

Abstract Submitted
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Testing Hadronic Interactions Beyond Collider Energies With the Pierre Auger Observatory JORGE FERNNDEZ SORIANO, The Graduate Center, City University of New York, PIERRE AUGER COLLABORATION — The muon content of extensive air showers is an observable sensitive to the primary composition and to the hadronic interaction models. I will discuss different methods which allow us to estimate the muon number at ground level and the muon production depth by exploiting the measurement of the longitudinal, lateral, and temporal distribution of particles in air showers recorded at the Pierre Auger Observatory. The results, obtained for primaries with energy $\sim 10^{10}$ GeV (or about 140 TeV center-of-mass energy for proton primaries), show a significant discrepancy in the shower muon content (greater than 2σ , statistical and systematics combined in quadrature) between predictions of LHC-tuned hadronic event generators and Auger data. This intriguing observation convincingly demonstrates that it is possible to test particle physics well above 100 TeV in the UHECR-air nucleon center-of-mass energy, using hybrid UHECR air showers, even with a mixed primary composition. I will also discuss how the added muon-electromagnetic separation and the significantly higher data-taking rate for the highest energy hybrid events provided by AugerPrime, the upgrade of the Pierre Auger Observatory, will give new insights on hadronic interactions well beyond collider energies.

Jorge Fernandez Soriano
The Graduate Center, City University of New York

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