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Particle physics in extensive air shower cascades

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With current large cosmic ray observatories, precise data of extensive air shower cascades is recorded up to primary particle energies of 10^{20} eV. While there is significant progress in understanding cosmic rays in general, and also particle physics in the air shower cascades, there are also tantalizing open questions. The most interesting one is the “muon mystery”, which is a strong hint for particle physics beyond the standard description in these cascades at ultra-high energies. The connection between particle physics and cosmic ray air shower observations is presented and discussed. The relation to relevant LHC measurements is highlighted.

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