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The Pierre Auger Observatory: Current Status and Expectations from the Upgrade

Friday, 21 February 2025 14:00 (17 minutes)

The Pierre Auger Observatory, with two decades of data, has significantly advanced our understanding of ultra-high-energy cosmic rays (UHECRs) with energies exceeding 10^{18} eV. Key results of the Observatory include: precise measurement of the cosmic ray spectrum at the highest energies, observation of anisotropies in UHECR arrival directions, pointing to possible sources and mass composition of UHECRs. However, this progress has also revealed a complex astrophysical landscape and tensions with existing models of hadronic interactions. To further our knowledge, determining the primary composition of the cosmic rays is crucial. The so-called AugerPrime upgrade aims to achieve this by disentangling electromagnetic and muonic components of extensive air showers on an event-by-event basis. To this end, the surface array was improved by adding new scintillator and radio detectors to the existing water Cherenkov stations and also underground muon counters were installed in a dense region of the array. In addition, to improve performance, small PMTs increased the dynamic range of the water Cherenkov detectors, while upgraded station electronics improved signal timing and resolution. As the commissioning of the final components of AugerPrime reaches its conclusion and the enhanced array comes fully online, we discuss expectations for its performance and the first results of this now multi-hybrid detector.

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