MLF Experimental Report	提出日 Date of Report 2017.06.25
課題番号 Project No. 2016A0159 実験課題名 Title of experiment High Magnetic Field Neutron Diffractions in Shastry-Sutherland System-Step3II 実験責任者名 Name of principal investigator Hiroyuki Nojiri 所属 Affiliation Institute for Materials Research, Tohoku University	装置責任者 Name of responsible person Takatsugu Masuda 装置名 Name of Instrument/（BL No.） BL12 実施日 Date of Experiment 2016/11/02-04

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.

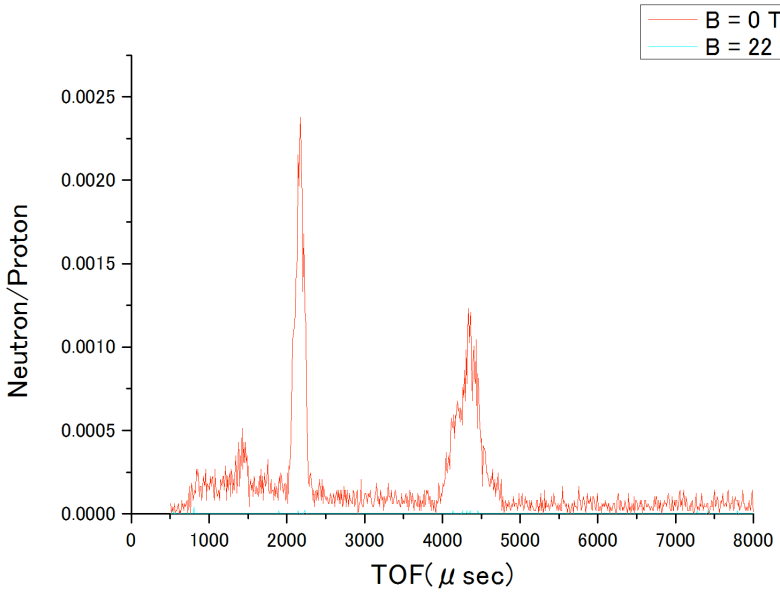
SrCu2(BO3)2 Single Crystal

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.

When the density of strongly interacting electrons is tuned by some external parameter, the system sometimes forms a charge density wave: CDW state associated with the localization of particles in some particular number of densities. In insulating magnetic systems, analogous phenomenon is found as the appearance of magnetization plateau. Instead of electrons, triplets condense in such “CDW” state for effective interactions among them when the density of triplet(magnetization) is tuned by magnetic fields. In fact, magnetization plateaus were observed in quasi two-dimensional systems $SrCu_2(BO_3)_2$. A neutron diffraction on $SrCu_2(BO_3)_2$ in high magnetic fields has been expected to be important and essential to understand the nature of this unique material in quantum magnetism. The present proposal is to realize this task based on the recent technical progress of neutron diffraction in pulsed high magnetic fields. In this new proposal, we used BL12 for two reasons. The first one is the shorter L_1=15 m(target to sample distance) at BL12. The second point is the higher flux for the difference of moderator in BL12.

As the pulsed field generator, we have used a compact capacitor bank developed at J-PARC by the collaboration with Tohoku University. Thanks to the compact size, it can be easily installed into the BL12 spectrometer. A pulsed magnet insert which can be combined with Orange cryostat was used for the present experiments.

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



The upper figure shows the TOF spectrum along (h 0 0) direction taken at B=22 T at 5- around 5 K. For the toruble of the cryostat, the lowest temperature was limited to 5-6 K and so we could not reach the target temperature of 1.8 K. As expected for this temperature, we could only observed a nuclear peak. Moreover, the beam intensity is much reduced from the expeted 400-500 kW to 150 kW. The beam intensity is very crucial for pulsed magnet experiments, where the data accumulation time is very limitted.

Despite the failure of the present experiment, we could make a solid qunatative estimate for the possilble data statistc, i.e. number of the pulsed field shots needed to observe the magnetic superlattice peak. According to the estimate, the experiment is quite feasible at BL12 in about a week beam time.

We are going to fix the trouble of the cryostat for the coninuing proposal in future round. In addition, we have prepared a cryostat for lower temperature to achive the combination of the 0.5 K and at 40 T. The present experiment was technically quite useful to determine the experimenta conditions and to shows the feasibility of pulsed magentic field diffraction at BL12.