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ОБЪЕДИНЕННЫЙ ИНСТИТУТ ЯДЕРНЫХ ИССЛЕДОВАНИЙ

ЛАБОРАТОРИЯ ВЫСОКИХ ЭНЕРГИЙ

Wang Kan-chang, Wang Tzu-tzen, V.I.Veksler, J.Vrana,
Ding Da-tzao, V.I.Ivanov, Kim Hi In, E.N.Kladnitzkaya,
A.A.Kuznetsov, Nguyen Dinh Tu, A.V.Nikitin,
M.I.Soloviev, T.Hofmokl, Chen Ling-yen

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After the non-conservation of parity in weak interactions was discovered, the problem about the role of this law in strong interactions is being discussed by different authors still more often.

In Refs./1/,/2/ the possibility of checking this law was discussed. It follows from these papers that the appearance of the longitudinal polarization of a Λ -hyperon created in nuclear collisions points to the parity nonconservation in strong interactions if there was no distinction in the direction of Λ -hyperons. A number of experiments have been performed with the aim of discovering the longitudinal polarization of hyperons. These papers were concerned with the region of zero/3/,/4/ or mean energy /5/,/6/,/7/ of the primary particles. As for the momentum of the produced strange particles, it was less than or about 300-500MeV/c in the c.m.s. There was not found a longitudinal polarization of hyperons. Analysing these data, one can come to the conclusion that in order to solve the question under discussion it is necessary to perform experiments at higher energy and to investigate the interactions with nucleons but not with nuclei, as the latter ones will make the understanding of the phenomenon more difficult.

With this aim we have analysed the angular asymmetries in the decays of Λ produced in $\pi^- p$ collisions with an energy of 7-8 BeV/c/8/. In this letter only the preliminary results are given. We scanned 14000 pictures obtained in π^- meson beam with the momentum 6,8 BeV/c.As a result,84 Λ and 9 V° were found,the latter ones can be treated both as Λ and K° , and after the scanning of 20000 pictures, the momenta of incident π^- mesons being 8BeV/c, there was found 91 Λ and 24 Λ or K^0. The admixture of Λ created on quasi-free protons constitutes 20%/8/, whereas the number of Λ , generated in Σ° decay is very small/9/.

All 208 events were divided into four intervals by momenta.

TABLE 1

p_Λ BeV/c	The number of Λ	Λ or K°	a systematic missing in scanning
< 400	3	0	
400-800	50	1	6
800-1200	54	3	
>1200	68	29	
	175	33	6

Λ may be in principle identified well by the kinematics of decay and by the ionization of the decay products only up to the momentum of 1200 MeV/c. In some cases the identification of V^{o} is difficult because of the experimental conditions (the geometry of decay, illumination). For this reason in the region below 1200MeV/c there remain 4 events which are not identified. In the region above 1200 MeV/c there are 29 V^{o} which according to kinematics may be considered both as Λ and K^{o}. The measurements of the ionization of the positive decay products in these events do not allow to distinguish Λ. Besides the difficulty of identifying the particles at high energies, systematic missing of events in scanning is also possible, if a π^{-} meson from Λ decay has the momentum of $\leqslant$50MeV/c (the range is about 7mm). The number of these events was estimated by the spectrum of the observed Λ and is not more than 3.5% (under the assumption that the angles of protons emission in the rest system of Λ are distributed isotropically). This corresponds to 6 events according to our statistics. The main contribution of these events lies in the interval from 500 up to 1000 MeV/c for P_{Λ}.

The asymmetry in the decays of Λ was investigated in the coordinate system drawn in Fig.1. The axis of the coordinates :

x - is the direction of the normal to the plane of Λ generation $[\vec{P}_{\pi} \times \vec{P}_{\Lambda}]$;
y - is the direction of Λ emission in the lab.system $\vec{P}_{\Lambda}$ and
z - is the direction perpendicular to the xy -plane $\vec{P}_{\Lambda} \times [\vec{P}_{\pi} \times \vec{P}_{\Lambda}]$.

The asymmetry in the distribution of the angle ξ is the up-down asymmetry; in the distribution of $\theta^{*}_{\circ}$ -the forward-backward asymmetry;in the distribution of φ - the right-left asymmetry.

The asymmetry coefficient has been calculated by the formula

$$\alpha \bar{P} = \frac{3}{N} \sum_{i=1}^{N} \cos \theta^{*}_{\circ i} \pm \sqrt{\frac{3}{N}[1-(\alpha \bar{P})^{2}]}$$

The results of our analysis are given in Table II with account of possible missings. Unidentified and missed events which were added are indicated in parentheses. The value $\alpha \bar{P}_{1}$ =-0.37 ± 0.15 for the cases with 400<P_{Λ}<1200 MeV/c and $\alpha \bar{P}_{1}$ =-0.24 ± 0.12 for all the cases are the lower limits since we included all unidentified events as Λ since it is known that a part of them, although very small, are K^{o}.

TABLE II

p_Λ	N	$\alpha\bar{p}_1$	$\alpha\bar{p}_1$	$\alpha\bar{p}_3$
		θ_+^*	φ	ξ
$400<p_\Lambda<1200$	104	-0.58 ± 0,17	0.00 ± 0.17	0.03 ± 0.17
	104 + (4)	-0.50 ± 0.15	0.06 ± 0.16	0.07 ± 0.16
	104 + (4) + (6)	-0.37 ± 0.15		
$p_\Lambda > 1200$	68	-o.66 ± 0.19	-0.14 ± 0.21	0.24 ± 0.21
	68 + (29)	-0.09 ± 0.17	-0.06 ± 0.17	0.21 ± 0.17
For all p_Λ	172	-o.61 ± o,12	0.05 ± 0.13	0.11 ± 0.13
	172 + (33)	-0.31 ± 0.12	0.00 ± 0.12	0.12 ± 0.12
	172 + (33) + (6)	-0.24 ± 0.12		

The problem was studied about possible systematic errors in prooessing, e.g., systematic errors in the particle momenta, in the angles which could lead to the distortion in the determination of θ_+^* etc. Such errors were not found.

Note that the mean momentum of Λ in the c.m.s. for the group of events belonging to the interval of momenta in the lab. system - 400 - 1200 MeV/c is equal to 1100 MeV/c, and for the group of cases with the momentum 1200 MeV/c in the lab. system is about 600 MeV/c. It is possible that the magnitude of $\alpha\bar{p}_1$ depends on the momentum Λ in the c.m.s. Of course, a further investigation is necessary.

There was not found "right-left" (for φ) and "up-down" (for ξ) asymmetry within the limits of statistical errors. The presenoe of "forward-backward" asymmetry is an important result in view of parity nonconservation in strong interactions when strange particles are generated. The research is in progress. It is likely that the result obtained is still a consequence of the incufficient statistios , as we have analysed only ~ 200 Λ.

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