TOKAI CROSS Experimental Report J-PARC	提出日 Date of Report 2013/01/10
課題番号 Project No. 2012A0042 実験課題名 Title of experiment 実験責任者名 Name of principal investigator Y. Kousaka 所属 Affiliation	装置責任者 Name of responsible person J. Suzuki 装置名 Name of Instrument/(BL No.) BL-15 実施日時 Date and time of Experiment 2012/11/07～11/12

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.

$Cr_{1/3}TaS_2$ (粉末)
MnSi (単結晶)

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: $T_{1/3}MS_2$ (T: transition metals, M: Nb or Ta), and MnSi. These compounds can form 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 firstly performed powder SANS experiments in $Cr_{1/3}TaS_2$. To see the magnetic signals, we subtract the intensity at lowest temperature from intensity at paramagnetic phase. The result is shown in Fig.

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

1. We can see a magnetic satellite peaks. However, the peak Q-position of the satellite depends on the extracted wavelength. Therefore, we need to retreat the data carefully.

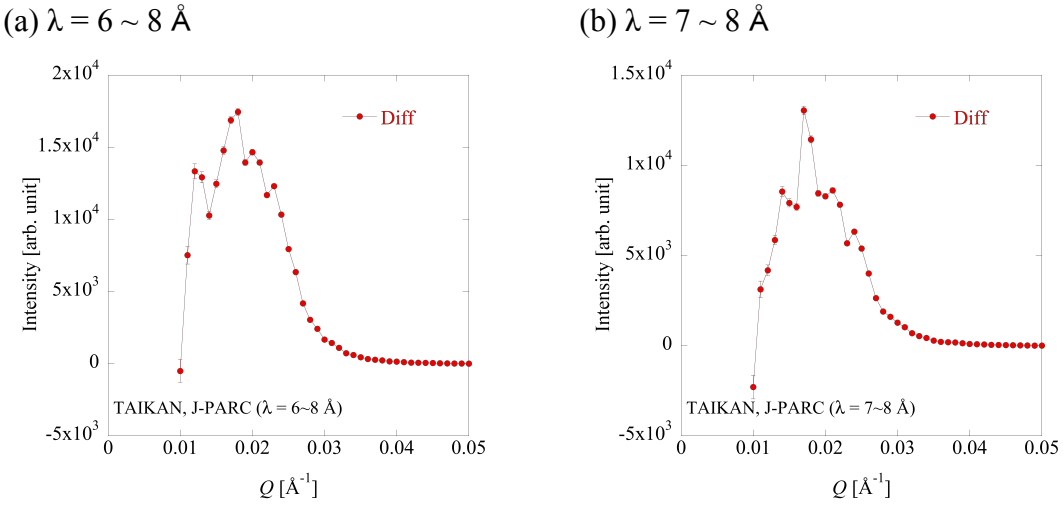

Fig. 1 Peak profiles around (0,0,0) reflection in $Cr_{1/3}TaS_2$.

Secondly, 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). If we apply the magnetic field along (1,1,1), we can expect the higher harmonics like (3q,3q,3q) due to the chiral magnetic soliton. As shown Fig. 1 (a), we succeeded in observing helimagnetic satellites. However, we cannot detect the higher harmonics. To detect the evidence of the soliton lattice, we need more statistics for minimizing the error.

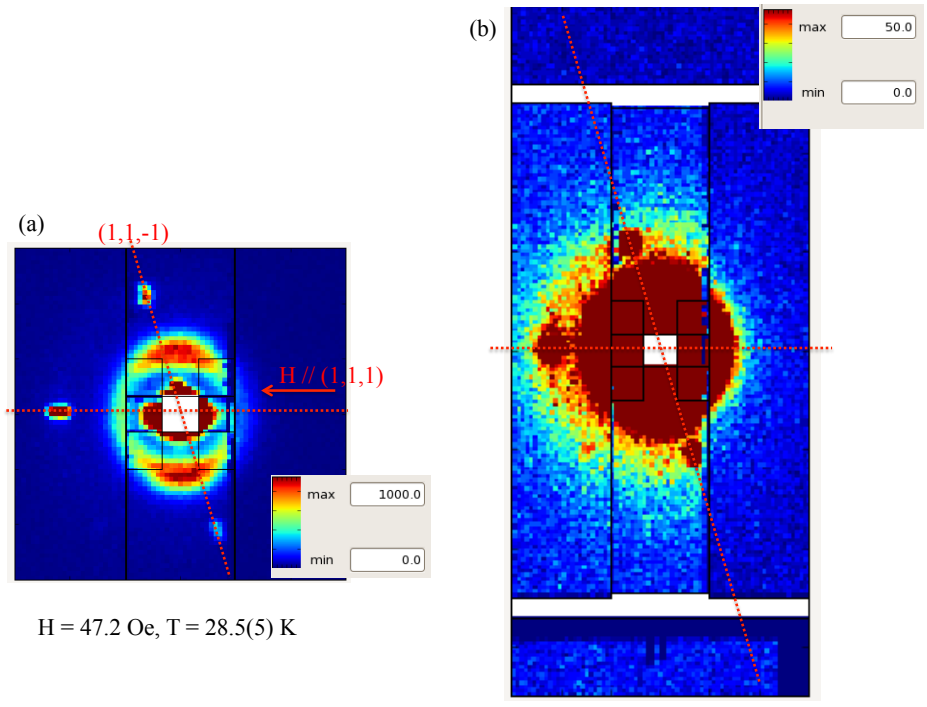

Fig. 1 Intensity color maps around (0,0,0) reflection in MnSi.