MLF Experimental Report

提出日 Date of report

実験装置名／BL番号 Name of Instrument/BL10

実験装置責任者 Name of the person responsible for the instrument:
Kenichi Oikawa
所属 Affiliation: 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 goup, (b) significant user support works, and (c) statistical summary of user experiments.

(a) Results of our instrument group

[Periodical measurement]

This year, we performed the periodical measurements for neutron intensity, neutron spectra and pulse shape at BL10 with a proton beam power up to 0.5 MW. Figure 1 shows the thermal and cold neutron reaction rates measured by the Au foil activation method by the same settings in April, 2015, October, 2015, and March, 2016, as a function of the proton beam power. The neutron reaction rate of the Au foil corresponds to the neutron intensity. An Au foil was located at 12.8 m from the moderator's surface with a Cd collimator whose aperture size is 1.0 cm × 1.0 cm. To derive the thermal and cold neutron intensity, 2 irradiations with/without Cd covers were performed. We confirmed that the neutron intensity was almost proportional to the proton beam power up to 0.5 MW. We will periodically measure neutron intensities up to 1.0 MW.

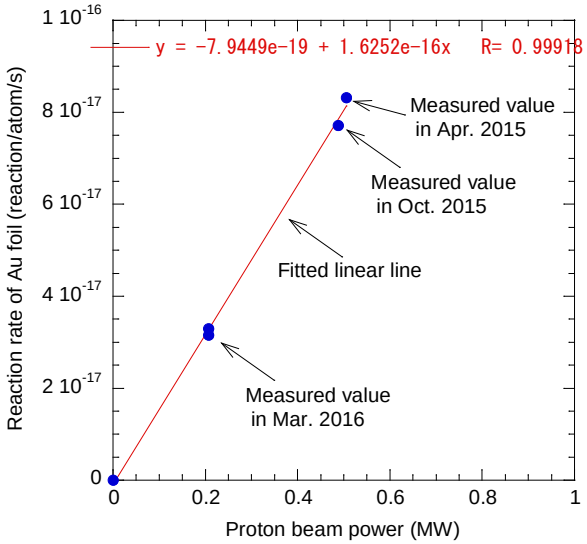

Figure 1. Measured neutron reaction rates of Au foil in April, 2015, October, 2015 and March, 2016.

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

The pulse shapes of the cold neutrons, ca. E_n < 10 meV, are very sensitive to the para-H_2 content of the moderator. A two-dimensionally aligned mica crystal has been used to measure the pulse shape of cold neutrons since 2008. This year, a standard powder sample, NIST SRM660 ($La^{11}B_6$), was also measured in the same experimental setting. The powder diffraction has an advantage when used for the reproducible measurement for the pulse shape of the thermal and cold neutrons. The powder sample contained in a cylindrical vanadium cell, 5 mm in diameter and 40 mm in height, was set on a sample position of NOBORU, 14.0 m from the decoupled moderator (DM). A zero-dimensional 1/2-inch ^{3}He counter was set at 1.0 m from the sample at $2\theta = 170^\circ$. In spite of a small solid angle of the single counter, an adequate counting statistics for the pulse shape estimation was obtained in a one-day measurement at 500 kW. The measured pulse shapes agreed well with the simulated ones. The estimated full-width at half-maximum of the latest data, plotted as a filled triangle in Fig. 2, shows good agreement with the expected pulse width (= $\Delta t_{1/2}$(cal.)) as well as the previous pulse shape measurements. The result supports the 100% para-H_2 condition in the JSNS moderator, which is realized at beam power of at least 500 kW.

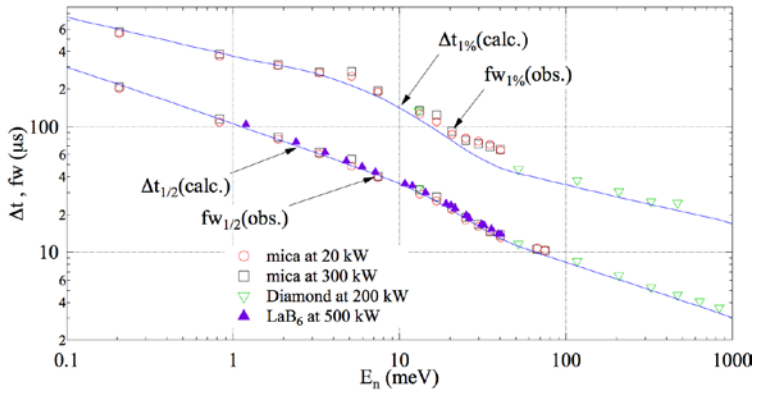

Figure 2. Pulse width at half and 1% maximum of the observed peaks and the calculated ones of DM of JSNS.

(b) Significant user support works

We did not have any instrumental trouble at BL10 during JFY 2015. Imaging experiments by the user, from preparation to data analysis, were fully supported by instrument member of BL10 and imaging team of MLF.

(c) Statistical summary of user experiments

There was no intrinsic failure of the instrument components of BL10. However, the beam-time operation was only 70 days in JFY 2015, because of malfunctions of the cooling system for the neutron target station on April 30th and November 20th 2015.

53.5 days were assigned to the general use of 2015A. Some of them were not yet completed in JFY 2015, and the remaining user program will be carried out in JFY 2016.

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.