

	<h1>MLF Experimental Report</h1>	提出日 Date of report
		2014/10/9
実験装置名／BL番号 Name of Instrument/BL		
ANNRI/BL04		
実験装置責任者 Name of the person responsible for the instrument:		
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所属 Affiliation: 日本原子力研究開発機構 Japan Atomic Energy Agency		

1. 研究成果概要 (a)装置グループ内の成果、(b)ユーザー課題実装時における特筆すべきサポート、(c)ユーザー課題の執行状況について、まとめてください。A4 サイズ用紙使用のこと。

Outline of your activities. Following results at your instrument should be reported in A4 size papers: (a) results of your instrument group, (b) significant user support works, and (c) statistical summary of user experiments.

(a)

•Feasibility study for prompt gamma-ray analysis

We have conducted to investigate the methodology and feasibility of developing a new prompt gamma-ray analysis. Standard samples were measured using two Cluster Ge detectors from the viewpoint of prompt gamma-ray activation analysis. We have measured the background, and obtained PGA, TOF, TOF-PGA, MPGA, TOF-MPGA spectra.

•X-stage Collimator

We have added a removable collimator at flight length of 13.5m (Figure 1). The collimator is called “X-stage collimator”. Using the “X-stage collimator” and the other removable collimator, “Rotary collimator”, users can select the beam size of 22mm ϕ , 7mm ϕ , well collimated 6.5mm ϕ , and pencil formed 15mm ϕ . In this set-up, the neutron flux for 6.5mm ϕ is a one-sixth strength comparison to that for 7mm ϕ and that for 15mm ϕ is a one-twentieth strength.



Fig.1 Installed new removable collimator

•LiF Shield

In the ANNRI, borated-rubber sheets were used for neutron shield for the Ge spectrometer. Indeed, $^{10}\text{B}(n,\alpha\gamma)$ reaction have large neutron capture cross-section and ^{10}B is suitable for the material for neutron shield. However, strong 478-keV γ rays are emitted from the $^{10}\text{B}(n,\alpha\gamma)$ reactions. The γ rays make huge background. On the other hand, $^6\text{Li}(n,\alpha)$ reaction also has large neutron capture cross-section and weak γ rays are emitted from the reaction. Therefore, we have replaced the borated-rubber sheets by ^6LiF tiles.

Figure 2 shows normalized capture yield for ^{118}Sn with the borated-rubber sheets and the ^6LiF tile. Using the ^6LiF tile instead of the borated-rubber sheets, the background due to $^{10}\text{B}(n,\alpha\gamma)$ reactions are drastically reduced.

1. 研究成果概要(つづき) Outline of experimental results (continued).

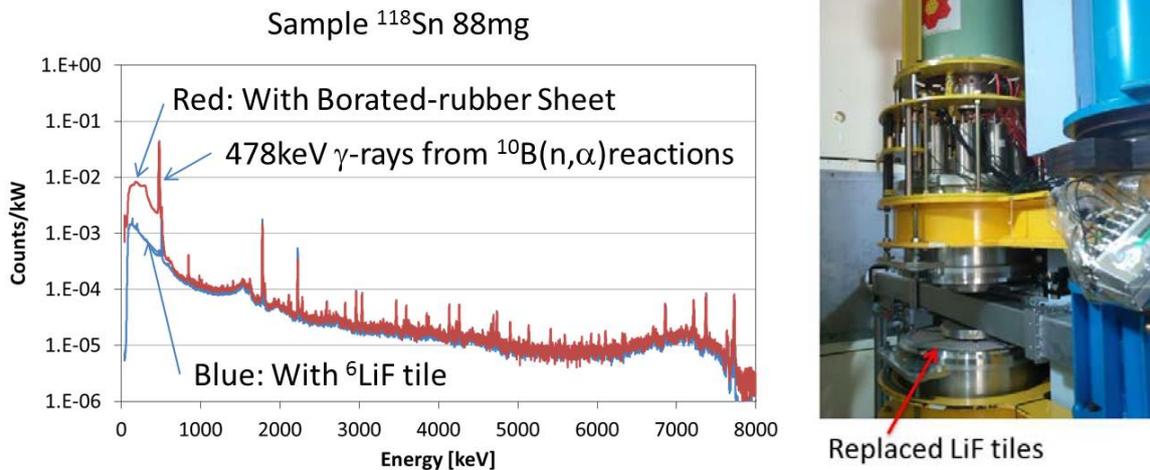


Fig. 2 Normalized capture yield for ^{118}Sn with the borated-rubber sheets and with the ^6LiF tile.

•NaI DAQ

Conventional systems for the NaI(Tl) detector in ANNRI, consisting of an analog shaping amplifier and a peak-hold analog-to-digital converter, cannot process a high counting rate of events without a large counting loss. Therefore, a fast data acquisition method based on pulse width analysis was developed for γ -ray spectroscopy with an NaI(Tl) detector. The new method was tested in experiments with standard γ -ray sources and a pulsed neutron beam from a spallation neutron source. Pulse height spectra were successfully reconstructed from pulse width distribution by use of an energy calibration curve.

(b)

The provision of advice, suggestions and useful information for sample preparation (size, weight, packing material etc.), the experimental setup (DSP mode, size of the collimators, measuring time etc.) and the spectra (TOF, PGA). Instructions for the sample changer.

1. 研究成果概要(つづき) Outline of experimental results (continued).

(c)

•2012A

4 days (elemental analysis)

7 days (whole beam line : performance test)

4 days (nuclear data : neutron energy distribution)

5 days (nuclear astrophysics : DAQ of NaI detectors)

11 days (nuclear data : DAQ of Ge detector)

•2012B

2 days (elemental analysis)

4 days (nuclear data : neutron energy distribution)

9 days (nuclear astrophysics : DAQ of NaI detectors)

10 days (nuclear data : DAQ of Ge detector)

必要に応じて、A4 サイズの用紙に続きを記入して下さい。

Please use A4-size papers for further reporting, if necessary.