served in the second row of chambers characterize the passage of the beam through the absorber more directly than the bursts in the first row, since the flux of nuclear-active particles in the shower core amounts to about 1% of all charged particles. The experimental size distribution of bursts in the second row of chambers is as follows (where ΔE is the energy interval, and Φ_E is the observed number of events in the given interval††):

ΔE, ev	$<2\cdot10^9$	$2\cdot10^9$–$2\cdot10^{10}$	$>2\cdot10^{10}$
Φ_E	39	7	2
Φ_B	40	5	3

Let us assume that the observed particle beams consist of high-energy μ mesons. The main process leading to the appearance of bursts of the size given above is the production of electron-positron pairs by μ mesons. Assuming a μ-meson energy $E = 10^{13}$ ev, as found in an earlier estimate,[1] we find that the probability that a single μ meson produces a pair of $>10^9$ ev in the lead-graphite absorber (~ 10 t) is 0.3. This means that the passage of μ mesons should, in general, be accompanied by small bursts in the second row of ionization chambers. A comparison of the experimental distribution of bursts in the second row of ionization chambers with the theoretical distribution Φ_B, obtained taking pair production by μ mesons into account,[5] is given above.

If we assume that the particle beam consists of μ mesons, then the relative increase in the particle number during the passage through 0.8 t of lead glass due to electromagnetic interactions of μ mesons should be negligible. This is borne out by the experiment.

Thus, the absence of multiplication during the passage of the particle beam through a 0.8 t thickness of lead glass strengthens the hypothesis that the beam consists of high-energy μ mesons. Also, this assumption is not contradicted by the ionization chamber data.

In conclusion, the authors would like to thank L. G. Smolenskiĭ and B. A. Zelenov for help in carrying out the experiment, and S. F. Semenko for help with the calculations.

*For $t_0 = 10^{11}$ ev, the maximum number of particles in the circle with the given radius is roughly 50 times smaller than for $E_0 \approx 10^{12}$ ev.

†The observed particle beams cannot be due to low-energy ($E_0 < 10^9$ ev) electrons and photons, since, in that case, the trajectories would not be collinear.

‡Although the difference in the frequency of beams in the open part of the chamber and under the lead glass lies within the limits of statistical error, it is possible that a certain increase in the beam frequency under the lead glass is due to the multiplication of single high-energy electrons and photons in the lead glass.

**We have carried out the calculations assuming a Furry distribution for the fluctuations (which leads to a large overestimate of events with a low multiplication). Even in this limiting case, we would be able to observe a picture under the lead glass for which the table predicts a probability of only $<10^{-2}$.

††The detection threshold is equal to ten relativistic particles, which corresponds to an energy of $\sim 10^9$ ev transferred to the electron-photon component.

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NON-MONOTONIC DEPENDENCE OF THE SURFACE IMPEDANCE OF TIN ON THE MAGNETIC FIELD AT 1.9 MEGACYCLES

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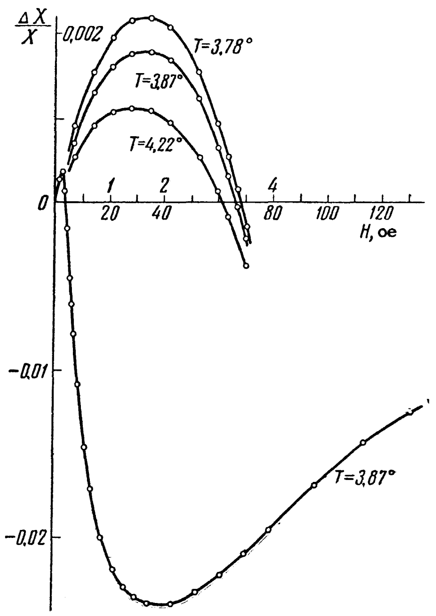
We carried out preliminary experiments on measuring the reactive part of the surface impedance of Sn at 1.9 Mc/sec and helium temperatures. Samples of a cylindrical shape were placed in the coil of an oscillating circuit. On applying the magnetic field the frequency of the generator was changed by change of reactive component of the sample impedance. The frequency shift was measured to an accuracy of 0.01 cycles by means of apparatus, the detailed description of which will be published shortly.

In the diagram are plotted the results of measurement on one of the samples placed in a mag-



netic field which was parallel to the axis of the coil and the specimen. Along the ordinate axis is plotted the relative change of the reactive component of the impedance relative to the total magnitude, the latter being determined from the change in the oscillator frequency when the sample has passed into the superconducting state. In the top portion of the diagram are plotted the first parts of the curves at various temperatures on a larger scale.

The samples, to which the quoted results apply, consisted of some large crystals, whose orientations differed by 2 — 3°, and, obviously, were grown from one seed. The [001] axes of these crystals were at an angle of ~ 35° with the sample axis, and the angle between the [100] axis and the projection of axis of the sample on the (001) plane was ~ 30°. Similar results were obtained on another sample, the axis of which made an angle of ~ 70° with the [001] axis.

These two specimens were prepared from tin, containing approximately $< 10^{-4}\%$ impurities $[\rho(4.2°K)/\rho(20°K) \approx 1 \times 10^{-5}]$ and cast in cylindrical quartz ampules, the ends of which were drawn out (sample diameter 8 mm, length of the cylindrical portion 40 mm, total length of the sample 60 mm.) The inner surface of the ampule was covered with a layer of carbon before casting. The sample was placed in the apparatus together with the ampule, which protected it from damage. After one of the samples had undergone a series of changes, it was removed from the ampule and the investigation repeated. In this case the character of the ΔX/X dependence was completely altered. Instead of a curve with two extrema, a monotonic reduction of X was observed in all the ranges of the field investigated. For a series of samples, prepared from some less pure tin and removed from the ampule before the measurements, the X-H dependence was also monotonically decreasing.

At present it is difficult to state any definite conclusions about the nature of the observed phenomena. A cyclotron-resonance experiment to explain its origin would require the introduction of a mean free path on the order of several centimeters. There is a striking similarity between our results and the oscillations of surface impedance at 9400 Mc/sec in a field of the order of several oersted, observed by M. S. Khaĭkin, for which there is still no explanation. A conjecture can be made that both the two effects are based on a mechanism which is independent of the frequency. To us it seems advisable to measure the impedance at still lower frequencies and make a static measurement of the magnetic susceptibility in the weak-field range.

We express our thanks to M. S. Khaĭkin for acquainting us with his results prior to their publication.

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CONCERNING CYCLOTRON RESONANCE IN TIN

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IN order to use cyclotron resonance studies[1] to explain the features of the structure of the Fermi surface of a metal, it is necessary to develop methods for analyzing cyclotron resonance spectra, which sometimes contain several tens of minima of the metal surface resistance.[2] The Kaner and Azbel' investigation[1] of the relative depth of resonances as a function of the order of