K^0_L

$I(J^P) = \frac{1}{2}(0^-)$

$m_{K^0_L} - m_{K^0_S}$

For earlier measurements, beginning with GOOD 61 and FITCH 61, see our 1986 edition, Physics Letters **170B** 132 (1986).

OUR FIT is described in the note on "Fits for K^0_L *CP*-Violation Parameters" in the K^0_L Particle Listings.

VALUE (10^{10} $\hbar$ s^{-1})	DOCUMENT ID		TECN	COMMENT
0.5301±0.0014 OUR FIT				
0.5311±0.0015 OUR AVERAGE Error includes scale factor of 1.1.				
0.5295±0.0020 ±0.0003	[1] ANGELOPO...	98D	CPLR	
0.5297±0.0030 ±0.0022	[2] SCHWINGEN...	95	E773	20–160 GeV K beams
0.5257±0.0049 ±0.0021	[2] GIBBONS	93C	E731	20–160 GeV K beams
0.5340±0.00255±0.0015	[3] GEWENIGER	74C	SPEC	Gap method
0.5334±0.0040 ±0.0015	[3] GJESDAL	74	SPEC	Charge asymmetry in $K^0_{\ell 3}$
0.542 ±0.006	CULLEN	70	CNTR	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.5307±0.0013	[4] ADLER	96C	RVUE	
0.5274±0.0029 ±0.0005	[1] ADLER	95	CPLR	Sup. by ANGELOPOULOS 98D
0.5286±0.0028	[5] GIBBONS	93	E731	20–160 GeV K beams
0.482 ±0.014	[6] ARONSON	82B	SPEC	E=30–110 GeV
0.534 ±0.007	[7] CARNEGIE	71	ASPK	Gap method
0.542 ±0.006	[7] ARONSON	70	ASPK	Gap method

[1] Uses $\overline{K}^0_{e3}$ and K^0_{e3} strangeness tagging at production and decay.

[2] Fits Δm and ϕ_{+-} simultaneously. GIBBONS 93C systematic error is from B. Winstein via private communtication.

[3] These two experiments have a common systematic error due to the uncertainty in the momentum scale, as pointed out in WAHL 89.

[4] ADLER 96C is the result of a fit which includes nearly the same data as entered into the "OUR FIT" value above.

[5] GIBBONS 93 value assume $\phi_{+-} = \phi_{00} = \phi_{SW} = (43.7 \pm 0.2)^\circ$.

[6] ARONSON 82 find that Δm may depend on the kaon energy.

[7] ARONSON 70 and CARNEGIE 71 use K^0_S mean life $= (0.862 \pm 0.006) \times 10^{-10}$ s. We have not attempted to adjust these values for the subsequent change in the K^0_S mean life or in η_{+-}.

K^0_L MEAN LIFE

VALUE (10^{-8} s)	EVTS	DOCUMENT ID		TECN
5.17 ±0.04 OUR FIT Error includes scale factor of 1.1.				
5.15 ±0.04 OUR AVERAGE				
5.154±0.044	0.4M	VOSBURGH	72	CNTR
5.15 ±0.14		DEVLIN	67	CNTR

• • • We do not use the following data for averages, fits, limits, etc. • • •

5.0	± 0.5		[8] LOWYS	67	HLBC
6.1	$^{+1.5}_{-1.2}$	1700	ASTBURY	65C	CNTR
5.3	± 0.6		FUJII	64	OSPK
5.1	$^{+2.4}_{-1.3}$	15	DARMON	62	FBC
8.1	$^{+3.2}_{-2.4}$	34	BARDON	58	CNTR

[8] Sum of partial decay rates.

K^0_L DECAY MODES

	Mode			Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	$3\pi^0$			(21.12 ± 0.27) %	S=1.1
Γ_2	$\pi^+\pi^-\pi^0$			(12.56 ± 0.20) %	S=1.7
Γ_3	$\pi^\pm\mu^\mp\nu_\mu$		[a]	(27.17 ± 0.25) %	S=1.1
	Called $K^0_{\mu 3}$.				
Γ_4	$\pi^-\mu^+\nu_\mu$				
Γ_5	$\pi^+\mu^-\overline{\nu}_\mu$				
Γ_6	$\pi^\pm e^\mp\nu_e$		[a]	(38.78 ± 0.27) %	S=1.1
	Called K^0_{e3}.				
Γ_7	$\pi^- e^+\nu_e$				
Γ_8	$\pi^+ e^-\overline{\nu}_e$				
Γ_9	2γ			$(5.92 \pm 0.15) \times 10^{-4}$	
Γ_{10}	3γ			$< 2.4 \times 10^{-7}$	CL=90%
Γ_{11}	$\pi^0 2\gamma$		[b]	$(1.70 \pm 0.28) \times 10^{-6}$	
Γ_{12}	$\pi^0\pi^\pm e^\mp\nu$		[a]	$(5.18 \pm 0.29) \times 10^{-5}$	
Γ_{13}	$(\pi\mu\,\text{atom})\nu$			$(1.06 \pm 0.11) \times 10^{-7}$	
Γ_{14}	$\pi^\pm e^\mp\nu_e\gamma$		[a,b,c]	$(3.62 {}^{+0.26}_{-0.21}) \times 10^{-3}$	
Γ_{15}	$\pi^\pm\mu^\mp\nu_\mu\gamma$			$(5.7 {}^{+0.6}_{-0.7}) \times 10^{-4}$	
Γ_{16}	$\pi^+\pi^-\gamma$		[b,c]	$(4.61 \pm 0.14) \times 10^{-5}$	
Γ_{17}	$\pi^0\pi^0\gamma$			$< 5.6 \times 10^{-6}$	

Charge conjugation × Parity (*CP*, *CPV*) or Lepton Family number (*LF*) violating modes, or $\Delta S = 1$ weak neutral current (*S1*) modes

Γ_{18}	$\pi^+\pi^-$	*CPV*		$(2.067 \pm 0.035) \times 10^{-3}$	S=1.1
Γ_{19}	$\pi^0\pi^0$	*CPV*		$(9.36 \pm 0.20) \times 10^{-4}$	
Γ_{20}	$\mu^+\mu^-$	*S1*		$(7.2 \pm 0.5) \times 10^{-9}$	S=1.4
Γ_{21}	$\mu^+\mu^-\gamma$	*S1*		$(3.25 \pm 0.28) \times 10^{-7}$	
Γ_{22}	e^+e^-	*S1*		$(9 {}^{+6}_{-4}) \times 10^{-12}$	
Γ_{23}	$e^+e^-\gamma$	*S1*		$(9.1 \pm 0.5) \times 10^{-6}$	
Γ_{24}	$e^+e^-\gamma\gamma$	*S1*	[b]	$(6.9 \pm 1.0) \times 10^{-7}$	

Γ_{25}	$\pi^+ \pi^- e^+ e^-$	*S1*	[*b*]	(3.5	± 0.6	) $\times 10^{-7}$		
Γ_{26}	$\mu^+ \mu^- e^+ e^-$	*S1*		(2.9	$^{+6.7}_{-2.4}$	) $\times 10^{-9}$		
Γ_{27}	$e^+ e^- e^+ e^-$	*S1*		(4.1	± 0.8	) $\times 10^{-8}$		S=1.2
Γ_{28}	$\pi^0 \mu^+ \mu^-$	*CP,S1*	[*d*]	$<$ 5.1		$\times 10^{-9}$		CL=90%
Γ_{29}	$\pi^0 e^+ e^-$	*CP,S1*	[*d*]	$<$ 4.3		$\times 10^{-9}$		CL=90%
Γ_{30}	$\pi^0 \nu \overline{\nu}$	*CP,S1*	[*e*]	$<$ 5.8		$\times 10^{-5}$		CL=90%
Γ_{31}	$e^\pm \mu^\mp$	*LF*	[*a*]	$<$ 3.3		$\times 10^{-11}$		CL=90%
Γ_{32}	$e^\pm e^\pm \mu^\mp \mu^\mp$	*LF*	[*a*]	$<$ 6.1		$\times 10^{-9}$		CL=90%
Γ_{33}	$\pi^0 \mu^\pm e^\mp$	*LF*	[*a*]	$<$ 6.2		$\times 10^{-9}$		CL=90%

[*a*] The value is for the sum of the charge states or particle/antiparticle states indicated.

[*b*] See the Particle Listings below for the energy limits used in this measurement.

[*c*] Most of this radiative mode, the low-momentum γ part, is also included in the parent mode listed without γ's.

[*d*] Allowed by higher-order electroweak interactions.

[*e*] Violates *CP* in leading order. Test of direct *CP* violation since the indirect *CP*-violating and *CP*-conserving contributions are expected to be suppressed.

CONSTRAINED FIT INFORMATION

An overall fit to the mean life, 4 decay rate, and 12 branching ratios uses 46 measurements and one constraint to determine 8 parameters. The overall fit has a χ^2 = 41.2 for 39 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\left\langle\delta p_i \delta p_j\right\rangle/(\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i, including the branching fractions, $x_i \equiv \Gamma_i/\Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

	x_1	x_2	x_3	x_6	x_9	x_{18}	x_{19}
x_2	−19						
x_3	−37	−28					
x_6	−49	−28	−36				
x_9	−8	22	−6	−5			
x_{18}	−12	35	−8	−8	64		
x_{19}	−10	27	−7	−6	84	77	
Γ	0	0	0	0	0	0	0

	Mode		Rate (10^8 s^{-1})	Scale factor
Γ_1	$3\pi^0$		0.0408 ± 0.0006	
Γ_2	$\pi^+\pi^-\pi^0$		0.0243 ± 0.0004	1.5
Γ_3	$\pi^\pm\mu^\mp\nu_\mu$ Called $K^0_{\mu3}$.	[a]	0.0525 ± 0.0007	1.1
Γ_6	$\pi^\pm e^\mp\nu_e$ Called K^0_{e3}.	[a]	0.0750 ± 0.0008	1.1
Γ_9	2γ		$(1.144\pm0.031)\times10^{-4}$	
Γ_{18}	$\pi^+\pi^-$		$(4.00\pm0.07)\times10^{-4}$	1.1
Γ_{19}	$\pi^0\pi^0$		$(1.81\pm0.04)\times10^{-4}$	

K^0_L DECAY RATES

$\Gamma(3\pi^0)$ — Γ_1

VALUE (10^6 s^{-1})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
4.08±0.06 OUR FIT					
$\mathbf{5.22^{+1.03}_{-0.84}}$	54	BEHR	66	HLBC	Assumes *CP*

$\Gamma(\pi^+\pi^-\pi^0)$ Γ_2

VALUE (10^6 s^{-1})	EVTS	DOCUMENT ID		TECN	COMMENT
2.43±0.04 OUR FIT	Error includes scale factor of 1.5.				
2.38±0.09 OUR AVERAGE					
$2.32^{+0.13}_{-0.15}$	192	BALDO-...	75	HLBC	Assumes *CP*
2.35±0.20	180	[9] JAMES	72	HBC	Assumes *CP*
2.71±0.28	99	CHO	71	DBC	Assumes *CP*
2.12±0.33	50	MEISNER	71	HBC	Assumes *CP*
2.20±0.35	53	WEBBER	70	HBC	Assumes *CP*
$2.62^{+0.28}_{-0.27}$	136	BEHR	66	HLBC	Assumes *CP*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.5 ±0.3	98	[9] JAMES	71	HBC	Assumes *CP*
3.26±0.77	18	ANDERSON	65	HBC	
1.4 ±0.4	14	FRANZINI	65	HBC	

In the fit this rate is well determined by the mean life and the branching ratio $\Gamma(\pi^+\pi^-\pi^0)/\left[\Gamma(\pi^+\pi^-\pi^0) + \Gamma(\pi^\pm\mu^\mp\nu_\mu) + \Gamma(\pi^\pm e^\mp\nu_e)\right]$. For this reason the discrepancy between the $\Gamma(\pi^+\pi^-\pi^0)$ measurements does not affect the scale factor of the overall fit.

[9] JAMES 72 is a final measurement and includes JAMES 71.

$\Gamma(\pi^\pm\mu^\mp\nu_\mu)$ Γ_3

VALUE (10^6 s^{-1})	EVTS	DOCUMENT ID		TECN
5.25±0.07 OUR FIT	Error includes scale factor of 1.1.			
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$4.54^{+1.24}_{-1.08}$	19	LOWYS	67	HLBC

$\Gamma(\pi^\pm e^\mp\nu_e)$ Γ_6

VALUE (10^6 s^{-1})	EVTS	DOCUMENT ID		TECN	COMMENT
7.50±0.08 OUR FIT	Error includes scale factor of 1.1.				
7.7 ±0.5 OUR AVERAGE					
7.81±0.56	620	CHAN	71	HBC	
$7.52^{+0.85}_{-0.72}$		AUBERT	65	HLBC	ΔS=ΔQ,*CP* assumed

$\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^\pm\mu^\mp\nu_\mu)+\Gamma(\pi^\pm e^\mp\nu_e)$ $(\Gamma_2+\Gamma_3+\Gamma_6)$

$K^0_L \rightarrow$ charged.

VALUE (10^6 s^{-1})	EVTS	DOCUMENT ID		TECN
15.18±0.14 OUR FIT	Error includes scale factor of 1.1.			
• • • We do not use the following data for averages, fits, limits, etc. • • •				
15.1 ±1.9	98	AUERBACH	66B	OSPK

$\Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu}) + \Gamma(\pi^{\pm}e^{\mp}\nu_e)$ $(\Gamma_3+\Gamma_6)$

VALUE (10^6 s^{-1})	EVTS	DOCUMENT ID		TECN	COMMENT
12.75±0.12 OUR FIT Error includes scale factor of 1.1.					
11.9 ±0.6 OUR AVERAGE Error includes scale factor of 1.2.					
12.4 ±0.7	410	[10] BURGUN	72	HBC	$K^+ p \to K^0 p \pi^+$
13.1 ±1.3	252	[10] WEBBER	71	HBC	$K^- p \to n \overline{K}^0$
11.6 ±0.9	393	[10,11] CHO	70	DBC	$K^+ n \to K^0 p$
$9.85^{+1.15}_{-1.05}$	109	[10] FRANZINI	65	HBC	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
8.47±1.69	126	[10] MANN	72	HBC	$K^- p \to n \overline{K}^0$
10.3 ±0.8	335	[11] HILL	67	DBC	$K^+ n \to K^0 p$

[10] Assumes $\Delta S = \Delta Q$ rule.
[11] CHO 70 includes events of HILL 67.

K^0_L BRANCHING RATIOS

$\Gamma(3\pi^0)/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE	EVTS	DOCUMENT ID		TECN
0.2112±0.0027 OUR FIT Error includes scale factor of 1.1.				
0.2105±0.0028	38k	[12] KREUTZ	95	NA31

[12] KREUTZ 95 measure $3\pi^0$, $\pi^+\pi^-\pi^0$, and $\pi e \nu_e$ modes. They assume PDG 1992 values for $\pi\mu\nu_\mu$, 2π, and 2γ modes.

$\Gamma(3\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_1/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.68 ±0.04 OUR FIT Error includes scale factor of 1.3.					
1.63 ±0.05 OUR AVERAGE Error includes scale factor of 1.4.					
1.611±0.014±0.034	38k	[13] KREUTZ	95	NA31	
1.80 ±0.13	1010	BUDAGOV	68	HLBC	
2.0 ±0.6	188	ALEKSANYAN	64B	FBC	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.65 ±0.07	883	BARMIN	72B	HLBC	Error statistical only

[13] KREUTZ 95 excluded from fit because it is not independent of their $\Gamma(3\pi^0)/\Gamma_{\text{total}}$ measurement, which is in the fit.

$\Gamma(3\pi^0)/\Gamma(\pi^{\pm}e^{\mp}\nu_e)$ Γ_1/Γ_6

VALUE	EVTS	DOCUMENT ID		TECN
0.545±0.009 OUR FIT Error includes scale factor of 1.1.				
0.545±0.004±0.009	38k	[14] KREUTZ	95	NA31

[14] KREUTZ 95 measurement excluded from fit because it is not independent of their $\Gamma(3\pi^0)/\Gamma_{\text{total}}$ measurement, which is in the fit.

$\Gamma(3\pi^0)/[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^\pm\mu^\mp\nu_\mu)+\Gamma(\pi^\pm e^\mp\nu_e)]$ — $\Gamma_1/(\Gamma_2+\Gamma_3+\Gamma_6)$

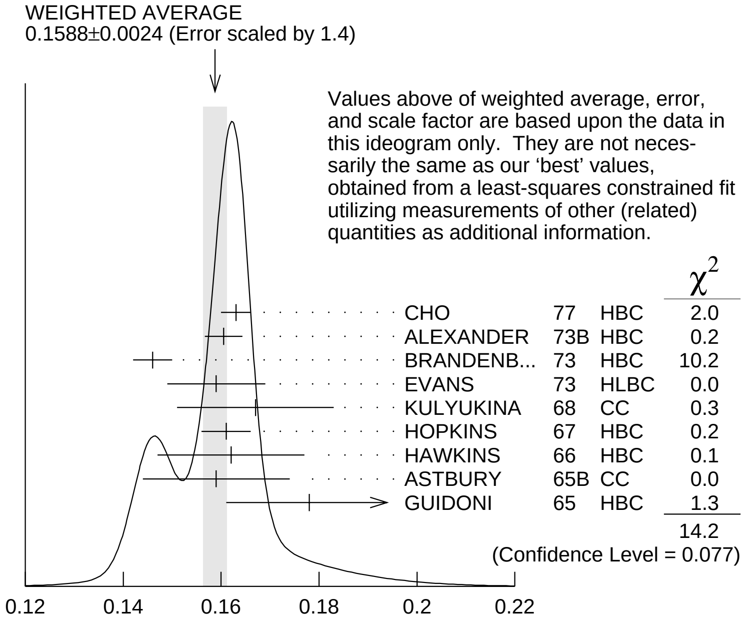
VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.269±0.004 OUR FIT Error includes scale factor of 1.1.					
0.260±0.011 OUR AVERAGE					
0.251±0.014	549	BUDAGOV	68	HLBC	ORSAY measur.
0.277±0.021	444	BUDAGOV	68	HLBC	Ecole polytec.meas
$0.31\ ^{+0.07}_{-0.06}$	29	KULYUKINA	68	CC	
0.24 ±0.08	24	ANIKINA	64	CC	

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_2/Γ

VALUE	DOCUMENT ID
0.1256±0.0020 OUR FIT Error includes scale factor of 1.7.	

