Building small integration spheres for testing the Muses-C multiband imaging camera (AMICA)

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We have been testing the multiband imaging camera of the Japanese first asteroid mission, Muses-C. The camera, Asteroid Multiband Imaging CAmera (AMICA), has eight bandpass filters and four polarizers placed just in front of the CCD surface for multiband imaging and polarimetric observation of the target asteroid's surface.

We intended to gain as much pre-flight data as possible during the spacecraft test, so that we plan to obtain pre-flight flatfield correction images at function check events of the Muses-C integration test. However, the integration sphere previously used to gain flatfield and responsibility data on the manufacturer's camera test, was too large to apply the flatfield image acquisitions after the camera was mounted on the spacecraft body. The small light source with uniform radiance was strongly required.

Recently, Saiki et al. (2001) has shown the small, simple integration sphere with their own design. They aimed to satisfy ONLY radiance homogeneity, not accuracy of absolute radiance, so that they could build small and simple integration sphere using styrene foam.

We regarded their design of integration sphere, and attempted to build smaller ones for the Muses-C AMICA integration test with strict spatial limitations among the camera, other equipment , and the floor of the room.

The main part of the integration sphere consists of two half-hollow spheres of styrene foam with 21cm in diameter. When we account this sphere the globe, aperture is the north pole, and eight small Krypton lamps are placed on Lat. N45deg. line at longitude intervals of 45deg. The inside surface of hollow sphere was prepared by coating surfacer for styrene foam and ground by emery paper. Repeating this process, we can gain a surface condition for integration sphere.

In order to examine a homogeneity of radiance, we took the aperture of the lighted sphere by another CCD camera of which flatfield was already corrected by other calibrated light source. The variation of radiance in the sphere's aperture ranges within 0.5%.

Since the Jan. 2003 function check event, we apply this small integration sphere for AMICA's test imaging. In this presentation, we report the detail of this integration sphere and its application to the Muses-C integration test.

Reference: Saiki, K. et al. (2001) Jour. Japanese Soc. Planetary Sci. Vol.10, pp.126-135 (in Japanese)