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Figure 1

Figure 1: Figure 1

**Abstract****Full Text****Physics****V. R. Karasik****Investigations of the Hall Effect and Transverse Magnetoresistance in Germanium in Fields up to 400 Kiloerstedes***(Presented by Academician I. K. Kikoin, 13 X 1959)*

To obtain strong magnetic fields, the installation described in work <sup>(1)</sup> was used. Samples of germanium single crystals grown along the [111] axis were studied. The resistivity of the *n*-type samples, alloyed with antimony, was, at room temperature,  $3 \Omega \cdot \text{cm}$  at a diffusion length of 0.7 mm. The *p*-type samples had a conductivity close to intrinsic, with a diffusion length of 1.7 mm.

**Fig. 1.** Dependence of the Hall e.m.f. on the magnetic field; *n*-type;  $\rho = 0.3 \Omega \cdot \text{cm}$ .

*A*  $-I = 15 \text{ ma}$ ,  $T = 77^\circ \text{ K}$ ; *B*  $-I = 4 \text{ ma}$ ,  $T = 20.4^\circ \text{ K}$ .

For investigations of the Hall effect, the samples were given the form of plates 4.2 mm long, 1.4 mm wide, and from 1.4 to 0.8 mm thick, or crosses with distances of 4.2 mm between the current and Hall contacts.

For investigation of magnetoresistance, rectangular plates equipped with potential contacts were used. The *n*-type samples were provided with tin contacts, and the *p*-type samples with indium contacts. Inductive e.m.f.'s arising in the measuring circuit were compensated by means of a movable rotating coil.

It was established that the geometry of the samples and the state of the surface do not affect the measurements. To eliminate even effects, measurement of the Hall e.m.f. was carried out for four relative orientations of the magnetic field and the current in the sample. In measurements of magnetoresistance, the Hall component was excluded by commutation of the current direction. The power dissipated by the measuring current in a sample immersed in liquid hydrogen or nitrogen did not exceed 0.01 W.

Figure 1A gives the results of investigations of the Hall effect on one of the samples at a temperature of  $77^\circ \text{ K}$ ; *E* is the Hall e.m.f. The weak variation

Fig. 2

Figure 2: Fig. 2

the change in slope found for all the investigated  $n$ - and  $p$ -type specimens corresponds to a change in the Hall constant of 15%.

Typical measurement results at 20.4° K are shown in Fig. 1b. For all the specimens investigated, the dependence of the Hall emf on the magnetic field is linear.

Fig. 2 gives the results of the study of the transverse magnetoresistance;  $r(H)/r(0)$  is the relative change of resistance in the magnetic

**Fig. 2.** Change of resistance in a magnetic field:  
 $n$ -type;  $\rho = 3 \Omega \cdot \text{cm}$ . 1- $T = 77^\circ \text{ K}$ ; 2- $T = 20.4^\circ \text{ K}$

field,  $E$  is the electric-field strength of the current. In Fig. 2, the initial part of the magnetoresistance curve in fields up to 36 kOe at  $T = 77^\circ \text{ K}$  is shown on an enlarged scale.

The results we have obtained are not in agreement with the existing theories<sup>(2,3)</sup>.

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Moscow State University  
named after M. V. Lomonosov

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*Note: Figure translations are in progress. See original paper for figures.*

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