

STEPS Students Report

Aleksei Mishchenko (Specialist 4)

Department of Mechanics and Mathematics, MSU

I work at the laboratory of Space Research Institute (IKI) under the direction of Izmodenov V.V. The members of our laboratory take part in the project on creation of the device "LYMUS". This instrument is a photometer with hydrogen cell which measures the intensity and spectral characteristics of scattered Lyman-alpha emission. The characteristics of this device help us to solve some scientific problems. Especially, accounting geometrical configuration of satellite motion with installed "LYMUS" on it, we can get complete maps of the sky in the intensity of scattered Lyman-alpha emission. Our Japanese colleagues, including the laboratory of Ichiro Yoshikawa, have extensive experience of creating such a scientific equipment. The staff of professor Yoshikawa's laboratory took part in the creation of the device "LAICA" (the PROCION mission) the purpose of which was to measure the intensity of scattered Lyman-alpha emission.

During my stay in Tokyo I have solved the following tasks:

- **On the basis of theoretical data and the expected characteristics of the device the necessary exposure time of the device was calculated.** Why is it so important? The detector of the device detects signals which are not only created by scattered Lyman-alpha, but also the signals created by the so-called "noise". It could be the gamma particles, for example. That is why the device should accumulate the signal for a period of time in order the level of the "noise" registered by the detector do not influence instrument readings.
- **Was made the algorithm of the movement of the device allowing to build a complete map of the sky in less than one day.** This algorithm has to consider the speed of a spacecraft in orbit, exposure time and the field of view of "LYMUS" and other factors. Building the full maps at least 1 time a day is very important not only as a standalone result but also as a tool for other researches. For example, with a creation of full maps of the sky with a temporal resolution of less than 1 day, it is possible to do a search for unknown comets, because the intensity of the scattered Lyman-alpha near the comet is higher in comparison with the rest of interstellar space.
- **Using the previous work of our colleagues from the laboratory of professor Yoshikawa was selected the appropriate configuration of the detector.** The

detector is one of the main parts of *"LYMUS"*. Probably, the 5-stage assembly of Microchannel Plate will be used in this device. This option for the detector was used in the work of Go Murakami and the detector consisted not just of the 5-stage assembly of MCP, but the 2-stage V-shape assembly and 3-stage Z-shape assembly. This configuration was chosen to reduce the influence of the abovementioned "noise".

Overall, during the trip, many things have been done, but there is still a lot of work. I hope I will continue my collaboration with my Japanese colleagues.