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A Fast and Accurate Monte Carlo EAS Simulation Scheme in the GZK Energy Region and Some Results for the TA experiment

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Abstract content

As described in an accompanying paper (kasahara), full M.C simulation of air showers in the GZK region is possible by a distributed-parallel processing method. However, this still needs a long computation time even with ˜50 to ˜100 cpu's which may be available in many pc cluster environments. Air showers always fluctuate event to event largely, and only 1 or few events are not appropriate for practical application. However, we may note that the fluctuations appear only in the longitudinal development; if we look into the ingredients (energy spectrum, angular distribution, arrival time distribution etc and their correlations) at the same "age" of the shower, they are almost the same (or at least can be scaled; e.g, for the lateral distribution, we may use appropriate Moliere length). In some cases (for muons and hadrons), we may use another parameter instead of the "age". Based on this fact, we developed a new fast and accurate M.C simulation scheme which utilizes a database in which full M.C results are stored (FDD). We generate a number of air showers by using the usual thin sampling method. The thin sampling is sometimes very dangerous when we discuss detailed ingredient (say,lateral distribution, energy spectrum, their correlations etc) but is safely employed to see the total number of particles in the longitudinal development (LDD; we can generate ˜1000 LDD showers by 50 cpu's in a day). Then, for a given 1 particular such an event at a certain depth, we can extract every details from FDD by a correspondence rule such as the one using "age" etc. We describe the method, its current status and show some results for the TA experiment.

If this papers is presented for a collaboration, please specify the collaboration

the TA collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 4 (HE part 1), pages 585-588

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