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Determining the Particle Identification of Ultra High Energy Cosmic Rays ANDREA BISCOVEANU, MIGUEL MOSTAFA, Pennsylvania State University — The mass composition of cosmic rays is of primary interest for determining their origin. The Pierre Auger Observatory uses both surface and fluorescence detectors to measure the depth of shower maximum, from which the mass of the primary particle can be inferred. The mean depth of shower maximum, $X_{\max}$, and the standard deviation from the mean are studied as a function of energy for cosmic rays with energies above $10^{18.8}$ eV reconstructed using the fundamental principle of shower universality. The results are compared with simulations for different nuclear primaries as well as with the official reconstruction used by the Pierre Auger Collaboration. Because the official reconstruction uses hybrid events that were recorded using both the surface and fluorescence detectors, there are insufficient statistics for determining $X_{\max}$ for energies above $10^{19.6}$ eV. The present analysis uses events recorded only with the surface detectors, so the measurements of $X_{\max}$ and its standard deviation can be extended up to $10^{19.8}$ eV. The $X_{\max}$ distribution seems consistent with a mixed composition even at the highest energies and is independent of zenith angle above 10^{19} eV.

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