Paper ID: 31978
oral

23rd IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Earth Observation Missions (4)

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DESIGN AND TESTING OF A DUAL-CAMERA PAYLOAD FOR ESEO

Abstract

Since 2012, European Space Agency (ESA), SITAEL and ten European universities have been developing the European Student Earth Orbiter (ESEO). The satellite bus is being designed, built and tested by SITAEL, whereas the payload modules are being developed by various universities throughout Europe. ESEO is a microsatellite to measure the radiation environment in Low Earth Orbit (LEO), test new technologies in space as well as take photos of Earth and other celestial bodies. The aim of the ESEO optical payload is to produce color images in the visible spectrum, mainly for public outreach purposes. Although, in addition to public outreach, the payload can also be used to monitor plankton blooms or changes in the polar ice caps.

This paper presents the design, development and pre-launch testing of a lightweight and power-efficient dual-camera system for ESEO. The two-camera solution enables imaging of the same target with a different field of view. The wide angle camera provides context for telescopic images, making it easier to pinpoint the area that was photographed. The primary camera of the payload is a wide-angle camera based on the ESTCube-1 design with a 4.4 mm telecentric lens, VGA CMOS color sensor and a 700 nm IR cut-off filter. With a field of view of $46° \times 35°$, the ground resolution of the primary camera is around 1 km per pixel. The secondary camera is telescopic, has a Zeiss C Sonnar T* 1.5/50 lens, a 2592×1944 pixel CMOS color sensor and a Schott BG40 filter. With a field of view of $6.63° \times 5°$, the ground resolution of the secondary camera is about 20 m per pixel. The payload features configurable internal image processing, progressive image compression and non-volatile storage. The resulting payload weighs about 800 g, on average consumes less than 560 mW of power, with peaks up to 1.5 W. The payload is currently being tested and will be launched on ESEO at the end of 2016.