equilibrium concentration $n_0 = p_0 = 1.1 \times 10^{16}$ cm^{-3} and T = 3.8°K (Fig. 3).

Estimates of the principal characteristics of the electron-hole drops in gallium arsenide, similar to those carried out in [1], yield $n_0 = p_0 = 3 \times 10^{16}$ cm^{-3}. The deviation from the value obtained from an analysis of the spectral curve is due to the existence of "indirect" transitions connected with Auger recombination of the electrons and holes in the drops. The latter undoubtedly takes place, as is evidenced by the long-wave tail of the experimental curve (Fig. 3).

The calculated local change of the width of the forbidden band, due to the correlation and exchange interaction of the carriers, is 7.6 meV. The potential-well depth determined from the radiation, 8.7 meV, is in satisfactory agreement with the calculated value. The slight discrepancy is not unexpected, since the numerical estimates of the condensate energy disregarded the correction due to the correlation interaction between carriers of opposite sign.

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MAIN FACTORS CONTROLLING AN INCLUSIVE PROCESS IN THE ENERGY INTERVAL 20 - 1500 GeV

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We have shown in [1] that the correlations between the longitudinal and transverse momenta in multiple generation at 400 GeV[1] are the consequence of phase space, the uniform filling of which is distorted only by the smallness of the transverse momenta. To approximate different distributions connected with this simplest condition, we used a spectrum of the form

$$\frac{d^2\sigma}{dp_t\,dp_\ell} = \frac{p_t}{\exp\sqrt{\left(\frac{p_t}{T_t}\right)^2 + \left(\frac{p_\ell}{T_\ell}\right)^2 + \frac{m^2}{T_t T_\ell}} - 1}\,. \qquad (1)$$

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[1] The data at 400 GeV were obtained with the aid of Tkhra-Tskaro installations, which consists of a cloud chamber in a magnetic field and an ionization calorimeter. The installation registers interactions of nuclear-active particles of cosmic radiation with nuclei of a polyethylene target located over the cloud chamber.

It was shown subsequently [2] that any distribution or correlation ($d\sigma/dp_\ell$, $d^2\sigma/dp_t$, $d \sin\theta$, etc.) obtained from $d^2\sigma/dp_t dp_\ell$ at ∿400 GeV[1]) is well described by expression (1).

In this article we compare the consequences of (1) with the experimental data obtained in a wide range of energies from 20 to 1500 GeV in accelerator experiments.

Expression (1) contains in essence no free parameters, once the average value of the inelasticity coefficient[2]) $\langle k \rangle$ and the energy dependence of the average multiplicity are known.

Actually, the parameter T_t, which determines mainly the distribution with respect to the transverse momentum, hardly varies with energy. Just as for 400 GeV, we shall henceforth assume it to be

$$T_t = 0.14 \text{ GeV}. \tag{2}$$

The parameter T_ℓ is a function of the average energy $\langle \varepsilon \rangle$ per secondary particle

$$T_\ell = \frac{2}{3}\left(\langle \varepsilon \rangle - m_\pi\right). \tag{3}$$

Since

$$\langle \varepsilon \rangle = \frac{2 \langle k \rangle E_0^c}{\langle n \rangle},$$

where E_0^c is the energy of the colliding particle in the C system, it follows that

$$T_\ell = \frac{2}{3}\left(\frac{2 \langle k \rangle E_0^c}{\langle n \rangle} - m_\pi\right). \tag{4}$$

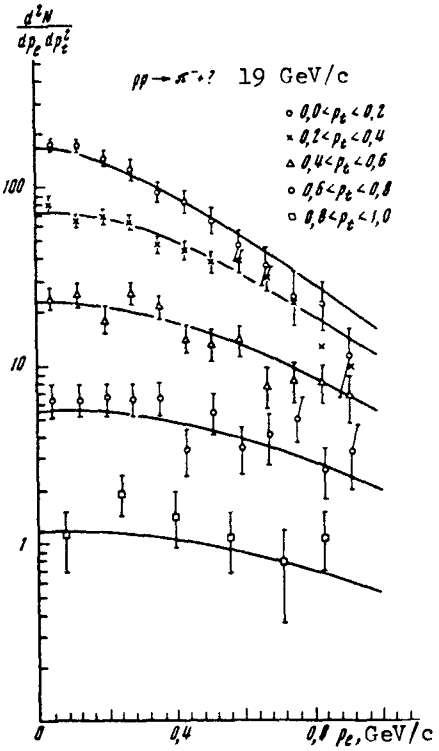

Fig. 1. Distribution with respect to the longitudinal momenta in different intervals of p_t in the process $p + p \to \pi^- +$ anything at 19 GeV [4]. The curves correspond to expression (1) at $T_t = 0.14$ GeV and $T_\ell = 0.25$ GeV.

In the calculations we have used the value $\langle k \rangle = 0.5$ and the following energy dependence of the mulitplicity

$$\langle n \rangle = \frac{3}{2}\left(1.44 + 2 \lg E_0\right)^{3)}. \tag{5}$$

When comparing experiment with calculation under such conditions, it is necessary only to reconcile their normalization.

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[2]) It is assumed that the inelasticity coefficient k varies very little with the energy.

[3]) Such a relation between the multiplicity and the energy follows from [3].

