Form 8

Research Result Report
ICRR Inter-University Research Program 2025

Research Subject: Monitoring and Ensuring the Correct Functioning of UDEAL in the EGADS Detector

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Summary of Research Result :

The activities carried out during FY2025 focused on the operation, monitoring, and maintenance of the UDEAL system.

Throughout the fiscal year, daily monitoring of UDEAL data taking and water transparency measurements were performed. This included checking the quality of the data, following the status of the system, and responding to operational issues when they appeared. The PI participated regularly in the online monitoring activities and also traveled twice to the Kamioka Observatory – Lab E – to perform onsite monitoring and to work on the installation of the new 445 nm laser.

During FY2025, maintenance activities and technical studies were needed to keep UDEAL running stably. Some periods were affected by problems in the beam direction control system and in the NSC200 actuator controller used by rainbow. After investigating the issue, the faulty controller was identified and replaced, and normal data taking was resumed.

A significant part of the work during the fiscal year was focused on the 445 nm laser, which started showing unstable behavior during some runs. While the other lasers continued working normally, the 445 nm laser sometimes failed during data taking or did not produce stable laser spots through the full water depth. Different checks and tests were performed to understand the origin of the problem, including studies

of the laser intensity, beam alignment, actuator behavior, and possible connection issues.

Several onsite inspections were carried out – by others collaborators – in Lab E during these studies. In some cases the laser recovered temporarily and successful data taking could be completed, but the instability continued intermittently. Discussions were therefore started regarding the replacement of the laser and the possibility of continuing operating temporarily without the 445 nm wavelength.

The PI participated directly in onsite work related to the installation, alignment, and testing of the replacement 445 nm laser together with another collaborator. During these activities, several technical issues affecting the new laser system were identified, and additional studies and tests were carried out in order to understand their origin. At the end of FY2025, the replacement laser was still not fully operational and further work will be needed before regular operation can resume.

Additional work was also carried out later in the fiscal year in relation to drain pump behavior, valve operation, and general UDEAL stability. During some periods, the PI was responsible for closely supervising UDEAL operation during data taking.

As a consequence of these issues, UDEAL was not able to take data regularly during the last part of the fiscal year. While sporadic measurements were still successfully collected, daily data taking was interrupted for extended periods, and during the last month of FY2025 no UDEAL data was collected.

Nevertheless, the available water transparency measurements remained generally stable during the periods in which UDEAL data could be taken. Typical LL15 values stayed around 80–83%, consistent with stable operating conditions, although temporary fluctuations were observed during some periods.

Overall, the activities carried out during FY2025 focused on maintaining and recovering UDEAL operation.

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