5%, which can produce, according to [5], a large stabilizing effect.

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PAIR CORRELATIONS IN THE INTERACTION OF COSMIC RAYS OF ENERGY ∿400 GeV

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We investigate pair correlations between the rapidities of the secondary particles in interactions of cosmic rays with energy ∿400 GeV. We show that if pionization is the main interaction mechanism, then the clearest ideas on the behavior of the correlation function can be obtained by investigating it in the rest system of the pionization particles.

It has recently become clear that no progress can be made in investigations of multiple generation without a study of the correlations between the particles.

Several recent papers are devoted to the correlation between the rapidities of the secondary particles in π^+p and π^-p interactions at energies 8 and 18 GeV [1], in pp collisions with energies 13, 18, 21, 24, and 28 GeV [3], and in K^+p interactions at 12 GeV [2]. Data on the correlations in pp collisions with energy ∿500 GeV are given in [4]. The correlations are estimated quantitatively in the cited paper by using a correlation function similar to

$$\left(\frac{d^2\sigma}{dy_1dy_2} - \frac{1}{\sigma_{tot}}\frac{d\sigma}{dy_1}\frac{d\sigma}{dy_2}\right)\Big/\frac{1}{\sigma_{tot}}\frac{d\sigma}{dy_1}\frac{d\sigma}{dy_2},$$

where y_1 and y_2 are the rapidities of the investigated particles and σ_{tot} is the total interaction cross section.

We wish to call attention in this paper to the need of taking into account the singularities of the multiple-generation mechanism when concrete use is made of a correlation function. We have in mind the following.

If in addition to the fragments of the incident particle there are produced in the interaction process also pionization particles, then the system in the latter has an appreciable collective motion as a whole in the rest system of the colliding particles. The fact that the collective motion has in the C-system a different velocity in each individual interaction act leads to a broadening of the single rapidity spectrum $d\sigma/dy$ in comparison with the $d\sigma/dy$ in the c.m.s. rest system of the pionization particles. It is obvious here that the quantity $(d\sigma/dy_1)(d\sigma/dy_2)$ decreases for small differences $y_1 - y_2$ and increases for large ones, whereas $d\sigma^2/dy_1dy_2$ remains the same in both reference frames. This results in considerable distortions in the correlation function C_2. We emphasize that in the considered interaction picture the quantity $(d\sigma/dy_1)(d\sigma/dy_2)$ has no physical meaning in the C-system. We assume on this basis that the correlation function should be determined not in the C system, but in the rest system of the investigated group of particles, i.e., not in an inclusive process but in exclusive ones. By way of example we present the correlation function C_2 determined from material obtained with the Tskhra-Tskaro installation in interactions between cosmic rays in a polyethylene target, as registered with a cloud chamber and an ionization calorimeter.

Figure 1 shows the correlation function C_2 as a function of Δy for an inclusive process

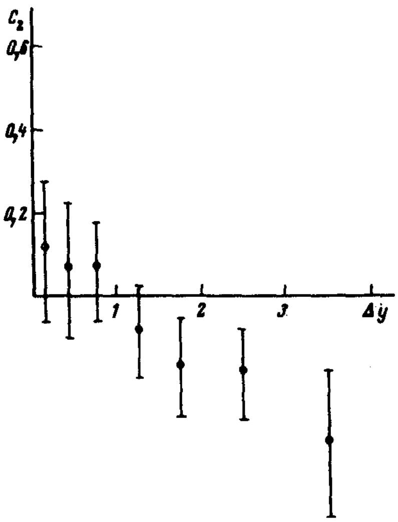

Fig. 1

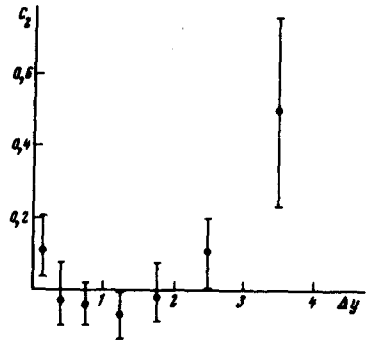

Fig. 2

Fig. 1. Correlation function C_2 in C-system vs Δy.

Fig. 2. Correlation function C_2 in S-system vs Δy.

(in the C-system), integrated over all values of y_1. Figure 2 shows the function C_2 determined in the rest system of the charged particles (the S system). There is an evident difference between the correlation functions determined in different reference frames. The function C_2 in the S system (Fig. 2) shows an appreciable positive correlation for particles with a large difference Δy, i.e., the particles with highest energy move apart in opposite directions in this system. This interesting physical regularity is completely erased in the C system because of the difference in the relative motions of the S and C systems in the individual interactions. Unfortunately, the statistics of this result is adequate only to call attention to the importance of complete investigations of this type, and does not make it possible to assess its physical meaning.

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PARTICLE-NUMBER SPECTRUM OF EXTENSIVE AIR SHOWERS AT SEA LEVEL

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Experimental results are presented on the investigation of the spectra of extensive air showers with respect to the number of particles N in the interval 10^6 - 10^8. The data indicate that the particle-number spectrum experiences a change in the region $N > 10^7$.

The possibility of a change in the spectrum of extensive air showers (EAS) with respect to the number of particles N in the region $N > 10^7$ was first noted in [1]. The N-spectrum analyzed there was that obtained in [2] in the interval $N = 10^6 - 10^8$. The spectrum of [2], however, was not investigated with sufficient accuracy, since the setup used in [2] and [3] had too small a number of detectored distributed over a large area.

The N-spectrum was subsequently investigated in [4, 5]. The results of [4] have low statistical accuracy, and the results of the Yakutsk installation [5] pertain to the interval $N = 10^7 - 10^{10}$. To investigate the features of the N spectrum in the region $N \geq 10^7$ it is apparently necessary to record the shower spectrum approximately in the interval 10^6 - 10^8, and in one and the same installation.