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Relation of Interaction Characteristics at Ultra-High Energies to Extensive Air Shower Observables

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Only by measurement of extensive air showers it is possible to explore the nature of cosmic ray particles at the highest energies. Most properties can only be obtained from the interpretation of air shower data and are thus depending on predictions of hadronic interaction models at ultra-high energies. We discuss different scenarios of model extrapolations from accelerator data to air shower energies and investigate their impact on the corresponding air shower predictions. For this purpose we developed an ad hoc model, which is based on the modification of the output of standard hadronic interaction event generators within the air shower simulation process. This model allows us to study the impact of changing interaction features on the air shower development. In a systematic study we demonstrate the resulting changes of important air shower observables and discuss them also in terms of the predictions of the Heitler model of air shower cascades.

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