A common feature of the obtained expressions is the linear-fraction character of the variation of ln T_c with the film thickness d 4); a similar variation is observed in the experimental data for aluminum films with oxide coatings [1]. For a more detailed comparison with these data we need reliable estimates of the thickness of the surface layer d_s and the mean free path ℓ.

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1) The tilde denotes that it is necessary to introduce in the Fourier expansion in x and y and in the expansion in the transverse-motion functions $\psi_m(z)$ with energy E_m a factor $f(\zeta, E_m) = \theta(\omega_0 - |\zeta + E_m|)$, where $\zeta = [(p_x^2 + p_y^2)/2m] - \mu$.

2) However, if the condition $md^2T_c \lesssim 1$ is satisfied, it becomes easy to consider also the case of arbitrary temperatures.

3) The dependence of this factor, and also of the second term in (8), on U is a reflection of the inhomogeneity of the particle distributions transverse to the film.

4) We note that such a dependence (in the simplest case when $p_0 d_s \gg 1$ and $\lambda = 0$) was obtained from qualitative considerations by Cooper [6] (see also [4]).

CP-ODD WEAK INTERACTION

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Two different effects - CP-parity nonconservation in K → 2π decays [1] and the absence of weak interaction of neutral currents [2,3] - can be simply explained if the weak-interaction Lagrangian has negative CP-parity

$$L_{qr} = iG/\sqrt{2}\left[j_\alpha^{(q)} j_\alpha^{(r)+} - j_\alpha^{(q)+} j_\alpha^{(r)} \right], \qquad (1)$$

where the indices q and r number the individual terms of the sequence of different weak currents

$$\begin{gathered}\bar{\nu}\,\gamma_\alpha(1+\gamma_5)e, \qquad \bar{\mu}\,\gamma_\alpha(1-\gamma_5)\nu, \qquad \bar{p}\,\gamma_\alpha(1+\gamma_5)n, \\ i\sqrt{2}\,(\partial_\alpha\,\Phi_\pi^+ \cdot \Phi_\pi - \Phi_\pi^+ \cdot \partial_\alpha\,\Phi_\pi), \qquad \bar{p}\,\gamma_\alpha(1+\gamma_5)\Lambda, \ldots,\end{gathered} \tag{2}$$

and the condition $q < r$ ensures a unique choice of the common phase factor.

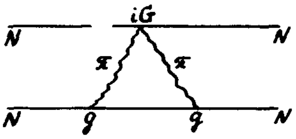
The assumption that the constant of weak interaction with $\Delta Y = 1$ is imaginary was advanced by Wolfenstein [4] (see also [5]), as a model of CP-parity violation in $K \to 2\pi$ decays. Our postulate is common to all weak interactions and is connected with definite transformation properties of the weak-interaction Lagrangian in charge space. The details will be published elsewhere. Here we point out only two radically different consequences of negative CP-parity of the interactions.

1. First-order effects in the weak interaction include:

(a) The absence of neutral-current interaction.

(b) The absence of interactions quadratic in the current (of the type $\nu_e + e \to \nu_e + e$ and $\nu_\mu + \mu \to \nu_\mu + \mu$). It is possible that the most realistic check on this circumstance would be a study of $\mu^+\mu^-$ and μ^+e^- pair production by scattering of high-energy neutrinos in the nucleon field of the nucleus. In our approach, production of a $\mu^+\mu^-$ pair by a muonic neutrino is possible only in second order in G, and may be essentially suppressed in comparison with the calculation [6-8] made in accord with the usual theory [9].

(c) The presence of CP-odd correlations of the order of unity in nuclear transitions with parity nonconservation. In this case, although contact weak interaction of four nucleons is forbidden [1], owing to virtual strong interactions of the type



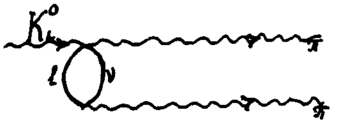
the weak process of scattering of a nucleon by a nucleon is possible in first order in G. It follows from analogous considerations that the nucleon should have electric dipole moment. Making the constant G dimensionless with the aid of the pion mass, we obtain

$$D \sim (\hbar/M_p c)Gm_\pi^2 = 4 \times 10^{-21}\ \text{cm}.$$

Present day experiments yield [10] $D < 5 \times 10^{-20}$ cm.

2. In second (arbitrary even) order in weak interaction, owing to positive CP-parity, processes which are absent in first order of CP-odd weak interaction become allowed. In the case of K mesons, in first order interaction with CP = -1, decay of the CP-odd combination $(1/\sqrt{2})(K^0 + \bar{K}^0)$ into two pions is allowed, but the transition of the CP-even state $(1/\sqrt{2})(K^0 - \bar{K}^0)$ into two pions is forbidden 1).

The state $(1/\sqrt{2})(K^0 - \bar{K}^0)$ can go over into two pions only as a result of a weak interaction of second (arbitrary even) order, and is therefore long lived. An estimate of the diagram



with cutoff parameter $\Lambda \approx 100$ GeV leads to the observed [1] ratio of the amplitudes of the $K^0_L \to 2\pi$ and $K^0_S \to 2\pi$ decays.

In addition, an account of weak interaction of even order makes complex the constants in the amplitudes of processes allowed in first order in G. For lepton-hadron processes (for example, β decay of a polarized neutron), this can lead to CP-odd correlations of order GM^2 (M - mass of the same order as that of the nucleon) relative to the main effect.

The difference between the expressions for the electron and muon currents in (2) is connected with the fact that in our representations the particles are e^-, μ^+, ν and the antiparticles are e^+, μ^-, $\bar{\nu}$ [11-13]. Then the transitions $\mu \to e + \gamma$ and $\mu \to 3e$ are forbidden by lepton-charge conservation. In such an approach, to obtain full agreement with experiment it is necessary to ascribe opposite helicities to the muonic and electronic neutrinos; this is reflected in (2).

A check of the correctness of the proposed scheme is made easy by the wide range of experimentally observed consequences.

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(1) The P-parity of the K meson is assumed negative.