Neutron group	Excitation energy, Mev	Spin of N^{14}	l_1	l_2	$10^{13} R_1$, cm	$10^{13} R_2$, cm	Λ_2/Λ_1
g_0	0.00	1^+	1	0	4.5	4.5	0.47
g_1	2.31	0^+	0	0	6.0	6.0	—
g_2	3.90	1^+	0	0	5.0	5.0	—
g_3	4.80	$0^-, 1^-$	0	0	6.5	7.5	—

dσ/dΩ, arbitrary units

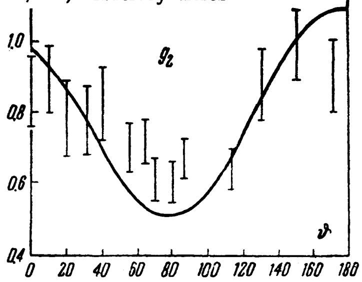

FIG. 2

dσ/dΩ, arbitrary units

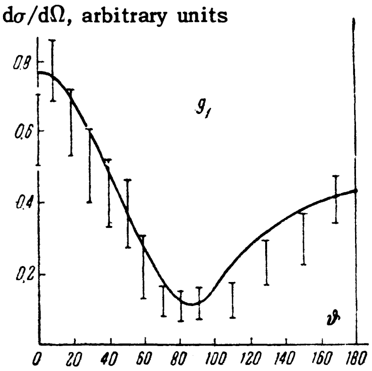

FIG. 3

dσ/dΩ, arbitrary units

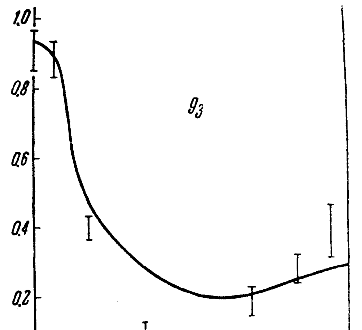

FIG. 4

The values of the parameters used for the calculation are given in the table; $\alpha_D = 0.23 \times 10^{13}$ cm^{-1}, $\alpha_H = 0.47 \times 10^{13}$ cm^{-1}.

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Translated by R. F. Peierls
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POSSIBLE INFLUENCE OF NUCLEON STRUCTURE IN HIGH ENERGY INTERACTIONS

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Submitted to JETP editor July 7, 1959

J. Exptl. Theoret. Phys. (U.S.S.R.) **38**, 633-634 (February, 1960)

CLARIFICATION of the relation between the angular distribution of shower particles and their energy spectrum could provide a means to study the inner structure of the nucleon. In several instances it is more convenient to consider the distribution in the Lorentz-invariant transverse momenta instead of the energy spectrum.

In the majority of showers[1] the average value of the transverse component of the momentum amounts to $\sim (1 - 1.5)\, m_\pi c$, where m_π stands for the mass of the pion. In his papers[2] devoted to the problem of multiple production of mesons, Heisenberg observed that the average value of the transverse momentum of particles produced in the high energy region should be of just that order of magnitude.

If the primary particle is sufficiently energetic to penetrate inside the nucleon, then depending on the initial conditions of the interaction (i.e., depending on the values of the impact parameter), the production of heavier mesons, e.g., K mesons, is possible and this process probably occurs in a volume characterized by the dimension $\sim \hbar/m_K c$. Such a phenomenological treatment (a different approach is given by Jastrov[3]) is discussed in great detail from various points of view in a series of papers by Blokhintsev et al.[4]

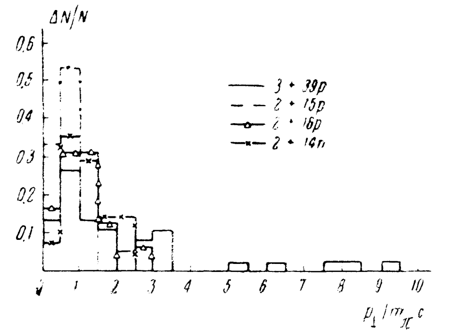

FIG. 1

It seems to us that a discussion of the interesting relation between the degree of anisotropy of shower particles and the character of the distribution of their transverse momenta is not without value. In Fig. 1 is shown the distribution in transverse momenta of particles produced in four showers: the showers 2+16p and 2+14n described by Edwards et al.,[1] the shower 2+15p described by Shein et al.,[5] and the shower 3+39p described by Debenedetti et al.[6] It is reasonably clear from this figure that the distribution of $p_\perp$ in the showers 2+16p, 2+14n and 3+39p corresponds to a significant number of particles with transverse momenta in excess of $m_\pi c$, whereas in the shower 2+15p the values of transverse momenta of the particles do not exceed $1.5\, m_\pi c$. When this fact is related to the character of the angular distributions of the indicated showers, them it becomes possible to reach an interesting conclusion. In Fig. 2 are shown integral angular distributions of

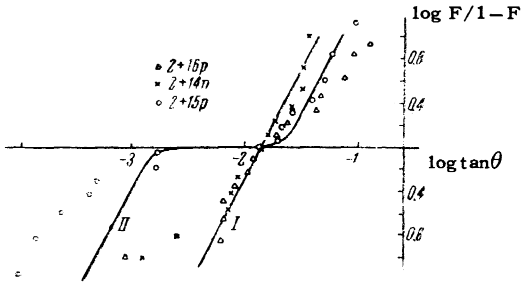

FIG. 2

the particles in the showers 2+16p, 2+14n, and 2+15p. The angular distribution of the particles in the shower 3+39p is nearly identical to that of the showers 2+16p and 2+14n. The straight line I corresponds to a particle distribution in the center of mass system that is isotropic in angle and monoenergetic, curve II corresponds to one anisotropic in angle (of the type $\cos^{2n}\theta^*$) and monoenergetic. We see upon comparison of the data shown in Figs. 1 and 2 that when the angular distribution is anisotropic the values of transverse momenta are essentially of order $m_\pi c$, whereas for a smaller degree of anisotropy (showers 2+16p, 2+14n, and 3+39p) values of transverse momenta in excess of $m_\pi c$ occur frequently. (Let us note that in the case of collisions between a nucleon and a complex nucleus large values of $p_\perp$ may appear as a consequence of scattering.) We propose that in the case of smaller anisotropy (which corresponds approximately to small values of the impact parameter) the production of heavier mesons is more probable, whereas in the case of a strongly anisotropic distribution (which corresponds to larger values of the impact parameter) essentially only π mesons are produced. From this point of view the relation between the degree of angular anisotropy and the character of distribution in transverse momenta of particles produced in the high energy region becomes comprehensible. At the present time we are engaged in an attempt to establish this relation between the degree of angular anisotropy and the distribution in transverse momenta for particles in showers produced by 10-Bev protons from the proton synchrotron of the Joint Institute for Nuclear Research.

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POLARIZATION OF HYDROGEN NUCLEI IN A FREE RADICAL

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Submitted to JETP editor July 25, 1959

J. Exptl. Theoret. Phys. (U.S.S.R.) **38**, 635-636 (February, 1960)

BELJERS et al.[1] have shown that Overhauser's[2] method can be used to polarize hydrogen nuclei in the free radical of diphenyl picryl hydrazyl (DPPH).

When the $\Delta M = \pm 1$ and $\Delta m = 0$ transitions (where M and m are the projections of the electron and nuclear spins respectively in the direction