$\Gamma(\pi^+\pi^-\pi^0)/[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^\pm\mu^\mp\nu_\mu)+\Gamma(\pi^\pm e^\mp\nu_e)]$ — $\Gamma_2/(\Gamma_2+\Gamma_3+\Gamma_6)$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.1600±0.0025 OUR FIT Error includes scale factor of 1.7.					
0.1588±0.0024 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.					
0.163 ±0.003	6499	CHO	77	HBC	
0.1605±0.0038	1590	ALEXANDER	73B	HBC	
0.146 ±0.004	3200	BRANDENB...	73	HBC	
0.159 ±0.010	558	EVANS	73	HLBC	
0.167 ±0.016	1402	KULYUKINA	68	CC	
0.161 ±0.005		HOPKINS	67	HBC	
0.162 ±0.015	126	HAWKINS	66	HBC	
0.159 ±0.015	326	ASTBURY	65B	CC	
0.178 ±0.017	566	GUIDONI	65	HBC	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.15\ ^{+0.03}_{-0.04}$	66	ASTBURY	65	CC	
0.144 ±0.004	1729	HOPKINS	65	HBC	See HOPKINS 67
0.151 ±0.020	79	ADAIR	64	HBC	
$0.157\ ^{+0.03}_{-0.04}$	75	LUERS	64	HBC	
0.185 ±0.038	59	ASTIER	61	CC	



$$\Gamma\left(\pi^+\pi^-\pi^0\right)/\left[\Gamma\left(\pi^+\pi^-\pi^0\right) + \Gamma\left(\pi^\pm\mu^\mp\nu_\mu\right) + \Gamma\left(\pi^\pm e^\mp\nu_e\right)\right]$$

$\Gamma\left(\pi^+\pi^-\pi^0\right)/\Gamma\left(\pi^\pm e^\mp\nu_e\right)$ — Γ_2/Γ_6

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*
0.324±0.006 OUR FIT	Error includes scale factor of 1.6.			
0.336±0.003±0.007	28k	KREUTZ	95	NA31

$\Gamma\left(\pi^\pm\mu^\mp\nu_\mu\right)/\Gamma\left(\pi^\pm e^\mp\nu_e\right)$ — Γ_3/Γ_6

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.701±0.009 OUR FIT					
0.697±0.010 OUR AVERAGE					
0.702±0.011	33k	CHO	80	HBC	
0.662±0.037	10k	WILLIAMS	74	ASPK	
0.741±0.044	6700	BRANDENB...	73	HBC	
0.662±0.030	1309	EVANS	73	HLBC	
0.71 ±0.05	770	BUDAGOV	68	HLBC	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.68 ±0.08	3548	BASILE	70	OSPK	
0.71 ±0.04	569	[15] BEILLIERE	69	HLBC	
0.648±0.030	1309	EVANS	69	HLBC	Repl. by EVANS 73
0.67 ±0.13		[16] KULYUKINA	68	CC	
0.82 ±0.10		DEBOUARD	67	OSPK	
0.7 ±0.2	273	HAWKINS	67	HBC	
0.81 ±0.08		HOPKINS	67	HBC	
0.81 ±0.19		ADAIR	64	HBC	

[15] BEILLIERE 69 is a scanning experiment using same exposure as BUDAGOV 68.

[16] KULYUKINA 68 $\Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu})/\Gamma(\pi^{\pm}e^{\mp}\nu_{e})$ is not measured independently from $\Gamma(\pi^{+}\pi^{-}\pi^{0})/\left[\Gamma(\pi^{+}\pi^{-}\pi^{0}) + \Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu}) + \Gamma(\pi^{\pm}e^{\mp}\nu_{e})\right]$ and $\Gamma(\pi^{\pm}e^{\mp}\nu_{e})/\left[\Gamma(\pi^{+}\pi^{-}\pi^{0}) + \Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu}) + \Gamma(\pi^{\pm}e^{\mp}\nu_{e})\right]$.

$\Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu})/\left[\Gamma(\pi^{+}\pi^{-}\pi^{0}) + \Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu}) + \Gamma(\pi^{\pm}e^{\mp}\nu_{e})\right]$ $\Gamma_3/(\Gamma_2+\Gamma_3+\Gamma_6)$

VALUE	EVTS	DOCUMENT ID		TECN
0.3461±0.0030 OUR FIT Error includes scale factor of 1.1.				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.335 ±0.055	330	[17] KULYUKINA	68	CC
0.39 $^{+0.08}_{-0.10}$	172	[17] ASTBURY	65	CC
0.356 ±0.07	251	[17] LUERS	64	HBC

[17] This mode not measured independently from $\Gamma(\pi^{+}\pi^{-}\pi^{0})/\left[\Gamma(\pi^{+}\pi^{-}\pi^{0}) + \Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu}) + \Gamma(\pi^{\pm}e^{\mp}\nu_{e})\right]$ and $\Gamma(\pi^{\pm}e^{\mp}\nu_{e})/\left[\Gamma(\pi^{+}\pi^{-}\pi^{0}) + \Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu}) + \Gamma(\pi^{\pm}e^{\mp}\nu_{e})\right]$.

$\Gamma(\pi^{\pm}e^{\mp}\nu_{e})/\left[\Gamma(\pi^{+}\pi^{-}\pi^{0}) + \Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu}) + \Gamma(\pi^{\pm}e^{\mp}\nu_{e})\right]$ $\Gamma_6/(\Gamma_2+\Gamma_3+\Gamma_6)$

VALUE	EVTS	DOCUMENT ID		TECN
0.4939±0.0030 OUR FIT Error includes scale factor of 1.1.				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.498 ±0.052	500	KULYUKINA	68	CC
0.46 $^{+0.08}_{-0.10}$	202	ASTBURY	65	CC
0.487 ±0.05	153	LUERS	64	HBC
0.46 ±0.11	24	NYAGU	61	CC

$\Gamma(\pi^{\pm}e^{\mp}\nu_{e})/\left[\Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu}) + \Gamma(\pi^{\pm}e^{\mp}\nu_{e})\right]$ $\Gamma_6/(\Gamma_3+\Gamma_6)$

VALUE	EVTS	DOCUMENT ID		TECN
0.5880±0.0033 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.415 ±0.120	320	ASTIER	61	CC

$\left[\Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu}) + \Gamma(\pi^{\pm}e^{\mp}\nu_{e})\right]/\Gamma_{\rm total}$ $(\Gamma_3+\Gamma_6)/\Gamma$

VALUE	DOCUMENT ID
0.6596±0.0030 OUR FIT Error includes scale factor of 1.2.	

$\Gamma(2\gamma)/\Gamma_{\rm total}$ Γ_9/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
5.92±0.15 OUR FIT					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.54±0.84		[18] BANNER	72B	OSPK	
4.5 ±1.0	23	ENSTROM	71	OSPK	K^0_L 1.5–9 GeV/c
5.0 ±1.0		[19] REPELLIN	71	OSPK	
5.5 ±1.1	90	KUNZ	68	OSPK	Norm.to 3 π(C+N)
7.4 ±1.6	33	[20] CRONIN	67	OSPK	
6.7 ±2.2	32	TODOROFF	67	OSPK	Repl. CRIEGEE 66
1.3 ±0.6		[21] CRIEGEE	66	OSPK	

[18] This value uses $(\eta_{00}/\eta_{+-})^2 = 1.05 \pm 0.14$. In general, $\Gamma(2\gamma)/\Gamma_{\rm total} = [(4.32 \pm 0.55) \times 10^{-4}]\,[(\eta_{00}/\eta_{+-})^2]$.

[19] Assumes regeneration amplitude in copper at 2 GeV is 22 mb. To evaluate for a given regeneration amplitude and error, multiply by (regeneration amplitude/22mb)^2.

[20] CRONIN 67 replaced by KUNZ 68.

[21] CRIEGEE 66 replaced by TODOROFF 67.

$\Gamma(2\gamma)/\Gamma(3\pi^0)$ — Γ_9/Γ_1

VALUE (units 10^{-3})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
2.80±0.08 OUR FIT	Error includes scale factor of 1.1.				
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.13±0.43	28	BARMIN	71	HLBC	
2.24±0.28	115	BANNER	69	OSPK	
2.5 ±0.7	16	ARNOLD	68B	HLBC	Vacuum decay

$\Gamma(2\gamma)/\Gamma(\pi^0\pi^0)$ — Γ_9/Γ_{19}

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*
0.632±0.009 OUR FIT				
0.632±0.004±0.008	110k	BURKHARDT	87	NA31

$\Gamma(3\gamma)/\Gamma_{\rm total}$ — Γ_{10}/Γ

VALUE	*CL%*	*DOCUMENT ID*		*TECN*
$<2.4 \times 10^{-7}$	90	[22] BARR	95C	NA31

[22] Assumes a phase-space decay distribution.

$\Gamma(\pi^0 2\gamma)/\Gamma_{\rm total}$ — Γ_{11}/Γ

VALUE (units 10^{-6})	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.7 ±0.2 ±0.2		63	[23] BARR	92	SPEC	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1.86±0.60±0.60		60	PAPADIMITR...	91	E731	$m_{\gamma\gamma} > 280$ MeV
< 5.1	90		PAPADIMITR...	91	E731	$m_{\gamma\gamma} < 264$ MeV
2.1 ±0.6		14	[24] BARR	90C	NA31	$m_{\gamma\gamma} > 280$ MeV
< 2.7	90		PAPADIMITR...	89	E731	In PAPADI...91
<230	90	0	BANNER	69	OSPK	

[23] BARR 92 find that $\Gamma(\pi^0 2\gamma,\ m_{\gamma\gamma} < 240\ \text{MeV})/\Gamma(\pi^0 2\gamma) < 0.09$ (90% CL).

[24] BARR 90C superseded by BARR 92.

$\Gamma(\pi^0\pi^\pm e^\mp\nu)/\Gamma_{\rm total}$ — Γ_{12}/Γ

VALUE (units 10^{-5})	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*
5.18±0.29 OUR AVERAGE					
5.16±0.20±0.22		729	MAKOFF	93	E731
6.2 ±2.0		16	CARROLL	80C	SPEC
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<220	90		[25] DONALDSON	74	SPEC

[25] DONALDSON 74 uses $K^0_L \to \pi^+\pi^-\pi^0/(\text{all } K^0_L)$ decays = 0.126.

$\Gamma\big((\pi\mu\text{atom})\nu\big)/\Gamma\big(\pi^{\pm}\mu^{\mp}\nu_{\mu}\big)$ — Γ_{13}/Γ_{3}

VALUE (units 10^{-7})	EVTS	DOCUMENT ID		TECN
3.90±0.39	155	[26] ARONSON	86	SPEC
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	18	COOMBES	76	WIRE

[26] ARONSON 86 quote theoretical value of $(4.31 \pm 0.08) \times 10^{-7}$.

$\Gamma\big(\pi^{\pm}e^{\mp}\nu_{e}\gamma\big)/\Gamma\big(\pi^{\pm}e^{\mp}\nu_{e}\big)$ — Γ_{14}/Γ_{6}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$0.934\pm0.036^{+0.055}_{-0.039}$	1384	LEBER	96	NA31	$E^{*}_{\gamma} \geq$ 30 MeV, $\theta^{*}_{e\gamma} \geq 20^{\circ}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3.3 ±2.0	10	PEACH	71	HLBC	γ KE >15 MeV

$\Gamma\big(\pi^{\pm}\mu^{\mp}\nu_{\mu}\gamma\big)/\Gamma\big(\pi^{\pm}\mu^{\mp}\nu_{\mu}\big)$ — Γ_{15}/Γ_{3}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$2.08\pm0.17^{+0.16}_{-0.21}$	4261	BENDER	98	NA48	$E^{*}_{\gamma} \geq 30$ MeV

$\Gamma\big(\pi^{+}\pi^{-}\gamma\big)/\Gamma_{\text{total}}$ — Γ_{16}/Γ

For earlier limits see our 1992 edition Physical Review **D45,** 1 June, Part II (1992).

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
4.61±0.14 OUR AVERAGE					
4.66±0.15	3136	[27] RAMBERG	93	E731	E_{γ} >20 MeV
4.41±0.32	1062	[28] CARROLL	80B	SPEC	E_{γ} >20 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.52±0.16	516	[29] CARROLL	80B	SPEC	E_{γ} >20 MeV
2.89±0.28	546	[30] CARROLL	80B	SPEC	
6.2 ±2.1	24	[31] DONALDSON	74C	SPEC	

[27] RAMBERG 93 finds that fraction of Direct Emission (DE) decays with E_{γ} >20 MeV is 0.685 ± 0.041.
[28] Both components. Uses $K^0_L \rightarrow \pi^+\pi^-\pi^0$/(all K^0_L) decays = 0.1239.
[29] Internal Bremsstrahlung component only.
[30] Direct γ emission component only.
[31] Uses $K^0_L \rightarrow \pi^+\pi^-\pi^0$/(all K^0_L) decays = 0.126.

$\Gamma\big(\pi^{0}\pi^{0}\gamma\big)/\Gamma_{\text{total}}$ — Γ_{17}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN
< 5.6			BARR	94	NA31
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<230	90	0	ROBERTS	94	E799

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ — Γ_{18}/Γ

Violates *CP* conservation.

VALUE (units 10^{-3})	*DOCUMENT ID*	
2.067±0.035 OUR FIT	Error includes scale factor of 1.1.	
2.107±0.055	[32] ETAFIT	98

[32] This ETAFIT value is computed from fitted values of $|\eta_{+-}|$, the K^0_L and K^0_S lifetimes, and the $K^0_S \rightarrow \pi^+\pi^-$ branching fraction. See the discussion in the note "Fits for K^0_L *CP*-Violation Parameters."

$\Gamma(\pi^+\pi^-)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_{18}/Γ_2

Violates *CP* conservation.

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.645±0.030 OUR FIT	Error includes scale factor of 1.1.				
1.64 ±0.04	4200	MESSNER	73	ASPK	$\eta_{+-} = 2.23$

$\Gamma(\pi^+\pi^-)/\left[\Gamma(\pi^\pm\mu^\mp\nu_\mu)+\Gamma(\pi^\pm e^\mp\nu_e)\right]$ — $\Gamma_{18}/(\Gamma_3+\Gamma_6)$

Violates *CP* conservation.

VALUE (units 10^{-3})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
3.13±0.06 OUR FIT	Error includes scale factor of 1.1.				
3.08±0.10 OUR AVERAGE					
3.13±0.14	1687	COUPAL	85	SPEC	η_{+-}=2.28 ± 0.06
3.04±0.14	2703	DEVOE	77	SPEC	η_{+-}=2.25 ± 0.05
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.51±0.23	309	[33] DEBOUARD	67	OSPK	η_{+-}=2.00 ± 0.09
2.35±0.19	525	[33] FITCH	67	OSPK	η_{+-}=1.94 ± 0.08

[33] Old experiments excluded from fit. See subsection on η_{+-} in section on "PARAMETERS FOR $K^0_L \rightarrow 2\pi$ DECAY" below for average η_{+-} of these experiments and for note on discrepancy.

$\Gamma(\pi^+\pi^-)/\left[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^\pm\mu^\mp\nu_\mu)+\Gamma(\pi^\pm e^\mp\nu_e)\right]$ — $\Gamma_{18}/(\Gamma_2+\Gamma_3+\Gamma_6)$

Violates *CP* conservation.

VALUE (units 10^{-3})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
2.63 ±0.04 OUR FIT					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.60 ±0.07	4200	[34] MESSNER	73	ASPK	η_{+-} = 2.23 ± 0.05
1.93 ±0.26		[35] BASILE	66	OSPK	η_{+-} = 1.92 ± 0.13
1.993±0.080		[35] BOTT-...	66	OSPK	η_{+-} = 1.95 ± 0.04
2.08 ±0.35	54	[35] GALBRAITH	65	OSPK	η_{+-} = 1.99 ± 0.16
2.0 ±0.4	45	[35] CHRISTENS...	64	OSPK	η_{+-} = 1.95 ± 0.20

[34] From same data as $\Gamma(\pi^+\pi^-)/\Gamma(\pi^+\pi^-\pi^0)$ MESSNER 73, but with different normalization.

[35] Old experiments excluded from fit. See subsection on η_{+-} in section on "PARAMETERS FOR $K^0_L \rightarrow 2\pi$ DECAY" below for average η_{+-}.

$\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$ — Γ_{19}/Γ

Violates *CP* conservation.

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.936±0.020 OUR FIT					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.5 ±0.8	189	[36] GAILLARD	69	OSPK	η_{00}=3.6 ± 0.6
1.2 $^{+1.5}_{-1.2}$	7	[37] CRIEGEE	66	OSPK	

[36] Latest result of this experiment given by FAISSNER 70 $\Gamma(\pi^0\pi^0)/\Gamma(3\pi^0)$.
[37] CRIEGEE 66 experiment not designed to measure $2\pi^0$ decay mode.

$\Gamma(\pi^0\pi^0)/\Gamma(3\pi^0)$ — Γ_{19}/Γ_1

Violates *CP* conservation.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.443±0.012 OUR FIT Error includes scale factor of 1.1.					
0.39 ±0.06 OUR AVERAGE					
0.37 ±0.08	29	BARMIN	70	HLBC	η_{00}=2.02 ± 0.23
0.32 ±0.15	30	BUDAGOV	70	HLBC	η_{00}=1.9 ± 0.5
0.46 ±0.11	57	BANNER	69	OSPK	η_{00}=2.2 ± 0.3
not seen		BARTLETT	68	OSPK	See η_{00} below
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.21 ±0.30	150	[38] REY	76	OSPK	η_{00}=3.8 ± 0.5
0.90 ±0.30	172	[39] FAISSNER	70	OSPK	η_{00}=3.2 ± 0.5
1.31 ±0.31	133	[38] CENCE	69	OSPK	η_{00}=3.7 ± 0.5
1.89 ±0.31	109	[40] CRONIN	67	OSPK	η_{00}=4.9 ± 0.5
1.36 ±0.18		[40] CRONIN	67B	OSPK	η_{00}=3.92 ± 0.3

[38] CENCE 69 events are included in REY 76.
[39] FAISSNER 70 contains same $2\pi^0$ events as GAILLARD 69 $\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$.
[40] CRONIN 67B is further analysis of CRONIN 67, now both withdrawn.

