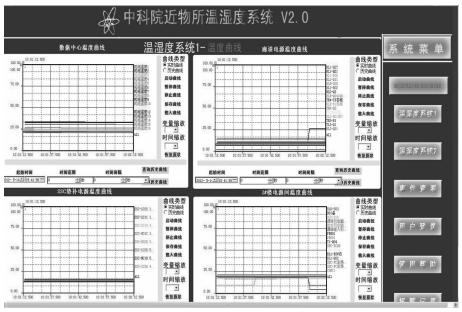

Fig. 4 The software interface for history data curve.

This environment T/H monitoring system has been working stable since Oct. 2012. It not only gave an accurate monitoring of the temperature and humidity for the HIRFL-CSR, but also provided a new way for the diagnosis of malfunction of the accelerator. Next year, the T/H monitoring system will be extended to CSRe.

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5 - 7 Design of a Small Size Nuclear Physics Data Acquisition System

Zhou Wenxiong, Wang Yanyu, Nan Gangyang and Zhang Jianchuan

In order to meet the need of small physics experiment, a small size data acquisition system based on FPGA and ARM11 is designed and realized in November 2012.

The whole data acquisition system consists of both hardware and software, and the heart of the hardware part is composed of FPGA and ARM11. There are two key points in its operating mechanism: firstly, FPGA is designed to control front-end circuit ADC/TDC[1,2], and transmit the data to ARM11. Secondly, ARM11 is expected to send the data to the back-end computers through the TCP/IP protocol. While in the software part, the distinctive feature is the implementation of high-speed data transmission method which helps FPGA to transfer data to ARM11. There are also two points in this part: the first and foremost one is the driver program and the application program of ARM11[3]. The driver program is applied to respond to the hardware interrupt and notify the application program to send those data to back-end computers. And then, the data processing software we developed in back-end computers can convert the date to real-time energy spectrum and save it to hard-disk in high-speed. As we can see, the Fig. 1 shows the circuit board of the data acquisition system.

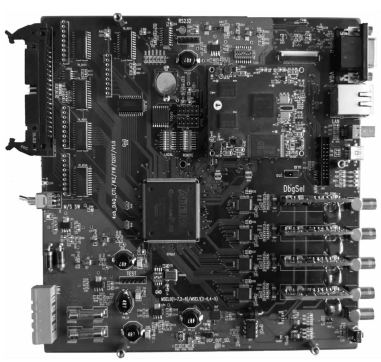

Fig. 1 The circuit board.

To sum up, the small size nuclear physics data acquisition system can be used in small nuclear physics experiment. It has been tested in laboratory with the radioactive source of Na_{22}, and the energy spectrum obtained in experiment is the same with that obtained through CAMAC PHILLIPS7164. Fig. 2 is the compare of the two energy spectrums obtained by the system and PHILLIPS7164. And the other realistic experimental results illustrate that the maximum data transmission rate can reach the point of circa 2.2 MB/s, while event trigger rate is about 250 kHz. It can meet the need of most lab detector test.