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COMPARISON OF ANGULAR DISTRIBUTIONS IN INTERACTIONS OF COSMIC RAY PARTICLES WITH THE EXPERIMENTAL DATA OF ATLAS EXPERIMENT AT THE LARGE HADRON COLLIDER

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This work presents results of study of the angular distributions in the interaction of cosmic rays with solid target. The work was carried out on the complex installation consisting of ionization calorimeter and X-ray emulsion chambers at an altitude of 3340 meters above sea level. Analysis was performed for 12,355 detected events 2,824 of which interacted directly in the target. For these events families was held for the selection, where the number of gamma rays $n \geq 4$ were selected 481 events. Increasing statistics of registered gamma rays by 21% in the study of angular correlations using two-dimensional correlation functions led to a change of paired structures for $0.5 < \Delta_\eta < 4.5$, $0.4 < \Delta_\phi < 2.6$. The obtained data have good agreement with the data of the CMS detector at the LHC in the proton-proton collisions.

PERFORMANCE OF THE HURST EXPONENT AND FRACTAL DIMENSION OF A TIME SERIES ESTIMATE IN A SINGLE PARALLEL ALGORITHM

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To address a persistent need for the effective parallel algorithms in experimental data processing we present parallel software program for the Hurst exponent and fractal dimension calculations [1] for a sample time series collected by a neutron monitor detectors array. Parallel programming environment was provided by OpenMPI package installed on three machines networked in the virtual cluster and operated by Debian Wheeze operating system. Our primary goal is effective parsing of raw data, reliability of results as well as performance and workload distribution optimization between the processes. The Hurst exponent and fractal dimension estimates in our study are matching the majority of the previously obtained results for geomagnetic indices and other data. Further studies involve parallel algorithm optimization and interpretation in terms of parallel quantum algorithms.

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