SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Small Satellites Potential for Future Integrated Applications and Services (4)

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STATUS OF VNIR HYPERSPECTRAL SENSOR HSC-III DEVELOPMENT: OPTICAL AND DATA ACQUISITION SUB-SYSTEM

Abstract

This paper describes the hyperspectral sensor for small satellites that have missions for the earth observation. Hyperspectral remote sensing has capabilities for observed applications such as agriculture, environment and geology. The Space-Science Industries Program has a goal which is building new businesses with small satellites and hyperspectral technology. Our first airborne remote sensing experiment was executed in 2005 using by a laboratory model of HSC1.5. At the beginning of 2008, the program started to develop the spaceborne hyperspectral sensor named by HSC-III. The key requirements of the optical instrument call for GSD (Ground Sampling Distance) of 30 m, a spectral range of 400-1000 nm containing 61 bands of 10 nm resolution, SNR of > 300, and an instrument mass of < 10 kg. The imaging method employs push-bloom technique. The overall objectives are to demonstrate the technology in orbit and to commercially service the hyperspectral images such as agricultural monitoring. HSC-III mainly consists of a telescope, an imaging spectrometer, mission data handling unit (MDHU), and on-board calibration equipment. The telescope has a pupil diameter of 0.15 m, and has two mirror configuration of Ritchey-Chretien type. The spectrometer has the transmitting grating with the slit and relay-lens unit, and array sensor using back-illuminated CMOS image sensor. The entrance light from a slit is dispersed by the grating onto an array sensor. The slit is 50 mm long by 15m wide. A spectrometer based transmitting grating features design flexibility and miniaturization for the instrument. The equipped transmitting grating has 75 lines/mm grating frequency and the grating made of BK7 glass. MDHU includes a Field Programmable Gate Array (FPGA) based on-board computer and Solid State Drive (SSD) as a high-capacity memory. HSC-III is characterized by Space Wire that is worldwide used on many spacecrafts by space agency such as ESA, NASA and JAXA. The hyperspectral images are provided in BIL (Band Interleaved by Line) format by MDHS and the system manages sensing timing by RTC (Real-time clock) device. The communication interface between array sensor and MDHS employs the Camera Link standard up to 154 MByte/s. The imageries are saved in SSD up to 32Gbytes by the Camera Link standard. It is scheduled that HSC-III Proto-Flight Model is completed at the end of FY2010.