Form 8

Research Result Report
ICRR Inter-University Research Program 2022

Research Subject:

Study for Galactic CR origin using the ALPACA air shower array in Bolivia

Principal Investigator:

Pedro Miranda

Participating Researchers:

Pedro MIRANDA, Rolando TICONA, Hugo RIVERA, Martin SUBIETA, Mirko RALJEVICH (Universidad Mayor de San Andres)

Yoshiki Tsunesada (Osaka Metropolitan University)

Masato Takita, Takashi Sako, Munehiro Onishi, Kazumasa Kawata, Takashi Sako, Sei Kato (ICRR, University of Tokyo)

Summary of Research Result :

　Highlight of the FY2022 activity was to resume the construction of the ALPAQUITA surface array. Japanese and Mexican members visited Bolivia in June to complete the arrangement of 97 detectors and cables with the cooperation of the Bolivian team as shown in Fig.1.

　The data taking started in September and it continues smoothly. The first air shower event observed in this new array is shown in Fig.2. By using the about 3 months of the initial data a deficit of the cosmic-ray air shower events around the moon, so called the moon shadow, is detected at the expected statistical significance. The event rate map and the significance of the deficit as a function of the number of background events are shown in Fig.3.
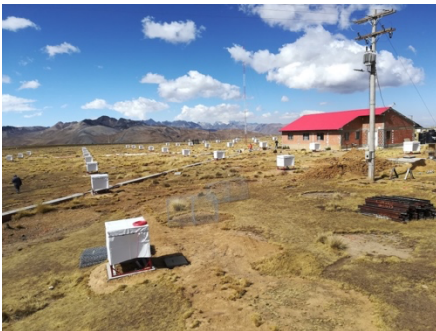

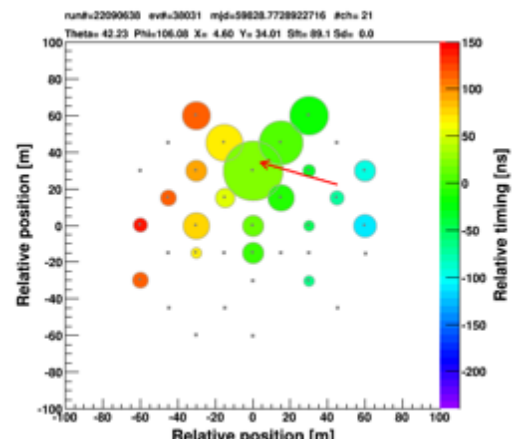Fig.1 Photo of the ALPAQUITA surface detector array.

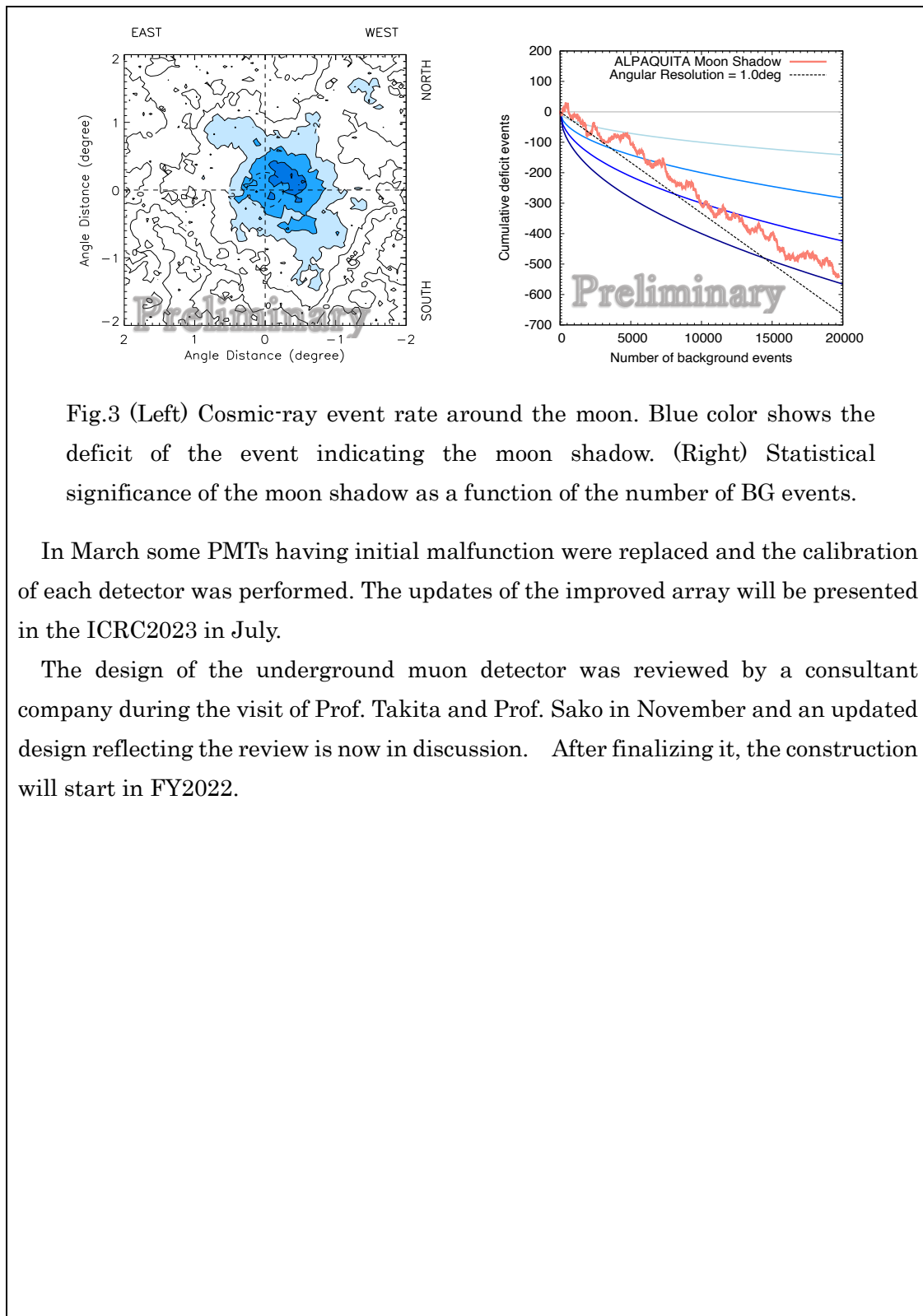Fig.2 Event display of the first air shower event.

No.

Fig.3 (Left) Cosmic-ray event rate around the moon. Blue color shows the deficit of the event indicating the moon shadow. (Right) Statistical significance of the moon shadow as a function of the number of BG events.

In March some PMTs having initial malfunction were replaced and the calibration of each detector was performed. The updates of the improved array will be presented in the ICRC2023 in July.

The design of the underground muon detector was reviewed by a consultant company during the visit of Prof. Takita and Prof. Sako in November and an updated design reflecting the review is now in discussion.   After finalizing it, the construction will start in FY2022.

No. F005