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# Overview of the Past, Present, and Future of the Pierre Auger Observatory: Advantages and limitations concerning accelerator data

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The Pierre Auger Observatory is the world's largest facility for detecting ultrahigh-energy cosmic rays that has been operating for nearly 20 years. The hybrid concept of the detector allows accurate estimations of the energy spectrum, mass composition, and arrival directions of cosmic rays, which are crucial for identifying the origin and nature of the highest energy particles arriving at Earth. With the data from the Auger Observatory, it is possible to explore particle physics in regions of phase space inaccessible by the existing man-made accelerators and probe the hadronic interactions at energies nearly two orders of magnitude higher than those attainable at the Large Hadron Collider. In this contribution, we review the current status and a selection of the key results of the Pierre Auger Observatory. We discuss the existing limitations in exploring the universe's most energetic phenomena and the future perspectives, including the ongoing enhancements provided by the upgrade of the Observatory.

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