STRANGE MESONS
($S = \pm 1$, $C = B = 0$)

$K^+ = u\bar{s}$, $K^0 = d\bar{s}$, $\overline{K}^0 = \bar{d}s$, $K^- = \bar{u}s$, similarly for K^*'s

NODE=MXXX020

$K^\pm$

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

NODE=S010

Mass $m = 493.677 \pm 0.015$ MeV [a] (S = 2.8)

NODE=S010M;DTYPE=M

Mean life $\tau = (1.2380 \pm 0.0020) \times 10^{-8}$ s (S = 1.8)

NODE=S010T;DTYPE=T

$c\tau = 3.711$ m

NODE=S010CTA;DTYPE=C;OUR EVAL

CPT violation parameters (Δ = rate difference/sum)

CLUMP=I

$\Delta(K^\pm \to \mu^\pm \nu_\mu) = (-0.27 \pm 0.21)\%$

NODE=S010D1;DTYPE=s;CLUMP=I

$\Delta(K^\pm \to \pi^\pm \pi^0) = (0.4 \pm 0.6)\%$ [b]

NODE=S010D4;DTYPE=s;CLUMP=I

CP violation parameters (Δ = rate difference/sum)

CLUMP=C

$\Delta(K^\pm \to \pi^\pm e^+ e^-) = (-2.2 \pm 1.6) \times 10^{-2}$

NODE=S010CPE;DTYPE=s;CLUMP=C

$\Delta(K^\pm \to \pi^\pm \mu^+ \mu^-) = 0.010 \pm 0.023$

NODE=S010CP;DTYPE=s;CLUMP=C

$\Delta(K^\pm \to \pi^\pm \pi^0 \gamma) = (0.0 \pm 1.2) \times 10^{-3}$

NODE=S010CPG;DTYPE=s;CLUMP=C

$\Delta(K^\pm \to \pi^\pm \pi^+ \pi^-) = (0.04 \pm 0.06)\%$

NODE=S010D2;DTYPE=s;CLUMP=C

$\Delta(K^\pm \to \pi^\pm \pi^0 \pi^0) = (-0.02 \pm 0.28)\%$

NODE=S010D3;DTYPE=s;CLUMP=C

T violation parameters

CLUMP=T

$K^+ \to \pi^0 \mu^+ \nu_\mu \quad P_T = (-1.7 \pm 2.5) \times 10^{-3}$

NODE=S010PTM;DTYPE=t;CLUMP=T

$K^+ \to \mu^+ \nu_\mu \gamma \quad P_T = (-0.6 \pm 1.9) \times 10^{-2}$

NODE=S010PT;DTYPE=t;CLUMP=T

$K^+ \to \pi^0 \mu^+ \nu_\mu \quad \mathrm{Im}(\xi) = -0.006 \pm 0.008$

NODE=S010IXI;DTYPE=t;CLUMP=T

Slope parameter *g* [c]

CLUMP=S

(See Particle Listings for quadratic coefficients and alternative parametrization related to $\pi\pi$ scattering)

$K^\pm \to \pi^\pm \pi^+ \pi^- \; g = -0.21134 \pm 0.00017$

NODE=S010GT;DTYPE=s;CLUMP=S

$(g_+ - g_-) \,/\, (g_+ + g_-) = (-1.5 \pm 2.2) \times 10^{-4}$

NODE=S010DG;DTYPE=s;CLUMP=S

$K^\pm \to \pi^\pm \pi^0 \pi^0 \; g = 0.626 \pm 0.007$

NODE=S010GTP;DTYPE=s;CLUMP=S

$(g_+ - g_-) \,/\, (g_+ + g_-) = (1.8 \pm 1.8) \times 10^{-4}$

NODE=S010DG0;DTYPE=s;CLUMP=S

$K^\pm$ decay form factors [d,e]

