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* We assume (see [2]) that the electrons do not go from one film level to another.

** Satisfaction of the second condition of (2) was postulated in order to be able to neglect the level broadening by collision (see also the remark made at the end of the article.

*** For equilibrium electrons and phonons $f_0 N_0 \sim f_M(N_0 + 1)$, since $\omega_0 \sim M\omega_c$.

ASYMPTOTIC SU(3) SYMMETRY, CABIBBO ANGLES, AND SUM RULES FOR THE CONSTANTS OF COUPLING BETWEEN PSEUDOSCALAR MESONS AND BARYONS

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We discuss in the present note certain dispersion sum rules for vertex functions. These rules are derived under the following assumptions:

1. The consequences that follow from unbroken SU(3) symmetry are satisfied for the vertex form factors in the asymptotic region of large momentum transfers.

2. The dispersion integrals are saturated by the contribution of the nearest poles in the t-channel. Let us consider the matrix element of the weak hadron current between the states of the baryon octet. Cabibbo [1] advanced the hypothesis that the current operator is of the form

$$J_\mu = V_\mu + A_\mu, \tag{1a}$$

$$J_\mu = \cos\theta(J_\mu^1 + iJ_\mu^2) + \sin\theta(J_\mu^4 + iJ_\mu^5), \tag{1b}$$

where V_μ and A_μ are the vector and axial currents, and the unitary indices i = 1, 2, 4, 5 determine the terms of the current octet with strangeness selection rules $\Delta S = 0, 1$. Determination of the parameters of the theory in accordance with the experimental data yielded the following values [2]:

$$\sin\theta_V = 0.21 \qquad \sin\theta_A = 0.27$$
$$D/D + F = 0.665 \pm 0.018. \tag{2}$$

Recognizing that the leptonic baryon decays used to derive (2) are accompanied by small momentum transfers, we make the following assumption: in the asymptotic region $t \to \infty$ all the form factors $F^\lambda(t)$ of the local current (1a) are described by the three parameters θ_∞, $F_F^\lambda(t)$, and $F_D^\lambda(t)$, where the indices λ = V, A, T, P characterize the spin structure and the values of θ_∞ and D/F can differ from (2). The introduction of the t-dependent Cabibbo angles into the weak-interaction Lagrangian would be equivalent to a nonlocal coupling of the hadron and lepton currents. Unlike (1b), we introduce the angles θ_∞ simply as a method of parametrizing the form factors in the region $t \to \infty$. We shall consider below the "superconverging" dispersion relations

$$\int_0^\infty \operatorname{Im} G(t)\,dt = 0, \tag{3}$$

where G(t) is the corresponding combination of the form factors of the "induced pseudoscalar" $F^P(t)$ (the index P will henceforth be omitted throughout). If we retain in the dispersion relation (3) only the contributions of the pole due to exchange of pseudoscalar mesons, then we arrive at the following conclusions:

1. The $\pi(K)$ meson - baryon constants satisfy the relations of SU(3) symmetry.
2. The SU(3)-symmetry relations connecting the pion constants with the kaon constants may be violated. Let us consider the combination of the form factors

$$G(t) = \frac{\sqrt{2}}{\cos\theta_\infty} F_{n\to p}(t) + \frac{1}{\sin\theta_\infty}(\sqrt{3}F_{\Lambda\to p}(t) - F_{\Sigma^0\to p}(t)). \tag{4}$$

Substituting (4) in (3) and taking the saturation hypothesis into account we obtain the sum rule

$$2\frac{f_\pi}{\cos\theta_\infty} g_{pp\pi^0} + \frac{f_K}{\sin\theta_\infty}(\sqrt{3}g_{p\Lambda K} - g_{p\Sigma K}) = 0, \tag{5}$$

where

$$\frac{w(\pi\to\mu\nu)}{w(K\to\mu\nu)} = \frac{f_\pi^2 m_\pi (1 - m_\mu^2/m_\pi^2)^2}{f_K^2 m_K (1 - m_\mu^2/m_K^2)^2} = 0{,}745 \pm 0{,}014$$

$$g^2_{pp\pi^0}/4\pi = 14{,}6 \pm 0{,}6. \tag{6}$$

Taking into account the connection between $g_{p\Lambda K}$ and $g_{p\Sigma K}$ in accord with SU(3) symmetry, we get

$$\mathrm{tg}\,\theta_\infty = -\sqrt{3}\frac{f_K g_{p\Lambda K}(1 + D/F)}{f_\pi g_{pp\pi^0}(3 + D/F)}. \tag{7}$$

The coupling constant $g_{p\Lambda K}$ was recently determined in a number of papers [5-8] from the dispersion relations for KN scattering: $g^2_{p\Lambda K}/4\pi = 4.8 \pm 1.0$ [5]; 5.9 ± 1.0 [6]; 6.8 ± 2.4 [7]; and 7.4 ± 1.2 [8]. Substituting successively in (7) the values of $g_{p\Lambda K}$ and D/F = 3/2, 2, and 3 we obtain the following limits of the value of $\sin\theta_\infty$:

$$0.16 \le |\sin\theta_\infty| \le 0.23. \tag{8}$$

The lower (upper) limit in (8) corresponds to the values D/F = 3/2 (3) and $g^2_{p\Lambda K}/4\pi = 4.8$ (7.4). We note that $\sin\theta_V = 0.21$ lies within the limits of (8). It is therefore tempting to retain one universal constant in the theory:

$$\lim_{t\to\infty}\sin\theta_A(t) = \sin\theta_\infty = \sin\theta_V = 0.21 \tag{9}$$

The experimental consequences of (8) and (9) can be verified in the reactions

$$\begin{aligned} \nu + N &\to \ell + N, \\ \nu + N &\to \ell + Y \end{aligned} \tag{10}$$

at large momentum transfers.

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