Design of a telephoto camera and development of a performance evaluation device for Martian Moon eXploration

*Hiroki Kato[1], Naoya Osada[1], Shingo Kameda[1]

1. Rikkyo University

Mars has two satellites, Phobos and Deimos, and there are currently two hypotheses for the origin of these satellites. The first of these hypotheses is that the moons are captured primitive asteroids, and the second is that they formed as a consequence of a giant impact event on Mars. The Japan Aerospace Exploration Agency (JAXA) is planning the Martian Moon eXploration (MMX) mission, which is a sample-return mission for Phobos to determine which hypothesis is correct and reveal the origins of these two satellites.

The telescope camera(TL)that will be installed in MMX has the purpose of measuring the geographical features of Phobos to locate a suitable landing site less influenced by space weathering. To achieve this goal, the angular resolution of the TL was designed to be 5.79 μrad [Osada, 2017].However, stray light was not considered in this optical design. For TL, observation with an S/N ratio greater than 30 is required, so we designed baffles to reduce stray light and to perform ray tracing to evaluate stray light. Internal reflection was also taken into consideration by setting the reflection properties of each optical element.

The performance of TL must be confirmed to be as designed after its manufacture. A collimated light is necessary in a ground experiment to obtain the point spread function. We succeeded to make a collimated light source with an angular width less than 11.6 μrad.

In this poster, we report the results of this research and the development of the performance evaluation device.

Keywords: Mars, Phobos, Optical design

