

Research Result Report

ICRR Inter-University Research Program 2024

Research Subject: Research and Development of the high-performance segment mirrors and the camera entrance windows for the CTA Large Size Telescopes

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Summary of Research Result :

We designed LSTs not only with large reflectors but also with highly reflective mirrors, UV-transparent camera entrance windows, high QE and high-speed photosensors, and high-bandwidth readout electronics to achieve lower energy thresholds. Thanks to the low energy threshold, the CTA-LSTs extend the gamma-ray observation horizon to a redshift of $z = 4$, enabling observational studies of high-redshift AGNs and bursting sources, such as gamma-ray bursts. Additionally, CTA plans for a long-term operation period of about 20 to 30 years, and all telescope components must maintain stable performance over a long period.

- 1) We experimented with a seven-layer coating instead of the current five-layer coating to improve reflectivity and extend the lifespan of segmented mirrors using a sputtering chamber at Sanko Ltd. However, we did not achieve satisfactory results in reflectivity. This may be due to the difficulty of precisely controlling the thickness and uniformity of individual layers (30 nm-50 nm thick) on the surface.
- 2) The UV-transmissive PMMA dome for the camera entrance window can be coated with an anti-reflective and antistatic layer to enhance transmittance and reduce dust adhesion. We were unable to find suitable material for the nano coating. We have already supplied the necessary domes for MSTs in the North and LSTs in the South with the current technology. However, we will explore new materials and coating techniques.

We appreciate very much the continuous support from ICRR for this project.

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