electron-impurity t_0 satisfies relation (2). Estimates show that the influence of the dislocations on the NWD is appreciable if $c_{dis} \gtrsim 10^5$ cm^{-2}.

5. We present now a formula for the NWD coefficient (Γ) for the case when the "two-level" wave absorption ($\beta >> 1$) occurs under quasistatic conditions ($\omega t_0 << 1$):

$$\Gamma = (1 + (u_0 t_0)^2 \hbar^{-2})(1 + 4(u_0 t_0)^2 \hbar^{-2})^{-1/2} \Gamma_0(w). \tag{4}$$

Formula (4) was obtained in the t_0-approximation; a factor ~ 1 preceding $(u_0 t_0/\hbar)^2$ has been left out. Here $\Gamma_0(w)$ is the wave damping coefficient of the linear theory [4] and does not depend on t_0 of the MB, w(H) is the probability of interband tunneling (the MB probability), and $\Gamma_0(w) \sim \Gamma_0(0)$. In the linear limit $u_0 t_0 \hbar^{-1} \to 0$ we have $\Gamma \to \Gamma_0(w)$. If $u_0 t_0 >> \hbar$, then we have in accordance with (4) $\Gamma \sim u_0 t_0 \hbar^{-1} \Gamma_0 >> \Gamma_0$. The latter holds true only for the case $\beta >> 1$ and $\omega t_0 << 1$; in other situations ($\beta << 1$ or $\omega t_0 << 1$) we have $\Gamma \to 0$ as $u_0 \to \infty$. In the quasiclassical limit $w \to 0$ or 1, when the energy levels $E_n(p_z)$ are almost equidistant, independent two-level transitions (at $\omega t_0 << 1$) are no longer possible. Equation (4) is therefore valid only in the region $w(1 - w)\hbar\Omega_0 >> u$.

A detailed investigation of the entire situation at arbitrary ωt_0, and c_{dis} will be reported in a separate article.

It is my pleasant duty to thank I. M. Lifshitz and M. I. Kaganov for valuable discussions.

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1)The reason for this structure of $E_n(p_z)$ is that the orbits of different bands, coupled by the MB, have non-commensurable periods [2].

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LIMITING TEMPERATURE AND NONLOCALITY OF STRONG INTERACTION

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Arguments are presented in favor of the assumption than an exponential growth of the hadron density of states means nonlocality of the strong interaction. The dimensions of the corresponding nonlocality region are in strong disagreement with experiment.

1. The question of the existence of a limiting maximum permissible temperature T_0 of the order of the ion mass (see, e.g., [1])

$$T < T_0 \approx 130 - 160 \text{ MeV}. \tag{1}$$

has been extensively discussed of late. In addition to arguments based on the data on the interaction of high-energy particles1), Eq. (1) is favored by the statement that the hadron density of states increases exponentially,

$$\rho(E) = \int d\nu\, \delta(E - E_\nu) \sim \exp(E/T_0) \tag{2}$$

as the hadron mass $E \to \infty$. This statement is a consequence of the statistical bootstrap and of the dual resonance model. At low values of E, Eq. (2) agrees with the averaged empirical data.

Substitution of (2) into the expression for the partition function

$$Z(T) = \int d\nu \exp(-E_\nu/T) = \int dE \rho(E) \exp(-E/T) \quad (3)$$

does indeed lead to a meaningless divergence at $T > T_0$.

2. It has been noted recently that the aforementioned models correspond to nonlocal field theory. This is connected in final analysis with the general statement that an exponential growth of the Wightman function in the momentum representation, with an exponent that increases linearly ($\sim \ell E$) or more strongly with the energy E, means a possibility of space-time localization only with accuracy of order ℓ (see [4], where references to earlier papers can be found).

A possible illustration is the problem of wave scattering by a "hard sphere" of radius ℓ [5]. In this case the scattering amplitude vanishes not at $t < 0$, as is usual, but at $t < -\ell$ (the instant of time $t = 0$ corresponds to the arrival of the wave front at the center of the sphere). Accordingly, the amplitude acquires a factor $\exp(i\ell E)$ that increases exponentially in the complex E plane.

