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Redundant Flight Computer Architecture for CREAM-III

Abstract content

Cosmic Ray Energetics And Mass (CREAM) is a balloon-borne experiment flown on long duration balloons (LDB) in Antarctica to measure the energy spectra and composition of cosmic rays. The CREAM Science Flight Computer (SFC) system collects physics, calibration, pedestal and housekeeping event data from various instruments and transfers them to NASA/WFF's Command and Data Module (CDM) for transmission to the ground. The SFC also transfers commands arriving from the ground through the CDM to the instrument command system. Telemetry is sent in flight via the Telemetry and Data Relay Satellite System (TDRSS) to White Sands and ultimately to a Science Operations Center (SOC) at the University of Maryland. The probability of Single Event Upsets (SEUs) due to ionizing radiation is much greater at an altitude of 37.5 km – 40.5 km than at sea level, especially above Antarctica where the geomagnetic cutoff energy is much lower than at equatorial latitudes. With flight durations of many weeks, the vulnerability of a simplex SFC to SEUs can be significant, and could lead to loss of instrument functionality. To improve SFC reliability for the 2007/2008 CREAM Antarctic campaign, we utilize a redundant flight computer architecture with a standby replacement policy to maximize data acquisition system availability and allowing the mission to continue even in case of permanent or transient faults due to SEUs. The design, implementation and reliability of the CREAM redundant SFC system are presented in this paper.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

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