Validation of High-energy electron detector simulator for the HEP instruments onboard Arase

Takefumi Mitani[1]; Inchun Park[2]; Tomoaki Hori[3]; Taku Namekawa[4]; Kazushi Asamura[1]; Takeshi Takashima[5]; Satoshi Kasahara[6]; Satoshi Kurita[3]; Mariko Teramoto[7]; Nana Higashio[8]; Yoshizumi Miyoshi[3]; Iku Shinohara[9]
[1] ISAS/JAXA; [2] ISEE,Nagoya univ.; [3] ISEE, Nagoya Univ.; [4] Earth and Planetary Science, Tokyo Univ.; [5] ISAS, JAXA; [6] The University of Tokyo; [7] Kyutech; [8] JAXA; [9] ISAS/JAXA

The high-energy electron experiments (HEP) onboard the Arase satellite detects 70 keV-2 MeV electrons and generates a three-dimensional velocity distribution for these electrons in every period of the satellite's rotation. Electrons are detected by two instruments, namely, HEP-L and HEP-H, which differ in their geometric factor (G-factor) and range of energies they detect. HEP-L detects 70 keV - 1 MeV electrons and its G-factor is 9.3 x 10^{-4} cm^2 sr at maximum, while HEP-H observes 0.7 MeV - 2 MeV electrons and its G-factor is 9.3 x 10^{-3} cm^2 sr at maximum. The instruments utilize silicon strip detectors and application-specific integrated circuits to readout the incident charge signal from each strip.

In order to deduce the distribution of incident electrons from the direction and energy detections in orbit, we have developed a detector simulator using the Geant4 toolkit. Especially contamination due to high energy particles must be considered quantitatively. We have also been working on electron irradiation experiments using HEP detector modules which are almost the same as the flight model in order to compare detailed simulations and experimental data.

We will present a comparison between results from the electron irradiation experiments and those from the detector simulator. And we will discuss its influence on the interpretation of the observational data obtained in orbit.