CLUMP=F

Assuming μ-e universality

$\lambda_+(K^+_{\mu 3}) = \lambda_+(K^+_{e3}) = (2.959 \pm 0.025) \times 10^{-2}$

NODE=S010L+E;DTYPE=f;CLUMP=F

$\lambda_0(K^+_{\mu 3}) = (1.76 \pm 0.25) \times 10^{-2}$ (S = 2.7)

NODE=S010LE2;DTYPE=f;CLUMP=F;OUR EVAL;→ UNCHECKED ←

Not assuming μ-e universality

$\lambda_+(K^+_{e3}) = (2.956 \pm 0.025) \times 10^{-2}$

NODE=S010LM1;DTYPE=f;CLUMP=G; OUR EVAL;→ UNCHECKED ←

$\lambda_+(K^+_{\mu 3}) = (3.09 \pm 0.25) \times 10^{-2}$ (S = 1.5)

NODE=S010LM2;DTYPE=f;CLUMP=G; OUR EVAL;→ UNCHECKED ←

$\lambda_0(K^+_{\mu 3}) = (1.73 \pm 0.27) \times 10^{-2}$ (S = 2.6)

NODE=S010L01;DTYPE=f;CLUMP=G;OUR EVAL;→ UNCHECKED ←

K_{e3} form factor quadratic fit

λ'_+ ($K^\pm_{e3}$) linear coeff. $= (2.59 \pm 0.04) \times 10^{-2}$ NODE=S010LPE;DTYPE=f;CLUMP=H

λ''_+($K^\pm_{e3}$) quadratic coeff. $= (0.186 \pm 0.021) \times 10^{-2}$ NODE=S010LQE;DTYPE=f;CLUMP=H

λ'_+ (LINEAR $K^\pm_{\mu 3}$ FORM FACTOR FROM QUADRATIC FIT) $= (24 \pm 4) \times 10^{-3}$ NODE=S010LPM;DTYPE=f;CLUMP=H

λ''_+ (QUADRATIC $K^\pm_{\mu 3}$ FORM FACTOR) $= (1.8 \pm 1.5) \times 10^{-3}$ NODE=S010LQM;DTYPE=f;CLUMP=H

M_V (VECTOR POLE MASS FOR $K^\pm_{e3}$ DECAY) $= 890.3 \pm 2.8$ MeV NODE=S010MVE;DTYPE=f;CLUMP=H

M_V (VECTOR POLE MASS FOR $K^\pm_{\mu 3}$ DECAY) $= 878 \pm 12$ MeV NODE=S010MVM;DTYPE=f;CLUMP=H

M_S (SCALAR POLE MASS FOR $K^\pm_{\mu 3}$ DECAY) $= 1210 \pm 50$ MeV NODE=S010MSM;DTYPE=f;CLUMP=H

Λ_+ (DISPERSIVE VECTOR FORM FACTOR IN $K^\pm_{e3}$ DECAY) $= (2.460 \pm 0.017) \times 10^{-2}$ NODE=S010LAM;DTYPE=f;CLUMP=H

Λ_+ (DISPERSIVE VECTOR FORM FACTOR IN $K^\pm_{\mu 3}$ DECAY) $= (25.4 \pm 0.9) \times 10^{-3}$ NODE=S010LMM;DTYPE=f;CLUMP=H

$\ln(C)$ (DISPERSIVE SCALAR FORM FACTOR in $K^\pm_{\mu 3}$ decays) $= (182 \pm 16) \times 10^{-3}$ NODE=S010LLM;DTYPE=f;CLUMP=H

K^+_{e3} $\left|f_S/f_+\right| = (-0.08^{+0.34}_{-0.40}) \times 10^{-2}$ NODE=S010FS;DTYPE=f;CLUMP=H

K^+_{e3} $\left|f_T/f_+\right| = (-1.2^{+1.3}_{-1.1}) \times 10^{-2}$ NODE=S010FT;DTYPE=f;CLUMP=H

