

Solar cell degradation monitored by Korean STSAT-1

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Abstract: High energy charged particles are trapped by geomagnetic field in the region named Van Allen Belt. These particles can move to low altitude along magnetic field and threaten even low altitude spacecraft. Space Radiation can cause equipment failures and on occasions can even destroy operations of satellites in orbit. Sun sensors aboard Science and Technology Satellite (STSAT-1) were designed to determine the direction of the sun with silicon solar cells which performance had been degraded during satellite operation. In this study, we try to identify what energy particles most effectively contribute to the solar cell degradation with ground based radiation facilities. In our experiment, we measured the short circuit current after bombarding the solar cells same as used in STSAT-1 sun sensors with electrons and protons. In addition, we estimated particle flux on the STSAT-1 orbit with particle data measured by polar orbiting NOAA POES satellites. Our result clearly shows STSAT-1 solar cell degradation was caused by energetic protons which energy is about 700 keV to 1.5 MeV. This result can be applied to model solar cell conditions of other satellites, which might be used to estimate spacecraft life time and design robust spacecraft.

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