3. The density of states is not connected directly with the Wightman functions. Nonetheless, even with a very simple quantum-mechanical system as an example one can show that, regardless of the model, expression (2) leads in itself to a limited possibility of localization with an elementary length

$$\ell \sim 1/T_0 \, . \quad (4).$$

Let us consider the Green's function $G(\vec{x}, \vec{x}', t) = i\theta(t)g(\vec{x}, \vec{x}', t)$ of the single-particle problem, where

$$g(x, x', t) = \int d\nu \bar{\psi}_\nu(x')\psi_\nu(x)\exp(-iE_\nu t).$$

Normalizing $\int d\vec{x}|\psi_\nu(x)|^2$ to the volume of the system and averaging over $\vec{x}$, we have

$$\overline{g(x, x, t)} = \int d\nu \exp(-iE_\nu t) = \int dE \rho(E) \exp(-iEt). \quad (5)$$

Substitution of (2) in (5) leads to an infinite result. Since the mean value cannot exceed all the averaged quantities, x must be infinite in some region and the quantity $G(\vec{x}, \vec{x}', t)$, which has the direct physical meaning of the amplitude of the transition of a system initially localized at the point $\vec{x}$ to the same point after a time t[2].

This still does not mean, however, that in our case no space-time description is possible at all. All that is impossible as a pointlike local description. To verify this, we introduce "smoothing" with respect to time with the aid of a smooth form factor, e.g., $F(t) = a/[\ (t\ +$ $a/[\pi(t^2 + a^2)]$. Then

$$\int d\tau F(\tau) \overline{g(x, x, t - \tau)} = \int dE \rho(E) \exp(-iEt - aE).$$

This expression does indeed become finite at a $\sigma \geq \ell \sim 1/T_0$.[3]

A similar analysis in quantum field theory would encounter certain difficulties. However, restoration of the locality of the theory in this case is not very likely.

4. The similarity between expressions (3) and (5) is a reflection of the far-reaching analogy between dynamics and statistics, consisting in a close similarity of the timelike relations in dynamics to the temperature relations in statistics. This analogy, symbolically expressed in the form [6]

$$it \sim 1/T, \quad (6)$$

is based on the similarity of the quantum-mechanical evolution operator $\exp(-itH)$ and the statistical operator $\exp(-H/T)$.

This suggests that there is a direct connection between the limiting temperature and nonlocality, obtainable without consideration of the exponential growth of (2). One can arrive at statistics with the limitation (1) only from a dynamics that differs radically from the usual one in a small space-time region. According to (6), the dimensions of this region are determined by the quantity (4).

5. The value of T_0 from (1) leads, when substituted in (4), to an elementary length $\ell \sim 10^{-13}$ cm. Yet experiments (particularly those aimed at verifying the dispersion relations) confirm even now the validity of the locality principle, all the way to scales on the order of 10^{-15} cm. There are grounds for assuming that ℓ is actually even much smaller and coincides with the quantum-gravitational length $\ell_g \sim 10^{-33}$ [7].

All the foregoing constitutes one more argument against the existence of a limiting temperature of the order of (1). It either does not exist at all, or its order of magnitude is much larger than the pion mass (for $\ell \sim \ell_g$, for example, we have $T_0 \sim 10^{19}$ GeV).[4] Accordingly, the hadron density of states either increases asymptotically more slowly than an exponential with linear argument, or is characterized by a temporal parameter that assumes much larger values as $E \to \infty$ than at small E.

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1)Actually these arguments are not necessarily valid, since the indicated data admit also of another interpretation [2].

2)In particular, for a free nonrelativistic particle the quantity $G(\vec{x}, \vec{x}, t) \sim t^{-3/2}$ describes the "spreading" of an initially localized packet.

3)A more correct analysis based on the "smoothing" of the δ function in the right-hand side of the equation for the Green's function leads to practically the same result.

4)The idea of the limiting temperature in connection with quantum-gravitational effects is developed in [8].

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FEASIBILITY OF STRONG-COUPLING MAGNETIC CONDENSONS

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A mechanism whereby strong-coupling magnetic condensons are produced is indicated and systems that may be suitable for the realization of this mechanism are indicated.

Magnetic condensons (MC) are self-consistent states of the polaron type in homopolar crystals, and are produced by sufficiently strong magnetic fields, 10^5 Oe < H < 10^6 Oe [1]. Relatively simple quantitative results for the self-energy of the MC, for its effective mass, and for other characteristics can be obtained provided that the dimensionless parameter of the problem is

$$\gamma = \frac{\rho_0}{r_z} = \frac{1}{8\pi\rho_0}\frac{m^* D^2}{\hbar^2 \rho s^2} << 1 \qquad (1)$$