Development of HP-Ge Gamma-ray Spectrometer Cooled by Stirling Refrigerator on Japanese Lunar Polar Orbiter SELENE

N. Hasebe[1], T. Doke[1], J. Kikuchi[1], M. N. Kobayashi[1], O. Okudaira[1], A. Oka[1], Y. Ohira[1], E. Shibamura[2], T. Kashiwagi[3], T. Takashima[4], K. Narasaki[5], K. Tsurumi[5], K. Mori[6], C. d'Uston[7], H. Barthe[7], S. Maurice[8] and R.C. Reedy[9]

1. Advanced Research Institute for Science and Engineering, Waseda Univ.
3-4-1. Okubo, Shinjuku, Tokyo 169-8555 Japan
2. Saitama Prefectural Univ., College of Health Science, Saitama Japan
3. Faculty of Engineering, Kanagawa Univ., Kanagawa-ku, Yakohama Japan
4. Department of Physics, Nagoya Univ., Chikusa-ku, Nagoya Japan
5. Niihama Works, Sumitomo Heavy Industries Ltd, Niihama, Ehime, Japan
6. Clear Pulse Ltd, Ohta-ku, Tokyo Japan
7. Centre d'Etude Spatiale des Rayonnements, CNRS/UPS, Colonel Roche, B.P. 4346, France
8. Observatoire Midi-Pyrenee, Toulouse, France
9. Los Alamos National Laboratory, Los Alamos, New Mexico, 87545, USA

The development of Gamma-Ray Spectrometer (GRS) onboard SELENE is reviewed. The GRS consists of a high purity Ge detector as a main detector and a BGO scintillator as an active shielding detector. The 250 cc Ge-detector is cooled by a Stirling refrigerator down to 80-90K. The GRS will provide the global mapping for major elements of O, Mg, AL, Si, Ti, Fe, etc. and natural radioactive elements of K, Th and U with a high precision. Precise measurements will greatly improve our understanding of the origin and the evolution of the lunar crust. The GRS has such an excellent energy resolution that it would identify prompt gamma-ray line from hydrogen. If there exists water ice in the lunar Polar Regions, the GRS will detect a hydrogen peak between two significant peaks of Si and Al lines. The characteristics of the GRS and the present results for various environment tests are reported.