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**HARDWARE AND SOFTWARE DESIGN FOR THE TSC-1 PAYLOAD FLAT-SAT PLATFORM:
HYPERSPECTRAL IMAGING AND SPACE PARTICLE WEATHER DETECTION**

Abstract

The TSC-1 project, a pioneering scientific endeavor by Thailand, focuses on hyperspectral imaging and the detection of space particle weather. Currently in development phase, the project involves comprehensive validation and testing to ensure the satellite's functionalities meet the requisite standards. A crucial component of this phase is the development of a dedicated flat-sat platform. Specifically, the TSC-1 payload flat-sat incorporates a CMV4000 image sensor coupled with a Xilinx Zynq MPSoC electronic circuit board for hyperspectral imaging, and an LTC2265 Analog-to-Digital converter for space weather readout procedures. To store and transmit scientific data, the data handling unit built with NAND memory and the X-band transmitter from EnduroSat is attached. Additionally, the in-payload communication software, designed for transmitting commands and data to the ground via the data handling unit, is a key focus of software testing. Both hardware and software are built as a platform which enabling the design reusable. This platform is specifically designed to facilitate efficient testing and rapid debugging of the satellite's core functionalities. By enabling seamless electrical connections among the TSC-1 payload components and ensuring accessibility to key interfaces for bus system connectivity and testing apparatus, the flat-sat platform significantly enhances the testing process. This paper demonstrates the design and elaborate of payload flat-sat, the capability of data transferring by utilizing the robust protocol, the power consumption and also specified the mission planning based on the experiment results to ensure the maximum advantage of the satellite.