

Electromagnetic compatibility (EMC) performance of Lunar Radar Sounder (LRS) on board the SELENE spacecraft

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The main purpose of the Lunar Radar Sounder Experiment (LRS) onboard the SELENE (SELenological and ENgineering Explorer) spacecraft is to obtain shapes of surface and subsurface structures of the Moon by using an FMCW (Frequency Modulated Continuous Wave) radar technique in HF frequency range from 4 to 6 MHz. In addition to the radar experiment, LRS provide the spectrum of plasma waves and solar and planetary radio waves in wide frequency range covering from 10Hz to 30MHz. The echo signals and planetary radio waves are detected by two sets of dipole antenna with a tip-to-tip length of 30 m, and fed into pre-amplifier units. The receiver system of LRS is, however, very sensitive not only to signals but also to noises. The electromagnetic noises radiated from other components onboard the SELENE can be detected by the LRS antenna system. The potential difference between the SELENE body panels, which is produced by the unbalanced cable currents between components on the panels, can be noises for the LRS pre-amplifier units. Based on Ono et al. [2000], pre-amplifier input level of the sounder echo signal from a subsurface structure 6 km below the surface is estimated to be 0.3 uV, assuming transmitting power of 800 W, spacecraft height of 100 km, and loss tangent value $\tan \delta$ of 0.06. The input level of Jovian hectometric (HOM) radiation is estimated to be up to 3 uV, which corresponds to a power flux of -185 dBW/m²Hz at 1AU, as reported by Zarka [1998]. In order to avoid the interference noises, all components on board the SELENE spacecraft are under strict electromagnetic compatibility (EMC) regulations. It is also needed that internal noises caused inside the LRS receiver are sufficiently suppressed. The final performance of the LRS receiver will be precisely checked through the LRS component test until March, 2005. The total EMC performance of the whole SELENE spacecraft system will be examined via System EMC Test, which is planned in June, 2005.