$K^+_{\mu 3}$ $\left|f_S/f_+\right| = (0.2 \pm 0.6) \times 10^{-2}$ NODE=S010FSM;DTYPE=f;CLUMP=H

$K^+_{\mu 3}$ $\left|f_T/f_+\right| = (-0.1 \pm 0.7) \times 10^{-2}$ NODE=S010FTM;DTYPE=f;CLUMP=H

$K^+ \to e^+ \nu_e \gamma$ $\left|F_A + F_V\right| = 0.133 \pm 0.008$ (S = 1.3) NODE=S010F+E;DTYPE=f;CLUMP=H

$K^+ \to \mu^+ \nu_\mu \gamma$ $\left|F_A + F_V\right| = 0.165 \pm 0.013$ NODE=S010F+M;DTYPE=f;CLUMP=H

$K^+ \to e^+ \nu_e \gamma$ $\left|F_A - F_V\right| < 0.49$, CL = 90% NODE=S010F-E;DTYPE=f;CLUMP=H

$K^+ \to \mu^+ \nu_\mu \gamma$ $\left|F_A - F_V\right| = -0.153 \pm 0.033$ (S = 1.1) NODE=S010F-M;DTYPE=f;CLUMP=H

Charge radius CLUMP=R

$\langle r \rangle = 0.560 \pm 0.031$ fm NODE=S010CR;DTYPE=r;CLUMP=R

Forward-backward asymmetry CLUMP=J

$A_{FB}(K^\pm_{\pi\mu\mu}) = \frac{\Gamma(cos(\theta_{K\mu})>0) - \Gamma(cos(\theta_{K\mu})<0)}{\Gamma(cos(\theta_{K\mu})>0) + \Gamma(cos(\theta_{K\mu})<0)} < 0.9 \times 10^{-2}$, CL = 90% NODE=S010AFB;DTYPE=s;CLUMP=J

