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Preliminary observations of gamma ray emissions from the Moon surface by the Gamma-Ray Spectrometer on SELENE (KAGUYA)

C. d'Uston1, N. Hasebe2, and the Kaguya-GRS team

1 Centre d'Etude Spatiale des Rayonnements, CNRS, Toulouse France

2 Research Institute for Science and Engineering, Waseda University, Tokyo, Japan

(lionel.duston@cesr.fr, Phone : +33 5 61 55 66 72)

The Japanese lunar polar orbiter SELENE (KAGUYA), launched on Sep. 14, 2007[1] carries a gamma ray spectrometer (GRS) which consists of a large volume germanium semiconductor detector of 252cc as the main detector and of bismuth-germanate and plastic scintillators as an active shielding [2]. The gamma rays measured at or near a planet have often been used to determine elemental abundances in the top few tens of centimeters of the planet's surface [3]. With its excellent energy resolution and high sensitivity, this instrument is intended to provide the elemental abundances in the subsurface of the entire Moon. Maps of major elements, O, Mg, Al, Si, Ti, Ca, Fe, of natural radioactive elements, K, Th, and U, and possibly of H will enable to study lunar geoscience problems concerning the crust, and mantle composition [4], and also the history of heat of the Moon, the volcanism and the debated volatile reservoirs in the polar regions [5].

SELENE was inserted in lunar orbit on Oct. 4, 2007. After injection into circular orbit at 100 km altitude of approximately two hours periodicity, the GRS as well as the other onboard scientific instruments passed through a health check and a function check; during these tests, lunar gamma ray spectra were accumulated over about 74 hours of real measurements, and demonstrated that the GRS was working nominally [6]. These data were then used to exercise the tools built to evaluate the various spectral lines of

interest. The spectra include not only gamma rays from the lunar surface materials but also parasitic gamma rays produced locally within the sensor head itself as well as in the materials of the spacecraft body. With the individual spectra from different lunar regions, evaluation of these instrumental backgrounds will be possible because Fe and Th contents are known to be small in the highlands but Ca and the Al, in contrast, are relatively low in the maria.

The GRS was shifted to its regular observation on Dec. 21, 2007. As of preparing this abstract, only few observation data are available and low level data processing has just started. As the data processing is progressing, differences in gamma-ray spectra among lunar regions will show up. Long integrations of gamma ray measurements will eventually allow a precise evaluation of the composition in the various characteristic terrains of the Moon.

This presentation reports on the current status of the GRS operation and describes early observation data.

[1] http://www.selene.jaxa.jp/en/index.htm. [2] Hasebe, N., et al. (2008) *Earth, Planets and Space*, in press. [3] Reedy R.C. et al. (1973) *JGR, 78*, 5847-5866. [4] Gasnault O. et al. (2008) *LPSC XXXIX* Abstract #2111. [5] Kobayashi M.N., (2000) *ICEUM-4 Proc., ESA SP-462*. [6] Kobayashi M.N., et al. (2008) *LPSC XXXIX* Abstract #nnnn.