

SPACE POWER SYMPOSIUM (C3)
Small and Very Small Advanced Space Power Systems (4)

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QUALIFICATION TESTS AND PERFORMANCE VALIDATION OF POWER SYSTEM FOR SMALL
SATELLITES

Abstract

This paper introduces a fully analog power system of “Swayam” satellite and mainly focuses on the performance testing of the power system of the satellite. The system described and developed, realizes a low cost and optimized power system stressing on maximum energy utilization, while considering the environmental parameters prevalent at Low-Earth Orbits (LEO). The rigorous and appropriate testing is very important because the satellite undergoes very harsh conditions. This paper describes the benchmark tests to be done on the COTS components for space applications. Calibrated measuring devices and precise test equipment were used for testing so as to obtain accurate results. Compliance of current, voltage and rise times specifications of all loads in accordance with designed power system have been validated. DC-DC converter, which is the critical module of the system, has been exposed to various standard electrical tests to get optimum output and maximum efficiency under dynamic load conditions. The solar side converter has been tested rigorously with solar panel simulator. The PCB design which accounts for system engineering factors like size constraints, efficiency and reliability has been tested and validated to provide a magnetically clean environment for any sensitive payloads of the satellite. The sensors are characterized and its variation over a temperature range has been determined. The load protection circuits are tested by emulating faults in a single module as well as multiples modules. A special arrangement is made so that the antenna deployment can be tested number of times without disassembling the satellite. The battery has been tested and characterized for its capacity, internal resistance, self-discharge rate and outgassing. The entire integrated system is tested for 160 hour in continuum, with the provision of logging and display of all the important parameters of the circuit. The entire integrated system has sustained the thermovac test. The results obtained meet the mission and design requirements.