

実験報告書様式(一般利用課題・成果公開利用)

(※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。)

 <b>MLF Experimental Report</b>	提出日 Date of Report
課題番号 Project No. 2014B0027 実験課題名 Title of experiment Neutron Capture Cross-Section Measurements for Gd-155 and 157 実験責任者名 Name of principal investigator Atsushi Kimura 所属 Affiliation Japan Atomic Energy Agency	装置責任者 Name of responsible person Yosuke Toh 装置名 Name of Instrument/(BL No.) BL04 実施日 Date of Experiment 2015/4/27～2015/5/1 2015/3/30～2016/3/31

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。(適宜、図表添付のこと)  
 Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.
Gd-157 Foil 30mm * 30mm * 200nmt (6 Sheets) 30 mm x 30mm x 2μmt (12 Sheets)  Gd-155 Foil 30mm * 30mm * 200nmt (6 Sheets) 30 mm x 30mm x 2μmt (12 Sheets)

2. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。) Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.
Neutron capture measurements were performed with the neutron time-of-flight method at the ANNRI in MLF/J-PARC using isotopically enriched thick and thin Gd samples. The measurements were performed with the NaI (TI) spectrometer at the flight length of 28 m. The thicknesses of the thicker samples are enough thick to capture almost all neutrons in the neutron energy range up to 0.1 eV. In this energy range, by taking ratios of capture yields of the thick and thin samples, neutron intensity and detection efficiency of the NaI (TI) spectrometer are cancelled out and absolute neutron capture cross sections are deduced with high accuracy. In the energy range over 0.1 eV, relative cross sections were normalized to the obtained absolute cross sections. The neutron capture cross sections of Gd-155 and Gd-157 were obtained in the neutron energy range from 5meV to 1keV.

## 2. 実験方法及び結果(つづき) Experimental method and results (continued)

### A. experiment for the Region-1 (0.005 to 1 eV)

Preliminary cross sections for Gd-157 under 1eV are shown in Figure 1.

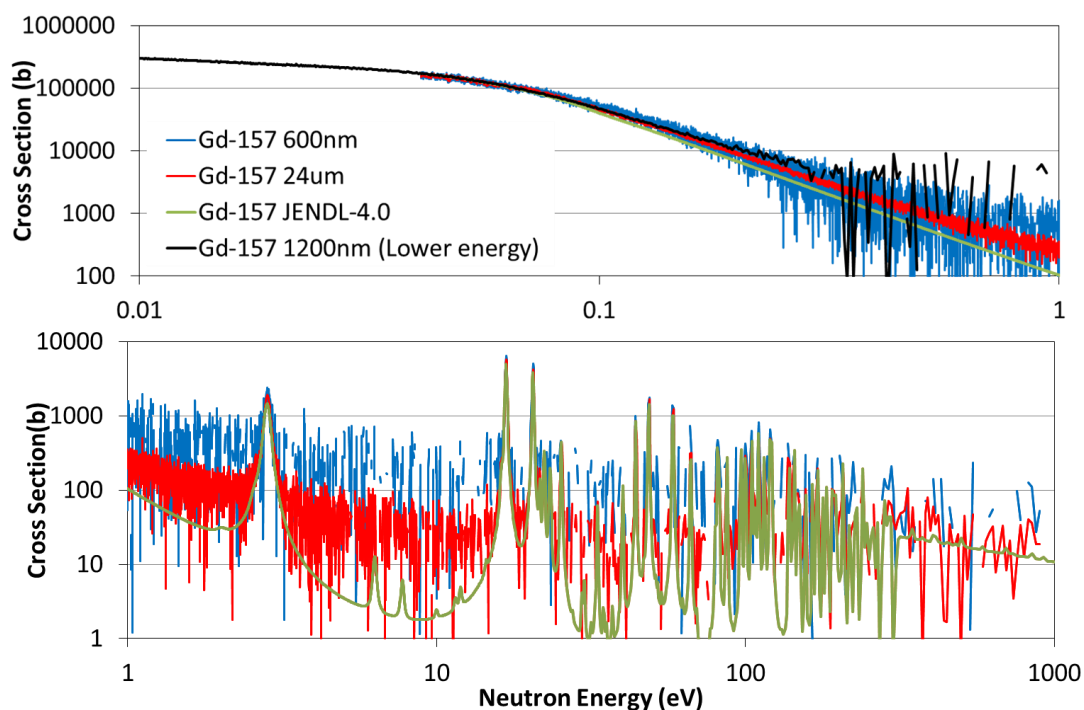


Figure. 1 Obtained neutron capture cross section of Gd-157.

By taking ratios of the thick and thin samples, absolute neutron capture cross sections are deduced with high accuracy. At thermal energy, the obtained cross sections agreed with evaluated value and experimental result by Moller but do not agree with that by Leinweber.

### B. experiment for the Region-2 (0.1 to 1000 eV)

In the energy range over 0.1 eV, relative cross sections were normalized to the obtained absolute cross sections. The neutron capture cross sections of Gd-155 and Gd-157 were obtained in the neutron energy range from 5meV to 1keV. In the energy range over 1eV, the obtained cross sections agreed with evaluated value. However, in the energy range from 0.1eV to 1eV, the shapes of the cross sections for  $^{157}\text{Gd}$  are different between the obtained cross sections and evaluated value.