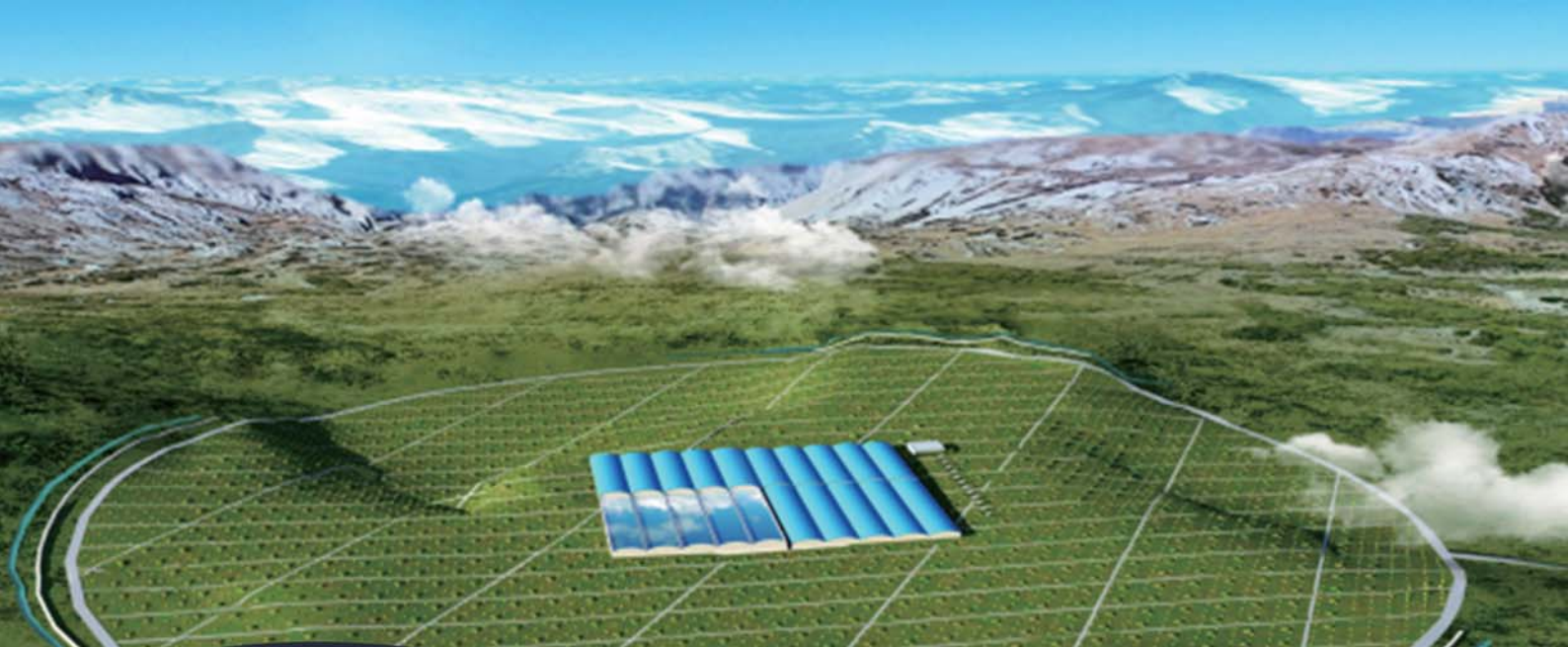

A LHAASO Collection Published in *Radiation Detection Technology and Methods*

https://www.springer.com/journal/41605

Radiation detection technology and methods (RDTM) is a peer-reviewed, international and interdisciplinary research journal that focuses on all aspects of radiation detection technology and methods. Columns include electronics and system design, computer and control techniques, detection technology and methods, data processing and imaging. It presents an attractive mix of authoritative and comprehensive reviews, original articles on cutting-edge research and brief communications. The journal offers rapid review and publication of articles.

