the interface and the onset of the heterophase system The results of a more detailed investigation of the metastability effect under conditions of developed evaporation (the dependence on the intensity, on the pulse waveform, etc.) will be reported separately.

The authors thank A. M. Prokhorov for interest in the work and valuable remarks.

[1)] We emphasize that under the considered conditions the acoustic signal is due precisely to the decay of the metastable state, and not to the change in the recoil pressure of the escaping gases at the start and end of the radiation pulse [8].

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FOCUSING OF ELECTRONS IN A METAL BY A TRANSVERSE MAGNETIC FIELD

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Submitted 10 December 1973
ZhETF Pis. Red. 19, No. 2, 114 - 116 (20 January 1974)

A microcontact technique was used to observe the focusing of electrons in bismuth by a transverse homogeneous magnetic field. Focusing in multiple fields was observed.

Sharvin has proposed [1] and realized with his co-workers [2, 3] an experiment in which he produced and observed electron beams produced in metals have large mean free paths; the electrons emerged from a definite point of the sample and were focused by a longitudinal magnetic field onto another point of the sample.

It is of interest to focus the electrons in a transverse homogeneous magnetic field. The experimental setup used for this purpose is shown in Fig. 1. Two thin needles B and C of copper wire of 0.1 mm diameter were welded to a single-crystal bismuth plate M of 2 mm thickness, in which the C_3 axis was perpendicular to the surface. The distance between the needle points was $L \simeq 0.15$ mm, and the contact diameter was on the order of a micron. Current of 500 μA was made to flow through the circuit of point B. The voltage difference U between the point C and the peripheral point of the sample was registered with a galvanometric amplifier V and an automatic recorder. The sample was placed in a magnetic field H that could be varied in magnitude and

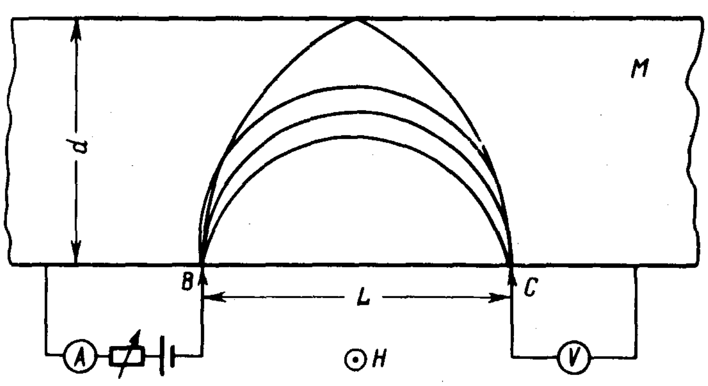

Fig. 1. Diagram of experiment

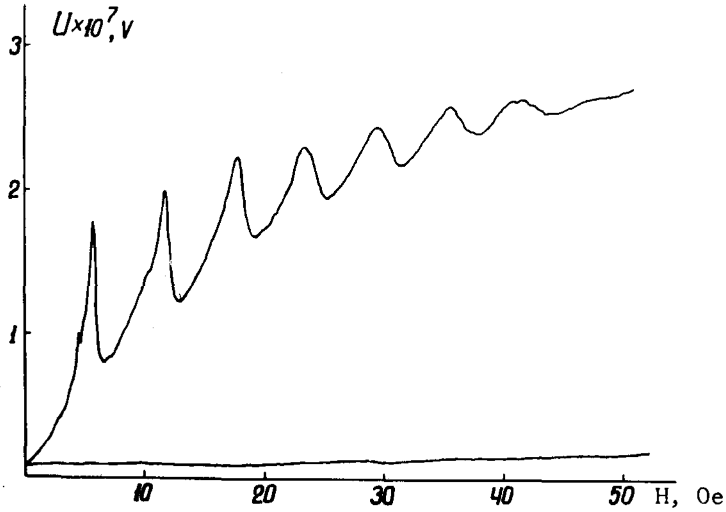

Fig. 2. Plot of U(H).

rotated in the plane of the sample. If the segment BC is not perpendicular to C_1, then U increases monotonically with increasing H. A plot of U(H) for BC perpendicular to C_1 is shown in Fig. 2. The voltage peak in a field of approximately 6 Oe can be attributed to focusing of the electrons of the cylindrical part of the "ellipsoid," the direction of the major principal axis of which is perpendicular to AB. The value of the field H* at the maximum of U(H) agrees with the value calculated from the known parameters of the electron "ellipsoid." When $\vec{H}$ is inclined to the normal to BC through an angle ϕ, we have $H(\phi) = H_{\phi=0}\text{cosec}\,\phi$. When H is perpendicular to BC but so directed that the trajectories of the electrons emitted from the contact B are twisted away from C, the effect disappears (see the lower curve of Fig. 2). Reversal of the direction of the current through the point B reverses the sign of U, but does not affect the shape of the curve. The amplitude of the peak U at H ≈ H* is smaller by about 10^4 times than the voltage on the contact B; this agrees with estimates of the effect, similar to those presented in [1]. When the temperature is lowered from 4.2 to 1.7°K, the amplitude of the peak increases by about 50%.

The appearance of peaks at multiples of the field 2H*, 3H*, ... (see Fig. 2) is made possible by two factors: 1)The onset of a chain of spikes. At a field 2H*, for example, a voltage spike appears at a distance L/2 from B, owing to the focusing of the electrons. This spike serves as an accelerating potential for the electrons focused at C. The situation is similar for the case 3H* etc. 2) The specular character of the reflection of the electrons incident on the sample surface at an angle close to 90° should lead to focusing at H = 2H*, 3H*,... Since etching the sample caused the amplitude of the peaks U to decrease sharply with increasing number of the peak, and the oscillations of U practically disappeared at H > 3H*, it can be stated that the decisive condition for the existence of peaks in multiple fields is the specularity of electron reflection. Assuming the amplitude of the n-th peak to be $A_n = A_1 q^{n-1}$ (q is the specularity coefficient), we obtain q ≈ 0.75 for the case shown in Fig. 2.

An investigation of the observed effect can yield information on the extremal dimensions of the Fermi surface, on the mean free path and its dependence on the electron temperature and energy, and on the coefficient of specular reflection of the electrons by the surface of the sample (measurements in multiple fields and at d ≲ L).

I am grateful to Yu. V. Sharvin and V. F. Gantmakher for useful advice on the experimental technique.

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