$\Gamma(\pi^0\pi^0)/\Gamma(\pi^+\pi^-)$ — Γ_{19}/Γ_{18}

Violates *CP* conservation.

VALUE	DOCUMENT ID	
0.453 ±0.006 OUR FIT		
0.4535±0.0063	[41] ETAFIT	98

[41] This ETAFIT value is computed from fitted values of $|\eta_{00}\ /\ \eta_{+-}|$ and the $\Gamma(K^0_S \rightarrow \pi^+\pi^-)\ /\ \Gamma(K^0_S \rightarrow \pi^0\pi^0)$ branching fraction. See the discussion in the note "Fits for K^0_L *CP*-Violation Parameters."

$\Gamma(\mu^+\mu^-)/[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^\pm\mu^\mp\nu_\mu)+\Gamma(\pi^\pm e^\mp\nu_e)]$ — $\Gamma_{20}/(\Gamma_2+\Gamma_3+\Gamma_6)$

Test for $\Delta S = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 2.0	90	BOTT-...	67	OSPK
< 35.0	90	FITCH	67	OSPK
<250.0	90	ALFF-...	66B	OSPK
<100.0		ANIKINA	65	CC

$\Gamma(\mu^+\mu^-)/\Gamma(\pi^+\pi^-)$ Γ_{20}/Γ_{18}

Test for $\Delta S = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
3.50±0.21 OUR AVERAGE			Error includes scale factor of 1.4.			
3.87±0.30		179	[42] AKAGI	95	SPEC	
3.38±0.17		707	HEINSON	95	B791	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
3.9 ±0.3 ±0.1		178	[43] AKAGI	91B	SPEC	In AKAGI 95
3.45±0.18±0.13		368	[44] HEINSON	91	SPEC	In HEINSON 95
4.1 ±0.5		54	INAGAKI	89	SPEC	In AKAGI 91B
2.8 ±0.3 ±0.2		87	MATHIAZHA...	89B	SPEC	In HEINSON 91
4.0 $^{+1.4}_{-0.9}$		15	SHOCHET	79	SPEC	
4.2 $^{+5.1}_{-2.6}$		3	[45] FUKUSHIMA	76	SPEC	
5.8 $^{+2.3}_{-1.5}$		9	[46] CARITHERS	73	SPEC	
< 1.53	90	0	[47] CLARK	71	SPEC	
< 18.	90	0	DARRIULAT	70	SPEC	
<140.	90	0	FOETH	69	SPEC	

[42] AKAGI 95 gives this number multiplied by the PDG 1992 average for $\Gamma(K^0_L \rightarrow \pi^+\pi^-)/\Gamma(\text{total})$.

[43] AKAGI 91B give this number multiplied by the 1990 PDG average for $\Gamma(K^0_L \rightarrow \pi^+\pi^-)/\Gamma(\text{total})$.

[44] HEINSON 91 give $\Gamma(K^0_L \rightarrow \mu\mu)/\Gamma_{\text{total}}$. We divide out the $\Gamma(K^0_L \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}$ PDG average which they used.

[45] FUKUSHIMA 76 errors are at CL = 90%.

[46] CARITHERS 73 errors are at CL = 68%, W.Carithers, (private communication 79).

[47] CLARK 71 limit raised from 1.2×10^{-6} by FIELD 74 reanalysis. Not in agreement with subsequent experiments. So not averaged.

$\Gamma(\mu^+\mu^-\gamma)/\Gamma_{\text{total}}$ Γ_{21}/Γ

Test for $\Delta S = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-7})	CL%	EVTS	DOCUMENT ID		TECN
3.25±0.28 OUR AVERAGE					
3.4 ±0.6 ±0.4		45	FANTI	97	NA48
3.23±0.23±0.19		197	SPENCER	95	E799
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.8 ±2.8		1	[48] CARROLL	80D	SPEC
<78.1	90		[49] DONALDSON	74	SPEC

[48] Uses $K^0_L \rightarrow \pi^+\pi^-\pi^0/(\text{all } K^0_L)$ decays = 0.1239.

[49] Uses $K^0_L \rightarrow \pi^+\pi^-\pi^0/(\text{all } K^0_L)$ decays = 0.126.

$\Gamma(e^+e^-)/\Gamma_{\text{total}}$ Γ_{22}/Γ

Test for $\Delta S = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-10})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.087$^{+0.057}_{-0.041}$		4	AMBROSE	98	B871	

• • • We do not use the following data for averages, fits, limits, etc. • • •

$<$ 1.6	90	1	AKAGI	95	SPEC	
$<$ 0.41	90	0	[50] ARISAKA	93B	B791	
$<$ 1.6	90	1	AKAGI	91	SPEC	Sup. by AKAGI 95
$<$ 5.6	90		INAGAKI	89	SPEC	In AKAGI 91
$<$ 3.2	90		MATHIAZHA...	89	SPEC	In ARISAKA 93B
$<$ 110	90		COUSINS	88	SPEC	
$<$ 45	90		GREENLEE	88	SPEC	Repl. by JASTRZEMBSKI 88
$<$ 12	90		JASTRZEM...	88	SPEC	
$<$ 15.7	90		[51] CLARK	71	ASPK	
$<$1500	90	0	FOETH	69	ASPK	

[50] ARISAKA 93B includes all events with $<$6 MeV radiated energy.

[51] Possible (but unknown) systematic errors. See note on CLARK 71 $\Gamma(\mu^+\mu^-)/\Gamma(\pi^+\pi^-)$ entry.

$\Gamma(e^+e^-)/[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^\pm\mu^\mp\nu_\mu)+\Gamma(\pi^\pm e^\mp\nu_e)]$ $\Gamma_{22}/(\Gamma_2+\Gamma_3+\Gamma_6)$

Test for $\Delta S=1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-6})	*CL%*	*DOCUMENT ID*		*TECN*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<$ 23.0	90	BOTT-...	67	OSPK
$<$ 200.0	90	ALFF-...	66B	OSPK
$<$1000.0		ANIKINA	65	CC

$\Gamma(e^+e^-\gamma)/\Gamma_{total}$ Γ_{23}/Γ

Test for $\Delta S=1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-6})	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*
9.1±0.5 OUR AVERAGE					
9.2±0.5±0.5		1053	BARR	90B	NA31
$9.1\pm0.4^{+0.6}_{-0.5}$		919	OHL	90B	B845
• • • We do not use the following data for averages, fits, limits, etc. • • •					
17.4±8.7		4	[52] CARROLL	80D	SPEC
$<$27	90	0	[53] BARMIN	72	HLBC

[52] Uses $K^0_L \rightarrow \pi^+\pi^-\pi^0$/(all K^0_L) decays = 0.1239.

[53] Uses $K^0_L \rightarrow 3\pi^0$/total = 0.214.

$\Gamma(e^+e^-\gamma\gamma)/\Gamma_{total}$ Γ_{24}/Γ

Test for $\Delta S=1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-7})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
6.9±1.0 OUR AVERAGE					
$8.0\pm1.5^{+1.4}_{-1.2}$	40	SETZU	98	NA31	$E_\gamma > 5$ MeV
6.5±1.2±0.6	58	NAKAYA	94	E799	$E_\gamma > 5$ MeV
6.6±3.2		MORSE	92	B845	$E_\gamma > 5$ MeV

$\Gamma(\pi^+\pi^- e^+ e^-)/\Gamma_{\rm total}$ — Γ_{25}/Γ

Test for $\Delta S = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-7})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
3.5±0.6 OUR AVERAGE						
3.2±0.6±0.4		37	ADAMS	98	KTEV	
4.4±1.3±0.5		13	TAKEUCHI	98	SPEC	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 4.6	90		NOMURA	97	SPEC	$m_{ee} > 4$ MeV
< 25	90	0	BALATS	83	SPEC	
< 88.1	90		[54] DONALDSON	76	SPEC	
<300			ANIKINA	73	STRC	

[54] Uses $K^0_L \rightarrow \pi^+\pi^-\pi^0$/(all K^0_L) decays = 0.126.

$\Gamma(\mu^+\mu^- e^+ e^-)/\Gamma_{\rm total}$ — Γ_{26}/Γ

Test for $\Delta S = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-9})	CL%	EVTS	DOCUMENT ID		TECN
$\mathbf{2.9^{+6.7}_{-2.4}}$		1	GU	96	E799
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<4900	90		BALATS	83	SPEC

$\Gamma(e^+ e^- e^+ e^-)/\Gamma_{\rm total}$ — Γ_{27}/Γ

Test for $\Delta S = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-8})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
4.1 ±0.8 OUR AVERAGE Error includes scale factor of 1.2.						
6 ±2 ±1		18	[55] AKAGI	95	SPEC	m_{ee} >470 MeV
10.4 ±3.7 ±1.1		8	[56] BARR	95	NA31	
3.96±0.78±0.32		27	GU	94	E799	
3.07±1.25±0.26		6	VAGINS	93	B845	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
7 ±3 ±2		6	[55] AKAGI	95	SPEC	m_{ee} >470 MeV
6 ±2 ±1		18	AKAGI	93	CNTR	Sup. by AKAGI 95
4 ±3		2	BARR	91	NA31	Sup. by BARR 95
<260	90		BALATS	83	SPEC	

[55] Values are for the total branching fraction, acceptance-corrected for the $m_{\rm ee}$ cuts shown.

[56] Distribution of angles between two e^+e^- pair planes favors CP=−1 for K^0_L.

$\Gamma(\pi^0\mu^+\mu^-)/\Gamma_{\rm total}$ — Γ_{28}/Γ

Violates CP in leading order. Test for $\Delta S = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-9})	CL%	EVTS	DOCUMENT ID		TECN
< 5.1	90	0	HARRIS	93	E799
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 1200	90	0	[57] CARROLL	80D	SPEC
<56600	90		[58] DONALDSON	74	SPEC

[57] Uses $K^0_L \rightarrow \pi^+\pi^-\pi^0$/(all K^0_L) decays = 0.1239.

[58] Uses $K^0_L \rightarrow \pi^+\pi^-\pi^0$/(all K^0_L) decays = 0.126.

$\Gamma(\pi^0 e^+ e^-)/\Gamma_{total}$ Γ_{29}/Γ

Violates *CP* in leading order. Direct and indirect *CP*-violating contributions are expected to be comparable and to dominate the *CP*-conserving part. Test for $\Delta S = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

VALUE (units 10^{-9})	CL%	EVTS	DOCUMENT ID		TECN
< 4.3	90	0	HARRIS	93B	E799
< 7.5	90	0	BARKER	90	E731
< 5.5	90	0	OHL	90	B845
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 40	90		BARR	88	NA31
< 320	90		JASTRZEM...	88	SPEC
<2300	90	0	[59] CARROLL	80D	SPEC

[59] Uses $K^0_L \rightarrow \pi^+ \pi^- \pi^0/(\text{all } K^0_L)$ decays = 0.1239.

$\Gamma(\pi^0 \nu \overline{\nu})/\Gamma_{total}$ Γ_{30}/Γ

Violates *CP* in leading order. Test of direct *CP* violation since the indirect *CP*-violating and *CP*-conserving contributions are expected to be suppressed. Test of $\Delta S = 1$ weak neutral current.

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN
< 5.8	90	0	WEAVER	94	E799
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 22	90	0	GRAHAM	92	CNTR
<760	90		[60] LITTENBERG	89	RVUE

[60] LITTENBERG 89 is from retroactive data analysis of CRONIN 67.

$\Gamma(e^\pm \mu^\mp)/\Gamma_{total}$ Γ_{31}/Γ

Test of lepton family number conservation.

VALUE (units 10^{-11})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
< 3.3	90	0	[61] ARISAKA	93	B791	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 9.4	90	0	AKAGI	95	SPEC	
< 3.9	90	0	ARISAKA	93	B791	
< 9.4	90	0	AKAGI	91	SPEC	Sup. by AKAGI 95
< 43	90		INAGAKI	89	SPEC	In AKAGI 91
< 22	90		MATHIAZHA...	89	SPEC	
< 190	90		SCHAFFNER	89	SPEC	
<1100	90		COUSINS	88	SPEC	
< 670	90		GREENLEE	88	SPEC	Repl. by SCHAFFNER 89
< 157	90		[62] CLARK	71	ASPK	

[61] This is the combined result of ARISAKA 93 and MATHIAZHAGAN 89.
[62] Possible (but unknown) systematic errors. See note on CLARK 71 $\Gamma(\mu^+ \mu^-)/\Gamma(\pi^+ \pi^-)$ entry.

$\Gamma(e^\pm e^\pm \mu^\mp \mu^\mp)/\Gamma_{total}$ Γ_{32}/Γ

Test of lepton family number conservation.

VALUE (units 10^{-9})	CL%	EVTS	DOCUMENT ID		TECN
<6.1	90	0	[63] GU	96	E799

[63] Assuming uniform phase space distribution.

$\Gamma(e^{\pm}\mu^{\mp})/[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^{\pm}\mu^{\mp}\nu_{\mu})+\Gamma(\pi^{\pm}e^{\mp}\nu_e)]$ $\Gamma_{31}/(\Gamma_2+\Gamma_3+\Gamma_6)$

Test of lepton family number conservation.

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.1	90	BOTT-...	67	OSPK
<0.08	90	FITCH	67	OSPK
<1.0	90	CARPENTER	66	OSPK
<10.0		ANIKINA	65	CC

$\Gamma(\pi^0\mu^{\pm}e^{\mp})/\Gamma_{\text{total}}$ Γ_{33}/Γ

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID		TECN
$<6.2\times10^{-9}$	90	ARISAKA	98	E799

ENERGY DEPENDENCE OF K^0_L DALITZ PLOT

For discussion, see note on Dalitz plot parameters in the $K^{\pm}$ section of the Particle Listings above. For definitions of a_v, a_t, a_u, and a_y, see the earlier version of the same note in the 1982 edition of this *Review* published in Physics Letters **111B** 70 (1982).

$|\text{matrix element}|^2 = 1 + gu + hu^2 + jv + kv^2 + fuv$
where $u = (s_3 - s_0) / m^2_{\pi}$ and $v = (s_1 - s_2) / m^2_{\pi}$

LINEAR COEFFICIENT g FOR $K^0_L \to \pi^+\pi^-\pi^0$

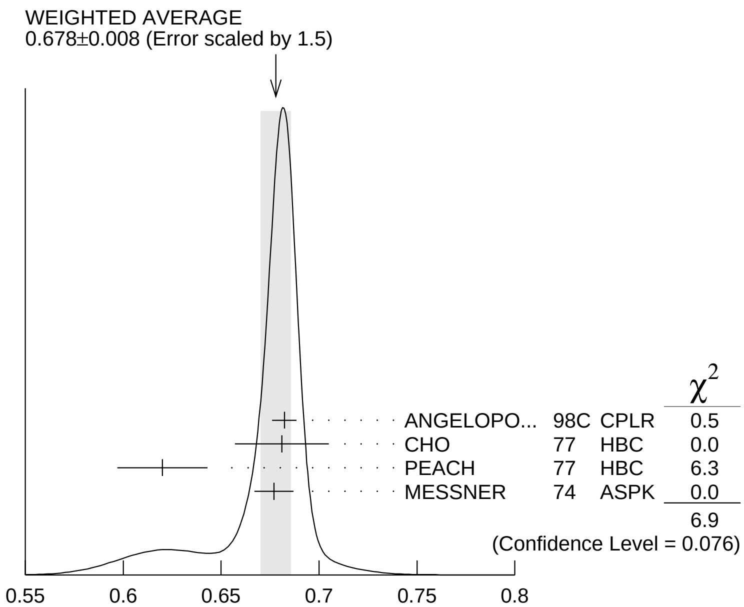
VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.678 ±0.008 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.				
0.6823±0.0044±0.0044	500k	ANGELOPO...	98C	CPLR	
0.681 ±0.024	6499	CHO	77	HBC	
0.620 ±0.023	4709	PEACH	77	HBC	
0.677 ±0.010	509k	MESSNER	74	ASPK	$a_y = -0.917 \pm 0.013$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.69 ±0.07	192	[64] BALDO-...	75	HLBC	
0.590 ±0.022	56k	[64] BUCHANAN	75	SPEC	$a_u = -0.277 \pm 0.010$
0.619 ±0.027	20k	[64,65] BISI	74	ASPK	$a_t = -0.282 \pm 0.011$
0.612 ±0.032		[64] ALEXANDER	73B	HBC	
0.73 ±0.04	3200	[64] BRANDENB...	73	HBC	
0.50 ±0.11	180	[64] JAMES	72	HBC	
0.608 ±0.043	1486	[64] KRENZ	72	HLBC	$a_t = -0.277 \pm 0.018$
0.688 ±0.074	384	[64] METCALF	72	ASPK	$a_t = -0.31 \pm 0.03$
0.650 ±0.012	29k	[64] ALBROW	70	ASPK	$a_y = -0.858 \pm 0.015$
0.593 ±0.022	36k	[64,66] BUCHANAN	70	SPEC	$a_u = -0.278 \pm 0.010$

0.664 ±0.056	4400	[64] SMITH	70	OSPK	$a_t = -0.306 \pm 0.024$
0.400 ±0.045	2446	[64] BASILE	68B	OSPK	$a_t = -0.188 \pm 0.020$
0.649 ±0.044	1350	[64] HOPKINS	67	HBC	$a_t = -0.294 \pm 0.018$
0.428 ±0.055	1198	[64] NEFKENS	67	OSPK	$a_u = -0.204 \pm 0.025$
0.64 ±0.17	280	[64] ANIKINA	66	CC	$a_v = -8.2^{+0.9}_{-1.3}$
0.70 ±0.12	126	[64] HAWKINS	66	HBC	$a_v = -8.6 \pm 0.7$
0.32 ±0.13	66	[64] ASTBURY	65	CC	$a_v = -5.5 \pm 1.5$
0.51 ±0.09	310	[64] ASTBURY	65B	CC	$a_v = -7.3^{+0.6}_{-0.8}$
0.55 ±0.23	79	[64] ADAIR	64	HBC	$a_v = -7.6 \pm 1.7$
0.51 ±0.20	77	[64] LUERS	64	HBC	$a_v = -7.3 \pm 1.6$

[64] Quadratic dependence required by some experiments. (See sections on "QUADRATIC COEFFICIENT *h*" and "QUADRATIC COEFFICIENT *k*" below.) Correlations prevent us from averaging results of fits not including *g*, *h*, and *k* terms.

