

Development of a camera using DMD as an occulting mask for observations of faint emission around planets

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We have developed a camera using an innovative occulting mask for the observation of planets. When we observe faint emission close to a bright source like a planet, stray light due to scattering in the telescope deteriorates the S/N ratio of the faint object. In order to prevent such effect, a dense filter is usually put to occult a bright source. When we make observation of the Io plasma torus (IPT), a filter is put to occult the Io disk. However, the Io disk still disturbs observation of IPT, especially in a region close to Io, since Io moves relative to Jupiter during observation. Therefore, a mask that can be variable in its position and also in its shape in the FOV is strongly desired.

In order to realize this requirement, we have developed a camera using an occulting mask that employed DMD (Digital Micromirror Device). DMD is a device which can select the light incident on it dynamically by flipping tiny mirrors (Flipping angle is +/- 12 degree relative to the array surface). The size of each mirrors is 13um x 13um, and they are arranged in an array of 1024 x 768. Each tiny mirror element can be independently controlled by a PC. Based on preliminary experiment performed so far, unwanted light could be reduced to 10^{-3} - 10^{-4} , and this is expected to be sufficient for observation of IPT. Diffracted light from the DMD surface and scattered light from the edge of each mirrors of DMD are obstructed by a physical stop on an exit pupil of a camera.

By using such innovative DMD mask, we will be able to observe not only IPT mentioned above, but also the inner planets like Mercury. In addition, various observations are expected when a camera system using DMD mask is on board space vehicles.

The performance of the camera and the observation plan will be presented.