（ ※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。 ）

TOKAI CROSS **Experimental Report** J-PARC

**承認日**Date of Approval 2013/11/23
**承認者**Approver Jun-ichi SUZUKI
**提出日**Date of Report 2013/06/04

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|---|---|
| 課題番号 Project No.<br>2012B0104 | 装置責任者 Name of responsible person<br>J. Suzuki |
| 実験課題名 Title of experiment | 装置名 Name of Instrument/(BL No.)<br>BL-15 |
| 実験責任者名 Name of principal investigator<br>Y. Kousaka | 実施日時 Date and time of Experiment<br>2013/02/28～03/06 |
| 所属 Affiliation<br>Aoyama-Gakuin University | |

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.

MnSi (single crystal)

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 aim for this experiment was to investigate the formation of helimagnetic ordering chiral magnetic soliton lattice in chiral magnetic compounds MnSi. This compound forms chiral helimagnetic ordering due to the competition between ferromagnetic exchange interaction and D-M interaction, The pitch angle of the helix is determined by the ratio of ferromagnetic exchange interaction and D-M interaction. As a result, the period is hundreds of angstroms, and thermal neutron diffraction does not have enough Q-resolution to separate fundamental Bragg and magnetic satellite peaks. Therefore, they are often misinterpreted as a ferromagnetic compound. The chiral helimagnetic compounds are recently paied attention due to theoretical prediction of formating chiral magnetic soliton lattice under an applied magnetic field perpendicular to the helical axis. The period can be tunable with the amplitude of an applied magnetic field, and it expects phenomena like new giant magneto resistive effect. To reveal the long periodic magnetic structure, SANS experiments can be an answer.

In TAIKAN, we performed single crystalline SANS experiments in MnSi. As MnSi has cubic symmetry, the magnetic satellite peaks can be observed (1,1,1) direction and its equivalent directions like (1,1,-1).

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

If we apply the magnetic field along the (1,1,1), we can expect the chiral magnetic soliton formation and observe the higher harmonics at 2q and/or 3q along the helimagnetic domains non-parallel to the (1,1,1). As shown Fig. 1, we succeeded in observing helimagnetic satellites at (q,q,q) and (q,q,q), and higher harmonics at (2q,2q,−2q).

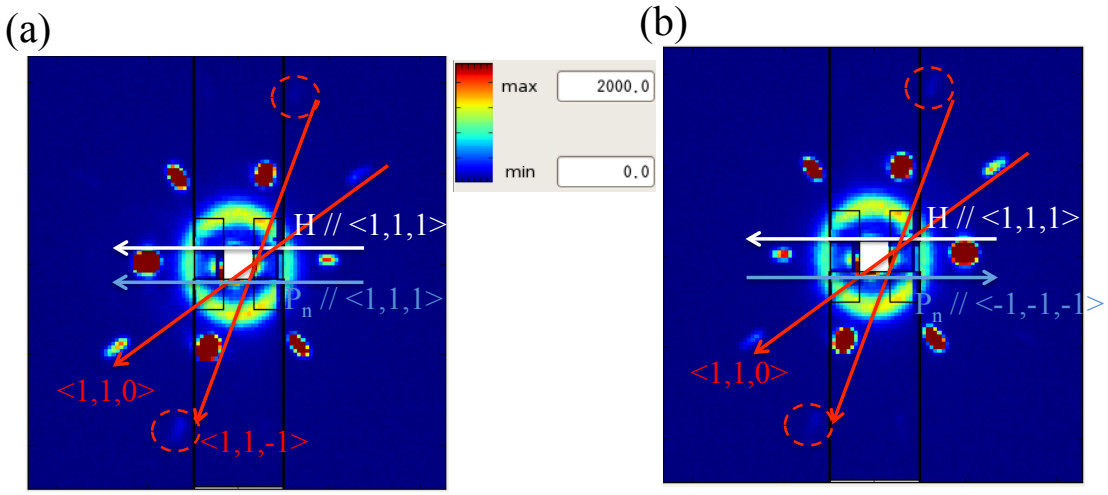


Fig. 1 Intensity color maps around (0,0,0) reflection in MnSi with the incident neutron polarization along (a) the (1,1,1) and (b) the (−1,−1,−1) directions. Dotted circles indicate higher harmonics observed at 2q positions.

Fig. 2 shows the reciprocal line profiles of (h,h,h) and (h,h,−h) reflections. While there was no higher harmonics along (h,h,h), the magnetic peak were observed at (2q,2q,−2q). As we compare the intensity difference between up and down incident neutron polarization, all the magnetic peak intensities are described by the chiral magnetic structure model like chiral magnetic soliton lattice.

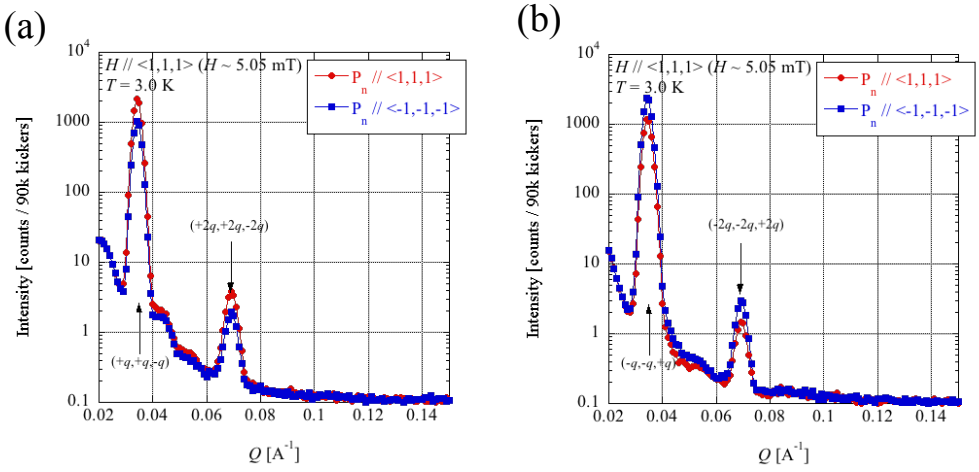


Fig. 2 the reciprocal line profiles of (a) the (h,h,h) and (b) the (h,h,−h) reflections.