[65] BISI 74 value comes from quadratic fit with quad. term consistent with zero. *g* error is thus larger than if linear fit were used.

[66] BUCHANAN 70 result revised by BUCHANAN 75 to include radiative correlations and to use more reliable K_L^0 momentum spectrum of second experiment (had same beam).



Linear coeff. *g* for $K_L^0 \rightarrow \pi^+\pi^-\pi^0$ matrix element squared

QUADRATIC COEFFICIENT *h* FOR $K_L^0 \rightarrow \pi^+\pi^-\pi^0$

VALUE	EVTS	DOCUMENT ID		TECN
0.076±0.006 OUR AVERAGE				
0.061±0.004±0.015	500k	ANGELOPO...	98C	CPLR
0.095±0.032	6499	CHO	77	HBC
0.048±0.036	4709	PEACH	77	HBC
0.079±0.007	509k	MESSNER	74	ASPK

• • • We do not use the following data for averages, fits, limits, etc. • • •

-0.011 ± 0.018	29k	[67] ALBROW	70	ASPK
0.043 ± 0.052	4400	[67] SMITH	70	OSPK

See notes in section "LINEAR COEFFICIENT g FOR $K^0_L \rightarrow \pi^+\pi^-\pi^0$ |MATRIX ELEMENT|^2" above.

[67] Quadratic coefficients h and k required by some experiments. (See section on "QUADRATIC COEFFICIENT k" below.) Correlations prevent us from averaging results of fits not including g, h, and k terms.

QUADRATIC COEFFICIENT k FOR $K^0_L \rightarrow \pi^+\pi^-\pi^0$

VALUE	EVTS	DOCUMENT ID		TECN
0.0099±0.0015 OUR AVERAGE				
$0.0104\pm0.0017\pm0.0024$	500k	ANGELOPO...	98C	CPLR
$0.024\ \pm0.010$	6499	CHO	77	HBC
$-0.008\ \pm0.012$	4709	PEACH	77	HBC
0.0097 ± 0.0018	509k	MESSNER	74	ASPK

LINEAR COEFFICIENT j FOR $K^0_L \rightarrow \pi^+\pi^-\pi^0$ (CP-VIOLATING TERM)

Listed in CP-violation section below.

QUADRATIC COEFFICIENT f FOR $K^0_L \rightarrow \pi^+\pi^-\pi^0$ (CP-VIOLATING TERM)

Listed in CP-violation section below.

QUADRATIC COEFFICIENT h FOR $K^0_L \rightarrow \pi^0\pi^0\pi^0$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN
$\mathbf{-3.3\pm1.1\pm0.7}$	5M	[68] SOMALWAR	92	E731

[68] SOMALWAR 92 chose m_{π^+} as normalization to make it compatible with the Particle Data Group $K^0_L \rightarrow \pi^+\pi^-\pi^0$ definitions.

K^0_L FORM FACTORS

For discussion, see note on form factors in the $K^\pm$ section of the Particle Listings above.

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 $K^0_{\mu3}$ value except in the K^0_{e3} sections.

$d\xi(0)/d\lambda_+$ is the correlation between $\xi(0)$ and λ_+ in $K^0_{\mu3}$.

$d\lambda_0/d\lambda_+$ is the correlation between λ_0 and λ_+ in $K^0_{\mu3}$.

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 = $K^0_{\mu 3}/K^0_{e3}$ branching ratio analysis.
E = positron or electron spectrum analysis.
RC = radiative corrections.

λ_+ (LINEAR ENERGY DEPENDENCE OF f_+ IN K^0_{e3} DECAY)

For radiative correction of K^0_{e3} DP, see GINSBERG 67 and BECHERRAWY 70.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0300±0.0016 OUR AVERAGE		Error includes scale factor of 1.2.			
0.0306±0.0034	74k	BIRULEV	81	SPEC	DP
0.025 ±0.005	12k	[69] ENGLER	78B	HBC	DP
0.0348±0.0044	18k	HILL	78	STRC	DP
0.0312±0.0025	500k	GJESDAL	76	SPEC	DP
0.0270±0.0028	25k	BLUMENTHAL	75	SPEC	DP
0.044 ±0.006	24k	BUCHANAN	75	SPEC	DP
0.040 ±0.012	2171	WANG	74	OSPK	DP
0.045 ±0.014	5600	ALBROW	73	ASPK	DP
0.019 ±0.013	1871	BRANDENB...	73	HBC	PI transv.
0.022 ±0.014	1910	NEUHOFER	72	ASPK	PI
0.023 ±0.005	42k	BISI	71	ASPK	DP
0.05 ±0.01	16k	CHIEN	71	ASPK	DP, no RC
0.02 ±0.013	1000	ARONSON	68	OSPK	PI
+0.023 ±0.012	4800	BASILE	68	OSPK	DP, no RC
−0.01 ±0.02	762	FIRESTONE	67	HBC	DP, no RC
+0.01 ±0.015	531	KADYK	67	HBC	e,PI, no RC
$+0.08\ ^{+0.10}_{-0.08}$	240	LOWYS	67	FBC	PI
+0.15 ±0.08	577	FISHER	65	OSPK	DP, no RC
+0.07 ±0.06	153	LUERS	64	HBC	DP, no RC
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.029 ±0.005	19k	[69] CHO	80	HBC	DP
0.0286±0.0049	26k	BIRULEV	79	SPEC	Repl. by BIRULEV 81
0.032 ±0.0042	48k	BIRULEV	76	SPEC	Repl. by BIRULEV 81

[69] ENGLER 78B uses an unique K_{e3} subset of CHO 80 events and is less subject to systematic effects.

$\xi_a = f_-/f_+$ (determined from $K^0_{\mu 3}$ 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	COMMENT
−0.11±0.09 OUR EVALUATION			Error includes scale factor of 2.3. Correlation is $d\xi(0)/d\lambda_+ = -14$. From a fit discussed in note on $K_{\ell 3}$ form factors in 1982 edition, PL **111B** (April 1982).			
−0.10±0.09	−12	150k	[70] BIRULEV	81	SPEC	DP
+0.26±0.16	−13	14k	[71] CHO	80	HBC	DP
+0.13±0.23	−20	16k	[71] HILL	79	STRC	DP
−0.25±0.22	−5.9	32k	[72] BUCHANAN	75	SPEC	DP
−0.11±0.07	−17	1.6M	[73] DONALDSON	74B	SPEC	DP
−1.00±0.45	−20	1385	[74] PEACH	73	HLBC	DP
−1.5 ±0.7	−28	9086	[75] ALBROW	72	ASPK	DP
+1.2 ±0.8	−18	1341	[76] CARPENTER	66	OSPK	DP

• • • We do not use the following data for averages, fits, limits, etc. • • •

$+0.50\pm0.61$	unknown	16k	[77] DALLY	72	ASPK	DP
$-3.9\ \pm0.4$		3140	[78] BASILE	70	OSPK	DP, indep of λ_+
$-0.68^{+0.12}_{-0.20}$	-26	16k	[77] CHIEN	70	ASPK	DP

[70] BIRULEV 81 error, $d\xi(0)/d\lambda_+$ calculated by us from λ_0, λ_+. $d\lambda_0/d\lambda_+ = 0$ used.

[71] HILL 79 and CHO 80 calculated by us from λ_0, λ_+, and $d\lambda_0/d\lambda_+$.

[72] BUCHANAN 75 is calculated by us from λ_0, λ_+ and $d\lambda_0/d\lambda_+$ because their appendix A value -0.20 ± 22 assumes $\xi(t)$ constant, i.e. $\lambda_- = \lambda_+$.

[73] DONALDSON 74B gives $\xi = -0.11 \pm 0.02$ not including systematics. Above error and $d\xi(0)/d\lambda_+$ were calculated by us from λ_0 and λ_+ errors (which include systematics) and $d\lambda_0/d\lambda_+$.

[74] PEACH 73 gives $\xi(0) = -0.95 \pm 0.45$ for $\lambda_+ = \lambda_- = 0.025$. The above value is for $\lambda_- = 0$. K.Peach, private communication (1974).

[75] ALBROW 72 fit has λ_- free, gets $\lambda_- = -0.030 \pm 0.060$ or $\Lambda = +0.15^{+0.17}_{-0.11}$.

[76] CARPENTER 66 $\xi(0)$ is for $\lambda_+ = 0$. $d\xi(0)/d\lambda_+$ is from figure 9.

[77] CHIEN 70 errors are statistical only. $d\xi(0)/d\lambda_+$ from figure 4. DALLY 72 is a reanalysis of CHIEN 70. The DALLY 72 result is not compatible with assumption $\lambda_- = 0$ so not included in our fit. The nonzero λ_- value and the relatively large λ_+ value found by DALLY 72 come mainly from a single low t bin (figures 1,2). The (f_+,ξ) correlation was ignored. We estimate from figure 2 that fixing $\lambda_- = 0$ would give $\xi(0) = -1.4 \pm 0.3$ and would add 10 to χ^2. $d\xi(0)/d\lambda_+$ is not given.

[78] BASILE 70 is incompatible with all other results. Authors suggest that efficiency estimates might be responsible.

$\xi_b = f_-/f_+$ (determined from $K^0_{\mu3}/K^0_{e3}$)

The $K^0_{\mu3}/K^0_{e3}$ branching ratio fixes a relationship between $\xi(0)$ and λ_+. We quote the author's $\xi(0)$ and associated λ_+ but do not average because the λ_+ values differ. The fit result and scale factor given below are not obtained from these ξ_b values. Instead they are obtained directly from the authors $K^0_{\mu3}/K^0_{e3}$ branching ratio via the fitted $K^0_{\mu3}/K^0_{e3}$ ratio $(\Gamma(\pi^\pm\mu^\mp\nu_\mu)/\Gamma(\pi^\pm e^\mp\nu_e))$. The parameter ξ is redundant with λ_0 below and is not put into the Meson Summary Table.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
-0.11 ± 0.09 OUR EVALUATION		Error includes scale factor of 2.3. Correlation is $d\xi(0)/d\lambda_+ = -14$. From a fit discussed in note on $K_{\ell3}$ form factors in 1982 edition, PL **111B** (April 1982).			

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.5\ \pm0.4$	6700	BRANDENB...	73	HBC	BR, λ_+=0.019 ± 0.013
-0.08 ± 0.25	1309	[79] EVANS	73	HLBC	BR, λ_+=0.02
$-0.5\ \pm0.5$	3548	BASILE	70	OSPK	BR, λ_+=0.02
$+0.45\pm0.28$	569	BEILLIERE	69	HLBC	BR, λ_+=0
-0.22 ± 0.30	1309	[79] EVANS	69	HLBC	
$+0.2\ ^{+0.8}_{-1.2}$		KULYUKINA	68	CC	BR, λ_+=0
$+1.1\ \pm1.1$	389	ADAIR	64	HBC	BR, λ_+=0
$+0.66^{+0.9}_{-1.3}$		LUERS	64	HBC	BR, λ_+=0

[79] EVANS 73 replaces EVANS 69.

$\xi_c = f_-/f_+$ (determined from μ polarization in $K^0_{\mu 3}$)

The μ polarization is a measure of $\xi(t)$. No assumptions on λ_{+-} necessary, t (weighted by sensitivity to $\xi(t)$) should be specified. In λ_+, $\xi(0)$ parametrization this is $\xi(0)$ for $\lambda_+ = 0$. $d\xi/d\lambda = \xi t$. For radiative correction to μ polarization in $K^0_{\mu 3}$, see GINSBERG 73. The parameter ξ is redundant with λ_0 below and is not put into the Meson Summary Table.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
−0.11 ±0.09 OUR EVALUATION					Error includes scale factor of 2.3. Correlation is $d\xi(0)/d\lambda_+ = -14$. From a fit discussed in note on $K_{\ell 3}$ form factors in 1982 edition, PL **111B** (April 1982).
$+0.178 \pm 0.105$	207k	[80] CLARK	77	SPEC	POL, $d\xi(0)/d\lambda_+ = +0.68$
-0.385 ± 0.105	2.2M	[81] SANDWEISS	73	CNTR	POL, $d\xi(0)/d\lambda_+ = -6$
$-1.81 \, ^{+0.50}_{-0.26}$		[82] LONGO	69	CNTR	POL, t=3.3
• • • We do not use the following data for averages, fits, limits, etc. • • •					
-1.6 ± 0.5	638	[83] ABRAMS	68B	OSPK	Polarization
-1.2 ± 0.5	2608	[83] AUERBACH	66B	OSPK	Polarization

[80] CLARK 77 $t = +3.80$, $d\xi(0)/d\lambda_+ = \xi(t)t = 0.178 \times 3.80 = +0.68$.

[81] SANDWEISS 73 is for $\lambda_+ = 0$ and $t = 0$.

[82] LONGO 69 $t = 3.3$ calculated from $d\xi(0)/d\lambda_+ = -6.0$ (table 1) divided by $\xi = -1.81$.

[83] t value not given.

Im(ξ) in $K^0_{\mu 3}$ DECAY (from transverse μ pol.)

Test of T reversal invariance.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
−0.007±0.026 OUR AVERAGE					
0.009 ± 0.030	12M	MORSE	80	CNTR	Polarization
0.35 ± 0.30	207k	[84] CLARK	77	SPEC	POL, t=0
-0.085 ± 0.064	2.2M	[85] SANDWEISS	73	CNTR	POL, t=0
-0.02 ± 0.08		LONGO	69	CNTR	POL, t=3.3
-0.2 ± 0.6		ABRAMS	68B	OSPK	Polarization
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.012 ± 0.026		SCHMIDT	79	CNTR	Repl. by MORSE 80

[84] CLARK 77 value has additional $\xi(0)$ dependence $+0.21\mathrm{Re}[\xi(0)]$.

[85] SANDWEISS 73 value corrected from value quoted in their paper due to new value of Re(ξ). See footnote 4 of SCHMIDT 79.

λ_+ (LINEAR ENERGY DEPENDENCE OF f_+ IN $K^0_{\mu 3}$ DECAY)

See also the corresponding entries and notes in section "$\xi_A = f_-/f_+$" above and section "λ_0 (LINEAR ENERGY DEPENDENCE OF f_0 IN $K^0_{\mu 3}$ DECAY)" below. For radiative correction of $K^0_{\mu 3}$ Dalitz plot see GINSBERG 70 and BECHERRAWY 70.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.034 ±0.005 OUR EVALUATION					From a fit discussed in note on $K_{\ell 3}$ form factors in 1982 edition, PL **111B** (April 1982).
0.0427 ± 0.0044	150k	BIRULEV	81	SPEC	DP
0.028 ± 0.010	14k	CHO	80	HBC	DP
0.028 ± 0.011	16k	HILL	79	STRC	DP

0.046 ±0.030	32k	BUCHANAN	75	SPEC	DP
0.030 ±0.003	1.6M	DONALDSON	74B	SPEC	DP
0.085 ±0.015	9086	ALBROW	72	ASPK	DP
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0337±0.0033	129k	DZHORD...	77	SPEC	Repl. by BIRULEV 81
0.046 ±0.008	82k	ALBRECHT	74	WIRE	Repl. by BIRULEV 81
0.11 ±0.04	16k	DALLY	72	ASPK	DP
0.07 ±0.02	16k	CHIEN	70	ASPK	Repl. by DALLY 72

λ_0 (LINEAR ENERGY DEPENDENCE OF f_0 IN $K^0_{\mu3}$ DECAY)

Wherever possible, we have converted the above values of $\xi(0)$ into values of λ_0 using the associated λ_+^{μ} and $d\xi(0)/d\lambda_+$.

VALUE	$d\lambda_0/d\lambda_+$	EVTS	DOCUMENT ID		TECN	COMMENT
0.025 ±0.006	**OUR EVALUATION**		Error includes scale factor of 2.3. Correlation is $d\lambda_0/d\lambda_+$=−0.16. From a fit discussed in note on $K_{\ell3}$ form factors in 1982 edition, PL **111B** (April 1982).			
0.0341±0.0067	unknown	150k	[86] BIRULEV	81	SPEC	DP
+0.050 ±0.008	−0.11	14k	CHO	80	HBC	DP
+0.039 ±0.010	−0.67	16k	HILL	79	STRC	DP
+0.047 ±0.009	1.06	207k	[87] CLARK	77	SPEC	POL
+0.025 ±0.019	+0.5	32k	[88] BUCHANAN	75	SPEC	DP
+0.019 ±0.004	−0.47	1.6M	[89] DONALDSON	74B	SPEC	DP
−0.060 ±0.038	−0.71	1385	[90] PEACH	73	HLBC	DP
−0.018 ±0.009	+0.49	2.2M	[87] SANDWEISS	73	CNTR	POL
−0.043 ±0.052	−1.39	9086	[91] ALBROW	72	ASPK	DP
−0.140 $^{+0.043}_{-0.022}$	+0.49		[87] LONGO	69	CNTR	POL
+0.08 ±0.07	−0.54	1371	[87] CARPENTER	66	OSPK	DP
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.041 ±0.008		14k	[92] CHO	80	HBC	BR, λ_+=0.028
+0.0485±0.0076		47k	DZHORD...	77	SPEC	In BIRULEV 81
+0.024 ±0.011		82k	ALBRECHT	74	WIRE	In BIRULEV 81
+0.06 ±0.03		6700	[93] BRANDENB...	73	HBC	BR, λ_+=0.019 ± 0.013
−0.067 ±0.227	unknown	16k	[94] DALLY	72	ASPK	DP
−0.333 ±0.034	+1.	3140	[95] BASILE	70	OSPK	DP

[86] BIRULEV 81 gives $d\lambda_0/d\lambda_+ = -1.5$, giving an unreasonably narrow error ellipse which dominates all other results. We use $d\lambda_0/d\lambda_+ = 0$.

[87] λ_0 value is for $\lambda_+ = 0.03$ calculated by us from $\xi(0)$ and $d\xi(0)/d\lambda_+$.

[88] BUCHANAN 75 value is from their appendix A and uses only $K_{\mu3}$ data. $d\lambda_0/d\lambda_+$ was obtained by private communication, C.Buchanan, 1976.

[89] DONALDSON 74B $d\lambda_0/d\lambda_+$ obtained from figure 18.

[90] PEACH 73 assumes $\lambda_+ = 0.025$. Calculated by us from $\xi(0)$ and $d\xi(0)/d\lambda_+$.

