of the active centers.

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1) There is only one published communication [5] concerning a laser with vibrating crystal, but it does not contain any proof of narrowing down of the spectrum of stimulated emission from the ruby.

2) The generation threshold ($V \sim 1700$ V, $C = 1000$ μF) remains practically unchanged as the crystal moves.

CONCERNING ONE MECHANISM OF CP-INVARIANCE VIOLATION

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After Christenson, Cronin, et al. [1] reported observation of a $K_L \to \pi^+\pi^-$ decay 1), the realization of which apparently contradicts CP-parity conservation, many models were proposed to explain the very fact of this phenomenon and its magnitude. Recently Lee and Wolfenstein [6,7] investigated a phenomenological model on the assumption that CP parity is not conserved only in the mass operator of the (K_1, K_2) system, and that all other matrix elements and amplitudes are CP-invariant. In other words, the CP-parity nonconservation is manifest only in the mixing of the states K_1 and K_2, so that the CP parity of the diagonal combinations K_S (short-lived component) and K_L (long-lived component) is not defined but is conserved in the decays.

In the present note we consider a possibility which in some sense is just the opposite, namely we assume that the "diagonal" states are $K_S = K_i \equiv K + \bar{K}$ and $K_L = K_2 \equiv K - \bar{K}$, and that CP parity is not conserved only in decay processes. Thus, in particular, K_2 can decay into 2π. 2)

Generally speaking, such a situation is unreal, since virtual processes of the type $K_2 \to 2\pi \to K_1$ will make possible transitions $K_1 \rightleftarrows K_2$, and the mixing of the states K_2 and K_1 will be precisely of the order of violation of CP invariance in real decays. There is, however, at least one exception.

Let us assume a weak interaction $W_{5/2}$, causing transitions with $\Delta T = 5/2$, is CP-odd, while the interactions $W_{1/2}$ and $W_{3/2}$ are CP-even. The decay $K_2 \to \pi^+\pi^-$ will be brought about by the interaction $W_{5/2}$. The ratio of the amplitudes $A(K_2 \to \pi^+\pi^-)/A(K_1 \to \pi^+\pi^-)$ will be

$$\epsilon = A(K_2 \to \pi^+\pi^-)/A(K_1 \to \pi^+\pi^-) \approx i/(2)^{1/2} a_2^{(5/2)} \Big/ a_0^{(1/2)}; \quad |\epsilon| \approx 2 \times 10^{-3} \tag{1}$$

where $a_0^{(\Delta T)} = |a_0^{(\Delta T)}| \exp(i\delta_0)$ and $a_2^{(\Delta T)} = |a_2^{(\Delta T)}| \exp(i\delta_0)$ are the amplitudes of transition to states with isotopic spins T = 0 and 2, respectively (the index ΔT is equal to 1/2 or 5/2, depending on which of the interactions $W_{1/2}$ or $W_{5/2}$ plays a role). On the other hand, there will be no transitions $K_2 \rightleftarrows K_1$. In fact, the transitions $K_2 \rightleftarrows K_1$ arise only when the matrix elements of the mass operator $M_{K\overline{K}}$ and $M_{\overline{K}K}$ are different ($M_{KK} = M_{\overline{K}\overline{K}}$ because of CPT invariance). This difference can result only from the interaction $W_{5/2}$, precisely the interaction that leads to violation of CP invariance. In the virtual process $K \to j \to \overline{K}$ there is no interference between the interactions $W_{1/2}$ and $W_{5/2}$, since they lead to intermediate states of j with different isospins. However, an interference of $W_{5/2}$ and $W_{3/2}$ is possible in the processes $K \to j \to \overline{K}$, where the intermediate state has T = 2.

Thus, the difference between the matrix elements $M_{K\overline{K}}$ and $M_{\overline{K}K}$ is due essentially to the interference $W_{5/2} \times W_{3/2}$. This difference should be ascribed to the main transition

$$K \xrightarrow{\Delta T = 1/2} j \xrightarrow{\Delta T = 1/2} \overline{K}$$

which occurs in the second approximation in the interaction $W_{1/2}$. Thus, the parameter of the mixing of the states K_1 and K_2 is of the order $W_{3/2}W_{5/2}W_{1/2}W_{1/2}$, and is smaller by $W_{3/2}/W_{1/2}$ than the violation of CP invariance in amplitudes of real decays.[3)]

We next discuss several specific consequences of such a model. In terms of the amplitudes of decay into states with definite isotopic spin, the ratio of the amplitudes $[A(K_2 \to 2\pi^0)]/A(K_1 \to 2\pi^0)]$ is equal to

$$\epsilon_0 = A(K_2 \to 2\pi^0)/A(K_1 \to 2\pi^0) \approx -\, i(2)^{1/2} a_2^{(5/2)}/a_0^{(1/2)} \tag{2}$$

Thus, using (1) and (2), we obtain for the probability ratio:

$$\Gamma(K_2 \to \pi^+\pi^-)/\Gamma(K_2 \to 2\pi^0) = (1/4)\Gamma(K_1 \to \pi^+\pi^-)/\Gamma(K_1 \to 2\pi^0) = 1/2 \tag{3}$$

It is also important that in this model there are obtained unambiguous predictions for the phases of the quantities ϵ and ϵ_0 ($e = |\epsilon| i \exp[i(\delta_2 - \delta_0)]$, $\epsilon_0 = -\,|\epsilon_0| i \exp[i(\delta_2 - \delta_0)]$). The relative phase of ϵ and ϵ_0 is equal to π and does not depend on the interaction in the final state. The phases of the parameters ϵ and ϵ_0 can be established in experiments aimed at a study of the interference of the $K_1 \to 2\pi$ and $K_2 \to 2\pi$ decays (see, for example, [3,8,9]).

