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Investigation of angular distributions in the interaction of cosmic-ray particles with a dense target and comparison with data of the Large Hadron Collider.

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Cosmic ray measurements are carried out on at a detector station located in the Tian Shan mountains at an altitude of 3340 meters above sea level using the complex installations “Hadron-9” and “Hadron-44”. The main objective of these studies is the interaction of cosmic rays with nuclei, in particular the study of anomalous events occurring in the cores of extensive air showers (EAS). Analysis was performed for 10199 detected events, of which 2657 events interacted directly in the target. 462 events with a Gamma-ray number of $n \geq 4$ could be identified. For these events angular correlations were investigated using two-dimensional correlation functions of the form $\Delta\eta$-$\Delta\varphi$. Here $\Delta\eta$ is the difference of pseudorapidities (η= -ln(tan(θ/2)) with θ the polar angle measured by the deviation from the beam axis deviation, and $\Delta\varphi$ is the difference between the azimuth angles of two particles. As a result we received a well-defined structure for the paired $0.5 < \Delta\eta < 4.5$, $0.4 < \Delta\varphi < 2.6$ two-particle correlation functions, almost similar to the results obtained in the “Observation of long-range, near-side angular correlations in proton-proton collisions at the LHC”. This is the first observation of such a structure in the two-particle correlation function of the interaction of cosmic rays with matter.

Collaboration

– not specified –

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