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A simulation study of the effects of diffractive collisions on observables of air showers experiments

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A hadronic interaction plays an important role in air shower development, and the detailed understanding is a key to understand the mass composition.

The diffractive collision is one of the proposed sources of the uncertainties of air shower predictions. In this work, we investigate how the difference in the diffractive collision treatment between models affects the depth of the maximum of the air shower developments X_{max} , the depth of the maximum of muon productions X_{max}^{μ} and the number of muons on the ground N_{μ} with focusing on detail characteristics of diffractive collisions; the fraction of diffractive collisions and the modeling of the diffractive collisions. We demonstrate the fraction of diffractive collisions to inelastic collisions affects 8.9 g/cm^2 and 9.5 g/cm^2 on $\langle X_{max} \rangle$ and $\langle X_{max}^{\mu} \rangle$, respectively. On the other hand, the effects of and the modeling of diffractive collisions are relatively small.

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