

Avenues to New Physics Searches in Cosmic Ray Air Showers

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Cosmic Rays (CR) impinging on the terrestrial atmosphere provide a viable opportunity to study new physics in hadron-nucleus collisions at energies covering many orders of magnitude, including a regime well beyond LHC energies.

The flux of primary CR is well studied and can be used to estimate event rates for a given type of new physics scenario. As a step to estimate the potential for new physics searches in CR-induced Extensive Air Showers (EAS), we here determine for the first time the total luminosity stemming from the cascade of secondaries in p-, π^- , and K-air interactions using Monte Carlo simulations of the hadronic shower component with CORSIKA 8. We show results obtained for single showers and discuss the interplay with the CR spectrum.

Furthermore, we discuss the possibility to study BSM phenomenology in EAS, focusing on so-called *high multiplicity events* as an explicit example and their impact on EAS phenomenology.

Secondary track (number)

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