

Measurements of the energy deposit of multi-muon events in the Cherenkov water calorimeter

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Abstract

To solve the problem of the excess of multi-muon events observed in several cosmic ray experiments at ultra-high energies (so-called ‘muon puzzle’), the analysis of the energy characteristics of the muon component of extensive air showers (EAS) is required. A possible approach to such investigations is the measurement of the energy deposit of muon bundles in the detector, which provides information on the mean muon energy. In the experiment being now conducted at the NEVOD-DECOR complex, the local muon density and EAS arrival direction are determined according to the data of the coordinate-tracking detector DECOR, whereas the energy deposit is measured by means of the Cherenkov water calorimeter NEWOD. Results of the measurements of the energy deposit of the inclined muon bundles at various zenith angles based on the data accumulated during more than 23,000 h observations in 2012 – 2016 are presented and compared with simulations performed by means of the CORSIKA program.