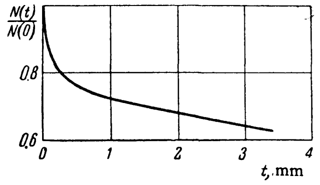
The energy carried away by π^0 mesons is determined from the number of electrons in the chamber. The transition effect in the chamber walls changes the picture. The transition effect, however, has not been accounted for in any of the experiments, although the thickness of the walls vary considerably.

We calculated the change of the number of electrons in the transition of the cascade from lead into the iron wall of the chamber. The calculations were carried out according to formulae given in Ch. VI of the book of Belenkii.[2] The calculations given there, however, do not take into account the scattering of low energy electrons which influences considerably the effective range of such electrons. We accounted for the variation of the range of low energy electrons due to their scattering according to Chap. VII, § 27 of the book. An equilibrium electron spectrum and a photon spectrum accounting for the energy dependence of the total photon absorption coefficient were used. The calculation is applicable to a thickness of lead equal to or greater than $t_{\max}$ since the electron spectrum in lead at cascade maximum is close to equilibrium and slowly varies with depth[3] ($t_{\max}$ is the depth of cascade maximum). The result of the calculation for the transition effect lead-iron is shown in the figure. The sharp decrease in the number of electrons for a small thickness of iron is due to ionization stopping of electrons and can be explained by the soft energy spectrum in lead. The difference in the transition effect due to variation of the chamber wall thickness from 1 to 3 mm amounts to 8% only.



The author would like to express his gratitude to J. B. Khristiansen for a helpful discussion of the results.

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ANISOTROPY OF THE ELECTRICAL RESISTANCE OF A GOLD MONOCRYSTAL IN A MAGNETIC FIELD AT 4.2°K

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THE results of numerous experiments (cf., for example, references 1 and 2) concerned with the investigation of the galvanomagnetic properties of monovalent metals are in disagreement with theory. In view of this, it appeared of interest to investigate the character of the electrical resistance of these metals in a magnetic field for various crystalline orientations.

A gold monocrystal is most suitable for this purpose. The monocrystal was prepared from gold of 99.9999% purity. It was in the form of a cylinder 30 mm in height and 0.3 mm in diameter. The resistance of the sample varied by a factor of 1650 between room temperature and 4.2°K. The fourth-order axis of the crystal was oriented approximately along the axis of the sample. To avoid the secondary effects commonly observed with sufficiently pure metals in a magnetic field, the gold crystal was mounted with the results of reference 3 taken into consideration.

A polar diagram was taken for this crystal at 4.2°K, in a magnetic field H = 23 kilooersteds, which was rotated in a plane perpendicular to the axis of the sample.

The dependence of $\Delta r_H/r_0 = (r_H - r_0)/r_0$ (where r_H and r_0 are the resistances in the presence and the absence of the magnetic field) upon the magnetic field was determined for the directions of the greatest of the maxima and the smallest of the minima of the polar diagram. The results of these measurements are illustrated in Figs. 1 and 2 (the region represented in Fig. 2 is indicated by the rectangle in Fig. 1). The mag-

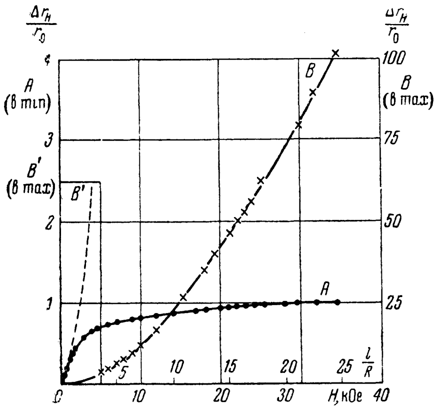

FIG. 1

nitude of the ratio of the mean free path l to the radius of curvature R of the trajectory of the conduction electrons in the magnetic field ($l/R = H/\rho nec$, where e and n are the charge and density of the conduction electrons, ρ is the resistivity, and c is the velocity of light) is given along the x axis in addition to the magnetic field intensity.

From the dependences shown in the figures it is evident that while in the direction of the maximum the resistance increases indefinitely ($\Delta r_H/r_0 \sim H^{1.8}$), the resistance in the direction of the minimum becomes completely saturated,* with $\Delta r_H/r_0 \approx 1$ for fields $H \gg H_0$ (H_0 is determined from the equality $l/R = 1$, and is in the present case equal to 1.4 koe). Analogous behavior is observed for all of the maxima and minima of the polar diagram.

It should be noted that for monocrystals of Pb[4] and Cu[5] a weak tendency towards saturation has been observed in the direction of the minimum.

On the basis of the results obtained it may be suggested that the linear increase in resistance in a magnetic field found by Kapitza,[6] observable in polycrystalline samples,[1,2] is the result of an averaging over angle of the various dependences† for $\Delta r_H/r_0$.

We assume that the considerable anisotropy of the resistance in a magnetic field is associated with the existence of an open Fermi energy surface for gold.[7]

We regard it as a pleasant duty to express our gratitude to Academician P. L. Kapitza for his consideration of the results obtained.

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*The copper monocrystal with which preliminary measurements were carried out behaves in a similar fashion.

†We have averaged the experimental curves of $\Delta r_H/r_0$ obtained for various angles with the gold monocrystal. The averaged dependence of $\Delta r_H/r_0$ upon H thus obtained has indeed a linear character.

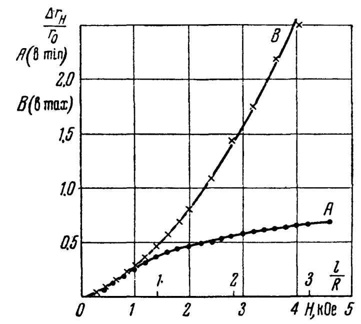

FIG. 2

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OPTICAL METHODS OF OBSERVING THE IONIZATION ALONG FAST PARTICLE TRACKS

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THE following processes accompany the passage of ionizing particles through a gas: ionization, excitation of atoms and molecules, and dissociation of molecules. Two of the processes are used for particle detection: ionization (ionization chambers, gas counters) and excitation (scintillation detectors). For observation of the tracks, the method of vapor condensation on ions is used in cloud and diffusion chambers. The amount of light from excited atoms in the gas is too small for a direct ob-