

Research Result Report

ICRR Inter-University Research Program 2025

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 :

The CTA-LST Collaboration designed the LSTs with large reflectors, highly reflective mirrors, UV-transparent camera entrance windows, high-quantum-efficiency and fast photosensors, and high-bandwidth readout electronics to achieve the lowest possible energy threshold. Owing to this capability, the CTA-LSTs will extend the gamma-ray observation horizon to redshifts of $z \sim 4$, enabling observations of distant AGNs and transient phenomena such as gamma-ray bursts. Since CTA is expected to operate for 20–30 years, all telescope components must maintain stable long-term performance.

We investigated an advanced seven-layer coating design, replacing the current five-layer configuration, to further improve the reflectivity and durability of the segmented mirrors in the sputtering chamber at Sanko. This study provided valuable technical insight into the precise control of multilayer coatings with thicknesses of 30–50 nm, representing an important step toward future optimization.

The UV-transmissive PMMA dome used as the camera entrance window has further potential for improvement through anti-reflective and antistatic nano-coatings, which could enhance transmittance and reduce dust adhesion. Although a fully suitable coating material has not yet been identified, the current technology has already enabled the successful production and delivery of the required domes for the MSTs in the North and the LSTs in the South.

We would like to express our sincere appreciation for the Institute for Cosmic Ray Research's continued support for this project.

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