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LEVIS – A HDTV VIDEO IMAGING SYSTEM FOR LUNAR EXPLORER MISSIONS

Abstract

In this paper we introduce the design of a high definition digital video camera system called LEVIS (Lunar Explorer Video Imager System). The main goal of LEVIS is to improve mission public outreach significantly by taking (live) videos of interesting mission scenarios in high quality (HDTV). The usefulness of television or high quality images was demonstarted by APOLLO missions but also by instruments like the HRSC on the Mars Express mission. On the Japanese Kaguya S/C a HDTV camera was implemented for the first time. But this instrument needed high budget allocation of mass and power. With the current available technologies LEVIS can be implemented with lower mass and power consumption but significantly higher performance and quality compared to the Kaguya camera.

LEVIS is dedicated as a payload/mission support instrument. Its imaging sequences and capabilities shall not interfere with the scientific instrument set of an explorer mission, but can support them. LEVIS can be used to create videos or to monitor, respectively: • Earth and moon view during cruise phase • Descend and landing • Rover and robotics operation • Landing site and surrounding area. Depending on available telemetry bandwidth videos can be sent live or can be recorded internally for later transmission. If real time commanding is available for the mission, even live operation is possible.

The LEVIS-Camera design is based on active pixel sensors (e.g. 5 MPixel) with Bayer pattern for colour recording. It supports several video formats and frame rates in which the 1080p format is the most common used.

Optics with three different focal lengths, each combined with its own sensor, is foreseen to cover a wide area of viewings. The video data stream is compressed in MPEG4-AVC (H264) format and is internally stored or directly sent to S/C for transmission. A 64 Gbyte non-volatile NAND-flash memory is capable to store approximately 3 hours of uncompressed full HD video.

Due to its two axis mounting LEVIS can view in any direction and panoramic views can be shot as far as unconstrained view is possible by the accommodation. Its motor drive is capable to move the camera head with 6 per second, so it can follow moving objects, e.g. separation of sub-satellites.

With its low mass of 2.5 kg, its moderate power consumption of 14 W and an envelope of 240 x 240 x 320 mm3 this instrument can be easily accommodated to different mission scenarios.