

Measurement of the muon content in EAS with muon detectors of LHAASO-KM2A

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High-energy cosmic rays interact with the atmosphere, generating extensive air showers. Measuring the evolution of muon content in EAS is of profound significance for the research of interaction models. This report is based on the data samples recorded by LHAASO-KM2A of 2022 with zenith angle $\theta \leq 40^\circ$, which energy is estimated around $10^{14} - 10^{16.7}$ GeV. The Monte Carlo samples are produced for five cosmic ray components using CORSIKA for air shower simulation and GEANT4 for KM2A detector response simulation. Both hadronic interaction models EPOS-LHC and QGSJET-II-04 of CORSIKA are utilized. We conducted a comparative analysis of the relationship between the average muon number per energy and energy in both observed data and simulations, revealing a shift towards lighter composition in the data after reaching 1 PeV. In addition, we measured the attenuation length of muon content within air showers using a constant-intensity-cut method. We present the variation of attenuation length with reconstruction energy, demonstrating a increase from 100 TeV to 10 PeV. Remarkably, simulation predictions and experimental measurements are in good agreement within the margin of error. Notably, at 20 PeV, the attenuation length for muon number closely resembles the predictions from KASCADE simulations, as opposed to the experimental results.

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