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Detailed studies in high energy ranges about ⟨Xmax⟩ and RMS of extensive air showers.

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Cosmic rays are defined as particles with cosmic origin that reach the Earth. While there are several problems in the study of these particles, there are two central issues to be solved: their origin (production, acceleration and propagation) and their importance in the total energy balance of the universe, since the energy density of cosmic radiation is of the same order of magnitude of the energy density of stars and galactic magnetic fields. At least three fundamental pieces of information could be obtained from a cosmic ray experiment: the energy of the incident particle, its arrival direction and its identity. With these basic quantities we can reconstruct many statistically significant quantities: (a) the energy spectrum, (b) the angular distribution function of arrival directions or anisotropy, and (c) the composition as a function of energy. The study of depth of shower maximum, Xmax, has crucial importance in the estimation of the energy and of mass composition of cosmic rays. The RMS of the ⟨Xmax⟩ distribution (1-2) has been also shown to be an important and independent composition parameter. In this study, we will use CORSIKA (3) and CONEX simulation programs to run around 2.000.000 showers in the energy range from 10^{17} to $10^{20.5}$ eV in steps of 0.1 in log(EeV) and for several primary particle types. For the low energy hadronic model we will use FLUKA-INFN and for the high energy interaction models QGSJETII-04, SIBYLL2.3d and EPOS-LHC will be used. We will calculate the ⟨Xmax⟩ parameter as its RMS as a function of primary composition and energy for different hadronic interaction models. A detailed comparison and parameterization for different simulation models is also going to be studied and updated.

Palavras-chave: Cosmic Rays; Xmax; Chemical Composition.

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Referências:

1 PEIXOTO, C. J. D.; SOUZA, V.; BELLIDO, J. A. Comparison of the moments of the distribution predicted by different cosmic ray shower simulation models. **Astroparticle Physics**, v. 47, p. 18-30, Jul. 2013. DOI: 10.1016/j.astropartphys.2013.05.011.

2 ARBELETCHE, L. B.; SOUZA, V. On the parametrization of the distributions of depth of shower maximum of ultra-high energy extensive air showers. **Astroparticle Physics**, v. 116, p. 102389, Mar. 2020. DOI: 10.1016/j.astropartphys.2019.102389.

3 HECK, D. *et al.* **CORSIKA**: A Monte Carlo code to simulate extensive air showers. p. 1–90, 1998.