stream instability [5,6]. Turbulent heating of the plasma under conditions of two-stream instability is usually accompanied by an anomalously large resistance to current flow [7,8]. A similar effect is observed in our experiment. Figure 3 shows oscillograms of the hf voltage and current in the plasma. It follows from them that at low voltages (oscillograms 1-3) the current in the plasma has an inductive character, although a tendency is observed for the phase shift between the current and the voltage to decrease with increasing electric-field amplitude. When $V > V_{crit} \approx 20$ V, the current reaches a critical value, and is purely ohmic and limited in amplitude by the large plasma resistance (oscillogram 4). The plasma-density oscillations at the ion-sound frequency lead to low-frequency modulation of the current amplitude. Corresponding to this is the smearing of the current signal on Fig. 2, obtained by multiple triggering of the oscilloscope sweep. We note that the observed half-wave rectification of the hf current is due to the presence of an emitting surface on one end of the Q-machine only. The collector electrode on the other end was not heated.

Our experimental results can be summarized as follows:

1. A strong ($eEL \gg T$) high-frequency electric field superimposed on a "quiet" thermal plasma leads to an appreciable increase of the electron temperature.

2. The plasma heating efficiency increases with increasing frequency of the external laternating field, and this may be of interest from the point of view of turbulent plasma heating.

3. In a non-isothermal plasma situated in a strong high-frequency field, intense oscillations of the ion-sound type are excited, with a frequency much lower than that of the external alternating field.

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DEPENDENCE OF THE TRANSPARENCY OF ALUMINUM FILMS ON THE THICKNESS

N. E. Alekseevskii and S. I. Vedeneev
Institute of Physics Problems, USSR Academy of Sciences
Submitted 16 August 1967
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It was reported earlier [1] that the value of T_c of an aluminum film evaporated in a sealed ampoule under conditions that hinder the formation of an oxide layer increases with decreasing film thickness. An increase in T_c of Al films with decreasing thickness was observed earlier by others and was attributed to formation of an oxide layer and to the consequent appearance of surface superconductivity.

On the other hand, as noted in [1], one might assume, in accord with the work of V. Z. Kresin and V. A. Tavger [2], that the increase of T_c of the film may be due to the effect of electron quantization.

An attempt could be made to reveal quantization of electrons in a film by measuring the change in the optical transparency of the film as a function of the thickness.*

The light source used in the apparatus employed for this purpose was a single-mode gas laser operating at 0.6328 μ. An ampoule provided with two special windows was evacuated to $P = 1.6 \times 10^{-6}$ mm Hg and sealed. An aluminum film was sputtered on one of the windows at liquid-helium temperature. The film thickness varied over a length of 15 mm approximately from 1×10^{-5} to 2×10^{-6} cm.**

The light beam was moved along the Al film by means of a system of mirrors and was directed to a photomultiplier after passing through the film. The photomultiplier current was amplified and plotted with an x-y recorder.

Our measurements in the region of helium temperatures have shown the presence of small film-transparency oscillations as a function of the thickness.

When the temperature was raised to that of liquid nitrogen, the amplitude of the oscillations decreased and vanished completely at room temperature.

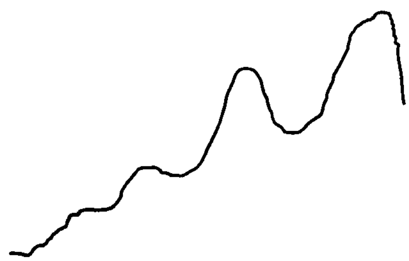

Fig. 1. Transparency of aluminum film vs. thickness at 4.2°K. The abscissas and ordinates are the film thickness and the intensity of the transmitted light (in arbitrary units), respectively.

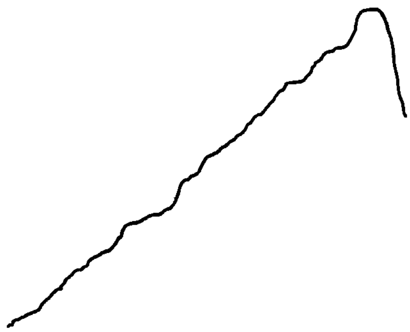

Fig. 2. Transparency of aluminum film vs. thickness at room temperature. The abscissas and ordinates are the film thickness and the intensity of the transmitted light (in arbitrary units), respectively.

These oscillations were usually observed with an exponential variation of the transparency as a function of the thickness. To make the oscillations more noticeable, a compensating wedge, kept at room temperature, was placed over the entrance window of the instrument. The resultant variation of the transparency with thickness is shown in Fig. 1. Figure 2 shows the same variation at room temperature. It is seen from the figures that the film transparency oscillates as a function of the thickness at helium temperatures, and the plot has five transparency maxima. It can be assumed that the obtained nonmonotonic variation of the transparency with thickness is the consequence of quantization. If we estimate the number of levels that should fit in the thickness interval from 10^{-5} to 2×10^{-6} cm, we find their number to be $d_1/d_2 \approx 5$.

The value of the carrier effective mass can be estimated by using the potential-well model. Such an estimate yields $m^* = (0.1 - 0.3)\ m_0$. Since this estimate is very approximate, the obtained values of m* can be regarded as satisfactory, especially in view of the possible influence of the light carriers on the observed effect. If the nonmonotonic change of the transparency obtained by us is indeed the consequence of quantization, then the decrease in the observed oscillations with increasing temperature must be assumed to result from the level spreading due to the decrease in the electron mean free path. The appearance of the effect of quantization in aluminum is quite probable, first because it is known that aluminum forms a good optical surface capable of producing specular reflection of the electrons, and further because the spin-orbit interaction, which is capable of smearing out the quantization effect, is quite small in aluminum.

It should be noted that a quantization effect was observed in the measurement of resistance of bismuth films [4].

The reported results are preliminary and naturally require further research.

In conclusion, it is our pleasant duty to thank Academician P. L. Kapitza for interest in the work and to V. Z. Kresin for a discussion of the results.

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* As was kindly reported to us by A. V. Ioganson, the question of the influence of quantization on optical characteristics was considered theoretically in [2].

** The film thickness was determined from the difference in the weights of the evaporator, and therefore the cited values may be slightly overvalued.

DEFECT STRUCTURE OF TRIGLYCINE SULFATE CRYSTALS IN THE FERROELECTRIC AND PARAELECTRIC STATES

G. I. Distler, V. P. Konstantinova, Yu. M. Gerasimov, and G. A. Tolmacheva
Crystallography Institute, USSR Academy of Sciences
Submitted 23 August 1967; resubmitted 30 August 1967
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It was shown earlier that charged particles of platinum are selectively precipitated from a colloidal solution on active surface centers of triglycine sulfate (TGS) crystals, and reveal a domain structure at the same time. In the case of thermal evaporation, nucleation on the active centers of substrate crystals is also selective [1,2]. In the present investigation we have decorated the TGS structure by thermal evaporation of silver. The annealed TGS crystals were cleaved in vacuum ($\sim 5 \times 10^{-5}$ mm Hg) and silver was evaporated