

SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Design and Technology for Small Satellites - Part 1 (6A)

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ADVANCED FOCAL PLANE ASSEMBLY FOR SMALL SATELLITES

Abstract

The high-resolution imaging of Earth has been a domain of conventional big satellite. With the advent of new technologies and the miniaturization of equipment, more small satellites are being developed for high-resolution imaging applications and some of them are already operational in space. Because of limited volume and mass available onboard however, high-resolution small satellites have performance limitations such as the modulation transfer function and the signal-to-noise ratio (SNR) compared with big satellites. In order to increase the integration time and thus SNR, imaging schemes such as the forward motion compensation has been used. However, such an imaging scheme imposes operational limitations. An alternative way is to use time-delay-integration (TDI) sensors for longer signal integration. TDI sensors have been widely used for big high-resolution satellite. A new focal plane assembly (FPA) is under development for high-resolution small satellites. This FPA includes detectors that have five TDI sensors on a single substrate to produce image data in one panchromatic and four multi-spectral bands. The proximity electronics needed for the operation of these sensors is also included close to them for high-speed operation. As the sensor operational speed increases for high-resolution imaging, more heat is generated by an FPA. In order to dissipate the heat more effectively, a ceramic structure is used as the base material for this FPA and its temperature is controlled with a thermal buffer and a radiator. With TDI sensors, the orbit altitude variation can cause a significant degradation of image quality. This FPA has the programmable line-rate function to cope with the altitude variation during operation. The image data is digitized within this FPA without any additional electronics module and can be directly transmitted to a solid-state recorder. This paper presents the main features of this new advanced FPA along with its development status.