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EAS age and energy determinations through the study of the LDF in the first few meters from the core with the ARGO-YBJ experiment

Saturday 1 August 2015 15:30 (1 hour)

The ARGO-YBJ experiment, a full coverage extensive air shower (EAS) detector located at high altitude (4300 m a.s.l.) in Tibet-China, has been operated with very high stability from the fall 2007 to the beginning of 2013. The array consisted of a carpet of about 7000 m^2 Resistive Plate Chambers (RPCs) operated in streamer mode and equipped with both digital and analog readout, providing the measurement of particle densities up to few particles per cm^2 , with single hit space and time resolutions better than 20cm and 2ns, respectively. The unique detector features (full coverage, wide dynamic range, ⋯) and location (very high altitude) allowed a detailed study of the lateral distribution function (LDF) of particles at ground very close to the shower axis, in a wide interval of primary energies from few TeV up to the knee of the all-particle spectrum.
The information collected in the first 10 meters from the shower has been shown to provide very effective tools for the determination of both energy and shower age. The shower age was shown to be correlated with the reconstructed LDF slope near the core, independently of the primary mass. This shower universality was then used to correct the detected truncated size at ground in order to have a mass independent energy estimator with a lognormal resolution at the level of 0.15, getting better with energy. The details of the adopted procedure together with the evaluation of its uncertainties will be fully discussed.

Collaboration

ARGO-YBJ

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