

Development and tests of Hayabusa-2 LIDAR

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The Japanese first asteroid mission, Hayabusa, visited at the small asteroid 25143 Itokawa in September, 2005. Images taken by Hayabusa are combined with other remote sensing observations and revealed that the asteroid as small as 500 m in the longest axis is the first rubble-pile body identified in our solar system. Despite of several serious failures of the spacecraft occurred during and after rendezvous, Hayabusa successfully retrieved samples from the surface of 25143 Itokawa to the Earth in 2010 to disclose unpredicted nature of a very small asteroid.

JAXA and collaborating scientists are now developing the second asteroid mission named "Hayabusa-2". Hayabusa-2 is based on a heritage of the first Hayabusa. At the same time, Hayabusa-2 is intended to improve engineering and scientific achievements of the first Hayabusa, and also to challenge new technologies. Furthermore, target asteroid is different from that of the first Hayabusa. The asteroid 25143 Itokawa is a silicate-rich S-type. On the other hand, Hayabusa-2 is visiting a C-type asteroid, (162173) 1999 JU3. Needless to say, C-type is more primitive than S-type, therefore is expected to be a key to understand chemical evolution of the early solar system.

LIDAR measures altitudes of the spacecraft from the surface of the asteroid by taking a time of flight of laser pulse. As a part of Attitude and Orbit Control System (AOCS), the LIDAR data are used for navigation of the spacecraft. The data are particularly important during touchdown operation. Besides, the LIDAR data are served for scientific analysis of the shape, mass, and surface properties of the asteroid in order to elucidate physical evolution of minor bodies such as impact fragmentation and coagulation. We also wish to expand outcomes of Itokawa exploration by examining uniformity and variation of porosity within rubble-pile body and detecting dusts levitating above the surface of asteroid. The remote sensing observations of Hayabusa-2 will be carried out from Home Position (HP), middle altitude, and low altitude whose distances from the asteroid surface are nominally 20 km, 5 km, and 1 km, respectively. We report recent progress of LIDAR development anticipating the launch in December 2014.

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