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The neutron flux monitor system design based on high-speed sampling

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With the development of nuclear electronics technology, using digital methods to measure the parameters information in the nuclear physics experiment has become a new research means. Compared with the conventional analog circuit , the digital measurement system has following advantages: the structure of system is relatively simple, multi-functional, flexible use, and strong anti-jamming ability, etc. With the development of high-speed digital technology, processing nuclear signal with digital method has become a trend.

In International Thermonuclear Experimental Reactor (ITER) project, we usually need to measure the information of neutron to diagnose the parameters of plasma area. In CGB-NFM project research, we need to measure neutron flux produced by DD and DT operation phase. The neutron flux is 1×10^{14}--7.5×10^{20} cps when ITER device is in DD and DT operation phase. Taking into account the detector placement and detection efficiency, the actual neutron flux detector is able to detect the range of about 0--1×10^{8} cps.

In the research work of neutron flux monitor system design, the whole system consists of four parts:

1. Detectors: fission chamber, used for neutron signals detection.
2. Preamplifier: used for shaping and amplifying the neutron signals.
3. Signal process unit: used for analysising and processing the neutron signals.
4. Dada manage unit: Control, Data Access and Communication(CODAC), used for data communication and save.

Based on high-speed sampling, we use digital algorithm to implement neutron-gamma discrimination, neutron flux measurement under counting mode and Campbell mode, and sampling data save. At the moment, we have launched some research experiments on each part of the system, and some in-depth works are ongoing… …