See the 1982 version of this note [4] for additional discussion of the $K^0_{\mu 3}$ parameters, correlations, and conversion between parametrizations, and also for a comparison of the experimental results.

(b) K_{e3} experiments. Analysis of K_{e3} data is simpler than that of $K_{\mu 3}$ because the second term of the matrix element assuming a pure vector current [Eq. (1) above] can be neglected. Here f_+ is usually assumed to be linear in t, and the linear coefficient λ_+ of Eq. (2) is determined.

If we remove the assumption of a pure vector current, then the matrix element for the decay, in addition to the terms in Eq. (2), would contain

$$+2m_K\, f_S\, \overline{\ell}(1+\gamma_5)\nu$$

$$+(2f_T/m_K)(P_K)_\lambda(P_\pi)_\mu\, \overline{\ell}\, \sigma_{\lambda\mu}(1+\gamma_5)\nu\ ,$$

where f_S is the scalar form factor, and f_T is the tensor form factor. In the case of the K_{e3} decays where the f_- term can be neglected, experiments have yielded limits on $|f_S/f_+|$ and $|f_T/f_+|$.

References

1. L.M. Chounet, J.M. Gaillard, and M.K. Gaillard, Phys. Reports **4C**, 199 (1972).
2. H.W. Fearing, E. Fischbach, and J. Smith, Phys. Rev. **D2**, 542 (1970).
3. N. Cabibbo and A. Maksymowicz, Phys. Lett. **9**, 352 (1964).
4. Particle Data Group, Phys. Lett. **111B**, 73 (1982).

$K^{\pm}_{\ell 3}$ FORM FACTORS

In the form factor comments, the following symbols are used.

f_+ and f_- are form factors for the vector matrix element.

f_S and f_T refer to the scalar and tensor term.

$f_0 = f_+ + f_-\, t/(m^2_K - m^2_\pi)$.

λ_+, λ_-, and λ_0 are the linear expansion coefficients of f_+, f_-, and f_0.

λ_+ refers to the $K^{\pm}_{\mu 3}$ value except in the $K^{\pm}_{e3}$ sections.

$d\xi(0)/d\lambda_+$ is the correlation between $\xi(0)$ and λ_+ in $K^{\pm}_{\mu 3}$.

$d\lambda_0/d\lambda_+$ is the correlation between λ_0 and λ_+ in $K^{\pm}_{\mu 3}$.

t = momentum transfer to the π in units of m^2_π.

DP = Dalitz plot analysis.

PI = π spectrum analysis.

MU = μ spectrum analysis.

POL= μ polarization analysis.

BR = $K^{\pm}_{\mu 3}/K^{\pm}_{e3}$ branching ratio analysis.

E = positron or electron spectrum analysis.

RC = radiative corrections.

λ_+ (LINEAR ENERGY DEPENDENCE OF f_+ IN $K^{\pm}_{e3}$ DECAY)

For radiative correction of $K^{\pm}_{e3}$ Dalitz plot, see GINSBERG 67 and BECHERRAWY 70.

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
0.0286±0.0022 OUR AVERAGE					
0.0284±0.0027±0.0020	32k	[72] AKIMENKO 91	SPEC		PI, no RC
0.029 ±0.004	62k	[73] BOLOTOV 88	SPEC		PI, no RC
0.027 ±0.008		[74] BRAUN 73B	HLBC	+	DP, no RC
0.029 ±0.011	4017	CHIANG 72	OSPK	+	DP, RC negligible
0.027 ±0.010	2707	STEINER 71	HLBC	+	DP, uses RC
0.045 ±0.015	1458	BOTTERILL 70	OSPK		PI, uses RC
0.08 ±0.04	960	BOTTERILL 68C	ASPK	+	e^+, uses RC
$-0.02\ {}^{+0.08}_{-0.12}$	90	EISLER 68	HLBC	+	PI, uses RC
$0.045\ {}^{+0.017}_{-0.018}$	854	BELLOTTI 67B	FBC	+	DP, uses RC
+0.016 ±0.016	1393	IMLAY 67	OSPK	+	DP, no RC
$+0.028\ {}^{+0.013}_{-0.014}$	515	KALMUS 67	FBC	+	e^+, PI, no RC
−0.04 ±0.05	230	BORREANI 64	HBC	+	e^+, no RC
−0.010 ±0.029	407	JENSEN 64	XEBC	+	PI, no RC
+0.036 ±0.045	217	BROWN 62B	XEBC	+	PI, no RC
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.025 ±0.007		[75] BRAUN 74	HLBC	+	$K_{\mu 3}/K_{e3}$ vs. t

