

Sec 3: Physics at the energy frontier – the synergy between UHECRs and Particle Physics

Synopsis: Discuss the contributions of UHECR experiments to particle physics at the energy frontier over the last decade. Address the current open questions, e.g. Muon Puzzle, and describe the expected perspectives over the next decade in the context of both accelerator and UHECR experiments. Outline remaining open and possible new questions, as well as new research opportunities, which will require interdisciplinary collaboration between the astrophysics and particle physics community over the next two decades.

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Outline

- Current status of the synergies (e.g. pp cross-section measurements, the Muon Puzzle)
- Constraining the mechanisms responsible for the Muon Puzzle within the next decade
- Future LHC experiments will inform updated hadronic interaction models, e.g. FPF
- Unique opportunities for existing UHECR experiments to refine our knowledge of hadronic interactions at the energy frontier, not all questions will be answered / new questions
- How can UHECR observatories contribute with particle physics measurements within the next two decades?
- *Potential synergies with BSM physics?*
- *Computational challenges (e.g. EAS simulations, hadronic interaction models)?*

Task Groups Involved

- Hadronic Interactions

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