Magnetic cleanliness program under control of electromagnetic compatibility for the SELENE (KAGUYA) spacecraft

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To achieve the scientific objectives of the KAGUYA mission, it was important to suppress the artificial noises which interfere with the observations. In fact, the control of electromagnetic compatibility (EMC), which was to be applied to all the components and subsystems of the KAGUYA spacecraft, was recognized as one of the critical issued from the beginning of the SELENE project. Hence the EMC working group (EMC-WG) was established in the project to investigate and solve problems related to all aspects of EMC.

Aiming at minimizing electromagnetic interference between onboard components, the EMC-WG conducted various EMC control procedures, such as EMC tests for respective parts, devices, components and subsystems, their redesign by feedback based on the EMC tests, and the system EMC test. It was necessary to exchange information on EMC control of all the components and subsystems early in the project. This could enable us to coordinate their efficient development under the strict EMC requirements through systematic EMC evaluation and realistic improvements in the EMC performance.

The magnetic cleanliness program was defined as one of the EMC control procedures, and magnetic tests were carried out for most of engineering and flight models. The EMC performance of all components was systematically controlled and examined through a series of EMC tests. To suppress a magnetic field which could not meet the EMC requirements, we employed three kinds of feats; that is, (a) permanent magnets to cancel the incompatible magnetic fields, (b) magnetically shielding boxes made from a high-permeability alloy to confine the incompatible magnetic field in them, and (c) additional current loops to cancel the incompatible magnetic field due to the electric currents. As a result, the KAGUYA spacecraft was made to be magnetically very clean. Hence reliable scientific data related to the magnetic field around the Moon were obtained by the LMAG (Lunar Magnetometer) and the PACE (Plasma energy Angle and Composition Experiment) onboard the KAGUYA spacecraft. There data will be opened to public for scientific use since November 2009.