

## **Design of Wireless Data Acquisition System in Nuclear Physics Experiment based on ZigBee**

In Inertial confinement fusion experiment (ICF), we should keep away from the experimental equipment because of the nuclear radiation. Therefore, the data acquisition unit is connected by long distance transmission line to the control section. Since the ICF experiment detector array is a large scale which has thousands of channels, there are massive troubles in data acquisition by transmission line such as complex routing, high maintenance costs, low error-tolerant rate, crosstalk, etc.

Compared to cable transmission, the wireless transmission based on ZigBee has the advantages of stable performance, convenient arrangement and flexible networking. ZigBee wireless communication technology, with its low power consumption, low latency, low cost, is suitable for nuclear physics experiment data acquisition.

The paper describes a wireless data acquisition system based on ZigBee Technology. The system mainly consists of front-end data acquisition board and ZigBee coordinator. Front-end data acquisition board completes the signal shaping filter, high speed analog-to-digital conversion, data storage and data pre-processing. The last two function is achieved by FPGA. When FPGA receives the command from the control section, it will transmit data to control section by ZigBee wireless network. The ZigBee coordinator establish a wireless network, which is used to send command and receive data. It is connected to PC via USB port which is convenient and flexible.

The system transmission distance can reach up to 100m. Even under the large electromagnetic interference in nuclear physics experimental environment, the transmission distance can still reach up to 20m. The transmission rate of the wireless data acquisition system can reach up to 10Kbps. Considering the ICF experiment run every several hours, there is enough time to transmit data and it will not introduce the bottleneck problem of transmission rate.

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