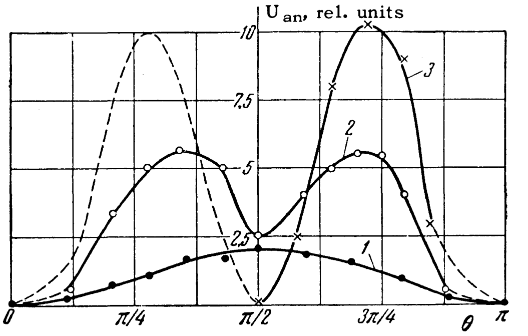

FIG. 2

it is only necessary that the factor $\mu H/c$ have a large value (μ is the Hall mobility of carriers, c is the velocity of light), irrespective of whether this value is obtained by increasing the magnetic field or increasing the mobility, as happens at low temperatures.

In conclusion the author takes this opportunity to thank Academician I. K. Kikoin for valuable discussions and interest in the present work, and L. M. Barkov and S. Kh. Khakimov for cooperation in the experiments.

[1)]This solenoid was kindly made available by Prof. I. I. Gurevich, L. M. Barkov and S. Kh. Khakimov, and the present author is very grateful for this assistance.

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266

EFFICIENCY OF A SPARK CHAMBER FOR RECORDING CHARGED SHOWER PARTICLES

V. N. BOLOTOV and M. I. DEVISHEV

P. N. Lebedev Physics Institute, Academy of Sciences, U.S.S.R.

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THE efficiency of a two-electrode spark chamber was determined in an arrangement consisting of two spark chambers of area 600×600 mm and interelectrode distances of 90 and 70 mm. The central electrode between the chambers consisted of 2-mm duraluminum sheet. Over the chambers was a 2-cm layer of lead in which the showers were produced by cosmic-ray electrons. A plastic scintillator with an FÉU-33 phototube was mounted under the chambers. When a shower of three or more particles passed through the scintillator, a pulse (100 kV) was applied to the chambers with a delay of 0.3 μsec. The chambers were filled with pure neon to a pressure of 765 mm Hg. The design of the spark chambers was similar to that of a chamber described earlier.[1] One of the electron showers recorded in the spark chambers is shown in Fig. 1.

We investigated the chamber efficiency q for recording a shower and the efficiency Q for recording individual particles in a shower. The quantity q was defined as the ratio of the number of showers recorded simultaneously in both chambers to the number of showers recorded in one chamber.

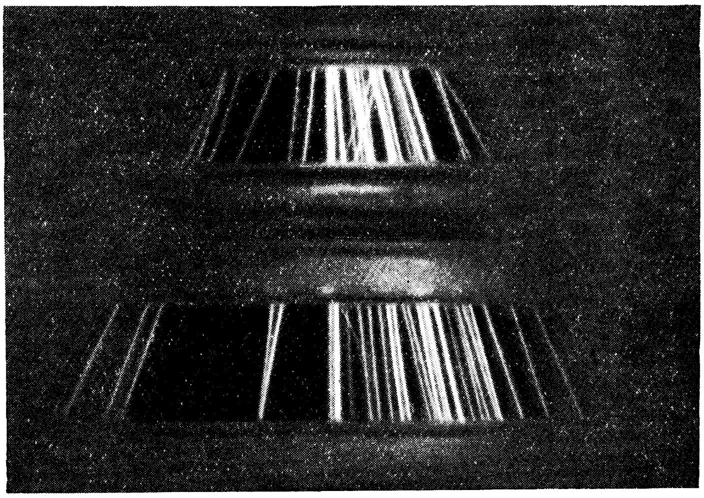

FIG. 1. Electron shower recorded in the spark chambers.

The efficiency for recording showers in each chamber is

$$q_1 = 0.95 \pm 0.05 \text{ and } q_2 = 0.94 \pm 0.05$$

(for chambers with interelectrode distances of 90 and 70 mm, respectively).

A spark chamber operating under similar conditions does not record particles entering at large angles to the direction of the electric field.[2,3] For this reason, the definition of the shower efficiency of the chamber Q as the ratio of the number of recorded particles to the number of particles passing through its effective volume was used only for angles < 40°. Since, in our case, the number of electrons produced in the electrode between the chambers is small, the efficiency Q is defined as

$$Q_1 = n/n_{H_2} \text{ and } Q_2 = n/n_{H_1},$$

where n_H is the number of sparks in the lower chamber from particles passing through both chambers, and n is the number of pairs of sparks in the upper and lower chambers produced by the same particle. To determine Q_2, the positions of the chamber were interchanged.

In this way we have calculated the shower efficiencies for both chambers: $Q_1 = 0.78 \pm 0.06$ and $Q_2 = 0.73 \pm 0.17$ with the mean numbers of particles in the chambers equal to 18.6 ± 2.1 and 20.0 ± 5.7. Figure 2 shows the distribution of showers recorded in the spark chamber as a function of the number of particles.

Figure 3 shows the dependence of the shower efficiency on the number of particles passing through the chamber. It is seen that within the limits of statistical error, this quantity remains unchanged up to several tens of particles in a shower.

It can be assumed that the particles entering at angles < 40° are recorded more efficiently than follows from the experimental data. The decreased shower efficiency could possibly be a consequence of the fact that the particles traveling through the upper chamber at large angles without being recorded are scattered in the central electrode and, upon passing through the lower chamber at smaller angles, are recorded. This effect can be important in showers under the lead, which have a large number of low-energy electrons. We carried out an analysis in which sparks occurring far from the shower axis in the lower chamber were not counted as shower particles. The shower efficiency proved to be $Q_1 = 0.92 \pm 0.07$. One month after the spark chamber was filled, its efficiency for recording showers changed only slightly.

The authors thank Prof. A. I. Alikhanyan for constant interest in the work and for valuable comments, A. P. Shmeleva and L. P. Kotenko for discussions of the results, S. A. Vartanyan for preparation of the large-size plastic scintillators used in the experiment, and K. M. Smyslov for aid in preparing the equipment.

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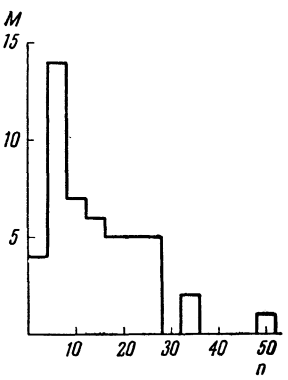

FIG. 2

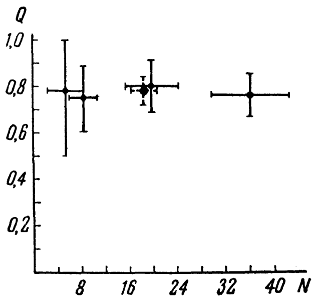

FIG. 3

FIG. 2. Distribution of the number of particles recorded per shower in a spark chamber.

FIG. 3. Dependence of the shower efficiency on the number of particles passing through the effective volume of the spark chamber.

STUDY OF ππ RESONANCES IN π^--p COLLISIONS AT 3.5 GeV/c

M. S. AĬNUTDINOV, S. M. ZOMBKOVSKIĬ, Ya. M. SELEKTOR, and V. N. SHULYACHENKO

Institute of Theoretical and Experimental Physics

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BY means of a 25-cm liquid hydrogen bubble chamber, we studied the reactions