

Development of SELENE small sub-satellites: Rstar and Vstar for lunar gravity field observation

T. Iwata (1), H. Minamino (2), N. Namiki (3), H. Hanada, N. Kawano (4), and T. Takano (1)

(1) Institute of Space and Astronautical Science, JAXA, Sagami-hara, Japan, (2) Japan Aerospace Exploration Agency, Tsukuba, Japan, (3) Kyushu University, Fukuoka, Japan, (4) National Astronomical Observatory, Mizusawa, Japan (iwata.takahiro@jaxa.jp / Phone: +81-29-868-2527)

Two small sub-satellites: Relay Satellite (Rstar) and VLBI Radio Satellite (Vstar), which are separated from SELENE Main Orbiter, will execute four-way Doppler measurements and differential VLBI observation to make global mapping of the lunar gravity field. These sub-satellites are requested to be simply structured, light weighted, and optimized for the selenodesy mission. We have, therefore, adopted spin stabilization without thrusters to control orbits and attitudes, which yield precise measurements of orbit perturbed by lunar gravity field. We developed a low-mass type release mechanism which consists of two rings connected with 24 stretching bow springs. Characteristic of the mechanism have been confirmed by the ground tests and displayed on orbit using Micro-Lab Sat. We also develop four-way tracking system to track two fully moving links between lunar orbiters. The transponder to receive a signal from the lunar satellite and to send a signal to an earth station has been designed by the concept of a broadband receiver instead of a PLL receiver. By this concept, a troublesome and difficult operation of carrier acquisition can be omitted on the last link of the four-way tracking. Performances of the four-way signal acquiring process have been examined by the compatibility tests at the ground station, which shows the enough performances to track two moving links between the lunar orbits. Properties of the light weighted S-band patch antenna and S/X-band dipole antenna have also been adjusted by ground tests. The S/X-band dipole antenna should have a beam wide enough to cover an earth station despite of a large ambiguity of the satellite attitude.