

High-energy Hadronic Interaction Models: Insights from the Pierre Auger Observatory

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Our knowledge about the primary composition of ultra-high-energy cosmic rays (UHECRs) relies heavily on our understanding of extensive air showers and the hadronic interactions governing their development. The Pierre Auger Observatory, the world's largest facility for studying UHECRs, employs various techniques to analyze shower characteristics, which can be exploited to infer the composition of the primary particle. These multi-hybrid measurements have been instrumental in assessing the performance of post-LHC tuned models of hadronic interactions, revealing unexpected phenomena such as an apparent deficit of muons in simulations compared to observed data. In this presentation, I will review these experimental endeavors, discuss their findings, and outline the Observatory's potential to further refine the parameters of hadronic interaction models in the future.

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