[91] ALBROW 72 λ_0 is calculated by us from ξ_A, λ_+ and $d\xi(0)/d\lambda_+$. They give $\lambda_0 = -0.043 \pm 0.039$ for $\lambda_- = 0$. We use our larger calculated error.

[92] CHO 80 BR result not independent of their Dalitz plot result.

[93] Fit for λ_0 does not include this value but instead includes the $K_{\mu3}/K_{e3}$ result from this experiment.

[94] DALLY 72 gives $f_0 = 1.20 \pm 0.35$, $\lambda_0 = -0.080 \pm 0.272$, $\lambda_0{}' = -0.006 \pm 0.045$, but with a different definition of λ_0. Our quoted λ_0 is his λ_0/f_0. We cannot calculate true λ_0 error without his (λ_0,f_0) correlations. See also note on DALLY 72 in section ξ_A.

[95] BASILE 70 λ_0 is for $\lambda_+ = 0$. Calculated by us from ξ_A with $d\xi(0)/d\lambda_+ = 0$. BASILE 70 is incompatible with all other results. Authors suggest that efficiency estimates might be responsible.

$|f_S/f_+|$ FOR K^0_{e3} DECAY

Ratio of scalar to f_+ couplings.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<0.04	68	25k	BLUMENTHAL	75	SPEC	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.095	95	18k	HILL	78	STRC	
<0.07	68	48k	BIRULEV	76	SPEC	See also BIRULEV 81
<0.19	95	5600	ALBROW	73	ASPK	
<0.15	68		KULYUKINA	67	CC	

$|f_T/f_+|$ FOR K^0_{e3} DECAY

Ratio of tensor to f_+ couplings.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<0.23	68	25k	BLUMENTHAL	75	SPEC	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.40	95	18k	HILL	78	STRC	
<0.34	68	48k	BIRULEV	76	SPEC	See also BIRULEV 81
<1.0	95	5600	ALBROW	73	ASPK	
<1.0	68		KULYUKINA	67	CC	

$|f_T/f_+|$ FOR $K^0_{\mu 3}$ DECAY

Ratio of tensor to f_+ couplings.

VALUE	DOCUMENT ID		TECN
0.12±0.12	BIRULEV	81	SPEC

α_{K^*} DECAY FORM FACTOR FOR $K_L \to e^+ e^- \gamma$

α_{K^*} is the constant in the model of BERGSTROM 83 which measures the relative strength of the vector-vector transition $K_L \to K^* \gamma$ with $K^* \to \rho, \omega, \phi \to \gamma^*$ and the pseudoscalar-pseudoscalar transition $K_L \to \pi, \eta, \eta' \to \gamma\gamma^*$.

VALUE	DOCUMENT ID		TECN
−0.28 ±0.08 OUR AVERAGE			
-0.28 ± 0.13	BARR	90B	NA31
$-0.280^{+0.099}_{-0.090}$	OHL	90B	B845

DECAY FORM FACTORS FOR $K^0_L \to \pi^\pm \pi^0 e^\mp \nu_e$

Given in MAKOFF 93.

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CP-VIOLATION PARAMETERS IN K_L^0 DECAYS

CHARGE ASYMMETRY IN $K^0_{\ell 3}$ DECAYS

Such asymmetry violates CP. It is related to Re(ϵ).

δ = weighted average of $\delta(\mu)$ and $\delta(e)$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.327±0.012 OUR AVERAGE		Includes data from the 2 datablocks that follow this one.			
0.333±0.050	33M	WILLIAMS	73	ASPK	$K_{\mu 3}$ + K_{e3}

$\delta(\mu) = [\Gamma(\pi^- \mu^+ \nu_\mu) - \Gamma(\pi^+ \mu^- \overline{\nu}_\mu)]$/SUM

Only the combined value below is put into the Meson Summary Table.

VALUE (%)	EVTS	DOCUMENT ID		TECN
The data in this block is included in the average printed for a previous datablock.				
0.304±0.025 OUR AVERAGE				
0.313±0.029	15M	GEWENIGER	74	ASPK
0.278±0.051	7.7M	PICCIONI	72	ASPK
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.60 ±0.14	4.1M	MCCARTHY	73	CNTR
0.57 ±0.17	1M	[96] PACIOTTI	69	OSPK
0.403±0.134	1M	[96] DORFAN	67	OSPK

[96] PACIOTTI 69 is a reanalysis of DORFAN 67 and is corrected for $\mu^+ \mu^-$ range difference in MCCARTHY 72.

$\delta(e) = [\Gamma(\pi^- e^+ \nu_e) - \Gamma(\pi^+ e^- \overline{\nu}_e)]$/SUM

Only the combined value below is put into the Meson Summary Table.

VALUE (%)	EVTS	DOCUMENT ID		TECN
The data in this block is included in the average printed for a previous datablock.				
0.333±0.014 OUR AVERAGE				
0.341±0.018	34M	GEWENIGER	74	ASPK
0.318±0.038	40M	FITCH	73	ASPK
0.346±0.033	10M	MARX	70	CNTR
0.246±0.059	10M	[97] SAAL	69	CNTR
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.36 ±0.18	600k	ASHFORD	72	ASPK
0.224±0.036	10M	[97] BENNETT	67	CNTR

[97] SAAL 69 is a reanalysis of BENNETT 67.

PARAMETERS FOR $K_L^0 \to 2\pi$ DECAY

η_{+-} = A($K_L^0 \to \pi^+ \pi^-$) / A($K_S^0 \to \pi^+ \pi^-$)
η_{00} = A($K_L^0 \to \pi^0 \pi^0$) / A($K_S^0 \to \pi^0 \pi^0$)

The fitted values of $|\eta_{+-}|$ and $|\eta_{00}|$ given below are the results of a fit to $|\eta_{+-}|$, $|\eta_{00}|$, $|\eta_{00}/\eta_{+-}|$, and Re(ϵ'/ϵ). Independent information on $|\eta_{+-}|$ and $|\eta_{00}|$ can be obtained from the fitted values of the $K_L^0 \to \pi\pi$ and $K_S^0 \to \pi\pi$ branching ratios and the K_L^0 and K_S^0 lifetimes. This information is included as data in the $|\eta_{+-}|$ and $|\eta_{00}|$ sections with a Document ID "BRFIT." See the note "Fits for K_L^0 CP-Violation Parameters" above for details.

$|\eta_{00}| = |A(K^0_L \rightarrow 2\pi^0) / A(K^0_S \rightarrow 2\pi^0)|$

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*	*COMMENT*
2.275±0.019 OUR FIT Error includes scale factor of 1.1.				
2.32 ±0.13 OUR AVERAGE				
2.47 ±0.31 ±0.24	ANGELOPO...	98	CPLR	
2.25 ±0.22	[98] BRFIT	98		
2.33 ±0.18	CHRISTENS...	79	ASPK	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.49 ±0.40	ADLER	96B	CPLR	Sup. by ANGELOPOULOS 98
2.71 ±0.37	[99] WOLFF	71	OSPK	Cu reg., 4γ's
2.95 ±0.63	[99] CHOLLET	70	OSPK	Cu reg., 4γ's

[98] This BRFIT value is computed from fitted values of the K^0_L and K^0_S lifetimes and branching fractions to $\pi\pi$. See the discussion in the note "Fits for K^0_L *CP*-Violation Parameters."

[99] CHOLLET 70 gives $|\eta_{00}|$ = (1.23 ± 0.24)×(regeneration amplitude, 2 GeV/c Cu)/10000mb. WOLFF 71 gives $|\eta_{00}|$ = (1.13 ± 0.12)×(regeneration amplitude, 2 GeV/c Cu)/10000mb. We compute both $|\eta_{00}|$ values for (regeneration amplitude, 2 GeV/c Cu) = 24 ± 2mb. This regeneration amplitude results from averaging over FAISSNER 69, extrapolated using optical-model calculations of Bohm et al., Physics Letters **27B** 594 (1968) and the data of BALATS 71. (From H. Faissner, private communication).

$|\eta_{+-}| = |A(K^0_L \rightarrow \pi^+\pi^-) / A(K^0_S \rightarrow \pi^+\pi^-)|$

VALUE (units 10^{-3})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
2.285±0.019 OUR FIT					
2.284±0.018 OUR AVERAGE					
2.271±0.024		[100] BRFIT	98		
2.310±0.043±0.031		[101] ADLER	95B	CPLR	K^0-$\overline{K}^0$ asymmetry
2.32 ±0.14 ±0.03	10^5	ADLER	92B	SPEC	K^0-$\overline{K}^0$ asymm.
2.27 ±0.12		CHRISTENS...	79B	ASPK	
2.30 ±0.035		GEWENIGER	74B	ASPK	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.28 ±0.06	1687	[102] COUPAL	85	SPEC	P(K)=70 GeV/c
2.09 ±0.02		[103] ARONSON	82B	SPEC	E=30–110 GeV

[100] This BRFIT value is computed from fitted values of the K^0_L and K^0_S lifetimes and branching fractions to $\pi\pi$. See the discussion in the note "Fits for K^0_L *CP*-Violation Parameters."

[101] ADLER 95B report $(2.312 \pm 0.043 \pm 0.030 - 1[\Delta m - 0.5274] + 9.1[\tau_S - 0.8926]) \times 10^{-3}$. We evaluate for our 1996 best values $\Delta m = (0.5304 \pm 0.0014) \times 10^{-10}\ \hbar s^{-1}$ and $\tau_S = (0.8927 \pm 0.0009) \times 10^{-10}$ s.

[102] COUPAL 85 concludes: no energy dependence of $|\eta_{+-}|$, because their value is consistent with above values which occur at lower energies. Not independent of COUPAL 85 $\Gamma(\pi^+\pi^-)/\Gamma(\pi\ell\nu)$ measurement. Enters $|\eta_{+-}|$ via BRFIT value. In editions prior to 1990, this measurement was erroneously also included in our $|\eta_{+-}|$ average and fit. We thank H. Wahl (WAHL 89) for informing us.

[103] ARONSON 82B find that $|\eta_{+-}|$ may depend on the kaon energy.

$|\eta_{00}/\eta_{+-}|$

VALUE	EVTS	DOCUMENT ID		TECN
0.9956±0.0023 OUR FIT Error includes scale factor of 1.8.				
0.9930±0.0020 OUR AVERAGE				
0.9931±0.0020		[104,105] BARR	93D	NA31
0.9904±0.0084±0.0036		[106] WOODS	88	E731
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.9939±0.0013±0.0015	1M	[104] BARR	93D	NA31
0.9899±0.0020±0.0025		[104] BURKHARDT	88	NA31
1.014 ±0.016 ±0.007	3152	BERNSTEIN	85B	SPEC
0.995 ±0.025	1122	BLACK	85	SPEC
1.00 ±0.09		[107] CHRISTENS...	79	ASPK
1.03 ±0.07	124	BANNER	72	OSPK
1.00 ±0.06	167	HOLDER	72	ASPK

[104] This is the square root of the ratio R given by BURKHARDT 88 and BARR 93D.

[105] This is the combined results from BARR 93D and BURKHARDT 88, taking into account a common systematic uncertainty of 0.0014.

[106] We calculate $|\eta_{00}/\eta_{+-}| = 1{-}3(\epsilon'/\epsilon)$ from WOODS 88 (ϵ'/ϵ) value.

[107] Not independent of $|\eta_{+-}|$ and $|\eta_{00}|$ values which are included in fit.

$\epsilon'/\epsilon \ \approx \ \mathrm{Re}(\epsilon'/\epsilon) = (1{-}|\eta_{00}/\eta_{+-}|)/3$

A measurement (2.80 ± 0.30(stat)±0.28(syst)) $\times$ 10^{-3} has been submitted to PRL by the KTeV experiment based on 20% of their data. It is listed below but not yet averaged becaused it is not yet accepted for publication.

Debu Pascal announced a preliminary NA48 result of (1.85 ± 0.45 ± 0.58) $\times$ 10^{-3} at a CERN seminar on June 18, 1999, based on 10% of their expected final data sample.

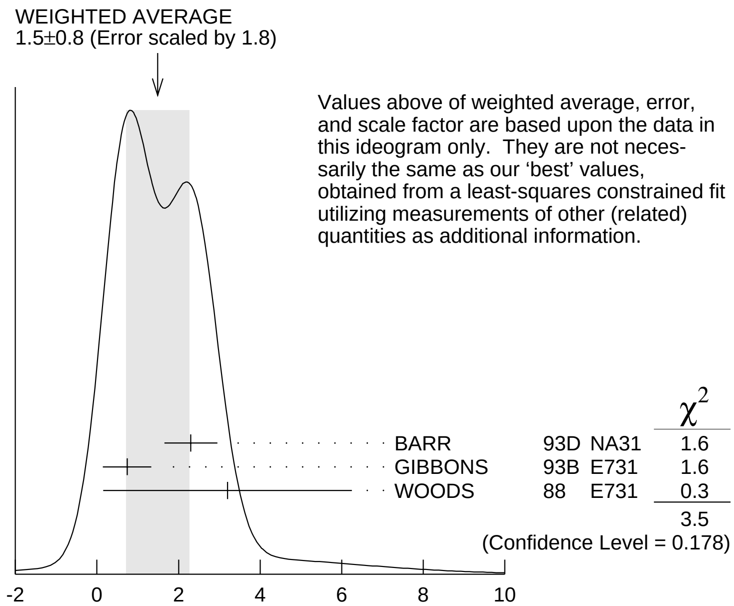
VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.5 ±0.8 OUR FIT Error includes scale factor of 1.8.					
1.5 ±0.8 OUR AVERAGE Error includes scale factor of 1.8. See the ideogram below.					
2.3 ±0.65		[108,109] BARR	93D	NA31	
0.74±0.52±0.29	>5E5	GIBBONS	93B	E731	
3.2 ±2.8 ±1.2		[108] WOODS	88	E731	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.80±0.30±0.28		[110] ALAVI-HARATI	99	KTEV	
2.0 ±0.7	1M	[111] BARR	93D	NA31	
−0.4 ±1.4 ±0.6		PATTERSON	90	E731	in GIBBONS 93B
3.3 ±1.1		[111] BURKHARDT	88	NA31	

[108] These values are derived from $|\eta_{00}/\eta_{+-}|$ measurements. They enter the average in this section but enter the fit via the $|\eta_{00}/\eta_{+-}|$ section only.

[109] This is the combined results from BARR 93D and BURKHARDT 88, taking into account their common systematic uncertainty.

[110] ALAVI-HARATI 99 not averaged because it is not yet accepted for publication (as of June 1999).

[111] These values are derived from $|\eta_{00}/\eta_{+-}|$ measurements.



$$\epsilon'/\epsilon \approx \mathrm{Re}(\epsilon'/\epsilon) = (1-\left|\eta_{00}/\eta_{+-}\right|)/3$$

ϕ_{+-}, PHASE of η_{+-}

The dependence of the phase on Δm and τ_S is given for each experiment in the comments below, where Δm is the K^0_L-K^0_S mass difference in units 10^{10} $\hbar s^{-1}$ and τ_s is the K_S mean life in units 10^{-10} s. For the "used" data, we have evaluated these mass dependences using our 1996 values, $\Delta m = 0.5304 \pm 0.0014$, $\tau_s = 0.8927 \pm 0.0009$ to obtain the values quoted below. We also give the regeneration phase ϕ_f in the comments below.

OUR FIT is described in the note on "Fits for K^0_L *CP*-Violation Parameters" in the K^0_L Particle Listings.

VALUE (°)	EVTS	DOCUMENT ID		TECN	COMMENT
43.5 ± 0.6 OUR FIT					
43.6 ± 1.2		[112] ADLER	95B	CPLR	K^0-$\overline{K}^0$ asymmetry
43.9 ± 0.8		[113,114] SCHWINGEN...	95	E773	$CH_{1.1}$ regenerator
42.9 ± 1.0		[114,115] GIBBONS	93	E731	B_4C regenerator
44.3 ± 1.8		[116] CAROSI	90	NA31	Vacuum regen.
44.5 ± 2.8		[117] CARITHERS	75	SPEC	C regenerator
44.0 ± 1.3		[118] GEWENIGER	74B	ASPK	Vacuum regen.
• • • We do not use the following data for averages, fits, limits, etc. • • •					
43.82 ± 0.63		[119,120] ADLER	96C	RVUE	
42.3 ± 4.4 ±1.4	10^5	[121] ADLER	92B	SPEC	K^0-$\overline{K}^0$ asymm.
47.7 ± 2.0 ±0.9		[114,122] KARLSSON	90	E731	
35.3 ± 3.9		[123] ARONSON	82B	SPEC	
41.7 ± 3.5		CHRISTENS...	79B	ASPK	
36.2 ± 6.1		[124] CARNEGIE	72	ASPK	Cu regenerator
37 ±12		[125] BALATS	71	OSPK	Cu regenerator
40 ± 4		[126] JENSEN	70	ASPK	Vacuum regen.

34	±10	[127] BENNETT	69	CNTR	Cu regenerator
44	±12	[128] BOHM	69B	OSPK	Vacuum regen.
45	± 7	[129] FAISSNER	69	ASPK	Cu regenerator
51	±11	[130] BENNETT	68B	CNTR	Cu reg. uses
70	±21	[131] BOTT-...	67B	OSPK	C regenerator
25	±35	[131] MISCHKE	67	OSPK	Cu regenerator
30	±45	[131] FIRESTONE	66	HBC	
45	±50	[131] FITCH	65	OSPK	Be regenerator

[112] ADLER 95B report $42.7^\circ \pm 0.9^\circ \pm 0.6^\circ +316[\Delta m - 0.5274]^\circ +30[\tau_S - 0.8926]^\circ$.

[113] SCHWINGENHEUER 95 reports $\phi_{+-} = 43.53 \pm 0.76 + 173[\Delta m - 0.5282] - 275[\tau_S - 0.8926]$.

[114] These experiments measure $\phi_{+-}-\phi_f$ and calculate the regeneration phase from the power law momentum dependence of the regeneration amplitude using analyticity and dispersion relations. SCHWINGENHEUER 95 [GIBBONS 93] includes a systematic error of 0.35° [0.5°] for uncertainties in their modeling of the regeneration amplitude. See the discussion of these systematic errors, including criticism that they could be underestimated, in the note on "*C* violation in K_L^0 decay."

