

Measurement of Neutron Capture Cross Sections

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The social acceptability of nuclear power reactors is related to the waste management of long-lived fission products (FP) and Minor Actinides (MA) during the burn-up of nuclear fuel. The transmutation is one of ways to reduce the radio toxicity of nuclear waste. In the transmutation study of FP's and MA's, the accurate data of neutron capture cross sections are necessary to evaluate reaction rates by reactor neutrons. In this view point, the cross section measurements have been made by an activation method, neutron time-of-flight (TOF) method and so on.

As for neutron TOF measurement, a high-speed data acquisition system has been developed, which comprising two parallel channels with a flash-ADC shown in Fig.1. One channel is intended for measuring fast neutrons, of which energies range from 10 eV up to several keV. The sampling rate is 40 MHz. The other is operated at a 4 MHz sampling rate for measuring slow neutrons of which energies range down to a few 10 eV. Laboratory tests for the developed system were performed, and the good efficiencies for the incoming counting rate were obtained.

The ²⁴¹Am and ²⁴³Am nuclides are important in the nuclear waste management, since the presence of these nuclides in the nuclear waste induce long-term radio toxicity because of long-lived alpha emitters. However, there are discrepancies among the reported data for the thermal neutron capture cross section σ_0 of ²⁴¹Am, which reach more than 20%. In addition, there is a discrepancy among the values for ²⁴³Am(n, γ) reaction cross section, which reaches about 10%. In these problems, the cross section measurements were made for the ²⁴¹Am(n, γ)²⁴²Am and ²⁴³Am(n, γ)^{244m+g}Am reactions.

In the session, the recent activities of cross section measurements will be presented as well as the details of the experiments and the tentative results.

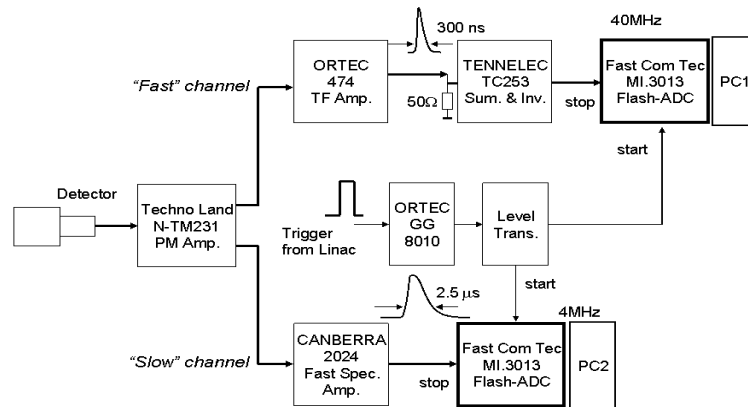


Fig. 1 Block diagram of the data acquisition system with two parallel F-ADC's