

On-orbit Properties of SELENE Small Sub-satellites for Selenodesy; OKINA and OUNA

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SELENE Main Orbiter (KAGUYA) has successfully separated two small sub-satellites; (1) the Relay Satellite OKINA (Rstar), and (2) the VLBI Radio Satellite OUNA (Vstar). OKINA and OUNA were injected into the elliptical lunar orbit of 2,395-120 km in altitude on Oct. 9, 2007, and 792-129 km on Oct. 12, 2007, respectively. These sub-satellites have started to perform 4-way Doppler measurements using Relay Satellite Transponder (RSAT), multi-frequency phase-delay differential VLBI observation using VLBI Radio Sources (VRAD) for global and precise mapping of lunar the gravity field, and Radio Science observations (RS) for detecting lunar ionosphere.

Initial check out were executed and properties of satellite bus equipments, onboard mission instruments, and observation systems including ground stations were evaluated between October and November in 2007. Results can be summarized as follows, which has shown that OKINA and OUNA have enough performances to produce efficient scientific data for RSAT/VRAD/RS missions.

- Electric Power Subsystem: nickel metal hydride (Ni-MH) battery, highly efficient silicon solar array, and the Power Control Unit are confirmed to generate, charge, and distribute enough electric power.

- The Thermal Control Subsystem: the designed thermal models are suitable to maintain adequate thermal environment for onboard instruments.

- Separation Mechanism: separation attitude and spin rate were estimated from Doppler data, which are suitable to keep communication links by a vertical dipole antenna (S/X-ANT) and electric power supply by solar arrays.

- Communication functions of mission instruments: all the telemetries and commands are confirmed to perform normal operation. Receiving and transmitting power of all the radio frequency communications are evaluated to have proper link budgets as designed and experimented by ground compatibility tests.