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。）

MLF Experimental Report	提出日 Date of Report June 25th, 2014
課題番号 Project No. 2013B0258 実験課題名 Title of experiment Magnetic excitations in the doped kagome lattice antiferromagnet $(Rb_xCs_{1-x})_2Cu_3SnF_{12}$ 実験責任者名 Name of principal investigator Kittiwit Matan 所属 Affiliation Mahidol University	装置責任者 Name of responsible person Kittiwit Matan 装置名 Name of Instrument/（BL No.） BL-14 実施日 Date of Experiment March 27th – April 2nd, 2014

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.

A Cs-doped distorted kagome lattice antiferromagnet $(Rb_{0.8}Cs_{0.2})_2Cu_3SnF_{12}$ in a single crystal form.

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.

In this experiment, magnetic excitations in $(Rb_{0.8}Cs_{0.2})_2Cu_3SnF_{12}$ were studied using the neutron time-of-flight spectrometer AMASTERAS at J-PARC, Japan. The measurements are a continuation of Proposal No. 2013A0170, which was cut short due to the accident at the Hadron Experimental Facility on May 24th, 2013. A single crystal sample of mass ~3g was aligned in (HHL) zone and loaded into a closed cycle He-4 cryostat for cooling to a base temperature of 6 K. The chopper configuration is set up so that the energy of incident neutrons is 17 meV, which is the same configuration as that used in the similar measurements on $Cs_2Cu_3SnF_{12}$ and the previous measurements on the same crystal. The dataset was taken at several sample rotation covering about 100 degrees in a step of 2 degree rotation. Background was measured at 70 K and 150 K. The intensity is integrated along the [0,0,L] direction, taking advantage of non-dispersive and rod-like scattering along the L axis.

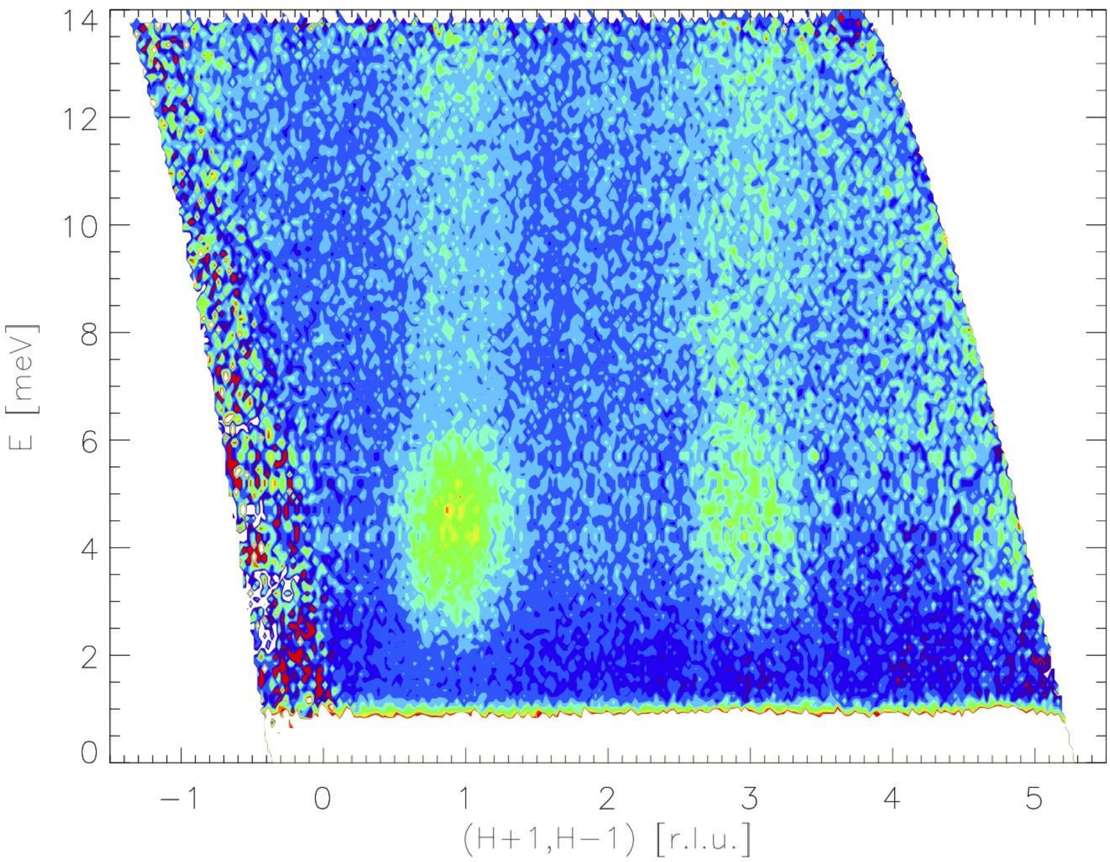

Figure 1. A background-subtracted scattering map shows magnetic excitations as a function of energy transfer and momentum transfer along [H,H] direction.

