Abstract Submitted
for the APR15 Meeting of
The American Physical Society

Extending the measurement of shower maximum to the highest energies using universality and data from the surface detector of the Pierre Auger Observatory ANDREA BISCOVEANU, MIGUEL MOSTAFÁ, Pennsylvania State Univ, PIERRE AUGER COLLABORATION — The determination of the mass composition of ultra high energy cosmic rays is key to understanding their origin. The depth in the atmosphere at which the number of secondary particles in an air shower reaches a maximum, $X_{\rm max}$, is the best proxy for the mass of the primary particle that initiated the air shower. Existing measurements of $X_{\rm max}$ are based on the longitudinal development of air showers observed with fluorescence detectors. Thus, they lack statistics for energies above $\sim 10^{19.4}$ eV due to the duty cycle of the telescopes and the stringent event selection. On the other hand, the value of $X_{\rm max}$ can be inferred for cosmic rays observed with surface detectors using the fundamental principle of shower universality. We will present our preliminary results for the measurement of $X_{\rm max}$ (mean value and standard deviation) as a function of energy extended up to $10^{20.1}$ eV using ten years of cosmic ray data recorded with the surface detector of the Pierre Auger Observatory.

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Date submitted: 08 Jan 2015 Electronic form version 1.4