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The Pierre Auger Observatory: Results and Prospects

The Pierre Auger Observatory, the world's largest cosmic-ray detector, continues to make significant advances in the study of ultra-high-energy cosmic rays (UHECRs). By utilizing a hybrid detection system of surface and fluorescence detectors, the Observatory has made substantial contributions to our understanding of UHECR origins, composition, and energy spectrum, offering a consistent picture of these characteristics. In this talk, I will highlight recent findings, including refined measurements of the UHECR energy spectrum, evidence for anisotropies at the highest energies, and new insights into cosmic-ray composition. Recent studies of hadronic interactions at energies beyond the reach of terrestrial accelerators will also be discussed, providing valuable insights into particle physics. The ongoing AugerPrime upgrade is poised to significantly enhance the Observatory's ability to distinguish between different primary particles and improve sensitivity to photons and neutrinos. These advancements will expand the Observatory's capability to investigate UHECRs, their sources, and propagation mechanisms, offering exciting opportunities for future discoveries in the coming decade.

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