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Type: **Poster contribution**

Time asymmetries in the Surface Detector signals of the Pierre Auger Observatory.

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The asymmetry in the risetime of signals in Auger surface detector stations with respect to the direction of an incoming air shower is a source of information on shower development. The asymmetry is due to a combination of the longitudinal evolution of the shower and geometrical effects related to the angles of incidence of the particles into the detectors. The magnitude of the effect depends upon the zenith angle and state of development of the shower and thus provides a novel observable sensitive to the mass composition of cosmic rays above 4×10^{18} eV. By comparing measurements with predictions from shower simulations, we find for both of our adopted models of hadronic physics (QGSJETII-04 and EPOS LHC) that the mean cosmic ray mass increases with energy, as has been inferred from other studies. However the absolute values of the mass are dependent on the shower model and on the range of distance from the shower core selected. Thus the method has uncovered further deficiencies in our understanding of shower modelling that ought to be resolved before the mass composition can be inferred from $(\sec \theta)_{max}$.

Collaboration

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