


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。)

	提出日 Date of Report 2013/02/26
課題番号 Project No. 2012B0134 実験課題名 Title of experiment Spin current on garnet ferrite $Y_3Fe_5O_{12}$ induced by temperature gradient 実験責任者名 Name of principal investigator Shin-ichi Shamoto 所属 Affiliation Japan Atomic Energy Agency	装置責任者 Name of responsible person Ryoichi Kajimoto 装置名 Name of Instrument/(BL No.) BL-01 実施日 Date of Experiment 2012/12/22 10:00~ 2012/12/26 10:00

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.
Measured single crystal sample is a garnet ferrite $Y_3Fe_5O_{12}$ (~8g).

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.
Our cylindrical single crystal grown along [111] direction was aligned horizontally. Incident energy $E_i = 12.5$ meV was selected to observe low energy spin waves at $E = 3.5$ meV. Spin wave excitation was clearly observed at (202) as shown in Fig. 1. Various temperature gradients such as 0, 10, 15, and 30 K were applied along $Q_b // [111]$ direction. Subtle changes were observed as shown in Fig. 2. By applying temperature gradient, scattering intensity decreased in the low temperature side. This result may suggest that diffusion of spin wave excitation is limited from high T side to low T side due to the temperature gradient after equilibrium with temperature gradient. It is not easy to understand the scenario based on simple spin current flow model from high T side to low T side. In addition, obtained statistics are not good enough to conclude our experiment even with about 23 hour measurement. We would like to try to carry out similar measurement on a different type of material again.

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

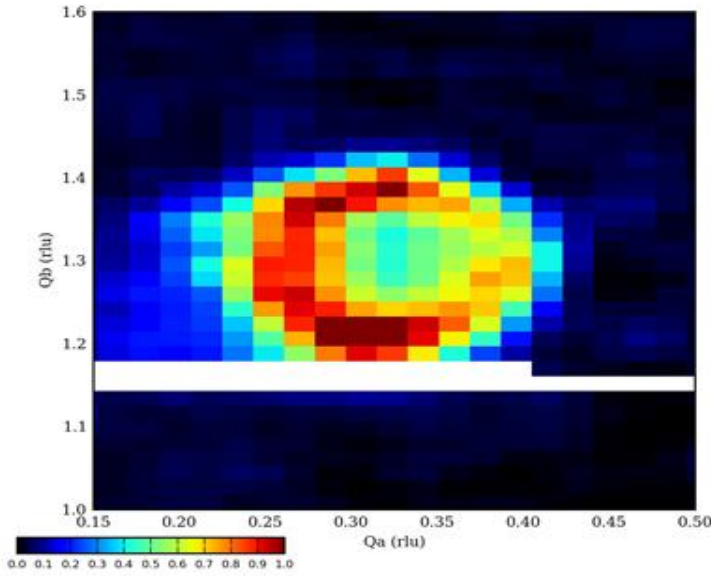


Fig. 1. Contour map of spin wave excitation at about $E=3.5$ meV in $Q_a//[2 -1 -1]$ and $Q_b//[1 1 1]$ plane.

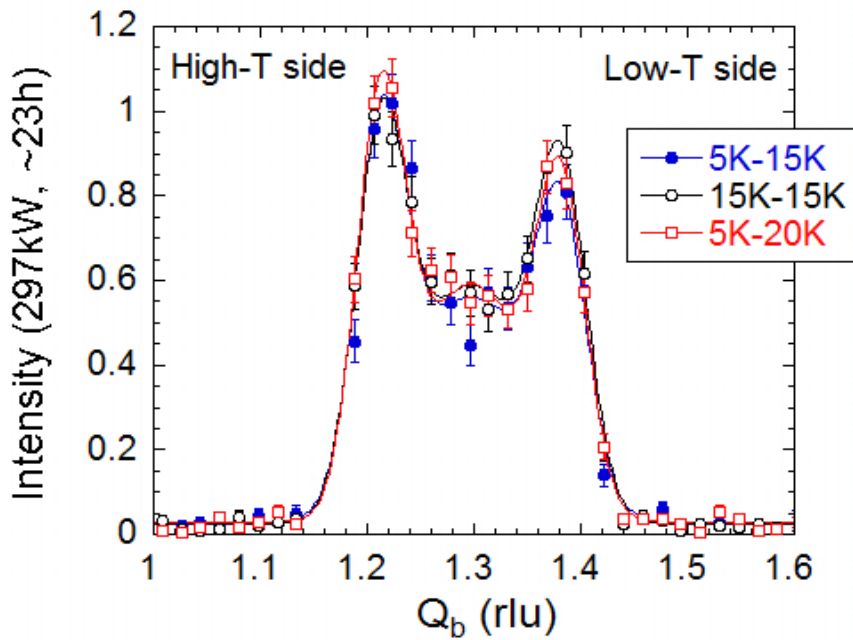


Fig. 2. Scattering profiles at (202) with and without temperature gradient along $Q_b//[1 1 1]$. Vertical slice cut in the range of Q_a from 0.28 to 0.38 in Fig. 1. Roughly estimated temperatures at crystal ends are 5 K to 15 K, 15 K to 15 K, and 5 K to 20 K for blue, black, and red data points, respectively. Data are fitted by three Gaussian functions due to mixing of high and low Q_b branches in addition to low Q_a part below 0.29.