Figure 1 shows the scattering intensity maps measured at the base temperature of 6 K. Red or green denotes high intensity while dark blue denotes low intensity. The figure shows magnetic excitations around (2,0,L) and (4,2,L) plotted along [H,H] direction. The measured scattering pattern is quite different from the magnetic excitations observed in both $Cs_2Cu_3SnF_{12}$ and $Rb_2Cu_3SnF_{12}$. The magnetic excitations appears to concentrate around the zone center and has a characteristic of a resonance scattering, that is, most of the scattering intensity concentrates within a small range of energy, in this case between 2-6 meV. Above 6 meV, the scattering form a rod along the energy axis, and become diffusive and relatively weak.

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

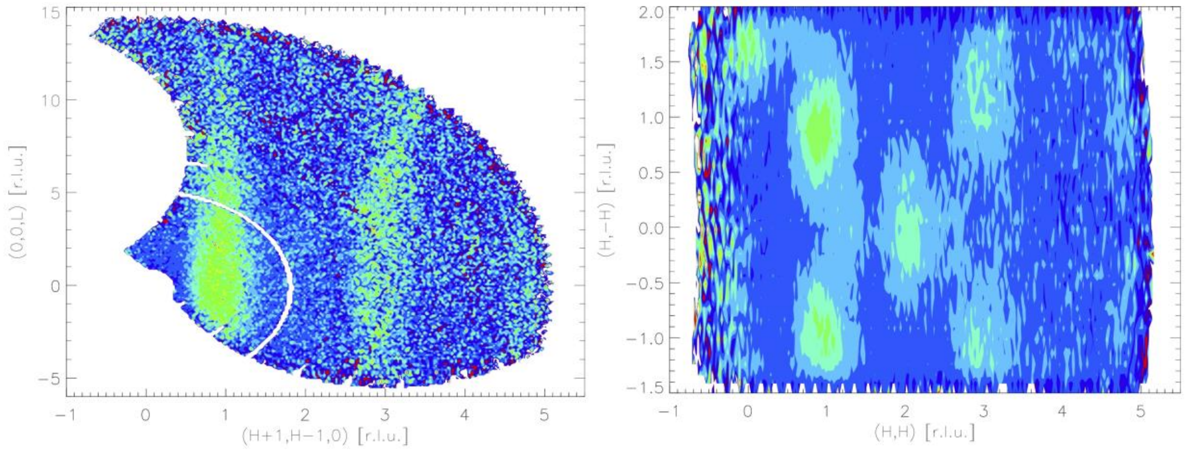

Figure 2. Background-subtracted scattering maps show magnetic excitations between energy transfer 3-6 meV as a function of momentum transfers [H,H,0] vs. [0,0,L] on the left panel and [H,H] vs. [−H,H] on the right panel. The energy is integrated from 3 meV to 6 meV.

Figure 2 shows energy-integrated scattering maps as a function of momentum transfers. The left panel shows the scattering rod along the L direction, attesting the two dimensionality of this system. The right panel shows strong scattering intensity around the Brillouin zones centered at (2,0,L), (0,2,L), (2,2,L), (2,4,L) and (4,2,L).

In summary, we observe magnetic excitations in $(Rb_{0.8}Cs_{0.2})_2Cu_3SnF_{12}$ that are quite different from those observed in $Cs_2Cu_3SnF_{12}$ and $Rb_2Cu_3SnF_{12}$. The origin of this scattering remains unclear. One possibility is that the resonance scattering is related to the valence-solid-bond state that gives rise to the singlet-triplet excitations observed in $Rb_2Cu_3SnF_{12}$. A less-interesting alternative is that it is due to randomness of exchange interactions caused by disordered doping. Further analysis is needed to distinguish between these two possibilities and examine other effects.