

Research Report
ICRR Inter-University Research Program 2021

Research Subject:

Study of UHECR origin using the TAx4 Fluorescence Detectors

Principal Investigator:

C.C.H. Jui

Participating Researchers:

C.C.H. Jui, J.N. Matthews, P. Sokolsky, G.B. Thomson, J.W. Belz, D.R. Bergman, T. Abu-Zayyad, R.U. Abbasi, D. Ivanov, Wm. Hanlon, J.H. Kim University of Utah
H. Sagawa, T. Sako ICRR University of Tokyo

Summary of Research Result :

To search for the origin of ultra-high energy cosmic rays, continuous operation of the Telescope Array, TALE and TAx4 experiments, their data analyses were performed.

In the limited access to the site, observations by the fluorescence detectors (FDs) of TALE and TAx4, and TA at the Middle Drum site were continued by on-site and remote shift members. The FD operations of TA at the Black Rock and Long Ridge sites also temporally restarted in November. Even after a long shutdown during COVID-19, there was no serious damage on the detectors. Meanwhile, a new electric power line was installed at the BR site to replace the old generators. This assures further stable operations at the BR FDs in FY2022.

In the end of fiscal year, we had a campaign to repair some malfunctional surface detectors (SDs) of TAx4. Totally 19 SDs were collected by helicopters and repaired at the Cosmic Ray Center in the Delta town. After this operation, the TAx4 SD improved the performance. Continuous online monitoring of the TA and TALE SDs were performed and the detectors were repaired by the local staffs when necessary.

New analysis results of TA, TALE and TAx4 are reported in the journals and International Cosmic Ray Conference. Highlights are listed in the publication list below.

Publications:

1. R.U.Abbasi et al., "Observation of variations in cosmic ray single count rates during thunderstorms and implications for large-scale electric field changes," PRD 105, 062002 (2022)
2. R.U.Abbasi et al., "Surface detectors of the TAx4 experiment", NIM A1019 (2021)

165726.

3. R.U.Abbasi et al., "The Cosmic-Ray Composition between 2 PeV and 2 EeV Observed with the TALE Detector in Monocular Mode", *ApJ*, 909:178 (2021).
4. Telescope Array Collaboration, "Telescope Array anisotropy summary," *Proceedings of Science (ICRC2021)* 392
5. Telescope Array Collaboration, "Monocular Energy Spectrum using the TAx4 Fluorescence Detector," *Proceedings of Science (ICRC2021)* 343
6. Telescope Array Collaboration, "Telescope Array Combined Fit to Cosmic Ray Spectrum and Composition," *Proceedings of Science (ICRC2021)* 338
7. Telescope Array Collaboration, "Analysis of TAx4 hybrid trigger and events," *Proceedings of Science (ICRC2021)* 332
8. Telescope Array Collaboration, "Reconstruction of Air Shower Events Measured by the Surface Detectors of the TAx4 Experiment," *Proceedings of Science (ICRC2021)* 331
9. Telescope Array Collaboration, "Performance and simulation of the surface detector array of the TAx4 experiment," *Proceedings of Science (ICRC2021)* 355
10. Telescope Array Collaboration, "Current status and prospects of surface detector of the TAx4 experiment," *Proceedings of Science (ICRC2021)* 203

No.
