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AOBA VELOX-IV CAMERA SYSTEM DESIGN FOR LUNAR HORIZON GLOW IMAGING IN A FUTURE LUNAR MISSION

Abstract

The lunar horizon glow (LHG) was first spotted in 1966 and 1968 by onboard cameras on Surveyor spacecraft after the sunset from the western horizon, and Apollo astronauts reported that they had seen the horizon glow. Surveyor missions observed lunar horizon in different distances, angles and time periods (from 0.5 to 2.5 hours after local sunset). Even though the horizon glow was highly visible in the Apollo 15 sunset, Apollo 16 showed no traces of the horizon glow. Therefore, it is highly varying phenomenon. Aoba VELOX-IV is a technology demonstration 2U CubeSat platform for LHG imaging in a future lunar mission. Nanyang Technological University (NTU Singapore) is collaborating with Kyushu Institute of Technology (Kyutech), to build Aoba VELOX-IV, which will be launched by Japan's national agency, the Japan Aerospace Exploration Agency (JAXA) in 2018. In this paper, the requirements of the LHG imaging system will be presented as well as hardware design, operation modes, sensitivity, power consumption and software. The camera options are limited due to power, volume and mass constraints. In addition, communication constraints for a lunar mission limit these options further. The horizon must be observed from the night side due to the physical mechanism of the LHG, and the visible light range must be selected as focus in order to provide evidence for Apollo observations. Also, this operation may require horizon detection to have a right perspective to capture the forward scattered light of the LHG, which is directly related to attitude determination and control subsystem. AOCS will rotate the camera to observe the horizon during the local sunset or sunrise.