[72] AKIMENKO 91 state that radiative corrections would raise λ_+ by 0.0013.

[73] BOLOTOV 88 state radiative corrections of GINSBERG 67 would raise λ_+ by 0.002.

[74] BRAUN 73B states that radiative corrections of GINSBERG 67 would lower λ^e_+ by 0.002 but that radiative corrections of BECHERRAWY 70 disagrees and would raise λ^e_+ by 0.005.

[75] BRAUN 74 is a combined $K_{\mu 3}$-K_{e3} result. It is not independent of BRAUN 73C ($K_{\mu 3}$) and BRAUN 73B (K_{e3}) form factor results.

$\xi_A = f_-/f_+$ (determined from $K^{\pm}_{\mu 3}$ spectra)

The parameter ξ is redundant with λ_0 below and is not put into the Meson Summary Table.

VALUE	$d\xi(0)/d\lambda_+$	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
−0.35±0.15 OUR EVALUATION			From a fit discussed in note on $K_{\ell 3}$ form factors in 1982 edition, PL **111B** (April 1982).			
−0.27±0.25	−17	3973	WHITMAN 80	SPEC	+	DP
−0.8 ±0.8	−20	490	[76] ARNOLD 74	HLBC	+	DP
−0.57±0.24	−9	6527	[77] MERLAN 74	ASPK	+	DP
−0.36±0.40	−19	1897	[78] BRAUN 73C	HLBC	+	DP
−0.62±0.28	−12	4025	[79] ANKENBRA... 72	ASPK	+	PI
+0.45±0.28	−15	3480	[80] CHIANG 72	OSPK	+	DP
−1.1 ±0.56	−29	3240	[81] HAIDT 71	HLBC	+	DP
−0.5 ±0.8	−26	2041	[82] KIJEWSKI 69	OSPK	+	PI
+0.72±0.93	−17	444	CALLAHAN 66B	FBC	+	PI
• • • We do not use the following data for averages, fits, limits, etc. • • •						
−0.5 ±0.9	none	78	EISLER 68	HLBC	+	PI, λ_+=0
$0.0\ {}^{+1.1}_{-0.9}$		2648	[83] CALLAHAN 66B	FBC	+	μ, λ_+=0
+0.7 ±0.5		87	GIACOMELLI 64	EMUL	+	MU+BR,λ_+=0
−0.08±0.7			[84] JENSEN 64	XEBC	+	DP+BR
+1.8 ±0.6		76	BROWN 62B	XEBC	+	DP+BR, λ_+=0

[76] ARNOLD 74 figure 4 was used to obtain ξ_A and $d\xi(0)/d\lambda_+$.

[77] MERLAN 74 figure 5 was used to obtain $d\xi(0)/d\lambda_+$.

[78] BRAUN 73C gives $\xi(t) = -0.34 \pm 0.20$, $d\xi(t)/d\lambda_+ = -14$ for $\lambda_+ = 0.027$, $t = 6.6$. We calculate above $\xi(0)$ and $d\xi(0)/d\lambda_+$ for their $\lambda_+ = 0.025 \pm 0.017$.

[79] ANKENBRANDT 72 figure 3 was used to obtain $d\xi(0)/d\lambda_+$.

[80] CHIANG 72 figure 10 was used to obtain $d\xi(0)/d\lambda_+$. Fit had $\lambda_- = \lambda_+$ but would not change for $\lambda_- = 0$. L.Pondrom, (private communication 74).