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Investigation of atmosphere thickness on EAS events by an array of particle detectors and CORSIKA simulations.

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Abstract content

Actually until the shower maximum the effect of the atmosphere is: 'an environment for extension of EAS events', but after it the 'absobtion effect of the atmosphere' will be dominant. Since the shower maximum for ˜100 TeV is ˜550 gr/cmˆ2(˜5000m a.s.l), and we are always after it (1200m a.s.l) specially for higher zenith angle events. So actually in the energy and the site we have to concentrate more on the absorbtion effect. Therefore for the investigation we logged about 400,000 EAS events by an array of particle detectors in a square 6m*6m. These cylindrical (r=35cm, h=120cm) detectors contain pure water and a face sinked PMT inside the water for detection of emitted Cerencov light from passed charged particles through the water. We calculated the local coordinates of (z,\phi) of each event. The z distribution of the logged events is dN=\sin(z)\cosˆn(z)dz with n=6.03. It seems that the decreasing distribution is due to the atmosphere thickness, so for better investigations of the effect we calculated the time differences between each two to six following events and we obtained the rate=(29.33+-0.14 sec)ˆ-1. With the rate and Hillass formula (Gaisser 1990) we obtained the energy threshold E_{th}=52 TeV. From 70,000 CORSIKA simulations of our experiment we obtained it 58 TeV. Then we fitted our simulated EAS events (50TeV to 5PeV) on the characteristics of our detectors and our array, and we calculated a probability distribution for different zenith angles which is in agreement with z distribution of our experiment. Also we drew the distribution of number of the secondary particles vs. z and the distribution of number of simulated events vs. secondary particles. Then we extracted the distribution of the number of simulated events vs. z. This is a good observable factor to compare with the experiment result. Our results show that a good coincidence between the simulated and observed curves. small differences in different zenith angles is from the 'efficiency of our array' which is in the investigation precess.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 4 (HE part 1), pages 15-18

Primary author(s) : Dr. KHAKIAN, Mehdi (Physics Dept., Sharif Univ. of Tech., 11365-9161, Tehran, Iran.)

Co-author(s) : Dr. BAHMANABADI, Mahmoud (Physics Dept., Sharif Univ. of Tech., 11365-9161, Tehran, Iran.); Prof. SAMIMI, Jalal (Physics Dept., Sharif Univ. of Tech., 11365-9161, Tehran, Iran.); Dr. ANVARI, Abbas (Physics Dept., Sharif Univ. of Tech., 11365-9161, Tehran, Iran.); Ms. SHEIDAEI, Farzaneh (Physics Dept., Sharif Univ. of Tech., 11365-9161, Tehran, Iran.)

Presenter(s) : Dr. KHAKIAN, Mehdi (Physics Dept., Sharif Univ. of Tech., 11365-9161, Tehran, Iran.)

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