

 	提出日 Date of Report 2013/6/18
実験装置名/BL番号 Name of Instrument/BL: 4SEASONS/BL01	
実験装置責任者 Name of the person responsible for the instrument: Mitsutaka Nakamura	
所属 Affiliation: J-PARC Center	

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) Results of our instrument group

We performed several test measurements to improve the performance of 4SEASONS. In this report, we will focus on our activity for the development of a radial collimator.

In order to obtain the good quality data in neutron scattering experiments using sample environmental apparatus, a countermeasure against the background is necessary. Radial collimator has been conventionally used to suppress the off-sample parasitic scattering without perturbing the sample scattering. Recently, inelastic neutron scattering measurements under high temperature or high magnetic field have been frequently requested. Thus, we started the research and development of a radial collimator for 4SEASONS.

At first we evaluated the properties of several shielding materials using the monochromatic incident neutron beams. Fig. 1 shows the TOF spectra of scattered neutrons both from Cd-coated Al plate (25um (Cd) + 1mm (Al) + 25um (Cd)) and Gd₂O₃ sheet (25um (Gd₂O₃) + 50um (binder) + 25um (Gd₂O₃)). In higher energy region, the shielding property of Cd-coated Al plate is found to be better than that of Gd₂O₃ sheet. Thus, we selected the Cd-coated Al plate as a shielding blade of radial collimator for 4SEASONS which uses relatively higher incident energy (E_i ~ 400meV).

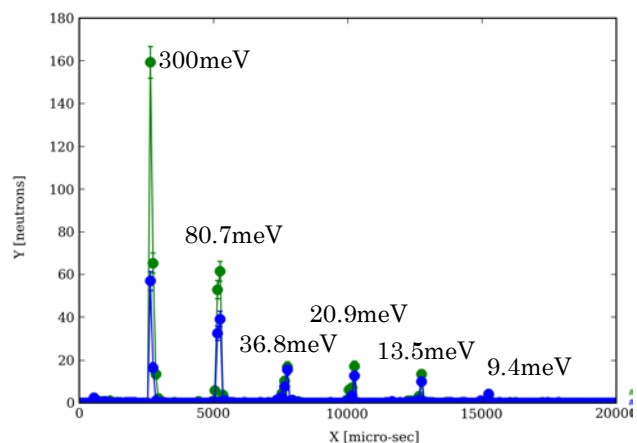


Fig.1 TOF spectra of scattered neutrons from Cd-coated Al thin plate (blue) and Gd₂O₃ sheet (green)

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

We have developed the radial collimator for 4SEASONS where a shielding blade is made of a Cd-coated Al thin plate (25um (Cd) + 100um (Al) + 25um (Cd)), the angular spacing is 2.5deg. and the oscillating speed is 0.04deg./sec. We performed the performance evaluation test of the radial collimator for 4SEASONS. The elastic spectra of vitreous silica rod (dia.=8.5mm) measured at room temperature with a radial collimator (blue) and without a radial collimator (green) is given in Fig.2. The vitreous silica rod was set into the 4K cryostat conventionally used at 4SEASONS. It is obvious that our radial collimator can effectively shield the unwanted scattering from the cryostat window and provide us the high quality data.

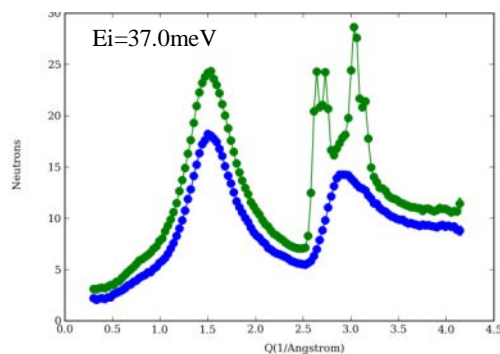


Fig.2 Q dependence of the elastic structure factor for vitreous silica rod (d=8.5mm) with a radial collimator (blue) and without a radial collimator (green). The sample is set into the cryostat and the measurements are performed at room temperature. The spiky peaks around 3\AA^{-1} observed in the data without a radial collimator are caused by the unwanted scattering from the cryostat window.

(b) User support works

Instrument group staffs of 4SEASONS (R. Kajimoto (CROSS), J. Sungdae (CROSS), K. Ikeuchi (CROSS), and M. Nakamura (JAEA)) performed user support works in pairs. In addition, many staffs significantly contributed to the user support based on their specialty, such as software (Y. Inamura (JAEA)), sample environment (Y. Yamauchi (JAEA)), electric work (H. Tanaka (JAEA)), machine design (T. Futagami (CROSS), W. Kambara (JAEA)), and radiation safety (M. Ishikado (CROSS)).

(c) Statistical Summary of user experiments

Twenty-two proposals were accepted as a “general proposal” of BL01 in JFY2012. One “urgent proposal” was accepted and finished the experiments in mid-June of 2012. J. G. Park who is a principal investigator of 2012B0145 asked us to cancel the experiment in JFY2012 due to the delay of sample preparation. All the experiments of general proposals except for 2012B0145 were finished during the JFY2012.

- + General proposal of 2012A: 11 → Finished
- + Urgent Proposal of 2012A: 1 (2012A0001(U)) → Finished
- + Cancelled general proposal of 2012A: 0
- + General proposal of 2012B: 10 → Finished
- + Cancelled general proposal of 2012B: 1 (2012B0145)

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.