（ ※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
課題番号 Project No.2016B0112 実験課題名 Title of experiment Superconducting neutron imager developed by using current biased kinetic inductance detectors (CB-KIDs) 実験責任者名 Name of principal investigator Professor Takekazu Ishida 所属 Affiliation Osaka Prefecture University	装置責任者 Name of responsible person Dr. Kenichi Oikawa 装置名 Name of Instrument/（BL No.） BL10 実施日 Date of Experiment Feb 09 (9:00) to Feb 15 (9:00), 2017

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.

Detector (#1) = Two layered X-Y detector (NW04)

Sample (#1) = B10-enriched dot array (100-um diameter, 250-um period, 50-um thickness by using stainless metallic mesh.

Detector (#2) = One layer detector with doubly meandered XY nanowire detector (NW06)

Sample (#2) = Punch stainless board (0.5-mm thickness, 1-mm hole, 2-mm pitch, triangular lattice), of which the holes are filled with B_4C paste

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.

[First experiment]

We performed an experiment by using detector (#1) and sample (#1). The sample (#1) was placed at the distance of 0.8 mm from the detector at 4K. Detector (#1) is supposed to serve as a high-spatial resolution detector of 10 um. However, we found that one of the two layers in detector (#1) has trouble in signal conduction. Therefore, we decided to quit this experiment. It took one day to replace the detector and the sample because we had to elevate the temperature of the whole system from 4K to 300K.

[Second experiment]

We changed our detector from detector (#1) (NW04) to detector (#2) (NW06). The detector (#2) is a single layered detector, but it has a doubly meandered nanowire structure. Detector (#2) is supposed to serve as a moderate spatial resolution of 400 um. We used sample (#2) at a distance of 100 mm from the detector in this experiment. We also chose a high L/D ratio (L=TOF distance, D=Opening diameter) to obtain neutron beams with a high degree of parallel beam profile.

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

[Measurement system]

The measurements were performed a delay-line CB-KID method, where the signal readouts have been done by the two different method. One is to observe the whole signal by using a digital oscilloscope of 0.4-ns sampling, while the other is done by using the Kalliope-DC-ToT readout circuilt. Kalliope circit was originally developed for the muon experiment, buth the Kalliope-DC-ToT circuit is modified to collect data for neutrons over the MLF repetition period of 40 ms. DC means the beam current appeared in a direct current (DC) mode. ToT is the time of threshold, where both the rising timestamp and the falling timestamp of each signal are stored in the mass storage.

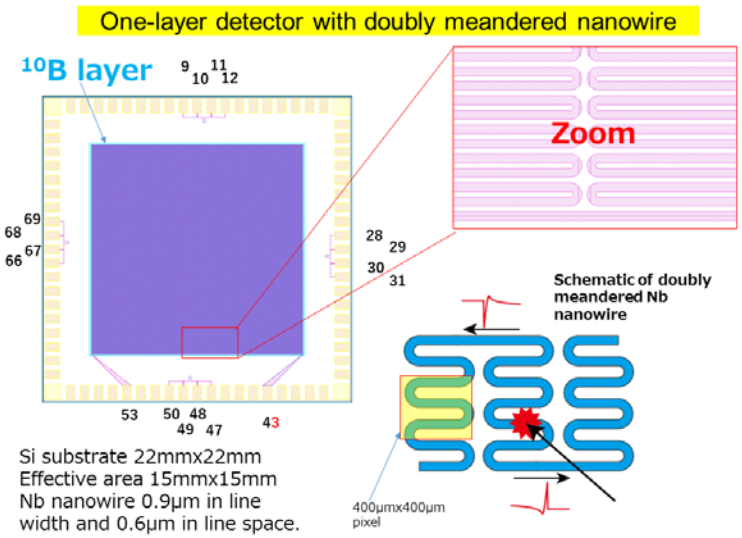

Fig. 1: Schematic figure of one-layer detector of doubly meandered nanowire (NW06). The detector (#2) can image the distribution of mesoscopic hot spots in the XY plane even if it has one-layer structure.

This is the first experiment by using a doubly-meandered structure. We consider that further experiments are necessary to develop the method and the analysis algorithm. The neutron radiography images are analyzed by using the stored data.

[Data analysis]

In Fig. 2, we show our preliminary analysis of the data to obtain the image. We notice that the two dimensional histogram of the neutron events for sample (#2) has a periodic appearance of the zone, where the number of neutron events is smaller than other places. However, we do not achieve a good agreement between image and the absorber pattern, yet. Further analysis and the development of the analysis method are needed.

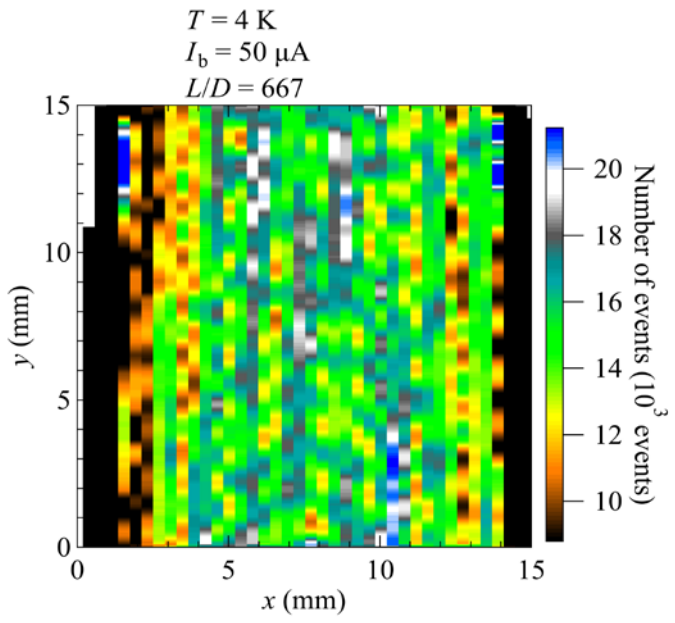

Fig. 2: Preliminary analysis of imaging of the 1000-um B_4C dots in a triangular lattice. We recognize a periodic suppression in neutron events in the image.