Form 8

Research Result Report
ICRR Inter-University Research Program 2024

Research Subject: Installation of Super-Kamiokande outer detector laser system

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Summary of Research Result : This is a project to install a new laser calibration system for the Super-Kamiokande (SuperK) outer detector photo-multiplier tubes (PMTs). In the SuperK, laser light is distributed through optical fibers to monitor the performance of PMTs. This laser has been in use for over 15 years, and its intensity is gradually decreasing. A new laser needs to be installed with a full operation system including a new interlock system, utilizing existing calibration systems such as 52 optical fibers laid in the detector tank to distribute laser light.

During 2024, the installation of new geomagnetic field compensation coils in the SuperK required cutting some of the optical fibers. Since these fibers are a part of the new outer detector laser calibration system, we planned to splice these fibers. First, immediately after the SuperK detector tank was opened for the new coil installation project, our team (Shunichi Mine, Takatomi Yano) went inside and cut the fibers, preparing them for later splicing work (picture, left).

The fibers are 15 years old and specially made, and the splicing work required special

knowledge, so we hired an external contractor (InfoFarm) for this task. By coordinating the task with the team at Kamioka Observatory, all 8 cut fibers were spliced (picture, right). Here, fibers are mechanically connected, and each fiber has its own box to protect the splicing point. 8 of these boxes are located on the top area of the detector tank.

Meantime, we are developing a new interlock system at King's College London (Karen Hayrapetyan) to operate a new laser purchased in 2024. By utilizing the 2025-2026 ICRR international collaboration grant, we plan to install the new laser system for the SuperK calibration. This will also test the performance of fibers in situ we spliced in 2024-2-25.

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