

UHECR mass composition from anisotropy of their arrival directions with the Telescope Array SD

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We propose a new method for the estimation of ultra-high energy cosmic ray (UHECR) mass composition from a distribution of their arrival directions. The method employs a test statistic (TS) based on a characteristic deflection of UHECR events with respect to the distribution of luminous matter in the local Universe modeled with a flux-weighted 2MRS catalog. Making realistic simulations of the mock UHECR sets, we show that this TS is robust to the presence of galactic and non-extreme extra-galactic magnetic fields and sensitive to the mass composition of events in a set. While the statistical power of the method depends somewhat on the magnetic fields parameters, this dependence decreases with the growth of statistics. We apply the method to the Telescope Array surface detector data and derive new independent constraints on UHECR mass composition at highest energies.

Keywords

UHECR, mass composition, anisotropy

Collaboration

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Subcategory

Experimental Results

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