STEPS Students Report

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I was looking forward to taking part in the STEPS program, for Japan is well known to be a country of high technology and cutting-edge science. I was overjoyed with the opportunity of visiting the best university in Japan – University of Tokyo. For my six weeks internship I was accepted at the laboratory of Professor Aihara. The research in the lab is conducted in different fields of particle physics. Some students of the Aihara group work on the world-famous projects such as B-meson factory Belle 2 and neutrino oscillation experiment Super-Kamiokande.

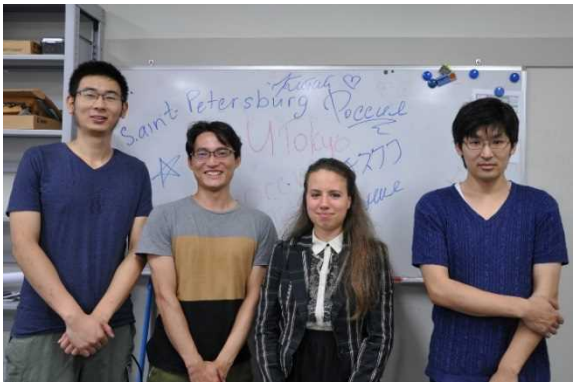
The dark matter questions are also the subject of the research in the lab. As we know the universe consists of ordinary matter (only 5%), dark matter and dark energy. Dark matter is not fully understood now, so the search of the forms of dark matter is still underway. The possible candidates are weakly interacting massive particles (WIMPs) and axions. The study on detecting these particles was managed by the assistant professor Yoshiyuki Onuki of the Aihara group.

There are some theories that claim the axions are constantly coming from the sun, so we do not need any special facilities to produce them. However, if you want to get accurate measurements you should make sure to reduce the noise coming from the background radiation. Environmental radioactivity is always present due to cosmic and terrestrial sources. Different types of shields are used to protect the detector. We studied the efficiency of the shields made from lead, tin and copper.

In this research we use CdTe semiconductor detector to measure the energy. The previous study showed that the efficiency of the detector becomes worse after the shielding experiment is performed at room temperature for 10 hours. It was suggested that this happened because of the polarization effect in semiconductor. To eliminate this effect, we tried to put the setup into the thermal chamber and run the experiment at a low temperature (-50 C). It successfully reduced polarization and after 24 hours of operation the efficiency of detector was still fine. In my internship, a tin shield was used

for the first time in this study. The experimental data indicated that the tin shield of 3 mm thickness together with a copper shield of 2 mm thickness showed results similar to a copper shield of 12 mm thickness. This is beneficial, because the smaller the thickness of the shield, the less secondary particles are produced.

At the end of my stay we had a trip to KEK (Tsukuba), J-PARC (Tokai) and Kashiwa campus of U-Tokyo (together with 2 other students of Aihara group). I am most grateful to Onuki-san, who organized this trip, because I was able to visit these places, where researchers expand the frontiers of science.



The students in the lab would always help me when I had some questions, not only about research but on daily issues. I enjoyed profound discussions on person's destiny and scientific society in Japan as well as most cheerful talks during lunchtime. On weekends I always went to discover new sights in Tokyo. I am extremely happy I was invited to climb the mountain Fuji since it was indeed an unforgettable trip. Although it was not an easy walk, it was worth doing. Standing above the clouds was breathtaking, so no regrets. Sushi restaurant, karaoke, farewell party, museums and shrines are my precious memories of my stay in Tokyo.

I hope the friendship between University of Tokyo and Saint Petersburg University would last for many years.