STEPS Students Report

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I took part in the STEPS exchange program from August 1, 2018 to September 8, 2018 and stayed in the Kashiwa campus, where I worked on my research topic «Electroinduced magnetic bubble domain nucleation» at the Institute for Solid State Physics in the Prof. Masashi Tokunaga's laboratory. Professor Tokunaga gave me a workplace, helped to assemble an experimental setup and did a lot for my comfortable stay in the foreign country.

The aim of my work was to study the effect of the magnetic bubble domain nucleation in iron garnet film by an electric field with a high-speed camera and to take part in the experiments conducted by the Japanese laboratory.

A series of experiments were made with the support of Professor Masashi Tokunaga and Project Research Associate Yuto Kinoshita (Fig.1), and we achieved the following results:

1) We confirmed the effect of the bubble domain generation in iron garnet film under the action of an inhomogeneous electric field (Fig.2);

2) A number of videos of the nucleation process with various forms of electrical pulses (sinusoidal, rectangular, and triangular) were recorded by a high-speed camera facility (Tokunaga Laboratory's Q1V camera provided with NAC image technology);

3) We investigated obtained movies and found that the possibility of bubble domain nucleation does not depend on the absolute value of the electric field and the generation always occurs on that part of the electric voltage where its derivative is positive;

4) The experimental setup made it possible to measure the bias current, which could affect the process of the nucleation of a domain. We established that a changing of a small bias current does not influence on the domain generation.

These results will be included in my graduate master's paper. All the time Prof. Tokunaga discussed experimental data with me and made a connection with other theoretical scientists from other Japanese universities.

In the middle of my stay, I participated in an experiment of the measuring a polarization of $BiFeO_3$ depending on the applied high magnetic fields up to ~ 70 T.

During my internship, I received new skills in working with new laboratory equipment, a huge experience in communicating with foreign scientists, and I practiced my English.

I also discovered a Japanese culture. I visited different regions of Tokyo, Kamakura, Kyoto and Nara, tried various types of food and met a lot of interesting people.

I am very grateful for the possibility of STEPS program to join the Japanese scientific laboratories. I hope that this experience will lead to the creation of the intensive research collaboration of our scientific group and Tokunaga's group.

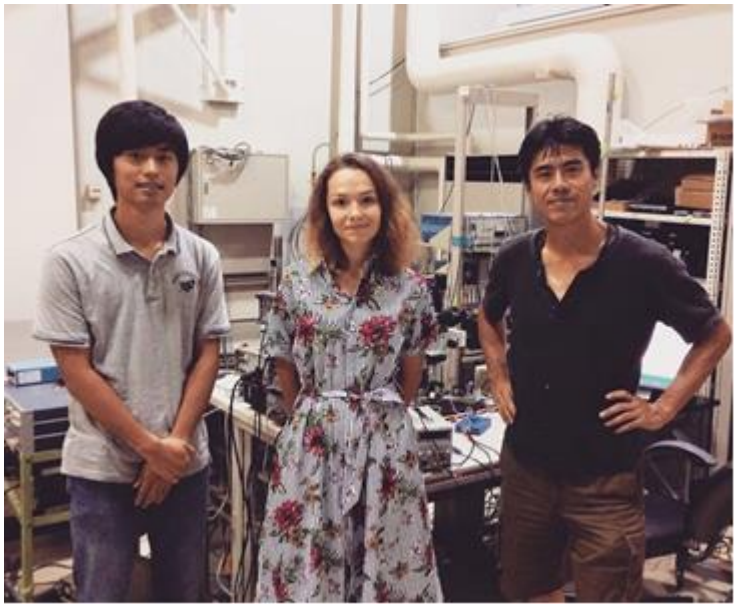

Fig.1. Project Research Associate Yuto Kinoshita and Associate Professor Masashi Tokunaga