Discussion

Kaneko, S: I would like to know how much error do you have in estimating σ value on the average.

Miesowicz, M.: The errors for individual σ_1 and σ_2 is of the order of 10~15%. But the difference taken for all 6 jets is more significant.

Zhdanov, G. B.: Have you taken into account of the possible influence of the velocity spread of secondary particles on the shape of two maxima of angular distribution ?

Miesowicz, M.: No.

Powell, C. F.: I'm not quite sure what extent your picture is compatible with that of Prof. McCusker's group, in which the penetration through the center of silver nuclei only gives the very low value of N_h. In your interpretation of these events with high N_h, you assume that they are due to the penetration of the center of silver nuclei.

Miesowicz: These are the phenomena of collision of nucleon with heavy nuclei. Prof. McCusker described the phenomena of central collision of π meson with nuclei, and, in his picture, the fireball decay inside the nucleus or outside the nucleus depends on the γ value of this fireball. In our picture, I believe, the fast fireball (γ~500) goes out and the slow fireball (γ~5) may decay inside the nucleus.

Koshiba, M.: If we take Prof. Miesowicz's model, there's no reason why we can not expect the same effect when π meson goes through silver. Because in this case we can expect only the slow fireball.

Miesowicz: I agree with you.

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III-6-11. High Energy Nuclear Interaction with Isotropic Distribution of Generated Particles

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While scanning 1 liter of photoemulsions of the NIKFI-R type exposed during ~150 hours at an altitude of ~10 km, an interesting event of the type 2+3+40p (Fig. 1) was found.

Angular distribution of the secondary particles were measured twice and from 4 to 8 cross sections of shower by the corresponding planes perpendicular to emulsion surface were used. This provided a reliable recording of all the produced particles and exclusion of electron-positron pair and random tracks.

Fig. 2 displays the angular distribution of particles obtained (circles) the continuation of the primary particle track taken as the shower axis direction.

The same figure shows the calculated curves for an isotropic distribution of particles in a certain coordinate system. In one case (the dotted curve) an assumption was used on equal velocities of the particles β_i ($\beta_i=\beta_c$, where β_c—velocity of the given coordinate system) and in another case—an assump-

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tion on the momentum spectrum of the shape $p^2(1+p^2)^{-2}$ (the solid curve). As one can see from the figure, a distribution of the second type describes well the experimental distribution for the majority of particles. The existence of a small "tail" of 3-5 particles can be attributed to secondary processes in the same nucleus, which is also indicated by the presence of 2 "black" and 3 "grey" prongs.

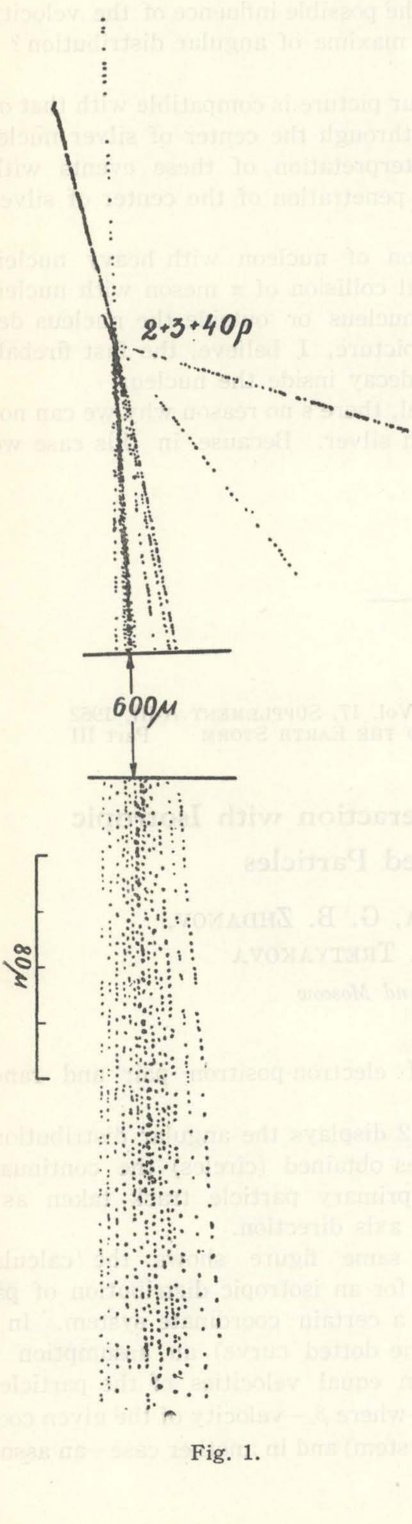

Fig. 1.

