

# **Lunar Global Topography by Laser Altimeter (LALT) on board SELENE**

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Japanese lunar orbiting mission SELENE (Selenological and Engineering Explorer) incorporates three selenodetic missions by RISE group (Researches In SElenodesy) in National Astronomical Observatory of Japan. The first is Laser Altimeter (LALT) which measures the distance between the main orbiter and the lunar surface for the lunar topography. Second is four-way range-rate measurement by using a sub-satellite (RSAT) and the last is differential VLBI measurement of the two sub-satellites which are equipped with radio sources of S and X bands (VRAD). SELENE is scheduled to be launched in summer 2007 and various tests has been carried out.

LALT incorporates Q-switched Nd:YAG laser system which transmits laser pulses per 1 second with 1064nm in wavelength, 17nsec time width, and 100mJ energy. Q-switch consists of LiNbO<sub>3</sub> Pockels cell. The output beam divergence is 0.4 mrad after passing through the 7.3cm Galileo refractor. Beam spot size on lunar surface is typically 40m when main orbiter altitude is 100km. Range accuracy between SELENE orbiter and the lunar surface is  $\pm 5$ m. The range data are transformed to the topography of the moon with the aid of position and attitude data of the SELENE orbiter. The foot print spacing will be 1.6 km in the equatorial region after 1 yr mission period. In the pole regions the distance of ranged position on the moon will be less than 300m and the mean distance will be 100m.

Mission objectives of LALT are summarized as making a low degree model of lunar figure and construction of lunar global topographic map with the accuracy that has never been so far. New topography of the moon will contribute the following scientific topics: [1] determination of the lunar global figure, [2] internal structure and surface processes, and [3] exploration of the lunar pole regions especially for permanent shadow or illuminated zones.

The manufacture of flight model of LALT (LALT-FM) was finished in March 2003. LALT-FM joined the SELENE system integration test by March 2004 for checking mechanical and electrical interfaces with SELENE main orbiter as well as functional performance of LALT itself. PFM (Proto-Flight Model) integration test (PFT 1<sup>st</sup> half) was carried out successfully from May 2005 to Oct. 2005. After the final vibration and thermal vacuum test in unit, LALT is now in the middle of PFT 2<sup>nd</sup> half or final environmental integration test scheduled from May 2006 to January 2007.