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DESIGN AND SIMULATION OF ELECTRICAL POWER SYSTEM FOR 6U SPECTRAL IMAGING CUBE SATELLITE

Abstract

This paper discusses the hardware design, testing and simulation of the Electrical Power System (EPS) of the Space Environment experiment (SPNeX), a 6U CubeSat. The 6U satellite features a high spectral camera system as its primary payload, a fluxgate magnetometer and a charged particle detector as its secondary payload. In order to provide the power requirements, an efficient deployable solar panel system is chosen along with a lithium polymer (LiPo) battery back as a secondary storage unit. The Maximum power point tracking (MPPT) algorithm is tested using MATLAB/SIMULINK and also by a solar array simulator with the proposed converter. The proposed LiPo battery back is tested in a thermal vacuum chamber (TVC) while being charged and discharged by an external battery management system to monitor its state of charge and depth of discharge estimations. All the subsystem design is based on Commercial off the Shelf (COTS) Components, selected based on low power consumption with small dimensions and lesser weight. MATLAB/SIMULINK is used to evaluate the performance of the proposed system and the used MPPT method.