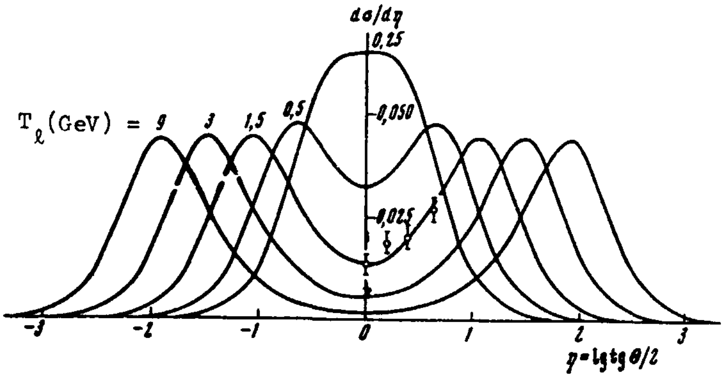

Fig. 2. Distribution with respect to $\eta = \log \tan \theta/2$. Points - data of [5] at $E_0 = 1500$ GeV. The curves correspond to expression (1) at different values of T_ℓ.

Figure 1 shows a family of longitudinal-momentum spectra in the C-system in different intervals with respect to the transverse momentum, obtained in [4] at 19 GeV in the reaction $p + p \to \pi^- +$ anything. The theoretical curves that correspond to expression (1) with parameters (2) and (4) are normalized to the p_ℓ spectrum under the condition $0.4 < p_t < 0.6$ GeV/c.

We see that the agreement between the experimental points and the calculation is very good.

The angular distribution of the secondary particles in pp collisions was recently obtained [5] in terms of the variables $\eta = \log \tan \theta^c/2$ with the CERN colliding-beam accelerator at an effective energy 1500 GeV. A characteristic feature of this distribution, which was previously observed in cosmic rays, is the dip in the η spectrum near $\eta = 0$ ($\theta^c = 90°$), which aroused an extensive discussion concerning this question. Figure 2 shows the family of curves that follow from the distribution (1) at different initial energies

$$\frac{d\sigma}{d\,\mathrm{lg}\,\mathrm{tg}\,\theta/2} \sim \frac{1 + \mathrm{tg}^2\,\theta/2}{\mathrm{tg}\,\theta/2} \int_0^{p_{t\,max}} \frac{d^2\sigma}{dp_t\,dp_\ell}\left(p_t,\ p_\ell = \frac{p_t}{\mathrm{tg}\,\theta}\right) dp_t^{\,4)}. \tag{6}$$

Attention is called to the interesting property of the curves, namely, at a sufficiently large initial energy ($E_0 > 10^{12}$ eV) the peaks in the η spectrum are described quite well by a Gaussian distribution with half-width $\sigma \sim 0.4$. This property may create the impression that the system of secondary particles, the center of gravity of which moves relative to the C-system, expands isotropically.

We note that the possible changes in the concrete values of k and n (Eqs. (4) and (5)) may shift somewhat the curves along the η axis, but would hardly affect their shape.

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4) We note that expression (6) has a perfectly general form that does not depend on the concrete form of $d^2\sigma/dp_t dp_\ell$. It consists of two factors. The first, which is the Jacobian of the transformation from $d^2\sigma/dp_t dp_\ell$ to $d^2\sigma/dp_t d$ log tan $\theta/2$ does not depend on the initial energy and has a minimum at the point $\theta = 90°$. The second factor, to the contrary, has a maximum that flattens out with increasing E_0. Therefore, the competing behaviors of the two factors are such that at sufficiently large E_0^c the log tan $\theta/2$ distribution should become doubly humped. A rigorous formulation of the condition necessary for the spectrum of η to have two humps is given in [6].

Figure 2 shows together with curves also the experimental data obtained in [5].

The experimental data were normalized to the point $\eta = 0$.

As seen from the figure, the agreement between the experiment and the curve corresponding to 1500 GeV is very good.

Thus, our analysis shows the following: a) in the intergy interval from 20 to 1500 GeV the inclusive experiment is completely described by the laws governing a phase space whose uniform filling is distorted only by the smallness of the transverse momentum; b) a convenient and sufficiently accurate approximation of these laws is the two-temperature distribution (1) with parameters (2) and (4).

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ANISOTROPY OF SURFACE SUPERCONDUCTIVITY OF LEAD SINGLE CRYSTALS

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Observation of surface superconductivity in type I superconductors is possible only if $\kappa \geq 0.418$ [1]. The only pure metal satisfying this requirement is lead. The occurrence of a superconducting surface layer in lead was confirmed, for example, in [2 - 4]. However, all the experiments performed to date were on polycrystalline samples with large impurity contents, or on films. Mention of measurements on a single crystal is contained in [4], but there are no data whatever on the anisotropy of the effect, and even the crystallographic orientation of the sample is not indicated.

We report here measurements of the surface resistance of lead single crystals whose superconductivity has been destroyed by a magnetic field. The electron mean free path ℓ, estimated from the cyclotron-resonance line width [5], amounts to 0.1 - 0.3 mm at T = 1.5°K and 0.05 - 0.1 mm at T = 4.2°K. Thus, the case of an extremely pure type-I superconductor ($\ell \gg \xi_0$) is realized in these experiments, and a large influence of non-local effects is to be expected.

The samples, in the form of disks 17.8 mm in diameter and 1 and 0.2 mm thick, were grown in a dismountable polished quartz mold [6] and placed in a strip resonator tuned to 9.2 - 9.6 GHz. The sample surface was not subjected to any additional treatment.

The change of the surface resistance of the sample in the magnetic field (Fig. 1) was revealed by the change in a klystron signal passing through a

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