

Testing the Compatibility of the Depth of the Shower Maximum Measurements performed at Telescope Array and the Pierre Auger Observatory

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The Telescope Array and the Pierre Auger Observatory estimate the composition of ultra-high-energy cosmic rays by observing the distribution of depths of air shower maximum, X_{\max} . Both experiments directly observe the longitudinal development of air showers using fluorescence telescopes with surface particle detectors used in conjunction to provide precision in determining air shower geometry. The two experiments differ in the details of the analysis of events, so a direct comparison of X_{\max} distributions is not possible. The Auger – Telescope Array Composition Working Group presents their results from a technique to compare X_{\max} measurements from Auger with those of Telescope Array. In particular, the compatibility of the first two moments of the X_{\max} distributions of Auger with the data from the Black Rock Mesa and Long Ridge detectors of the Telescope Array is tested for energies above $10^{18.2}$ eV. Quantitative comparisons are obtained using air shower simulations of four representative species made using the Sybill 2.3d high energy interaction model. These are weighted to fit the fractional composition seen in Auger data and reconstructed using the Telescope Array detector response and analysis methods.

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