

Studies of the ultra-high energy cosmic ray composition at the Pierre Auger Observatory

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The hybrid Pierre Auger Observatory, consisting of fluorescence detector with 24 telescopes and of surface detector with more than 1600 water Cherenkov stations, has been collecting quality data since January 2004. In this contribution we present current results of studies of ultra-high energy cosmic ray composition. The depth of maximum of air showers determined using fluorescence telescopes and the magnitude of the fluctuations of this maximum depth are reported as functions of energy. The mass composition is then derived from these data using modern hadronic interaction models, and subsequently the constraints are given on the parameters of the hadronic interactions in the ultra-high energy region. These results are also compared with the observables obtained independently from the surface array of water Cherenkov detectors, which are also sensitive to the mass composition, in particular with a risetime of the signals and with azimuthal asymmetries of the time distributions. Finally, we also briefly discuss the new limits on the flux of ultra-high energy photons and of diffuse ultra-high energy neutrinos, and we investigate the impact of these limits on top-down models of cosmic rays origin.

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