

## Optical performance verification of DCAM3-D/Hayabusa 2

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Small Carry-on Impactor (SCI) is one of the instruments carried on Hayabusa-2 space craft. It will be used for an active exploration on the surface of asteroid 1999JU3. The SCI consists of a disk impactor made of copper. This disk will be accelerated to a velocity of ~2km/s for the collision onto the asteroid surface, creating an artificial crater on 1999JU3. Then, samples in the crater and/or around the crater will be recovered by the Hayabusa-2 mother ship. Observation of the crater is expected to reveal the surface structure of 1999JU3. This SCI impact also has an aspect of an "impact experiment" on an asteroid that elucidates the impact phenomena on small bodies.

A miniaturized optical camera unit (DCAM3) is being developed for observations of the SCI impact. DCAM3 will be detached from Hayabusa-2 mother ship and obtain a close-up image of the SCI impact. The detached part of DCAM3 has two cameras; one is an analog camera (DCAM3-A) and the other is a digital camera (DCAM3-D). The purposes of DCAM3-D are (1) the detection of SCI explosion and impact on the asteroid and (2) the observation of ejecta created by the SCI impact.

DCAM3-D optical system has to satisfy strict required specifications to fulfill these purposes: it requires a large view angle (74 deg) to detect both the SCI and the asteroid, high imaging capability for whole sensor area, a bright optical system ( $F > 1.7$ ) to detect dark SCI and ejecta, resistance to radiation, and limited size and weight. Moreover, these conditions have to be accomplished without active temperature control.

In this presentation we report the results of the optical performance verification of a flight model of DCAM3-D. The optical performance verification tests consist of electrical test, collimator test, and integration sphere test. The electrical test evaluated the performance of the CMOS sensor. In the collimator test, lens-sensor distance and lens-sensor angle were adjusted. Then, imaging capability (i.e., ensquared energy), spatial resolution, and distortion were evaluated under vacuum condition (<1 torr) with various temperatures, wavelength regions, and angles of view. In the integration sphere test, sensitivity, limb darkening, and stray light were evaluated. We confirmed that the results of these evaluations were favorable and that the strict required specifications of the optical system are almost satisfied.

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