HADRONIC INTERACTION MODELS AND THE AIR SHOWER SIMULATION PROGRAM *CORSIKA*

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The Monte Carlo program CORSIKA simulates the 4-dimensional evolution of extensive air showers in the atmosphere initiated by photons, hadrons or nuclei. It contains links to the hadronic interaction models DPMJET, HDPM, neXus, QGSJET, SIBYLL, and VENUS. These codes are employed to treat the hadronic interactions at energies above 80 GeV. Since their first implementation in 1996 the models DPMJET and SIBYLL have been revised to versions II.5 [1] and 2.1 [2], respectively. Also the treatment of diffractive interactions by QGSJET has been slightly improved [3]. The models DPMJET, QGSJET and SIBYLL claim to be able to simulate collisions even at the highest energies reaching up to 10^{20} eV which are at the focus of present research. The recently added neXus 2 program [4] uses a unified approach combining Gribov-Regge theory and perturbative QCD. This model is based on the universality hypothesis of the behaviour of high-energy interactions and presently works up to 10^{17} eV. A comparison of simulations performed with different models gives an indication on the systematic uncertainties of simulated air shower properties which arise from the extrapolations to energies, kinematic ranges, or projectile-target combinations not covered by man-made colliders. Results obtained with the most actual programs are presented.

[1] J. Ranft, *preprint* hep-ph/9911213 (1999)

[2] R. Engel, *private communication* (2000)

[3] S.S. Ostapchenko, *private communication* (2000)

[4] H.J. Drescher et al., *preprint* hep-ph/0007198 (2000)