[115] GIBBONS 93 measures $\phi_{+}-\phi_f$ and calculates the regeneration phase ϕ_f from the power law momentum dependence of the regeneration amplitude using analyticity. An error of 0.6° is included for possible uncertainties in the regeneration phase. They find $\phi_{+-} = 42.21 \pm 0.9 + 189\ [\Delta m - 0.5257] - 460\ [\tau_S - 0.8922]^\circ$, as given in SCHWINGENHEUER 95, footnote 8. GIBBONS 93 reports ϕ_{+-} $(42.2 \pm 1.4)^\circ$

[116] CAROSI 90 $\phi_{+-} = 46.9 \pm 1.4 \pm 0.7 + 579\ [\Delta m - 0.5351] + 303\ [\tau_S - 0.8922]^\circ$.

[117] CARITHERS 75 $\phi_{+-} = (45.5 \pm 2.8) + 224\big[\Delta m - 0.5348\big]^\circ$. $\phi_f = -40.9 \pm 2.6^\circ$.

[118] GEWENIGER 74B $\phi_{+-} = (49.4 \pm 1.0) + 565\big[\Delta m - 0.540\big]^\circ$.

[119] ADLER 96C fit gives $(43.82 \pm 0.41)^\circ + 339(\Delta m - 0.5307)^\circ - 252(\tau_S - 0.8922)^\circ$.

[120] ADLER 96C is the result of a fit which includes nearly the same data as entered into the "OUR FIT" value above.

[121] ADLER 92B quote separately two systematic errors: ±0.4 from their experiment and ±1.0 degrees due to the uncertainty in the value of Δm.

[122] KARLSSON 90 systematic error does not include regeneration phase uncertainty.

[123] ARONSON 82 find that ϕ_{+-} may depend on the kaon energy.

[124] CARNEGIE 72 ϕ_{+-} is insensitive to Δm. $\phi_f = -56.2 \pm 5.2^\circ$.

[125] BALATS 71 $\phi_{+-} = (39.0 \pm 12.0) + 198\big[\Delta m - 0.544\big]^\circ$. $\phi_f = -43.0 \pm 4.0^\circ$.

[126] JENSEN 70 $\phi_{+-} = (42.4 \pm 4.0) + 576\big[\Delta m - 0.538\big]^\circ$.

[127] BENNETT 69 uses measurement of $(\phi_{+-})-(\phi_f)$ of ALFF-STEINBERGER 66B. BENNETT 69 $\phi_{+-} = (34.9 \pm 10.0) + 69\big[\Delta m - 0.545\big]^\circ$. $\phi_f = -49.9 \pm 5.4^\circ$.

[128] BOHM 69B $\phi_{+-} = (41.0 \pm 12.0) + 479(\Delta m - 0.526)^\circ$.

[129] FAISSNER 69 error enlarged to include error in regenerator phase. FAISSNER 69 $\phi_{+-} = (49.3 \pm 7.4) + 205\big[\Delta m - 0.555\big]^\circ$. $\phi_f = -42.7 \pm 5.0^\circ$.

[130] BENNETT 69 is a re-evaluation of BENNETT 68B.

[131] Old experiments with large errors not included in average.

ϕ_{00}, PHASE OF η_{00}

See comment in ϕ_{+-} header above for treatment of Δm and τ_S dependence.

OUR FIT is described in the note on "Fits for K_L^0 *CP*-Violation Parameters" in the K_L^0 Particle Listings.

VALUE (°)	EVTS	DOCUMENT ID		TECN	COMMENT
43.4± 1.0 OUR FIT					
41.9± 5.6±1.9		[132] ANGELOPO...	98	CPLR	
44.5± 2.5		[133] CAROSI	90	NA31	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
50.8± 7.1±1.7		[134] ADLER	96B	CPLR	Sup. by ANGELOPOULOS 98
47.4± 1.4±0.9		[135] KARLSSON	90	E731	
55.7± 5.8		CHRISTENS...	79	ASPK	
38.0±25.0	56	[136] WOLFF	71	OSPK	Cu reg., 4γ's
51.0±30.0		[137] CHOLLET	70	OSPK	Cu reg., 4γ's
first quadrant preferred		GOBBI	69B	OSPK	

[132] ANGELOPOULOS 98 $\phi_{00} = 42.0 \pm 5.6 \pm 1.9 + 240[\Delta m - 0.5307]$ with negligible τ_S dependence.

[133] CAROSI 90 $\phi_{00} = 47.1 \pm 2.1 \pm 1.0 + 579\ [\Delta m\ - 0.5351] + 252\ [\tau_S\ - 0.8922]^\circ$.

[134] ADLER 96B identified initial neutral kaon individually as being a K^0 or a $\overline{K}^0$. The systematic uncertainty is $\pm1.5^\circ$ combined in quadrature with $\pm0.8^\circ$ due to Δm.

[135] KARLSSON 90 systematic error does not include regeneration phase uncertainty.

[136] WOLFF 71 uses regenerator phase $\phi_f = -48.2 \pm 3.5^\circ$.

[137] CHOLLET 70 uses regenerator phase $\phi_f = -46.5 \pm 4.4^\circ$.

PHASE DIFFERENCE $\phi_{00} - \phi_{+-}$

Test of *CPT*.

OUR FIT is described in the note on "Fits for K_L^0 *CP*-Violation Parameters" in the K_L^0 Particle Listings.

VALUE (°)	DOCUMENT ID		TECN	COMMENT
− 0.1 ± 0.8 OUR FIT				
− 0.3 ± 0.8 OUR AVERAGE				
− 0.30± 0.88	[138] SCHWINGEN...	95		Combined E731, E773
0.2 ± 2.6 ±1.2	[139] CAROSI	90	NA31	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.62± 0.71±0.75	SCHWINGEN...	95	E773	
− 1.6 ± 1.2	[140] GIBBONS	93	E731	
− 0.3 ± 2.4 ±1.2	KARLSSON	90	E731	
12.6 ± 6.2	[141] CHRISTENS...	79	ASPK	
7.6 ±18.0	[142] BARBIELLINI	73	ASPK	

[138] This SCHWINGENHEUER 95 values is the combined result of SCHWINGENHEUER 95 and GIBBONS 93, accounting for correlated systematic errors.

[139] CAROSI 90 is excluded from the fit because it it is not independent of ϕ_{+-} and ϕ_{00} values.

[140] GIBBONS 93 give detailed dependence of systematic error on lifetime (see the section on the K_S^0 mean life) and mass difference (see the section on $m_{K_L^0} - m_{K_S^0}$).

[141] Not independent of ϕ_{+-} and ϕ_{00} values.

[142] Independent of regenerator mechanism, Δm, and lifetimes.

CHARGE ASYMMETRY IN $\pi^+\pi^-\pi^0$ DECAYS

These are *CP*-violating charge-asymmetry parameters, defined at beginning of section "LINEAR COEFFICIENT g FOR $K^0_L \to \pi^+\pi^-\pi^0$ above.

See also note on Dalitz plot parameters in $K^\pm$ section and note on *CP* violation in K^0_L decay above.

LINEAR COEFFICIENT j FOR $K^0_L \to \pi^+\pi^-\pi^0$

VALUE	EVTS	DOCUMENT ID		TECN
0.0011±0.0008 OUR AVERAGE				
0.0010±0.0024±0.0030	500k	ANGELOPO...	98C	CPLR
0.001 ±0.011	6499	CHO	77	
−0.001 ±0.003	4709	PEACH	77	
0.0013±0.0009	3M	SCRIBANO	70	
0.0 ±0.017	4400	SMITH	70	OSPK
0.001 ±0.004	238k	BLANPIED	68	

QUADRATIC COEFFICIENT f FOR $K^0_L \to \pi^+\pi^-\pi^0$

VALUE	EVTS	DOCUMENT ID		TECN
0.0045±0.0024±0.0059	500k	ANGELOPO...	98C	CPLR

PARAMETERS for $K^0_L \to \pi^+\pi^-\gamma$ DECAY

$|\eta_{+-\gamma}| = |A(K^0_L \to \pi^+\pi^-\gamma$, *CP* violating$)/A(K^0_S \to \pi^+\pi^-\gamma)|$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN
2.35 ±0.07 OUR AVERAGE				
2.359±0.062±0.040	9045	MATTHEWS	95	E773
2.15 ±0.26 ±0.20	3671	RAMBERG	93B	E731

$\phi_{+-\gamma}$ = phase of $\eta_{+-\gamma}$

VALUE (°)	EVTS	DOCUMENT ID		TECN
44 ± 4 OUR AVERAGE				
43.8± 3.5± 1.9	9045	MATTHEWS	95	E773
72 ±23 ±17	3671	RAMBERG	93B	E731

$|\epsilon'_{+-\gamma}|/\epsilon$ for $K^0_L \to \pi^+\pi^-\gamma$

VALUE	CL%	EVTS	DOCUMENT ID		TECN
<0.3	90	3671	[143] RAMBERG	93B	E731

[143] RAMBERG 93B limit on $|\epsilon'_{+-\gamma}|/\epsilon$ assumes than any difference between η_{+-} and $\eta_{+-\gamma}$ is due to direct *CP* violation.

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$x = \mathrm{A}(\overline{K}^0 \to \pi^- \ell^+ \nu)/\mathrm{A}(K^0 \to \pi^- \ell^+ \nu) = \mathrm{A}(\Delta S{=}-\Delta Q)/\mathrm{A}(\Delta S{=}\Delta Q)$

REAL PART OF x

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
(-1 ± 6) $\times 10^{-3}$		**OUR AVERAGE**			Error includes scale factor of 1.1.
$-0.0018 \pm 0.0041 \pm 0.0045$		ANGELOPO...	98D	CPLR	K_{e3} from K^0
$0.10\ {}^{+0.18}_{-0.19}$	79	SMITH	75B	WIRE	$\pi^- p \to K^0 \Lambda$
0.04 ± 0.03	4724	NIEBERGALL	74	ASPK	$K^+ p \to K^0 p \pi^+$
-0.008 ± 0.044	1757	FACKLER	73	OSPK	K_{e3} from K^0
-0.03 ± 0.07	1367	HART	73	OSPK	K_{e3} from $K^0 \Lambda$
-0.070 ± 0.036	1079	MALLARY	73	OSPK	K_{e3} from $K^0 \Lambda X$
0.03 ± 0.06	410	[144] BURGUN	72	HBC	$K^+ p \to K^0 p \pi^+$
-0.05 ± 0.09	442	[145] GRAHAM	72	OSPK	$\pi^- p \to K^0 \Lambda$
$0.26\ {}^{+0.10}_{-0.14}$	126	MANN	72	HBC	$K^- p \to n \overline{K}^0$
$0.25\ {}^{+0.07}_{-0.09}$	252	WEBBER	71	HBC	$K^- p \to n \overline{K}^0$
0.12 ± 0.09	215	[146] CHO	70	DBC	$K^+ d \to K^0 p p$
-0.020 ± 0.025		[147] BENNETT	69	CNTR	Charge asym+ Cu regen.
$0.09\ {}^{+0.14}_{-0.16}$	686	LITTENBERG	69	OSPK	$K^+ n \to K^0 p$
$0.09\ {}^{+0.07}_{-0.09}$	121	JAMES	68	HBC	$\overline{p} p$
$0.17\ {}^{+0.16}_{-0.35}$	116	FELDMAN	67B	OSPK	$\pi^- p \to K^0 \Lambda$
$0.035\ {}^{+0.11}_{-0.13}$	196	AUBERT	65	HLBC	K^+ charge exchange
$0.06\ {}^{+0.18}_{-0.44}$	152	[148] BALDO-...	65	HLBC	K^+ charge exchange
$-0.08\ {}^{+0.16}_{-0.28}$	109	[149] FRANZINI	65	HBC	$\overline{p} p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.04\ {}^{+0.10}_{-0.13}$	100	[145] GRAHAM	72	OSPK	$K_{\mu 3}$ from $K^0 \Lambda$
-0.13 ± 0.11	342	[145] MANTSCH	72	OSPK	K_{e3} from $K^0 \Lambda$
$0.04\ {}^{+0.07}_{-0.08}$	222	[144] BURGUN	71	HBC	$K^+ p \to K^0 p \pi^+$
0.03 ± 0.03		[147] BENNETT	68	CNTR	
0.17 ± 0.10	335	[146] HILL	67	DBC	$K^+ d \to K^0 p p$

[144] BURGUN 72 is a final result which includes BURGUN 71.
[145] First GRAHAM 72 value is second GRAHAM 72 value combined with MANTSCH 72.
[146] CHO 70 is analysis of unambiguous events in new data and HILL 67.
[147] BENNETT 69 is a reanalysis of BENNETT 68.
[148] BALDO-CEOLIN 65 gives x and θ converted by us to Re(x) and Im(x).
[149] FRANZINI 65 gives x and θ for Re(x) and Im(x). See SCHMIDT 67.

IMAGINARY PART OF *x*

Assumes $m_{K^0_L} - m_{K^0_S}$ positive. See Listings above.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0012±0.0019 OUR AVERAGE					
0.0012±0.0019	640k	ANGELOPO...	98E	CPLR	K_{e3} from K^0
-0.10 $^{+0.16}_{-0.19}$	79	SMITH	75B	WIRE	$\pi^- p \rightarrow K^0 \Lambda$
-0.06 ±0.05	4724	NIEBERGALL	74	ASPK	$K^+ p \rightarrow K^0 p \pi^+$
-0.017 ±0.060	1757	FACKLER	73	OSPK	K_{e3} from K^0
0.09 ±0.07	1367	HART	73	OSPK	K_{e3} from $K^0 \Lambda$
0.107 $^{+0.092}_{-0.074}$	1079	MALLARY	73	OSPK	K_{e3} from $K^0 \Lambda X$
0.07 $^{+0.06}_{-0.07}$	410	[150] BURGUN	72	HBC	$K^+ p \rightarrow K^0 p \pi^+$
0.05 ±0.13	442	[151] GRAHAM	72	OSPK	$\pi^- p \rightarrow K^0 \Lambda$
0.21 $^{+0.15}_{-0.12}$	126	MANN	72	HBC	$K^- p \rightarrow n \overline{K}^0$
0.0 ±0.08	252	WEBBER	71	HBC	$K^- p \rightarrow n \overline{K}^0$
-0.08 ±0.07	215	[152] CHO	70	DBC	$K^+ d \rightarrow K^0 p p$
-0.11 $^{+0.10}_{-0.11}$	686	LITTENBERG	69	OSPK	$K^+ n \rightarrow K^0 p$
$+0.22$ $^{+0.37}_{-0.29}$	121	JAMES	68	HBC	$\overline{p} p$
0.0 ±0.25	116	FELDMAN	67B	OSPK	$\pi^- p \rightarrow K^0 \Lambda$
-0.21 $^{+0.11}_{-0.15}$	196	AUBERT	65	HLBC	K^+ charge exchange
-0.44 $^{+0.32}_{-0.19}$	152	[153] BALDO-...	65	HLBC	K^+ charge exchange
$+0.24$ $^{+0.40}_{-0.30}$	109	[154] FRANZINI	65	HBC	$\overline{p} p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.12 $^{+0.17}_{-0.16}$	100	[151] GRAHAM	72	OSPK	$K_{\mu 3}$ from $K^0 \Lambda$
-0.04 ±0.16	342	[151] MANTSCH	72	OSPK	K_{e3} from $K^0 \Lambda$
0.12 $^{+0.08}_{-0.09}$	222	[150] BURGUN	71	HBC	$K^+ p \rightarrow K^0 p \pi^+$
-0.20 ±0.10	335	[152] HILL	67	DBC	$K^+ d \rightarrow K^0 p p$

[150] BURGUN 72 is a final result which includes BURGUN 71.
[151] First GRAHAM 72 value is second GRAHAM 72 value combined with MANTSCH 72.
[152] Footnote 10 of HILL 67 should read $+0.58$, not -0.58 (private communication) CHO 70 is analysis of unambiguous events in new data and HILL 67.
[153] BALDO-CEOLIN 65 gives x and θ converted by us to Re(x) and Im(x).
[154] FRANZINI 65 gives x and θ for Re(x) and Im(x). See SCHMIDT 67.

