

Tests of avalanche-photo diodes to develop a space-borne electron environment monitor for spacecraft charging

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Spacecraft charging is one of the most crucial matters for safe operation of spacecraft in orbit. If potential difference occurs on a surface of spacecraft due to electric charging, a discharge may happen and result in serious damage of the spacecraft. In October 2003, Japanese Earth-observing satellite ADEOS-II (also known as Midori-II) suddenly lost its electric power, and finally satellite operation was shut down. It is thought to be due to electric discharging between wires in the harness which provides electric power from the solar cells to the spacecraft bus system. Spacecraft charging takes place by dense thermal electrons hitting a spacecraft. It is, therefore, important to measure ambient electron environments which control surface potentials on spacecraft. For developing a space-borne electron monitor system, we have started tests of avalanche-photo diodes (APDs) for detecting keV-range electrons. APDs have advantages compared to conventionally-used micro-channel plates (MCPs), in terms of (1) high and stable detection efficiency, (2) small size and light weight, and (3) relatively low-voltage operation. Preliminary results of the tests show good performance of APDs. In the presentation, we will show results of APD tests and discuss possibilities for an electron monitor system.