for and study of unstable neutral particles with properties different from the Λ^0 and θ^0 particles, since the information on the number of D^0 mesons and their properties is of great importance for the systematics of elementary particles.

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ANGULAR DISTRIBUTION OF DECAY PRODUCTS OF $\Sigma^\pm$ -HYPERONS PRODUCED BY PROTONS IN PHOTOEMULSION

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SOLOV'EV[1] stressed the importance of studying the longitudinal asymmetry in the angular distribution of π mesons produced in hyperon decays. During a study of the strange-particle production by 9-Bev protons, Kostanashvili and Shakhulashvili[2] obtained an indication as to the possible existence of such an asymmetry in the decay of $\Sigma^\pm$ hyperons. In view of this, we undertook an experiment to improve the data on the angular distribution of $\pi^\pm$ mesons from the decay of $\Sigma^\pm$ hyperons produced in interactions between 9-Bev protons and photoemulsion nuclei. Our main concern was to choose a method of searching for hyperons free from any experimental bias and to identify carefully the cases of decay that were found.

The search for Σ hyperons was carried out by following the tracks from stars produced by the interaction of the primary protons with emulsion nuclei (NIKFI BR-400 emulsion). Each layer of the emulsion stack was area-scanned for stars with $N_h \geq 10$ in which there was at least one track satisfying the following conditions: a) the particle producing the track is emitted in the direction of the forward hemisphere relative to the motion of the proton beam; b) the line of horizontal projection of the track in one layer of emulsion was ≥ 3 mm; c) the value of the ionization I was within the limits of $1.5\,I_{min} \leq I \leq 7\,I_{min}$. Tracks satisfying these conditions were followed a distance of at least 2 cm or to the end if their length was less than 2 cm. The Σ -hyperon decays in flight via the scheme $\Sigma^\pm \rightarrow \pi^\pm + n$ were selected primarily by inspection. To do this, all points of disappearance of the tracks of particles which clearly did not stop within the layer of emulsion were carefully examined under high magnification (60 × 10 × 1.5) to seek a secondary relativistic or almost relativistic track. Such cases could represent the decay in flight of $\Sigma^\pm$ hyperons or $K^\pm$ mesons, where it may be expected beforehand that, owing to the great difference in the lifetimes of these two particles, the contamination of K mesons should be extremely slight.

The final identification was made on the basis of multiple scattering and ionization measurements. The values of the velocity (β) of the hyperon and K meson corresponding to the measured value of $p\beta$ and calculated with the tables in reference 3 were compared with the results of the ionization measurement by the method given in reference 4. The statistical error of the measurement of the quantity $p\beta$, as a rule, did not exceed 10 — 15%, and the relative error in the ionization measurement did not exceed 6 — 8%. Measurements to such an accuracy proved to be sufficient for a reliable identification of hyperons. Analogous measurements were made for control purposes on tracks of known K mesons (the K mesons were found incidentally, when extending the tracks from the selected stars) in the interval of ionization (2.5 — 7) $I_{\min}$; in all cases, the identification of the particles proved to be correct. Moreover, for two hyperons found by the above-described method the tracks of the π mesons produced in the decay could be followed. The ranges of the π mesons were in good agreement with the kinematics of the decay via the scheme $\Sigma^{\pm} \rightarrow \pi^{\pm} + n$.

In the method chosen for searching for the decays, the only cause for the missing of $\pi^{\pm}$ mesons could have been a low efficiency in detecting relativistic particles. To estimate this efficiency, we investigated 226 cases of $\pi \rightarrow \mu$ decay in which the μ meson stopped inside the emulsion stack. The electrons from the μ meson were not observed in eight cases. On this basis, one can evidently assume that there was no preferential selection of $\pi^{\pm}$ mesons in any direction in the $\Sigma^{\pm}$-hyperon decays found.

In all, 72 cases of $\Sigma^{\pm}$-hyperon decays in flight were found in this way. If it is assumed that the angular distribution has the form $(1 + a\cos\theta)$, where θ is the angle between the direction of flight of the Σ hyperon and the π meson in the hyperon rest system, then the value of a turns out to be 0.09 ± 0.2. After adding seven cases found by the same method, but under somewhat different conditions, we obtained $a = 0.03 \pm 0.2$.

In the process of searching for and identifying the hyperons, two cases were observed in which the secondary particle turned out to be an electron. The kinetic energies of the electrons were equal to ~1.5 Mev and (11 ± 2) Mev. Both cases could be explained by the proton undergoing charge exchange in a carbon nucleus of the emulsion and the subsequent β decay of the resulting nitrogen isotope N^{12}:

$$p + C^{12} \rightarrow N^{12} + n, \qquad N^{12} \rightarrow C^{12} + \beta^{+}.$$

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ON THE POSSIBILITY OF MEASURING IN THE LABORATORY THE SPEED OF PROPAGATION OF GRAVITATIONAL WAVES

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In recent years there has been some discussion[1-5] of possible new experiments to investigate the gravitational field, in particular, experiments to detect gravitational waves, terrestrial tests of general relativistic effects, a repetition of the classical Eötvös experiment, and so on. In view of the recent developments in electronics, it is natural to use the most modern, sensitive measuring techniques. The question of whether we can measure the speed of gravitational waves has been discussed in reference 5. To do this it is necessary to have a gravitational oscillator, radiating an intense, high-frequency gravitational wave, and, at some distance, a gravitational receiver. To use language borrowed from electrodynamics, we can say that a gravitational experiment with macroscopic objects must necessarily be done in the "induction zone," i.e., the distance between the oscillator and receiver must be less than a wavelength.

In the linear approximation to Einstein's equations, a weak gravitational field is described by D'Alembert's equation, with a suitable right-hand side. We therefore write a tentative expression for a typical component of the field strength, at distances small compared with a wavelength, with a dipole frequency ω (reference 6)

$$E_R = 2p_0 e^{i\omega t} R^{-3} \cos\theta\,(1 + k^2R^2/2 - ik^3R^3/2 + \ldots), \tag{1}$$

where $k = \omega/c_g$, c_g is the speed of propagation of the gravitational field in the wave zone, p_0 is the dipole moment, and R is the distance. This expression holds for $kR \ll 1$. There are two "nonstatic" terms in the brackets: $k^2R^2/2$ and $ik^3R^3/2$