K^0_L REFERENCES

ALAVI-HARATI	99	PRL (submitted)	A. Alavi-Harati+	(KTeV Collab.)
ADAMS	98	PRL 80 4123	J. Adams+	(KTeV Collab.)
AMBROSE	98	PRL 81 4309	D. Ambrose+	(BNL E871 Collab.)
ANGELOPO...	98	PL B420 191	A. Angelopoulos+	(CPLEAR Collab.)
ANGELOPO...	98C	EPJ C5 389	A. Angelopoulos+	(CPLEAR Collab.)
ANGELOPO...	98D	PL B444 38	A. Angelopoulos+	(CPLEAR Collab.)
ANGELOPO...	98E	PL B444 43	A. Angelopoulos+	(CPLEAR Collab.)
ARISAKA	98	PL B432 230	K. Arisaka+	(FNAL E799 Collab.)
BENDER	98	PL B418 411	M. Bender+	(NA 48 Collab.)
BRFIT	98	RPP		
ETAFIT	98	RPP		
SETZU	98	PL B420 205	M.G. Setzu+	(NA31 Collab.)
TAKEUCHI	98	PL B443 409	Y. Takeuchi+	
FANTI	97	ZPHY C76 653	V. Fanti+	(NA48 Collab.)
NOMURA	97	PL B408 445	T. Nomura+	(KYOT, KEK, HIRO)
ADLER	96B	ZPHY C70 211	+Alhalel, Angelopoulos+	(CPLEAR Collab.)
ADLER	96C	PL B369 367	+Angelopoulos+	(CPLEAR Collab.)
GU	96	PRL 76 4312	+	(RUTG, UCLA, EFI, COLO, ELMT, FNAL, ILL, OSAK)
LEBER	96	PL B369 69	+Beier+	(MANZ, CERN, EDIN, ORSAY, PISA)
ADLER	95	PL B363 237	+Alhalel, Angelopoulos, Apostolakis+	(CPLEAR Collab.)
ADLER	95B	PL B363 243	+Alhalel, Angelopoulos, Apostolakis+	(CPLEAR Collab.)
AKAGI	95	PR D51 2061	+Fukuhisa, Hemmi+	(TOHOK, TOKY, KYOT, KEK)
BARR	95	ZPHY C65 361	+Buchholz+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
BARR	95C	PL B358 399	+Buchholz+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
HEINSON	95	PR D51 985	+Horvath, Knibbe, Mathiazhagan+	(BNL E791 Collab.)
KREUTZ	95	ZPHY C65 67	+Holder, Rost+	(SIEG, EDIN, MANZ, ORSAY, PISAI)
MATTHEWS	95	PRL 75 2803	+Gu, Haas, Hogan+	(RUTG, EFI, ELMT, FNAL, ILL)
SCHWINGEN...	95	PRL 74 4376	Schwingenheuer+	(EFI, CHIC, ELMT, FNAL, ILL, RUTG)
SPENCER	95	PRL 74 3323	+	(UCLA, EFI, COLO, ELMT, FNAL, ILL, OSAK, RUTG)
BARR	94	PL B328 528	+Buchholz+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
GU	94	PRL 72 3000	+	(RUTG, UCLA, EFI, COLO, ELMT, FNAL, ILL, OSAK)
NAKAYA	94	PRL 73 2169	+	(OSAK, UCLA, EFI, COLU, ELMT, FNAL, ILL, RUTG)
ROBERTS	94	PR D50 1874	+	(UCLA, EFI, COLU, ELMT, FNAL, ILL, OSAK, RUTG)
WEAVER	94	PRL 72 3758	+	(UCLA, EFI, COLU, ELMT, FNAL, ILL, OSAK, RUTG)
AKAGI	93	PR D47 R2644	+Fukuhisa, Hemmi+	(TOHOK, TOKY, KYOT, KEK)
ARISAKA	93	PRL 70 1049	+Auerbach, Axelrod, Belz, Biery+	(BNL E791 Collab.)
ARISAKA	93B	PRL 71 3910	+Auerbach, Axelrod, Belz, Biery+	(BNL E791 Collab.)
BARR	93D	PL B317 233	+Buchholz+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
GIBBONS	93	PRL 70 1199	+Barker, Briere, Makoff+	(FNAL E731 Collab.)
Also	97	PR D55 6625	L.K. Gibbons+	(FNAL E731 Collab.)
GIBBONS	93B	PRL 70 1203	+Barker, Briere, Makoff+	(FNAL E731 Collab.)
GIBBONS	93C	Thesis RX-1487		(CHIC)
Also	97	PR D55 6625	L.K. Gibbons+	(FNAL E731 Collab.)
HARRIS	93	PRL 71 3914	+	(EFI, UCLA, COLO, ELMT, FNAL, ILL, OSAK, RUTG)
HARRIS	93B	PRL 71 3918	+	(EFI, UCLA, COLO, ELMT, FNAL, ILL, OSAK, RUTG)
MAKOFF	93	PRL 70 1591	+Barker, Briere, Gibbons+	(FNAL E731 Collab.)
Also	95	PRL 75 2069 (erratum)		
RAMBERG	93	PRL 70 2525	+Bock, Coleman, Enagonio, Hsiung+	(FNAL E731 Collab.)
RAMBERG	93B	PRL 70 2529	+Bock, Coleman, Enagonio, Hsiung+	(FNAL E731 Collab.)
VAGINS	93	PRL 71 35	+Adair, Greenlee, Kasha, Mannelli+	(BNL E845 Collab.)
ADLER	92B	PL B286 180	+Alhalel, Angelopoulos, Apostolakis+	(CPLEAR Collab.)
Also	92	SJNP 55 840	Adler, Alhalel, Angelopoulos+	(CPLEAR Collab.)
BARR	92	PL B284 440	+Buchholz+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
GRAHAM	92	PL B295 169	+Barker, Briere, Gibbons, Makoff+	(FNAL E731 Collab.)
MORSE	92	PR D45 36	+Leipuner, Larsen, Jastrzembski+	(BNL, YALE, VASS)
PDG	92	PR D45, 1 June, Part II	Hikasa, Barnett, Stone+	(KEK, LBL, BOST+)
SOMALWAR	92	PRL 68 2580	+Barker, Briere, Gibbons+	(FNAL E731 Collab.)
AKAGI	91	PRL 67 2614	+Fukuhisa, Hemmi+	(TOHOK, TOKY, KYOT, KEK)
AKAGI	91B	PRL 67 2618	+Fukuhisa, Hemmi+	(TOHOK, TOKY, KYOT, KEK)
BARR	91	PL B259 389	+Carosi+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
HEINSON	91	PR D44 R1	+	(UCI, UCLA, LANL, PENN, STAN, TEMP, TEXA+)
PAPADIMITR...	91	PR D44 R573	Papadimitriou, Barker, Briere+	(FNAL E731 Collab.)
BARKER	90	PR D41 3546	+Briere, Gibbons, Makoff+	(FNAL E731 Collab.)
Also	88	PRL 61 2661	Gibbons, Papadimitriou+	(FNAL E731 Collab.)
BARR	90B	PL B240 283	+Carosi+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
BARR	90C	PL B242 523	+Carosi+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
CAROSI	90	PL B237 303	+Clarke+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
KARLSSON	90	PRL 64 2976	+Gollin, Okamitsu, Tschirhart, Barker+	(FNAL E731 Collab.)

OHL	90	PRL 64 2755	+Adair, Greenlee, Kasha, Mannelli+	(BNL E845 Collab.)
OHL	90B	PRL 65 1407	+Adair, Greenlee, Kasha, Mannelli+	(BNL E845 Collab.)
PATTERSON	90	PRL 64 1491	+Barker+	(FNAL E731 Collab.)
INAGAKI	89	PR D40 1712	+Kobayashi, Sato, Shinkawa+	(KEK, TOKY, KYOT)
LITTENBERG	89	PR D39 3322		(BNL)
MATHIAZHA...	89	PRL 63 2181	Mathiazhagan+	(UCI, UCLA, LANL, PENN, STAN+)
MATHIAZHA...	89B	PRL 63 2185	Mathiazhagan+	(UCI, UCLA, LANL, PENN, STAN+)
PAPADIMITR...	89	PRL 63 28	Papadimitriou, Gibbons, Patterson+	(FNAL E731 Collab.)
SCHAFFNER	89	PR D39 990	+Greenlee, Kasha, Mannelli, Ohl+	(YALE, BNL)
WAHL	89	CERN-EP/89-86, H. Wahl — Rare Decay Symposium, Vancouver		(CERN)
BARR	88	PL B214 303	+Clarke+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
BURKHARDT	88	PL B206 169	+Clarke+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
COUSINS	88	PR D38 2914	+Konigsberg+	(UCLA, LASL, PENN, STAN, TEMP, WILL)
GREENLEE	88	PRL 60 893	+Kasha, Mannelli, Mannelli+	(YALE, BNL)
JASTRZEM...	88	PRL 61 2300	Jastrzembski, Larsen, Leipuner, Morse+	(BNL, YALE)
WOODS	88	PRL 60 1695	+Nishikawa, Patterson, Wah, Winstein+	(FNAL E731 Collab.)
BURKHARDT	87	PL B199 139	+	(CERN, EDIN, MANZ, LALO, PISA, SIEG)
ARONSON	86	PR D33 3180	+Bernstein, Bock+	(BNL, CHIC, STAN, WISC)
Also	82	PRL 48 1078	Aronson, Bernstein+	(BNL, CHIC, STAN, WISC)
PDG	86C	PL 170B 132	Aguilar-Benitez, Porter+	(CERN, CIT+)
BERNSTEIN	85B	PRL 54 1631	+Bock, Carlsmith, Coupal+	(CHIC, SACL)
BLACK	85	PRL 54 1628	+Blatt, Campbell, Kasha, Mannelli+	(BNL, YALE)
COUPAL	85	PRL 55 566	+Bernstein, Bock, Carlsmith+	(CHIC, SACL)
BALATS	83	SJNP 38 556	+Berezin, Bogdanov, Vishnevsky+	(ITEP)
		Translated from YAF 38 927.		
BERGSTROM	83	PL 131B 229	+Masso, Singer	(CERN)
ARONSON	82	PRL 48 1078	+Bernstein+	(BNL, CHIC, STAN, WISC)
ARONSON	82B	PRL 48 1306	+Bock, Cheng, Fischbach	(BNL, CHIC, PURD)
Also	82B	PL 116B 73	Fischbach, Cheng+	(PURD, BNL, CHIC)
Also	83	PR D28 476	Aronson, Bock, Cheng+	(BNL, CHIC, PURD)
Also	83B	PR D28 495	Aronson, Bock, Cheng+	(BNL, CHIC, PURD)
PDG	82B	PL 111B 70	Roos, Porter, Aguilar-Benitez+	(HELS, CIT, CERN)
BIRULEV	81	NP B182 1	+Dzhordzhadze, Genchev, Grigalashvili+	(JINR)
Also	80	SJNP 31 622	Birulev, Vestergombi, Genchev+	(JINR)
		Translated from YAF 31 1204.		
CARROLL	80B	PRL 44 529	+Chiang, Kycia, Li, Littenberg, Marx+	(BNL, ROCH)
CARROLL	80C	PL 96B 407	+Chiang, Kycia, Li, Littenberg, Marx+	(BNL, ROCH)
CARROLL	80D	PRL 44 525	+Chiang, Kycia, Li, Littenberg, Marx+	(BNL, ROCH)
CHO	80	PR D22 2688	+Derrick, Miller, Schlereth, Engler+	(ANL, CMU)
MORSE	80	PR D21 1750	+Leipuner, Larsen, Schmidt, Blatt+	(BNL, YALE)
BIRULEV	79	SJNP 29 778	+Vestergombi, Gvakhariya, Genchev+	(JINR)
		Translated from YAF 29 1516.		
CHRISTENS...	79	PRL 43 1209	Christenson, Goldman, Hummel, Roth+	(NYU)
CHRISTENS...	79B	PRL 43 1212	Christenson, Goldman, Hummel, Roth+	(NYU)
HILL	79	NP B153 39	+Sakitt, Snape, Stevens+	(BNL, SLAC, SBER)
SCHMIDT	79	PRL 43 556	+Blatt, Campbell, Grannan+	(YALE, BNL)
SHOCHET	79	PR D19 1965	+Linsay, Grosso-Pilcher, Frisch+	(EFI, ANL)
Also	77	PRL 39 59	Shochet, Linsay, Grosso-Pilcher+	(EFI, ANL)
ENGLER	78B	PR D18 623	+Keyes, Kraemer, Tanaka, Cho+	(CMU, ANL)
HILL	78	PL 73B 483	+Sakitt, Snape, Stevens+	(BNL, SLAC, SBER)
CHO	77	PR D15 587	+Derrick, Lissauer, Miller, Engler+	(ANL, CMU)
CLARK	77	PR D15 553	+Field, Holley, Johnson, Kerth, Sah, Shen	(LBL)
Also	75	Thesis LBL-4275	Shen	(LBL)
DEVOE	77	PR D16 565	+Cronin, Frisch, Grosso-Pilcher+	(EFI, ANL)
DZHORD...	77	SJNP 26 478	Dzhordzhadze, Kekelidze, Krivokhizhin+	(JINR)
		Translated from YAF 26 910.		
PEACH	77	NP B127 399	+Cameron+	(BGNA, EDIN, GLAS, PISA, RHEL)
BIRULEV	76	SJNP 24 178	+Vestergombi, Vovenko, Votruba+	(JINR)
		Translated from YAF 24 340.		
COOMBES	76	PRL 37 249	+Flexer, Hall, Kennelly, Kirkby+	(STAN, NYU)
DONALDSON	76	PR D14 2839	+Hitlin, Kennelly, Kirkby, Liu+	(SLAC)
Also	74	Thesis SLAC-0184	Donaldson	(SLAC)
FUKUSHIMA	76	PRL 36 348	+Jensen, Surko, Thaler+	(PRIN, MASA)
GJESDAL	76	NP B109 118	+Kamae, Presser, Steffen+	(CERN, HEIDH)
REY	76	PR D13 1161	+Cence, Jones, Parker+	(NDAM, HAWA, LBL)
Also	69	PRL 22 1210	Cence, Jones, Peterson, Stenger+	(HAWA, LRL)
BALDO-...	75	NC 25A 688	Baldo-Ceolin, Bobisut, Calimani+	(PADO, WISC)
BLUMENTHAL	75	PRL 34 164	+Frankel, Nagy+	(PENN, CHIC, TEMP)
BUCHANAN	75	PR D11 457	+Drickey, Pepper, Rudnick+	(UCLA, SLAC, JHU)
CARITHERS	75	PRL 34 1244	+Modis, Nygren, Pun+	(COLU, NYU)
SMITH	75B	Thesis UCSD unpub.		(UCSD)
ALBRECHT	74	PL 48B 393		(JINR, BERL, BUDA, PRAG, SERP, SOFI)

BISI	74	PL 50B 504	+Ferrero	(TORI)
DONALDSON	74	Thesis SLAC-0184		(SLAC)
Also	76	PR D14 2839	Donaldson, Hitlin, Kennelly, Kirkby, Liu+	(SLAC)
DONALDSON	74B	PR D9 2960	+Fryberger, Hitlin, Liu+	(SLAC, UCSC)
Also	73B	PRL 31 337	Donaldson, Fryberger, Hitlin, Liu+	(SLAC, UCSC)
DONALDSON	74C	PRL 33 554	+Hitlin, Kennelly, Kirkby+	(SLAC)
Also	74	Thesis SLAC-0184	Donaldson	(SLAC)
Also	76	PR D14 2839	Donaldson, Hitlin, Kennelly, Kirkby, Liu+	(SLAC)
FIELD	74	SLAC-PUB-1498 unpub.		(SLAC)
GEWENIGER	74	PL 48B 483	+Gjesdal, Kamae, Presser+	(CERN, HEIDH)
Also	74	Thesis CERN Int. 74-4	Luth	(CERN)
GEWENIGER	74B	PL 48B 487	+Gjesdal, Presser+	(CERN, HEIDH)
Also	74B	PL 52B 119	Gjesdal, Presser, Steffen+	(CERN, HEIDH)
GEWENIGER	74C	PL 52B 108	+Gjesdal, Presser+	(CERN, HEIDH)
GJESDAL	74	PL 52B 113	+Presser, Kamae, Steffen+	(CERN, HEIDH)
MESSNER	74	PRL 33 1458	+Franklin, Morse+	(COLO, SLAC, UCSC)
NIEBERGALL	74	PL 49B 103	+Regler, Stier+	(CERN, ORSAY, VIEN)
WANG	74	PR D9 540	+Smith, Whatley, Zorn, Hornbostel	(UMD, BNL)
WILLIAMS	74	PRL 33 240	+Larsen, Leipuner, Sapp, Sessoms+	(BNL, YALE)
ALBROW	73	NP B58 22	+Aston, Barber, Bird, Ellison+	(MCHS, DARE)
ALEXANDER	73B	NP B65 301	+Benary, Borowitz, Lande+	(TELA, HEID)
ANIKINA	73	JINR P1 7539	+Balashov, Bannik+	(JINR)
BARBIELLINI	73	PL 43B 529	+Darriulat, Fainberg+	(CERN)
BRANDENB...	73	PR D8 1978	Brandenburg, Johnson, Leith, Loos+	(SLAC)
CARITHERS	73	PRL 31 1025	+Nygren, Gordon+	(COLU, BNL, CERN)
Also	73B	PRL 30 1336	Carithers, Modis, Nygren+	(COLU, CERN, NYU)
EVANS	73	PR D7 36	+Muir, Peach, Budagov+	(EDIN, CERN)
Also	69	PRL 23 427	Evans, Golden, Muir, Peach+	(EDIN, CERN)
FACKLER	73	PRL 31 847	+Frisch, Martin, Smoot, Sompayrac	(MIT)
FITCH	73	PRL 31 1524	+Hepp, Jensen, Strovink, Webb	(PRIN)
Also	72	Thesis COO-3072-13	Webb	(PRIN)
GINSBERG	73	PR D8 3887	+Smith	(MIT, STON)
HART	73	NP B66 317	+Hutton, Field, Sharp, Blackmore+	(CAVE, RHEL)
MALLARY	73	PR D7 1953	+Binnie, Gallivan, Gomez, Peck, Sciulli+	(CIT)
Also	70	PRL 25 1214	Sciulli, Gallivan, Binnie, Gomez+	(CIT)
MCCARTHY	73	PR D7 687	+Brewer, Budnitz, Entis, Graven, Miller+	(LBL)
Also	72	PL 42B 291	McCarthy, Brewer, Budnitz, Entis, Graven+	(LBL)
Also	71	Thesis LBL-550	McCarthy	(LBL)
MESSNER	73	PRL 30 876	+Morse, Nauenberg, Hitlin+	(COLO, SLAC, UCSC)
PEACH	73	PL 43B 441	+Evans, Muir, Hopkins, Krenz	(EDIN, CERN, AACH)
SANDWEISS	73	PRL 30 1002	+Sunderland, Turner, Willis, Keller	(YALE, ANL)
WILLIAMS	73	PRL 31 1521	+Larsen, Leipuner, Sapp, Sessoms+	(BNL, YALE)
ALBROW	72	NP B44 1	+Aston, Barber, Bird, Ellison+	(MCHS, DARE)
ASHFORD	72	PL 38B 47	+Brown, Masek, Maung, Miller, Ruderman+	(UCSD)
BANNER	72	PRL 28 1597	+Cronin, Hoffman, Knapp, Shochet	(PRIN)
BANNER	72B	PRL 29 237	+Cronin, Hoffman, Knapp, Shochet	(PRIN)
BARMIN	72	SJNP 15 636	+Davidenko, Demidov, Dolgolenko+	(ITEP)
		Translated from YAF 15 1149.		
BARMIN	72B	SJNP 15 638	+Barylov, Davidenko, Demidov+	(ITEP)
		Translated from YAF 15 1152.		
BURGUN	72	NP B50 194	+Lesquoy, Muller, Pauli+	(SACL, CERN, OSLO)
CARNEGIE	72	PR D6 2335	+Cester, Fitch, Strovink, Sulak	(PRIN)
DALLY	72	PL 41B 647	+Innocenti, Seppi+	(SLAC, JHU, UCLA)
Also	70	PL 33B 627	Chien, Cox, Ettlinger+	(JHU, SLAC, UCLA)
Also	71	PL 35B 261	Chien, Cox, Ettlinger+	(JHU, SLAC, UCLA)
GRAHAM	72	NC 9A 166	+Abashian, Jones, Mantsch, Orr+	(ILL, NEAS)
HOLDER	72	PL 40B 141	+Radermacher, Staude+	(AACH, CERN, TORI)
JAMES	72	NP B49 1	+Montanet, Paul, Saetre+	(CERN, SACL, OSLO)
KRENZ	72	LNC 4 213	+Hopkins, Evans, Muir, Peach	(AACH, CERN, EDIN)
MANN	72	PR D6 137	+Kofler, Meisner, Hertzbach+	(MASA, BNL, YALE)
MANTSCH	72	NC 9A 160	+Abashian, Graham, Jones, Orr+	(ILL, NEAS)
MCCARTHY	72	PL 42B 291	+Brewer, Budnitz, Entis, Graven+	(LBL)
METCALF	72	PL 40B 703	+Neuhofer, Niebergall+	(CERN, IPN, WIEN)
NEUHOFER	72	PL 41B 642	+Niebergall, Regler, Stier+	(CERN, ORSAY, VIEN)
PICCIONI	72	PRL 29 1412	+Coombes, Donaldson, Dorfan, Fryberger+	(SLAC)
Also	74	PR D9 2939	Piccioni, Donaldson+	(SLAC, UCSC, COLO)
VOSBURGH	72	PR D6 1834	+Devlin, Esterling, Goz, Bryman+	(RUTG, MASA)
Also	71	PRL 26 866	Vosburgh, Devlin, Esterling, Goz+	(RUTG, MASA)
BALATS	71	SJNP 13 53	+Berezin, Vishnevsky, Galanina+	(ITEP)
		Translated from YAF 13 93.		

