

Germanium gamma-ray spectrometer onboard the lunar polar mission SELENE

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The first germanium-based gamma-ray spectrometer is going to be flown to the moon by Japanese SELENE mission in 2007. The SELENE Gamma-Ray Spectrometer employs a high-purity germanium crystal as a main detector, and BGO and plastic scintillators as anti-coincidence detectors. It will survey chemical composition of the entire lunar surface at 100 km in altitude for one year with much higher sensitivity than any previous gamma-ray observations including that by Lunar Prospector. The essential elements such as O, Mg, Al, Si, Ca, Ti, Fe, K, Th, U, and possibly H will be measured. The information on chemical composition will contribute to establish a model on the origin and evolution of the moon. The germanium crystal is cooled down to ~90 K by a Stirling cooler during observation. The mechanical noise is efficiently reduced by employing dual-opposed pistons, flexible thermal link, and rigid support on the spacecraft. The flight model of SELENE Gamma-Ray Spectrometer has successfully achieved an energy resolution of 3 keV FWHM at 1.33 MeV in a preflight test. The performance of the spectrometer and its capability of identifying line gamma rays and reducing background gamma rays are presented, along with the expected observation and its results.