Radiation Detection Technology and Methods publishes articles that focus on, but are not limited to, the following areas:

- Nuclear electronics
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- Particle Acceleration Technology
- Astroparticle technology
- Radiation protection
- Synchrotron-radiation based techniques and methods

Now we have made a collection of LHAASO published in RDTM for all LHAASO members' reference. We also look forward to more significant achievements of LHAASO being published in RDTM.

RDTM Editorial Office
Mar. 11th,2021

Design of the LHAASO detectors

Huihai He, Published in February, 2018
https://doi.org/10.1007/s41605-018-0037-3

The Large High Altitude Air Shower Observatory plans to build a hybrid extensive air shower array with an area of about 1 km2 at an altitude of 4,410 m a.s.l. in Sichuan province, China, to explore the origin of high-energy cosmic rays. The LHAASO detectors are designed to fulfill the physical goals in gamma ray astronomy and cosmic ray physics. One-fourth of LHAASO will be constructed and put into operation to produce physical data by the end of 2018. The whole array will be finished in the beginning of 2021.

LHAASO KM2A distributed long-distance data transmission

Feng-Fan Yang, Jin-Fan Chang, Zheng Wang et al., Published in May 2019
https://doi.org/10.1007/s41605-019-0123-1

The large high-altitude air shower observatory (LHAASO) is being built near Daocheng (4410 m a.s.l.) in the Sichuan province of China. Its main instrument is the one-kilometer square extensive air shower array (KM2A) which will comprise nearly 7000 detectors. The system adopts a distributed architecture where each detector has local front-end electronics for signal digitization and transmission. White Rabbit (WR) is the communication protocol used within KM2A to reach the required 1-ns synchronization accuracy between detectors. To provide data transport and synchronization over the same network. We have developed a firmware implementation of the TCP/IP protocol in Verilog hardware description language that can be coupled with a WR intellectual property core. LHAASO KM2A distributed data and clock synchronization network meets the high requirement of the array for reliable data transmission and clock synchronization.

Expectation on probing the origin of the cosmic ray knee with the LHAASO experiment

Chao Jin, Li-Qiao Yin, Song-Zhan Chen et al., Published in March 2019
https://doi.org/10.1007/s41605-019-0097-z

The cosmic-ray (CR) knee and the compositions contain abundant information for probing the CR's origin, acceleration and propagation mechanisms, as well as the frontier of the fundamental physics. Realizing that major proposals toward the knee's shape can be divided into two categories: the rigidity-dependent (also Z-dependent) knee and the mass-dependent (also A-dependent) knee, where the former one relates to the acceleration or the propagation mechanisms and the other one is often associated with the new physics; it is essential to precisely measure the individual compositions. Benefiting from the high altitude and hybrid detection methods, the LHAASO experiment has the ability to determine the individual component and brings us an opportunity in discriminating these two models. We test this expected ability of LHAASO from 100 TeV to 10 PeV with 3-year observation. As a result, these models can be discriminated when the knee is dominated by the CR component equal or heavier than the helium under LHAASO's first operation mode.

Trigger and noise filtering algorithms for the LHAASO water Cherenkov detector array

Xiao-Jie Wang, Zhi-Guo Yao, Min Zha et al., Published in July 2017
https://doi.org/10.1007/s41605-017-0015-1

The Large High Altitude Air Shower Observatory (LHAASO) will be constructed at Mt. Haizishan, Sichuan Province, China. Among several detector components of the LHAASO, the Water Cherenkov Detector Array (WCDA) is of great importance for gamma-ray astronomy from 100 GeV to 30 TeV. The single-channel counting rate of a photo-multiplier tube can reach as high as 30 -35 kHz, most of them are background noise hits from the low energy cosmic ray showers, bringing a big challenge on data transferring, data storage and event reconstruction. In this paper, a dedicated trigger scheme and a fast noise filtering method aiming to deal with these high rate background noise hits are introduced. These methods are tested with some Monte Carlo simulation data, showing a fair efficiency in filtering background noise hits, while most of the real shower signals are kept.