Development of a Low-Energy Electron Instrument for Monitoring Spacecraft Charging

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Electric charging on surfaces of a spacecraft body is caused by ambient low-energy dense electrons in space, and may damage components or systems of the spacecraft by discharging accumulated charges. To achieve technology against electric discharging, it is obvious that measuring such low-energy electrons is essential for understanding real space electron environments. We are developing a space-borne instrument of low-energy electrons for monitoring in-situ electron environments. Electrons with energies from a few keV up to several tens keV are thought to contribute to surface charging, and are the target of the instrument. Considering three-axis-stabilized satellites, a wide field of view of the instrument with enough angular resolutions is needed to measure non-thermal electron distributions like aurora electrons. Blocking UV photons is also crucial because particle detectors such as MCP (multi-channel plate) or APD (avalanche photo-diode) are sensitive to photons. Three concept designs of the instrument are now being studied: (1) using permanent magnets, (2) using an electrostatic analyzer, and (3) using a photon-blocking foil. In the presentation, we will show a concept of the instrument and results of initial studies.