BARMIN	71	PL 35B 604	+Barylov, Veselovsky, Davidenko+	(ITEP)
BISI	71	PL 36B 533	+Darriulat, Ferrero, Rubbia+	(AACH, CERN, TORI)
BURGUN	71	LNC 2 1169	+Lesquoy, Muller, Pauli+	(SACL, CERN, OSLO)
CARNEGIE	71	PR D4 1	+Cester, Fitch, Strovink, Sulak	(PRIN)
CHAN	71	Thesis LBL-350		(LBL)
CHIEN	71	PL 35B 261	+Cox, Ettlinger+	(JHU, SLAC, UCLA)
Also	72	PL 41B 647	Dally, Innocenti, Seppi+	(SLAC, JHU, UCLA)
CHO	71	PR D3 1557	+Dralle, Canter, Engler, Fisk+	(CMU, BNL, CASE)
CLARK	71	PRL 26 1667	+Elioff, Field, Frisch, Johnson, Kerth+	(LRL)
Also	70	Thesis UCRL 19709	Johnson	(LRL)
Also	71	Thesis UCRL 20264	Frisch	(LRL)
Also	74	SLAC-PUB-1498 unpub.	Field	(SLAC)
ENSTROM	71	PR D4 2629	+Akavia, Coombes, Dorfan+	(SLAC, STAN)
Also	70	Thesis SLAC-0125	Enstrom	(STAN)
JAMES	71	PL 35B 265	+Montanet, Paul, Pauli+	(CERN, SACL, OSLO)
MEISNER	71	PR D3 59	+Mann, Hertzbach, Kofler+	(MASA, BNL, YALE)
PEACH	71	PL 35B 351	+Evans, Muir, Budagov, Hopkins+	(EDIN, CERN)
REPELLIN	71	PL 36B 603	+Wolff, Chollet, Gaillard, Jane+	(ORSAY, CERN)
WEBBER	71	PR D3 64	+Solmitz, Crawford, Alston-Garnjost	(LRL)
Also	68	PRL 21 498	Webber, Solmitz, Crawford, Alston-Garnjost	(LRL)
Also	69	Thesis UCRL 19226	Webber	(LRL)
WOLFF	71	PL 36B 517	+Chollet, Repellin, Gaillard+	(ORSAY, CERN)
ALBROW	70	PL 33B 516	+Aston, Barber, Bird, Ellison+	(MCHS, DARE)
ARONSON	70	PRL 25 1057	+Ehrlich, Hofer, Jensen+	(EFI, ILLC, SLAC)
BARMIN	70	PL 33B 377	+Barylov, Borisov, Bysheva+	(ITEP, JINR)
BASILE	70	PR D2 78	+Cronin, Thevent, Turlay, Zylberajch+	(SACL)
BECHERRAWY	70	PR D1 1452		(ROCH)
BUCHANAN	70	PL 33B 623	+Drickey, Rudnick, Shepard+	(SLAC, JHU, UCLA)
Also	71	Private Comm.	Cox	
BUDAGOV	70	PR D2 815	+Cundy, Myatt, Nezrick+	(CERN, ORSAY, EPOL)
Also	68B	PL 28B 215	Budagov, Cundy, Myatt+	(CERN, ORSAY, EPOL)
CHIEN	70	PL 33B 627	+Cox, Ettlinger+	(JHU, SLAC, UCLA)
Also	71	Private Comm.	Cox	
CHO	70	PR D1 3031	+Dralle, Canter, Engler, Fisk+	(CMU, BNL, CASE)
Also	67	PRL 19 668	Hill, Luers, Robinson, Sakitt+	(BNL, CMU)
CHOLLET	70	PL 31B 658	+Gaillard, Jane, Ratcliffe, Repellin+	(CERN)
CULLEN	70	PL 32B 523	+Darriulat, Deutsch, Foeth+	(AACH, CERN, TORI)
DARRIULAT	70	PL 33B 249	+Ferrero, Grosso, Holder+	(AACH, CERN, TORI)
FAISSNER	70	NC 70A 57	+Reithler, Thome, Gaillard+	(AACH3, CERN, RHEL)
GINSBERG	70	PR D1 229		(HAIF)
JENSEN	70	Thesis		(EFI)
Also	69	PRL 23 615	Jensen, Aronson, Ehrlich, Fryberger+	(EFI, ILL)
MARX	70	PL 32B 219	+Nygren, Peoples+	(COLU, HARV, CERN)
Also	70B	Thesis Nevis 179	Marx	(COLU)
SCRIBANO	70	PL 32B 224	+Mannelli, Pierazzini, Marx+	(PISA, COLU, HARV)
SMITH	70	PL 32B 133	+Wang, Whatley, Zorn, Hornbostel	(UMD, BNL)
WEBBER	70	PR D1 1967	+Solmitz, Crawford, Alston-Garnjost	(LRL)
Also	69	Thesis UCRL 19226	Webber	(LRL)
BANNER	69	PR 188 2033	+Cronin, Liu, Pilcher	(PRIN)
Also	68	PRL 21 1103	Banner, Cronin, Liu, Pilcher	(PRIN)
Also	68	PRL 21 1107	Cronin, Liu, Pilcher	(PRIN)
BEILLIERE	69	PL 30B 202	+Boutang, Limon	(EPOL)
BENNETT	69	PL 29B 317	+Nygren, Saal, Steinberger+	(COLU, BNL)
BOHM	69B	NP B9 605	+Darriulat, Grosso, Kaftanov+	(CERN)
Also	68	PL 27B 321	Bohm, Darriulat, Grosso, Kaftanov	(CERN)
CENCE	69	PRL 22 1210	+Jones, Peterson, Stenger+	(HAWA, LRL)
EVANS	69	PRL 23 427	+Golden, Muir, Peach+	(EDIN, CERN)
FAISSNER	69	PL 30B 204	+Foeth, Staude, Tittel+	(AACH3, CERN, TORI)
FOETH	69	PL 30B 282	+Holder, Radermacher+	(AACH, CERN, TORI)
GAILLARD	69	NC 59A 453	+Galbraith, Hussri, Jane+	(CERN, RHEL, AACH)
Also	67	PRL 18 20	Gaillard, Krienen, Galbraith+	(CERN, RHEL, AACH)
GOBBI	69B	PRL 22 685	+Green, Hakel, Moffett, Rosen, Goz+	(ROCH, RUTG)
LITTENBERG	69	PRL 22 654	+Field, Piccioni, Mehlhop+	(UCSD)
LONGO	69	PR 181 1808	+Young, Helland	(MICH, UCLA)
PACIOTTI	69	Thesis UCRL 19446		(LRL)
SAAL	69	Thesis		(COLU)
ABRAMS	68B	PR 176 1603	+Abashian, Mischke, Nefkens, Smith+	(ILL)
ARNOLD	68B	PL 28B 56	+Budagov, Cundy, Aubert+	(CERN, ORSAY)
ARONSON	68	PRL 20 287	+Chen	(PRIN)
Also	69	PR 175 1708	Aronson, Chen	(PRIN)

BARTLETT	68	PRL 21 558	+Carnegie, Fitch+	(PRIN)
BASILE	68	PL 26B 542	+Cronin, Thevenet, Turlay+	(SACL)
BASILE	68B	PL 28B 58	+Cronin, Thevenet, Turlay, Zylberajch+	(SACL)
BENNETT	68	PL 27B 244	+Nygren, Steinberger+	(COLU, CERN)
BENNETT	68B	PL 27B 248	+Nygren, Steinberger+	(COLU, CERN)
BLANPIED	68	PRL 21 1650	+Levit, Engels+	(CASE, HARV, MCGI)
BOHM	68B	PL 27B 594	+	
BUDAGOV	68	NC 57A 182	+Burmeister, Cundy+	(CERN, ORSAY, IPNP)
Also	68B	PL 28B 215	Budagov, Cundy, Myatt+	(CERN, ORSAY, EPOL)
JAMES	68	NP B8 365	+Briand	(IPNP, CERN)
Also	68	PRL 21 257	Helland, Longo, Young	(UCLA, MICH)
KULYUKINA	68	JETP 26 20	+Mestvirishvili, Nyagu+	(JINR)
		Translated from ZETF 53 29.		
KUNZ	68	Thesis PU-68-46		(PRIN)
BENNETT	67	PRL 19 993	+Nygren, Saal, Steinberger+	(COLU)
BOTT-...	67	PL 24B 194	Bott-Bodenhausen, DeBouard, Cassel+	(CERN)
BOTT-...	67B	PL 24B 438	Bott-Bodenhausen, Debouard, Dekkers+	(CERN)
Also	66B	PL 20 212	Bott-Bodenhausen, Debouard, Cassel+	(CERN)
Also	66	PL 23 277	Bott-Bodenhausen, DeBouard, Cassel+	(CERN)
CRONIN	67	PRL 18 25	+Kunz, Risk, Wheeler	(PRIN)
Also	68	Thesis unpub.	Wheeler	(PRIN)
CRONIN	67B	Princeton 11/67	+Kunz, Risk, Wheeler	(PRIN)
DEBOUARD	67	NC 52A 662	+Dekkers, Jordan, Mermod+	(CERN)
Also	65	PL 15 58	DeBouard, Dekkers, Scharff+	(CERN, ORSAY, MPIM)
DEVLIN	67	PRL 18 54	+Solomon, Shepard, Beall+	(PRIN, UMD)
Also	68	PR 169 1045	Sayer, Beall, Devlin, Shephard+	(UMD, PPA, PRIN)
DORFAN	67	PRL 19 987	+Enstrom, Raymond, Schwartz+	(SLAC, LRL)
FELDMAN	67B	PR 155 1611	+Frankel, Highland, Sloan	(PENN)
FIRESTONE	67	PRL 18 176	+Kim, Lach, Sandweiss+	(YALE, BNL)
FITCH	67	PR 164 1711	+Roth, Russ, Vernon	(PRIN)
GINSBERG	67	PR 162 1570		(MASB)
HAWKINS	67	PR 156 1444		(YALE)
HILL	67	PRL 19 668	+Luers, Robinson, Sakitt+	(BNL, CMU)
HOPKINS	67	PRL 19 185	+Bacon, Eisler	(BNL)
KADYK	67	PRL 19 597	+Chan, Drijard, Oren, Sheldon	(LRL)
KULYUKINA	67	Preprint	+Mestvirishvili, Nyagu+	(JINR)
LOWYS	67	PL 24B 75	+Aubert, Chounet, Pascaud+	(EPOL, ORSAY)
MISCHKE	67	PRL 18 138	+Abashian, Abrams+	(ILL)
NEFKENS	67	PR 157 1233	+Abashian, Abrams, Carpenter, Fisher+	(ILL)
SCHMIDT	67	Thesis Nevis 160		(COLU)
TODOROFF	67	Thesis		(ILL)
ALFF-...	66B	PL 21 595	Alff-Steinberger, Heuer, Kleinknecht+	(CERN)
ANIKINA	66	SJNP 2 339	+Vardenga, Zhuravleva+	(JINR)
		Translated from YAF 2 471.		
AUERBACH	66B	PRL 17 980	+Mann, McFarlane, Sciulli	(PENN)
BASILE	66	Balaton Conf.	+Cronin, Thevenet+	(SACL)
BEHR	66	PL 22 540	+Brisson, Petiau+	(EPOL, MILA, PADO, ORSAY)
BOTT-...	66	PL 23 277	Bott-Bodenhausen, DeBouard, Cassel+	(CERN)
CARPENTER	66	PR 142 871	+Abashian, Abrams, Fisher	(ILL)
CRIEGEE	66	PRL 17 150	+Fox, Frauenfelder, Hanson, Moscat+	(ILL)
FIRESTONE	66	PRL 16 556	+Kim, Lach, Sandweiss+	(YALE, BNL)
HAWKINS	66	PL 21 238		(YALE)
Also	67	PR 156 1444	Hawkins	(YALE)
ANDERSON	65	PRL 14 475	+Crawford, Golden, Stern, Binford+	(LRL, WISC)
ANIKINA	65	JINR P 2488	+Vardenga, Zhuravleva, Kotlya+	(JINR)
ASTBURY	65	PL 16 80	+Finocchiaro, Beusch+	(CERN, ZURI)
Also	65	HPA 39 523	Pepin	
ASTBURY	65B	PL 18 175	+Michelini, Beusch+	(CERN, ZURI)
ASTBURY	65C	PL 18 178	+Michelini, Beusch+	(CERN, ZURI)
AUBERT	65	PL 17 59	+Behr, Canavan, Chounet+	(EPOL, ORSAY)
Also	67	PL 24B 75	Lowys, Aubert, Chounet, Pascaud+	(EPOL, ORSAY)
BALDO-...	65	NC 38 684	Baldo-Ceolin, Calimani, Ciampolillo+	(PADO)
FISHER	65	ANL 7130 83	+Abashian, Abrams, Carpenter+	(ILL)
FITCH	65	PRL 15 73	+Roth, Russ, Vernon	(PRIN)
FRANZINI	65	PR 140B 127	+Kirsch, Plano+	(COLU, RUTG)
GALBRAITH	65	PRL 14 383	+Manning, Jones+	(AERE, BRIS, RHEL)
GUIDONI	65	Argonne Conf. 49	+Barnes, Foelsche, Ferbel, Firestone+	(BNL, YALE)
HOPKINS	65	Argonne Conf. 67	+Bacon, Eisler	(VAND, RUTG)
ADAIR	64	PL 12 67	+Leipuner	(YALE, BNL)
ALEKSANYAN	64B	Dubna Conf. 2 102	+Alikhanyan, Vartazaryan+	(YERE)
Also	64	JETP 19 1019	Aleksanyan+	(LEBD, MPEI, YERE)
		Translated from ZETF 46 1504.		

ANIKINA	64	JETP 19 42	+Zhuravleva+	(GEOR, JINR)
		Translated from ZETF 46 59.		
CHRISTENS...	64	PRL 13 138	Christenson, Cronin, Fitch, Turlay	(PRIN)
FUJII	64	Dubna Conf. 2 146	+Jovanovich, Turkot+	(BNL, UMD, MIT)
LUERS	64	PR 133B 1276	+Mittra, Willis, Yamamoto	(BNL)
DARMON	62	PL 3 57	+Rousset, Six	(EPOL)
ASTIER	61	Aix Conf. 1 227	+Blaskovic, Rivet, Siaud+	(EPOL)
FITCH	61	NC 22 1160	+Piroue, Perkins	(PRIN, LASL)
GOOD	61	PR 124 1223	+Matsen, Muller, Piccioni+	(LRL)
NYAGU	61	PRL 6 552	+Okonov, Petrov, Rosanova, Rusakov	(JINR)
Also	61B	JETP 13 1138	Nyagu, Okonov, Petrov, Rozanova+	(JINR)
		Translated from ZETF 40 1618.		
BARDON	58	ANP 5 156	+Lande, Lederman	(COLU, BNL)

OTHER RELATED PAPERS

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"The Search for Direct CP Violation"				
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Tests of CPT conservation in the neutral kaon system.				
KLEINKNECHT	92	CNPP 20 281		(MANZ)
New Results on CP Violation in Decays of Neutral K Mesons.				
KLEINKNECHT	90	ZPHY C46 S57		(MANZ)
PEACH	90	JPG 16 131		(EDIN)
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"Rare Kaon Decays"				
KLEINKNECHT	76	ARNS 26 1		(DORT)
GINSBERG	73	PR D8 3887	+Smith	(MIT, STON)
GINSBERG	70	PR D1 229		(HAIF)
HEUSSE	70	LNC 3 449	+Aubert, Pascaud, Vialle	(ORSAY)
CRONIN	68C	Vienna Conf. 281		(PRIN)
RUBBIA	67	PL 24B 531	+Steinberger	(CERN, COLU)
Also	66C	PL 23 167	Rubbia, Steinberger	(CERN, COLU)
Also	66C	PL 20 207	Alff-Steinberger, Heuer, Kleinknecht+	(CERN)
Also	66B	PL 21 595	Alff-Steinberger, Heuer, Kleinknecht+	(CERN)
AUERBACH	66	PR 149 1052	+Dobbs, Lande, Mann, Sciulli+	(PENN)
Also	65	PRL 14 192	Auerbach, Lande, Mann, Sciulli, Uto+	(PENN)
FIRESTONE	66B	PRL 17 116	+Kim, Lach, Sandweiss+	(YALE, BNL)
BEHR	65	Argonne Conf. 59	+Brisson, Bellotti+	(EPOL, MILA, PADO)
MESTVIRISH...	65	JINR P 2449	Mestvirishvili, Nyagu, Petrov, Rusakov+	(JINR)
TRILLING	65B	UCRL 16473		(LRL)
Updated from 1965 Argonne Conference, page 115.				
JOVANOV...	63	BNL Conf. 42	Jovanovich, Fischer, Burris+	(BNL, UMD)