rays for 12 hours at an altitude of 28 to 30 km. The developed photoemulsions were scanned under microscope and $\pi \rightarrow \mu$ decays and σ captures were noted. Table I shows the results of the study.

In order to allow conclusions about the π-meson production cross section to be drawn from the table, we calculated and included corrections for the geometry of the experiment. As can be seen, the geometry of the experiment significantly affects the results, particularly when the target substance and detector are of comparable dimensions.

Assuming that the energy spectrum of the mesons produced in aluminum and lead in the energy region under study is of the form $n(E)dE = kE^{0.6}dE$ (E is the kinetic energy of produced mesons),[4] the total number of mesons with energy less than E_0 is given by

$$N(<E_0) = aE_0^{1.6}$$

Using this relation and the data of Table I we calculated lead to aluminum ratios of cross sections for production of mesons for various thicknesses of the target substance. They are given in Table II together with values of the coefficient a.

TABLE II

Target substance	Thickness (cm)	$a \cdot 10^{-4}$	σ_{Pb}/σ_{Al}
Al Pb	0.6 0.2	186.6±32.6 128 ±19	5.30±0.22
Al Pb	0.6 0.4	186.6±32.6 147.0±12.7	6.03±0.51
Al Pb	0.6 0.6	186.6±32.6 84.8± 6.6	3.70±0.88
Al Pb	1 1	147.7±15.7 38.8± 2.5	2.60±0.46

As can be seen from Table II, the lead-to-aluminum meson production cross section ratio increases with decreasing E_0 and, probably, becomes larger than the geometric $\sigma_{Pb}/\sigma_{Al} = 3.9$ for low-energy mesons.

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METHOD FOR DETERMINING HYPERON POLARIZATION IN THE REACTION $\pi + p \rightarrow Y + K$

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THE polarization of hyperons is one of the main features of the interactions that lead to the production of strange particles. On the other hand, the asymmetry in the subsequent decay of the polarized hyperons is specified by the product of the polarization and the asymmetry coefficient;[1,2] for the determination of the latter quantity, the polarization of the hyperon has to be known.

In the present note we propose a method for determining the polarization of the hyperon in the reactions

$$\pi + p \rightarrow (\Sigma, \Lambda) + K, \quad K + p \rightarrow (\Sigma, \Lambda) + \pi. \tag{1}$$

The method consists of measuring the asymmetry of the K or π mesons produced in the reactions (1) with a polarized proton target. We shall show that in this case the asymmetry gives directly the polarization of the hyperon in the reaction with an unpolarized proton target.

The matrix for a reaction of type (1) in the most general form can be written as

$$M = a + \mathbf{b} \cdot \sigma \tag{2}$$

(the hyperon spin is $1/2$, the K-meson spin is zero). The density matrix of the initial state is

$$\rho_0 = (1 + \mathbf{P}_0 \cdot \sigma)/2, \tag{3}$$

where $\mathbf{P}_0$ is the polarization of the target protons.

Using (2) and (3) we obtain the following expression for the differential cross section

$$\sigma(\theta, \varphi) = (aa^* + \mathbf{b} \cdot \mathbf{b}^*)\left(1 + \mathbf{P}_0 \frac{a^*\mathbf{b} + a\mathbf{b}^* + i[\mathbf{b}^* \times \mathbf{b}]}{aa^* + \mathbf{b} \cdot \mathbf{b}^*}\right). \tag{4}$$

Now we compute the polarization of the hyperon for the case of the unpolarized proton target and obtain

$$\mathbf{P} = \frac{a\mathbf{b}^* + a^*\mathbf{b} + i[\mathbf{b} \times \mathbf{b}^*]}{aa^* + \mathbf{b} \cdot \mathbf{b}^*}. \tag{5}$$

Two cases arise according to the intrinsic parity of the particles involved in the reaction.

1. The intrinsic parity does not change, i.e., $I_\pi I_p = I_Y I_K$. Here the matrix (2) is scalar and $\mathbf{b} = b_0 \times [\mathbf{k} \times \mathbf{k}']$, where $\mathbf{k}$ and $\mathbf{k}'$ are unit vec-

tors in the directions of the relative momenta of the initial and final states. From (4) and (5) we have

$$\sigma = \sigma_0 (1 + \mathbf{P}_0 \cdot \mathbf{P}); \quad \mathbf{P} = \frac{ab_0^* + a^* b_0}{aa^* + bb^*} [\mathbf{k} \times \mathbf{k}'], \tag{6}$$

where σ_0 is the cross section of the unpolarized protons.

