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Probing Hadronic Interactions with Cosmic Rays

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High-energy cosmic rays interact in the Earth's atmosphere and produce extensive air showers (EAS) which can be measured with large detector arrays at the ground. The interpretation of these measurements relies on sophisticated models of the EAS development which represents a challenge as well as an opportunity to test quantum chromodynamics (QCD) under extreme conditions. The EAS development is driven by hadron-ion collisions under low momentum transfer in the non-perturbative regime of QCD. Under these conditions, hadron production cannot be described using first principles and these interactions cannot be probed with existing collider experiments. Thus, accurate measurements of the EAS development provide a unique probe of multi-particle production in hadronic interactions. We will present an overview of current EAS measurements probing hadronic interactions and discuss various recent results. In addition, we will highlight the opportunities to test hadronic interactions with the next-generation cosmic ray experiments.

Summary

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