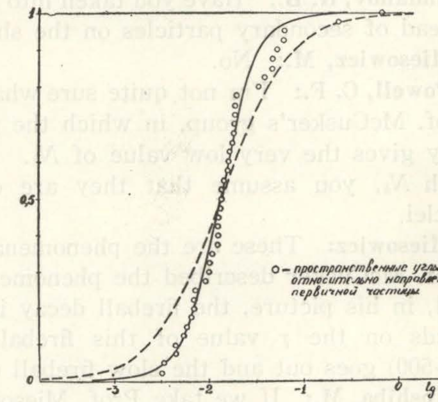

Fig. 2.

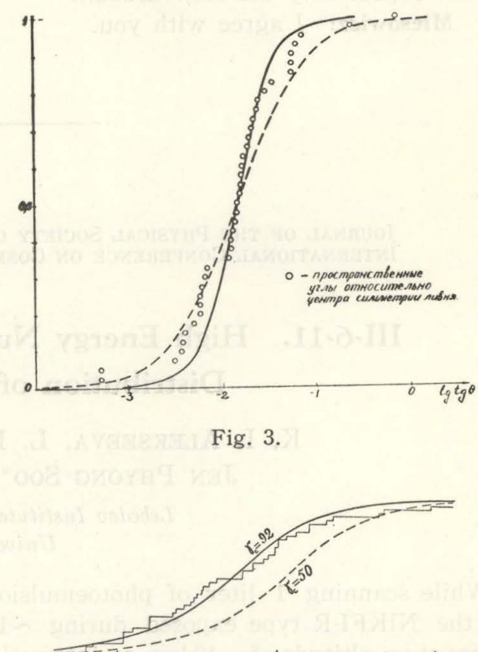

Fig. 3.

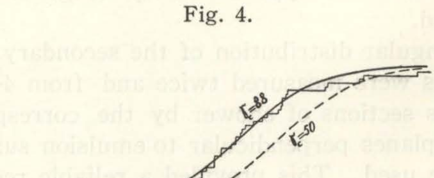

Fig. 4.

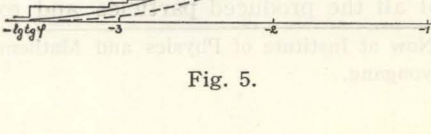

Fig. 5.

If we suppose that the axis direction error is underestimated and the true direction coincides with the centre of symmetry of particles produced then the angular distribution will look somewhat different (Fig. 3). Since measurements of depth angles are carried out, generally speaking, with a considerably greater error than measurements of projection angles on the emulsion plane, we studied also the projected angular distributions. As the comparison of experimental and calculated distributions by the method of ω-test has shown, the experimental data agree as before with the assumption on isotropy, (Fig. 4, 5), the γ_c-value being close to 90.

Proceeding from the average value of the particle transverse momentum $p_{\perp}=0.4$ Bev/c and from the ratio 0.5 of the number of neutral particles to charged ones, one can calculate that the total energy release $K\times E_0$ is about 2×10^{12} ev in the laboratory system and not less than 25 Bev in the system of isotropic particle emergence.

If one assumes that the latter system coincides with the centre-of-mass system of two colliding nucleons, then the inelasticity coefficient in the laboratory system $K=30\%$. But if one assumes the possibility of an asymmetrical emergence of the excited meson cloud, then from the only condition $K_L \leq K$ (primary system) $<100\%$ it becomes possible to conclude that the primary nucleon energy exceeded at least (4-5)10^{12} ev.

An isotropic character of the angular distribution in spite of a sufficiently high energy of the primary particle leads one to conclude that the observed interaction cannot be explained as a central interaction of the incident particle with one or several nucleons of the nucleus. This interaction is probably close by its character to those which were reported on this conference by Prof. Dobrotin's group but differs from them by a higher multiplicity and, therefore, by a higher mass value of supposed excited meson cloud (fire ball).

Discussion

Miesowicz, M.: I would like to remark that in our analysis of anisotropy of jets, we observed a very big spread of anisotropy parameter of individual jets. In the same energy interval ($\sim 10^{12}$ eV) we have jets with very high anisotropy and jets with isotropic angular distribution. This spread is, in my opinion, caused not only by fluctuations but is a consequence of different type of collision which demonstrates itself by the type of the angular distribution. Therefore the σ-value (the anisotropy parameter) is a very important parameter characterizing the type of collision in which the jet had been produced.

Zhdanov, G. B.: I suppose that from the pure central collision which can be described by the hydrodynamical theory it is practically impossible to have such a big fluctuation to give the practically isotropic distribution. We believe that this isotropy is not the matter of the fluctuation in the central collision, but this is the matter of peripherical collision.