

 MLF Experimental Report	提出日 Date of Report 2016/1/15
課題番号 Project No. 2014BU0410 実験課題名 Title of experiment Measurement of leakage neutron brightness from para-hydrogen coupled moderators for ESS moderator development 実験責任者名 Name of principal investigator Masahide Harada 所属 Affiliation JAEA	装置責任者 Name of responsible person Yosuke Toh (BL04), Kenichi Oikawa (BL10) 装置名 Name of Instrument/(BL No.) BL04 ANNRI BL10 NOBORU 実施日 Date of Experiment 2015/4/10 – 2015/4/11(BL10) 2015/4/11 – 2015/4/12(BL04)

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.
None

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.
<p>The nGEM detector [1], which was a gaseous ionization chamber using boron films, prepared for the neutron imaging experiment at BL22, was used for the measurement. Two measurements were done at BL10 for the decoupled moderator and at BL04 for the coupled moderator. At BL10, the detector was located at 13 m and a tiny collimator (3.1 x 3.1 mm) in the rotary collimator at 8.0 m was used. At BL04, the detector was located at 28.5 m and a pinhole Cd plate with a hole of 3 mm in diameter was placed at 21.5 m.</p> <p>Figure 1 shows the neutron spatial brightness around 5 meV from the decoupled moderator (BL10). The figure on the left shows the measurement result and the one on the right depicts the simulation. The simulation was done by PHITS [2] calculation with the engineering model of JSNS [3]. It was found that the distributions of the two sets of data were very similar with the highest intensities at the center. Also, an aluminum tube in the moderator was observed (the two vertical lines near the center).</p>

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

Figure 2 shows the neutron spatial brightness around 5 meV from the coupled moderator (BL04). In the same way as in Fig.1, the figure on the left shows the measurement result and the one on the right depicts the simulation. It was found that the distributions of the two sets of data were very similar and the highest intensities were observed near the target (upper side) and far from it (lower side).

The particular spatial brightness from the coupled moderator is of great interest to us and it is very important to measure these data for the moderator in a high-power spallation neutron source. These results validated the JSNS neutronic design. And they would be also very helpful for the ESS design.

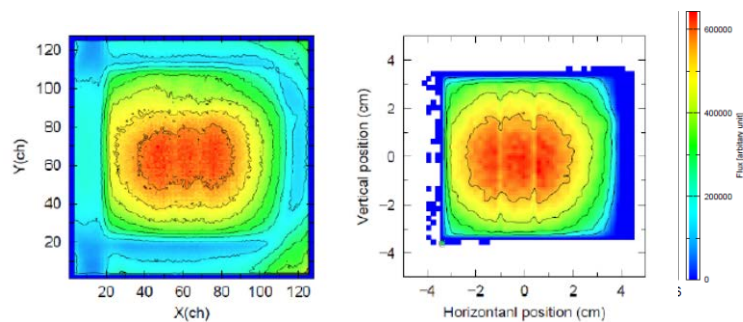


Figure 1: Neutron spatial distribution from the de-coupled moderator (BL10)

Left: measurement; right: simulation

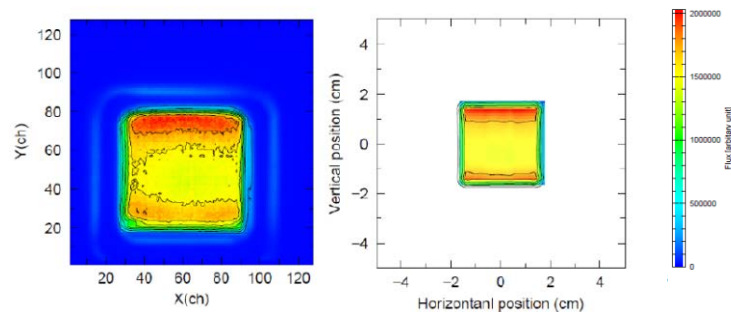


Figure 2: Neutron spatial distribution from the coupled moderator (BL04)

Left: measurement; right: simulation

Acknowledgement

The authors thank to the staffs of BL04 and BL10 for very helpful supports.

Reference

- [1] S. Uno et al, Physica Procedia, 26, 142 (2012)
- [2] T. Sato, J. Nucl. Sci. Technol. 50, 913 (2013)
- [3] M. Harada, et al., Prog. Nucl. Sci. Technol., 2, 872 (2011).