A specific consequence of the model is also the absence of charge asymmetry in lepton decays of the long-lived component:

$$\Gamma(K_2 \to \pi^+ e^- \nu)/\Gamma(K_2 \to \pi^- e^+ \nu) = 1 \tag{4}$$

(we assume that the rule $\Delta S = \Delta Q$ is satisfied). We note also that:

$$\Gamma(K_1 \to \pi^{\pm}e^{\mp}\nu) = \Gamma(K_2 \to \pi^{\pm}e^{\mp}\nu) \quad (5)$$

Interesting consequences arise in τ decays. Inasmuch as in the decays $K_1 \to 3\pi^0$ and $K_1 \to \pi^+\pi^-\pi^0$, which are due to the interaction $W_{5/2}$ with CP-parity violation, three pions are produced in a state with isotopic spin T = 3, and the following relation should be satisfied:

$$A(K_1 \to 3\pi^0)/A(K_1 \to \pi^+\pi^-\pi^0) = -2 \quad (6)$$

This relation is perfectly rigorous only when $\epsilon_+ = \epsilon_-$ ($\epsilon_\pm$ is the energy of the $\pi^\pm$ mesons). In this region no contributions are made by states with T = 0 and 2, which result from the CP-parity-conserving interactions $W_{1/2}$ and $W_{3/2}$ (see [10]). The interaction $W_{5/2}$ should become manifest in τ and τ' decays, where an increase by one order of magnitude in the determination of the ratio of the amplitudes of τ and τ' decays will apparently be sufficient to observe the admixture of $\Delta T = 5/2$ (see [10]), if the magnitude of this admixture is determined from (1).4)

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1) K_L is the long-lived component of the neutral K-meson beam (see, for example, [2-5]). When CP parity is conserved, K_L coincides with the K_2 meson, which is defined as a CP-odd state (CP $K_2 = K_2$; $K_2 = K - \bar{K}$). K_1 is defined respectively as a CP-even state (CP $K_1 = K_1$; $K_1 = K + \bar{K}$).

2) It must be noted that such a model was used formally in [8] in connection with a study of phenomena of interference in a K-meson beam. However, the authors were not interested in the question of how this could be realized and to what consequences this should lead.

3) The ratio of the amplitudes $A(K^+ \to \pi^+\pi^0)/A(K \to \pi^+\pi^-) \approx 3 \times 10^{-2}$ is the only indication of the size of deviation from the $\Delta T = 1/2$ rule. In all other processes, the $\Delta T = 1/2$ rule is satisfied within the limits of experimental accuracy. Therefore the ratio $W_{3/2}/W_{1/2}$ is at any rate not larger than 10^{-1}. This determines the accuracy with which the transitions $K_2 \rightleftarrows K_1$

can be neglected in our model.

[4] L. B. Okun' has made a remark that if the interaction $W_{5/2}$ conserves parity, then an tentermediate case arises: the decay $K_2 \rightarrow 2\pi$ proceeds only via the scheme $K_2 \rightarrow K_1 \rightarrow 2\pi$, while the decay $K_1 \rightarrow 3\pi$ proceeds essentially via CP violation in the decay amplitude. In this case the CP violation in $K \rightarrow 3\pi$ decays will be essentially $W_{1/2}/W_{3/2}$ larger than in $K \rightarrow 2\pi$ decays.

INVESTIGATION OF GALVANOMAGNETIC PROPERTIES OF TRANSITION METALS IN STRONG MAGNETIC FIELDS

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In the present communication we present the results of measurements of the galvanomagnetic properties of some transition metals, carried out in large effective magnetic fields. The measurements were made with apparatus described in [1], which yielded ~ 180 kOe pulsed fields of ~ 10^{-2} sec duration, the sensitivity of the recording part of the system amounting to ~ 2×10^{-7}. Use of this apparatus has made it possible to obtain data on the galvanomagnetic properties of transition metals in which the ratio of the resistance at room temperature to the resistance at liquid-helium temperature was relatively small.

We measured the magnetoresistance of W, V, Ti, and Cr. The measurements were made with single crystals several millimeters long with transverse dimensions approximately 0.5 - 0.3 mm. The potential and current leads were soldered to the samples by means of a discharge from a small capacitor bank. The orientation of the samples was determined by x-ray patterns.

In spite of the relatively small value of $\rho_{300°K}/\rho_{4.2°K}$, which ranged from 130 to 175 for such metals as Cr, Ti, and V, the maximum values of the effective field were sufficiently high and amounted to ~ 2×10^7. The change of the resistance of V and Ti in the magnetic field was quite insignificant. This pertains especially to V (see Fig. 2), in which $\Delta\rho_{4.2}(H)/\rho_{4.2}(H_c)$ (H_c smaller than 1 kOe) at $H_{eff} = 1.6 \times 10^7$ was only 0.55. The resistance of both V and Ti increases in a nearly quadratic fashion, and practically no anisotropy of the resistance is observed in either case.

The data obtained for W have confirmed the results published previously by others [2]. The magnitude of the anisotropy of the magnetoresistance does not change up to fields H ~ 150 kOe, and the resistance increases almost quadratically.

The results obtained with chromium single crystals are very interesting. In this case (Fig. 1), unlike in the metals considered above, the angular dependence of the resistance indicates a rather larger anisotropy in the variation of the resistance in the magnetic field, the anisotropy increasing in magnitude with increasing field. The direction of the minimum of the angle diagram corresponds to $\vec{J} \parallel [110]$ and $\vec{H} \parallel [\bar{1}10]$. The change of resistance with the field at the maximum of the angle plots is proportional to $H^{1.6}$, while at the minimum the exponent of H is somewhat smaller than unity. The maximum value of $\Delta\rho/\rho$ is 50 for the maximum and 10 for the minimum.