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Investigating Muon Content in Extensive Air Showers using Pythia 8

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The field of air shower physics dedicated to understanding the development of cosmic-ray interactions with the Earth's atmosphere faces a significant challenge regarding the muon content of air showers observed by the Pierre Auger Observatory. Thorough comparisons between extensive air shower (EAS) measurements and simulations are imperative for determining the primary energy and mass of ultra-high energy cosmic rays. Current simulations employing state-of-the-art hadronic interaction models reveal a muon deficit compared to experimental measurements, commonly known as the "Muon Puzzle". The primary cause of this deficit lies in the uncertainties surrounding high-energy hadronic interactions.

In this contribution, we propose the integration of a new hadronic interaction model, Pythia 8, into the effort to resolve the Muon Puzzle. While the Pythia 8 model is well-tailored in the context of Large Hadron Collider experiments, its application in air shower studies remained limited until now. However, recent advancements, particularly in the Angantyr model of Pythia 8, offer promising enhancements in describing hadron-nucleus interactions, thereby motivating its potential application in air shower simulations.

We present results from EAS simulations conducted using Corsika 8, wherein Pythia 8 is employed to model hadronic interactions.

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