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

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DESIGN & ANALYSIS OF UPESSAT ELECTRIC POWER SYSTEM

Abstract

UPESSAT is the flagship CubeSat project currently under development by the students of the University of Petroleum and Energy Studies, India. In this paper, the design and simulation results of the Electrical Power System (EPS) are presented. The subsystem has been designed and simulated keeping in mind the constraints of the CubeSat standard and providing it with an efficient mechanism of managing the power resources available for the in-flight operations of the nanosatellite. A power budget of electronic components has been produced to estimate the power consumption of electronics in standby and when active. The power consumption for periods where attitude control, communication and capturing images was necessary is then calculated to estimate the likely power requirements throughout an orbit. The required power usage is then used to select solar cells that would produce the necessary power. The efficiency of the solar cells as well as the secondary batteries has been analyzed and presented here in the form of Harmonic analysis, calculation of total harmonic distortion (THD) and load flow. A Maximum Power Point Tracking (MPPT) System has also been implemented and modeled in this paper to increase the efficiency of the recharging capability of the secondary batteries through the power generated by the solar panels. The MPPT system has been analyzed and recommendations are also presented in improving the system for greater gains in power conversion and conservation for the on-board systems. The subsystem has been developed and modeled to simulate system-level performance. This paper highlights the resourcefulness of the Electrical Power System (EPS) and discusses the various measures adopted in providing successful usage of the subsystem for the UPESSAT.