

Pre-launch calibration and the first image data of the optical navigation camera of Hayabusa 2

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Introduction: The optical navigation camera (ONC) system of Hayabusa 2 consists of three CCD cameras (T, W1, and W2). By taking images of both the mission target asteroid 1999JU3 and the star field, it navigates both the spacecraft and its scientific observations. Because of its high spatial resolutions and global coverage, it is expected to provide geologic context to other science instruments on Hayabusa 2.

As a part of optical calibration for the cameras, we conducted end-to-end tests to observe objects similar to the actual observation targets under conditions close to the actual flight situations are very effective.

ONC-T: Because the 0.7 μm absorption band is one of the most important observation targets of ONC-T multi-band imaging, we examined whether the actual ONC-T flight model can detect 0.7 μm absorption band of carbonaceous chondrites samples. The experimental results indicate that all the multi-band images of the former five CM samples clearly indicate the presence of 0.7 μm absorption and that that for Jbilet Winselwan, which is a CM chondrite with no 0.7 μm absorption, indicates the absence of the absorption. This result unambiguously shows that ONC-T can detect the 0.7 μm band if its strength is about 3%.

ONC-W1: The experimental results indicate that large and bright CAI's in CV meteorites are discernible. Although individual chondrule fragments in CM meteorites are too small to resolve with W1 even at proximity, the gradual brightness undulation due to the inhomogeneous distribution of chondrule fragments are discernible in W1 images. Because spatial inhomogeneity in CM chondrites are may be due to impact brecciation on their parent body, observation of such brightness distribution might be useful for understanding the mechanical history of the asteroid surface.

First Light of ONC: Soon after the launch, an image of the Moon was obtained with the W2 camera at ~50-deg of solar phase angle. This became the first light of ONC system. A preliminary analysis based on the brightness recorded in the image and pre-flight calibrations indicates that the apparent reflectance of the Moon is about 7%. The data by the Multi-band Imager (MI) onboard KAGUYA indicate that typical visible range (415 ? 1000 nm) reflectance for lunar highlands are 4.5 ? 10.7 % for 50-deg of solar phase angle. This agreement between W2 and MI suggests that the W2 camera has been calibrated properly and is functioning properly.

Keywords: asteroid, planetary exploration, Hayabusa 2 mission, Multi-band imaging