It is well known that for μ capture from a singlet state in a metal, a muon which is in a higher state in the hyperfine structure has a large probability of making a transition into a lower state and giving its energy to a conduction electron.[6] For example, the probability of such a transition in Al is $\sim 10^6 \text{ sec}^{-1}$. Thus for light nuclei we can test for the presence of a form factor by comparing the transition probabilities in metals and nonmetals. The muons in nonmetals are distributed statistically among the hyperfine state levels (if there is not some other kind of transition mechanism). In addition, a muon in a higher hyperfine state can also make a magnetic dipole transition to a lower state. It is known[7] that the probability of this transition varies as Z^{*q}, where Z^* is the effective charge. Thus for nuclei heavy enough to have an effective charge greater than 35, almost all the muons at a high hyperfine level make the transition to a lower state. Of course, a strong magnetic field would effect the magnetic dipole transition, and we could change the distribution of muons among the states of the hyperfine distribution.

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MOMENTUM DISTRIBUTION OF PARTICLES PRODUCED IN INELASTIC N-N COLLISIONS AT E = 9 Bev

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FIGURES 1 and 2 show theoretical and experimental momentum spectra of particles of different kinds, produced in inelastic collisions between nucleons (in the center-of-mass system of the colliding nucleons). The theoretical spectra are calculated with the statistical theory,[1] while the experimental results are taken from reference 2. Statistical measurement errors are indicated.

The table lists the values of the average momenta of the nucleons and pions, $\bar{p}$, calculated from the data of Figs. 1 and 2. The experimental values of $\bar{p}$ for the laboratory system of coordinates were obtained by the Lorentz transformation from the mass system under the assumption that in the p-p collisions the angular distributions of

	Pions		Protons	
	Experiment	Theory	Experiment	Theory
$\bar{p}_{l.s.}$, Bev/c	1.0±0.2	1.46	3.6±0.5	2.9
$\bar{p}_{c.m.s.}$, Bev/c	0.40±0.1	0.57	1.24±0.25	0.79

the pions and nucleons in the center-of-mass system are symmetrical with respect to the angle $\theta = \pi/2$. (This assumption agrees with the theoretical and experimental results obtained in references 3 and 4.) The values obtained are close to the values of $\bar{p}$ obtained in reference 5 from an analysis of the interaction between protons and photoemulsion nuclei, $\bar{p} \approx p_{sp} = (3.0 \pm 0.5)$ Bev/c for protons and $p \approx p_{s\pi} = (1.0 \pm 0.2)$ Bev/c for pions (p_{sp} is the momentum of fast protons, $p_{s\pi}$ is the momentum of fast pions).

It is seen from the table and from the diagrams that the experimental momentum spectra of the nucleons are harder and the spectra of the pions are softer than those calculated theoretically. Accordingly, the theoretical energy losses to the production of new particles in one act of inelastic p-p interaction, ΔE, is equal to $\sim 58\%$ of the primary-nucleon energy (of which approximately 50% is consumed for the production of pions and approxi-

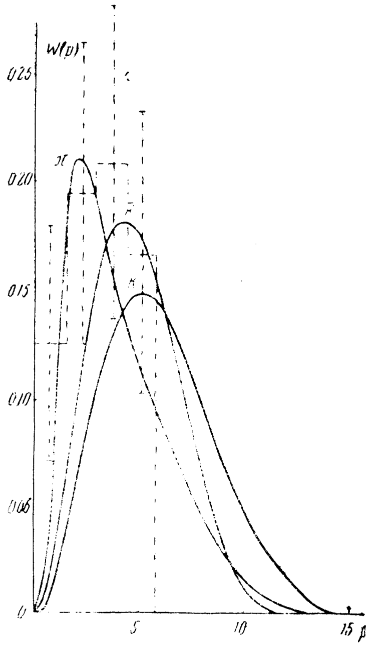

FIG. 1. Momentum spectra of π, K, and $\bar{K}$, mesons. Dotted curve – experimental histogram for pions. The momenta p are given in $m_\pi c$ units, W(p) – probability of momentum p normalized to unity.

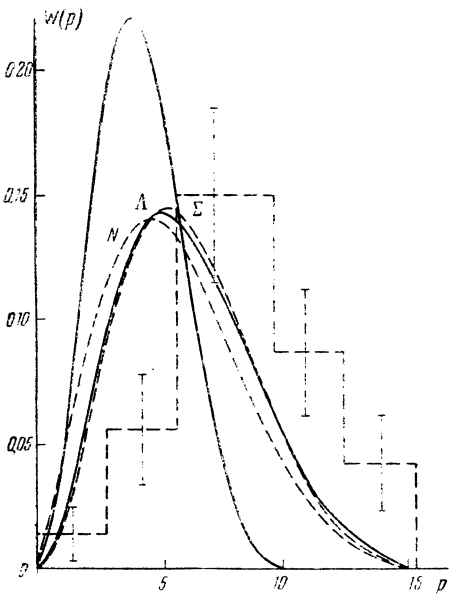

FIG. 2. Momentum spectra of nucleons, antinucleons, Λ hyperons, and Σ hyperons. The dotted curves show the theoretical and experimental spectra of the nucleons, and also the spectrum of Σ hyperons. The momenta p are given in units of $m_\pi c$; W(p) – probability of momentum p normalized to unity.

mately 8% for the production of strange particles,)* are found to be considerably higher than the average experimental values, namely ΔE = (30 to 40)%,[3] (40 ± 10)%,[5] and (35 ± 2)% (private communication from Bunyatov).

The difference between the theoretical and experimental values of the spectra and energy losses can be understood qualitatively, if it is considered that in the experimental investigations[2,3,5] the central N-N collisions were not separated in the measurements from the peripheral ones. On the other hand, the nucleon spectrum after a peripheral collision is on the average harder than the spectrum of nucleons produced in a central collision. To the contrary, the pions produced in a peripheral collision are on the average softer than the pions due to central collisions.

It was shown in reference 4 that an allowance for the peripheral collisions is also essential to explain the angular distributions of the particles produced in N-N collisions.

*Theoretical values of the energy losses are calculated on the basis of the momentum distributions, given in Figs. 1 and 2. This is followed by a changeover to the laboratory system under the assumption that the angular distributions of the particles, produced in p-p collisions, are symmetrical in the center-of-mass system about the angle $\theta = \pi/2$.

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