RECONSTRUCTION OF CHARGED PARTICLE DENSITY AT FIXED DISTANCE FROM THE SHOWER ARE BY VARIOUS METHODS

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Calculations of the attenuation length of the charged particle density at 600 metres from the shower axis were carried out in terms of the quark-gluon string model for primary protons and observation level of 1020 g/cm^2 for showers with various zenith angles. The Landau-Pomeranchuk-Migdal effect and neutral pions interactions are taken into accunt at high energies. The Monte Carlo method was used for primary protons while cascades from numerous charged pions were considered with the help of transport equations. Nearly 10^5 showers were simulated with various energies and zenith angles using a cluster of computers. Then signal spectra were calculated assuming the standard energy spectrum of the primary particles. At last taking cuts of the signal spectra one can obtain the development curve for a signal and estimate the attenuation length. The longitudinal development of a signal was calculated to estimate the attenuation length in the individual showers. The applicability of the last method is straightforward.
As a result the value of 530 ± 60 g/cm^2 was estimated for the attenuation length by the constant intensity cuts method which should be compared with 520 ± 70 g/cm^2 found experimentally. The longitudinal development gives 350 ± 12 g/cm^2 while calculations for vertical and inclined showers lead to various attenuation lengths of $300 - 400$ g/cm^2. The standard method of the constant intensity cuts usually used may decrease energy estimates by factor $\sim 1.1 - 2$.