

In the experiment we determined the relative change in counts of both telescopes due to the addition of brass filters 17 g/cm^2 thick. The filters were placed either in front of the first counters or behind the second counters of the telescopes. Aside from these filters, brass filters of thickness 8.5 g/cm^2 were permanently installed in front of the last counters.

Thus, we investigated in this experiment the nuclear absorption of mesons, the mean energy of which changed from 100 to 70 Mev as they passed through the filters. (This energy interval corresponds to the energy of mesons emitted in $K_{\pi 2}$ decay.)

These experiments showed only a slight change in the nuclear activity of the mesons, which could be explained by the decay of π mesons into μ mesons at a distance of one meter. Apart from the decrease in the nuclear activity, the errors of measurement allow a change of not more than 15% of the geometric cross section in the cross section for the nuclear absorption of mesons at a distance of 3 to 110 cm.

Hence, it should be assumed that the results obtained in the study of the nuclear activity of π mesons from the $K_{\pi 2}$ decay are apparently due to errors in measurements.

¹ Alexander, Johnston, and O'Ceallaigh, Nuovo cimento **6**, 478 (1957).

Translated by E. Marquit
371

MEASURING OF THE CHIRALITY OF THE MU MESON

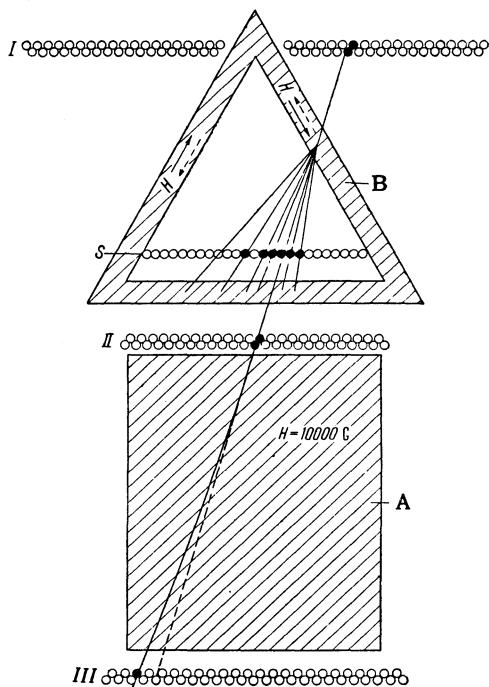
A. I. ALIKHANOV, Yu. V. GALAKTIONOV,
Yu. V. GORODKOV, G. P. ELISEEV, and
V. A. LYUBIMOV

Institute of Theoretical and Experimental
Physics, Academy of Sciences, U.S.S.R.

Submitted to JETP editor April 25, 1960

J. Exptl. Theoret. Phys. (U.S.S.R.) **38**, 1918-1920
(June, 1960)

IT is known that the decay of the μ meson is characterized, in particular, by the chirality of the μ meson, i.e., by the direction of the spin of the μ meson relative to its momentum. In the universal (V-A) theory of weak interaction, the direction of the spin of the μ meson is opposite



I, II, and III are rows of hodoscopic counters for the determination of the trajectory of the μ meson. S is a row of counters for the registration of the showers. A is the iron yoke of a permanent magnet for the determination of the sign of the μ mesons from the deflection in a magnetic field. B is the iron core of an electromagnet with a triangular cross-section, in which the μ mesons produced showers, including some on electrons polarized by the magnetic field.

to its momentum, and in the STP interaction the reverse is true.

In the present work we measured the chirality of the μ meson by a method proposed earlier,¹ based on measuring the cross section of the scattering of polarized μ mesons by polarized electrons, since this cross section depends on the relative orientation of the colliding particles.

The quantity measured directly in the test was the number of δ showers produced by μ mesons in magnetized iron and having not less than two particles ($n \geq 2$). Formulas and tentative estimates on the magnitude of this effect for cosmic-ray μ mesons are given in reference 1. The drawing shows the experimental setup. I, II, and III are arrays of hodoscopic counters, which allow to plot the trajectory of the particle from three points and to determine its sign from the deflection in a magnetic field of $\sim 10,000$ gauss in the iron yoke of the permanent closed magnet A. The μ meson was deflected in the iron core by the effect of the magnetic field (Δ_H) and by repeated scattering (Δ_S). Under our conditions $\Delta_H/\Delta_S = 6.7$. The δ showers occurred in the iron core of the closed electromagnet B, which had a triangular cross section.

The magnetic field had an induction of 14,400 gauss. The row of counters S registered the showers produced in the lateral sides of the "triangle." The direction of the magnetic field in the "triangle" was reversed after the registration of each shower.

The cases of interest to us were registered by a coincidence circuit I, II, III, and S, whenever not less than three counters ($m \geq 3$) operated in the array S. The number of μ mesons passing through the setup was 500 per minute, of which one or two gave rise to showers with $m \geq 3$. To date, 116,000 showers have been registered in which not less than three counters in an array were operated. The energies of the μ mesons that produced these showers ranged from 3 to 6.5 Bev. The upper limit of the μ -meson energy, 6.5 Bev, corresponded to a deflection in the magnetic field ($\Delta \approx 0.5$ cm) such that the signs of the particles were still distinguishable. The lower limit of the μ -meson energy was determined by the requirement $n \geq 2$ in the given thickness of the iron of the "triangle." μ mesons with an energy less than 3 Bev are unable to produce a δ electron that can satisfy the requirement $n \geq 2$.

The results of the test were the following: for μ^+ mesons the difference in the number of showers for two different directions of the current in the winding of the "triangle" yields

$$s_+ = -0.37 \pm 0.41 \quad (s = (N_+ - N_-)/(N_+ + N_-)),$$

for μ^- mesons

$$s_- = +0.82 \pm 0.42$$

and, finally, for both signs of the μ -meson charge the effect is

$$s_{\pm} = 0.58 \pm 0.29$$

with an expected value $s_{\text{theor}} = 0.6$, corresponding to a 50% of polarization of the μ mesons.² The sign of the effect is in accord with the predictions of the V-A theory of interaction, i.e., left-handed chirality of the μ^+ meson.

The probability that the effect is zero or less is 2×10^{-2} . The measurements are being continued, and a further increase in the statistics will reduce this probability.

¹ A. I. Alikhanov and V. A. Lyubimov, JETP **36**, 1334 (1959), Soviet Phys. JETP **9**, 946 (1959).

² A. I. Alikhanov, Trans. of the Conference on Cosmic Rays, Moscow, 1959 (in press).

Translated by I. Schroer
372