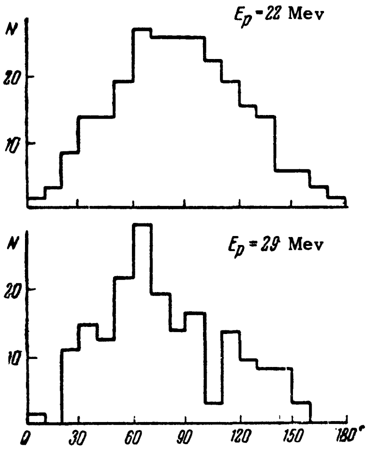
University. The bombardment was carried out simultaneously with several proton beams of different energies, separated by a system of diaphragms from the beam of the protons scattered by a wedge-like target inside the proton-synchrotron chamber.

At the present time, after an analysis of more than 500 stars, we counted 113 stars produced by protons of the foregoing energies. The diagram shows the angular distributions of the α particles in these stars (c.m.s.). It is seen from the diagram that whereas the angular distribution is symmetrical about 90° for the 22-Mev incident protons, the symmetry is violated for the 29-Mev protons, with emission of α particles in the forward hemisphere predominating.



The angular distribution shown indicates that for 29 ± 1 Mev incident protons interact directly with the α particle of the C^{12} nucleus.

It should be noted that for 22-Mev incident protons we observed individual cases of C^{12} decay, which can be classified as direct knock-out of an α particle by a proton inelastically scattered by this particle. These cases are characterized by relatively large energies of the knocked-out α particles, compared with the energies of the two other particles and with the scattering direction of the products (taking excitation energies of the possible intermediate nuclei into account).

Direct interaction of the p—α type with decay of the C^{12} nucleus into three α particles were observed for 180 and 340 Mev incident protons.[1] Our results deduce the presence of a noticeable admixture of type p—α direct interactions for 29 Mev protons and the presence of individual cases of such interactions for 22-Mev protons.

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SUPERCONDUCTIVITY OF BERYLLIUM AND ITS LOW-TEMPERATURE POLYMORPHISM

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It has been reported previously[1] that beryllium, in the form of a film condensed on a substrate at liquid helium temperature, becomes superconducting at ~ 8° K. In this note we present the results of a more accurate determination of the transition temperature. The existence of low-temperature modifications of a number of metals, including bismuth and beryllium, has recently been discovered[2] and in this connection it was especially interesting to examine the superconductivity and electrical conductivity of these beryllium films.

The films were formed by the well-known method.[1,3-5] Measurements were made on the superconducting transition and the temperature dependence of electrical resistance over a wide temperature range. The results on the superconducting transition are shown in Fig. 1. The various curves refer to different films. Some difference in the transition curves is probably related to the conditions of formation of the films and their thickness. All films examined which had a thickness between 400 and 2,500 A behaved in a similar way and became superconducting in the region between 7 and 9° K, over which the resistivity increased from zero to its maximum value.

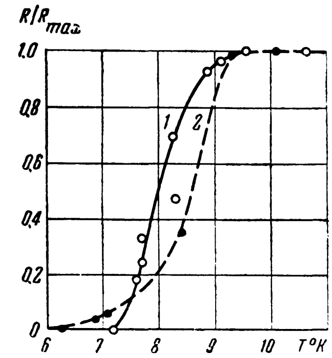

FIG. 1. Plots of the superconducting transition for beryllium films: 1 – film thickness 400 A, R_{max} = 360Ω; 2 – thickness 2300 A, R_{max} = 480Ω.

The detailed temperature variation of resistivity was studied in order to decide about a transition to a low-temperature form. Figure 2 shows this temperature variation up to about 400° K.

All films show, in common, a temperature re-

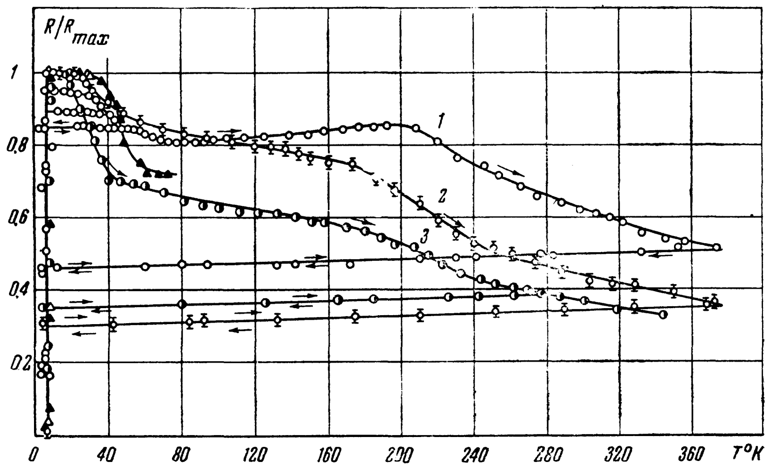

FIG. 2. Temperature variation of electrical resistance of beryllium films: 1 – film thickness 700 A, $R_{max} = 200\Omega$; 2 – thickness 1800 A, $R_{max} = 1070\Omega$; 3 – thickness 400 A, $R_{max} \doteq 360\Omega$; ▲ – data for thickness 500 A, $R_{max} = 300\Omega$ (film condensed at 20°K).

gion (up to 20 – 30°K) in which the superconducting modification exists. If heated up to this temperature, the films become superconducting again on subsequent cooling. Heating to temperatures above this leads to an incomplete superconducting transition on cooling again: some resistivity remains, which increases with increasing temperature of heating. Superconductivity is completely lost if heating is carried on above 60°K. This limiting temperature is somewhat lower if the heating time is increased.

We can presume that the first sharp drop on the heating curves is determined by the transition of the film into a different (non-superconducting) modification.

Further on, up to ~200°K the resistivity changes little. Around ~200°K the resistivity drops again and this is connected either with the transition to yet another form, appropriate to bulk beryllium, or with recrystallization of the film.

Structural investigation will enable a more precise opinion to be given on these transitions.

We have shown that by condensing beryllium from the vapor onto a cold substrate a new modification is formed with different properties from normal beryllium, in particular it shows superconductivity. It is possible that this is the same modification which is obtained by plastic deformation at temperatures below 20°K.[2] This seems likely in view of the analogous behavior of bismuth: superconductivity is found in the low temperature modification of bismuth obtained by plastic deformation[6] at a temperature close to the superconducting transition temperature of freshly condensed films.

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Translated by R. Berman
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THE MOTION OF A CHARGED PARTICLE IN A ROTATING MAGNETIC FIELD

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In plasma physics a discussion of the problem of the possibility of localizing a charged particle by a variable electromagnetic field within a certain region of space is of some interest. This question has been discussed by Trubnikov[1] and by Gaponov and Miller.[2] The behavior of a charged particle in a variable electromagnetic field was also discussed by Vedenov and Rudakov.[3] In the present note we show that the localization of a particle is possible in principle by means of a rotating magnetic field