2. The intrinsic parity changes, i.e., $I_\pi I_p = -I_Y I_K$. The matrix (2) is pseudoscalar with $a = 0$ and $\mathbf{b} = b_1\mathbf{k} + b_2\mathbf{k}'$. In this case we have

$$\sigma = \sigma_0 (1 - \mathbf{P}_0 \cdot \mathbf{P}); \quad \mathbf{P} = i \frac{b_1 b_2^* - b_2 b_1^*}{\mathbf{b} \cdot \mathbf{b}^*} [\mathbf{k} \times \mathbf{k}']. \tag{7}$$

Finally we obtain

$$\sigma(\theta, \varphi) = \sigma_0 (1 \pm P_0 P \sin(\delta - \varphi)), \tag{8}$$

where δ is the azimuth of the initial polarization vector ($\mathbf{P}_0$ is in the plane perpendicular to $\mathbf{k}$). Hence the asymmetry is equal to

$$e(\theta) = \pm P_0 P \sin \delta. \tag{9}$$

Thus a measurement of the reaction (1) with a polarized target would permit a determination of the polarization P of the hyperon in the reaction with an unpolarized target. If the parity (KY) relative to (πp) is known, then this experiment would also allow one to determine the sign of the polarization. On the other hand, if the sign of the polarization is determined from the hyperon decay, then the proposed experiment would afford a possibility to determine the relative parity (KY).

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179

SOME REMARKS ON THE STRUCTURE OF SHOCK WAVES

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1. The behavior of entropy in the transition zone of a not very strong shock wave is described by the general heat-transfer equation. Ia. B. Zel'dovich has shown that in a gas with a high thermal conductivity and negligible viscosity the entropy goes through a maximum and in that case the speed of sound in the system of coordinates associated with the discontinuity is equal to the local speed of sound.[1] We shall show that this coincidence also occurs in other cases. For a maximum to exist we must have a non-hydrodynamic energy flux associated above all with the thermal conductivity, since the viscosity alone can only increase the entropy. If we differentiate with respect to V (specific volume) the condition of the conservation of momentum flux at the point $dS = 0$ we obtain:

$$\left(\frac{dp}{dV}\right)_S = -m^2 + \left(\frac{4}{3}\mu + \zeta\right)\frac{d}{dV}\left(\frac{du}{dx}\right)$$
$$= -m^2 + \left(\frac{4}{3}\mu + \zeta\right)\frac{d^2u}{dx^2} \Big/ \frac{dV}{dx}. \tag{1}$$

The last term is equal to zero since at the point $S = S_{max}$ the velocity has a point of inflection, which can be shown to exist both in the case of weak waves,[2] and also in the case of waves of arbitrary intensity. At the same time $(dp/dV)_S = -m^2 = -\rho^2 u^2$, from which it follows that $\pm u = c_0$.

If we now turn to magnetohydrodynamics, then finite conductivity (Joule heat) alone can only increase the entropy. It may go through a maximum if we take thermal conductivity into account. Then, by investigating the conditions for the conservation of momentum flux and of the magnetic field perpendicular to the flow of gas,[3] it can be shown that a maximum exists when $\pm u = c_m = (c_0^2 + H^2/4\pi\rho)^{1/2}$, if the field has a point of inflection at this point.

If the influence of thermal conductivity or of any kind of diffusion is predominant while the viscosity and the Joule heat can be neglected, then the coincidence noted above can be easily established even in the relativistic case. It is of interest to note that under these circumstances, in the case of detonation, the process passes through the Jouguet point twice: the first time when the medium undergoes shock compression, but subsequently the removal of heat due to thermal conductivity lowers the entropy, and the process arrives at a point on the Hugoniot adiabatic, and from there the initiated detonation again brings the process to the Jouguet point.

2. We shall investigate qualitatively some aspects of the physical picture of the structure of a normal shock wave in magnetohydrodynamics. In this case a new type of dissipation, Joule heat, appears and manifests itself in the formula for the entropy discontinuity in a weak wave:[4]