K^- modes are charge conjugates of the modes below. NODE=S010225;NODE=S010

K^+ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
Leptonic and semileptonic modes				NODE=S010;CLUMP=A
$e^+\nu_e$	(1.582±0.007) × 10^{-5}		247	DESIG=11
$\mu^+\nu_\mu$	(63.56 ±0.11) %	S=1.2	236	DESIG=1
$\pi^0 e^+\nu_e$	(5.07 ±0.04) %	S=2.1	228	DESIG=6
Called K^+_{e3}.				
$\pi^0\mu^+\nu_\mu$	(3.352±0.034) %	S=1.9	215	DESIG=5
Called $K^+_{\mu3}$.				
$\pi^0\pi^0 e^+\nu_e$	(2.55 ±0.04) × 10^{-5}	S=1.1	206	DESIG=24
$\pi^0\pi^0\mu^+\nu_\mu$	(3.45 ±0.16) × 10^{-6}		156	DESIG=124
$\pi^+\pi^- e^+\nu_e$	(4.247±0.024) × 10^{-5}		203	DESIG=7
$\pi^+\pi^-\mu^+\nu_\mu$	(1.4 ±0.9) × 10^{-5}		151	DESIG=9
$\pi^0\pi^0\pi^0 e^+\nu_e$	< 5.4 × 10^{-8}	CL=90%	135	DESIG=44
Hadronic modes				NODE=S010;CLUMP=B
$\pi^+\pi^0$	(20.67 ±0.08) %	S=1.2	205	DESIG=2
$\pi^+\pi^0\pi^0$	(1.760±0.023) %	S=1.1	133	DESIG=4
$\pi^+\pi^+\pi^-$	(5.583±0.024) %		125	DESIG=3
Leptonic and semileptonic modes with photons				NODE=S010;CLUMP=C
$\mu^+\nu_\mu\gamma$	[f,g] (6.2 ±0.8) × 10^{-3}		236	DESIG=12
$\mu^+\nu_\mu\gamma(\mathrm{SD}^+)$	[d,h] (1.33 ±0.22) × 10^{-5}		–	DESIG=39
$\mu^+\nu_\mu\gamma(\mathrm{SD}^+\mathrm{INT})$	[d,h] < 2.7 × 10^{-5}	CL=90%	–	DESIG=81
$\mu^+\nu_\mu\gamma(\mathrm{SD}^- + \mathrm{SD}^-\mathrm{INT})$	[d,h] < 2.6 × 10^{-4}	CL=90%	–	DESIG=40
$e^+\nu_e\gamma$	(1.03 ±0.14) × 10^{-5}		247	DESIG=21
$\pi^0 e^+\nu_e\gamma$	[f,g] (2.698±0.033) × 10^{-4}		228	DESIG=18
$\pi^0 e^+\nu_e\gamma(\mathrm{SD})$	[d,h] < 5.3 × 10^{-5}	CL=90%	228	DESIG=41
$\pi^0\mu^+\nu_\mu\gamma$	[f,g] (1.25 ±0.25) × 10^{-5}		215	DESIG=28
$\pi^0\pi^0 e^+\nu_e\gamma$	< 5 × 10^{-6}	CL=90%	206	DESIG=47
Hadronic modes with photons or $\ell\bar{\ell}$ pairs				NODE=S010;CLUMP=D
$\pi^+\pi^0\gamma(\mathrm{INT})$	(− 4.2 ±0.9) × 10^{-6}		–	DESIG=119
$\pi^+\pi^0\gamma(\mathrm{DE})$	[f,i] (6.0 ±0.4) × 10^{-6}		205	DESIG=38
$\pi^+\pi^0 e^+ e^-$	(4.24 ±0.14) × 10^{-6}		205	DESIG=120
$\pi^+\pi^0\pi^0\gamma$	[f,g] (4.0 ±1.1) × 10^{-6}		133	DESIG=37
$\pi^+\pi^+\pi^-\gamma$	[f,g] (7.1 ±0.5) × 10^{-6}		125	DESIG=14
$\pi^+\gamma\gamma$	[f] (9.65 ±0.16) × 10^{-7}		227	DESIG=17
$\pi^+ 3\gamma$	[f] < 1.0 × 10^{-4}	CL=90%	227	DESIG=23
$\pi^+ e^+ e^-\gamma$	(1.19 ±0.13) × 10^{-8}		227	DESIG=118
Leptonic modes with $\ell\bar{\ell}$ pairs				NODE=S010;CLUMP=E
$e^+\nu_e\nu\overline{\nu}$	< 6 × 10^{-5}	CL=90%	247	DESIG=33
$\mu^+\nu_\mu\nu\overline{\nu}$	< 1.0 × 10^{-6}	CL=90%	236	DESIG=27
$e^+\nu_e e^+ e^-$	(2.48 ±0.20) × 10^{-8}		247	DESIG=32
$\mu^+\nu_\mu e^+ e^-$	(7.06 ±0.31) × 10^{-8}		236	DESIG=30
$e^+\nu_e\mu^+\mu^-$	(1.7 ±0.5) × 10^{-8}		223	DESIG=48
$\mu^+\nu_\mu\mu^+\mu^-$	< 4.1 × 10^{-7}	CL=90%	185	DESIG=117

Lepton family number (LF), Lepton number (L), $\Delta S = \Delta Q$ (SQ) violating modes, or $\Delta S = 1$ weak neutral current ($S1$) modes

NODE=S010;CLUMP=F

$\pi^+\pi^+e^-\overline{\nu}_e$	SQ	$<$	1.3	$\times 10^{-8}$	CL=90%	203	DESIG=8
$\pi^+\pi^+\mu^-\overline{\nu}_\mu$	SQ	$<$	3.0	$\times 10^{-6}$	CL=95%	151	DESIG=10
$\pi^+e^+e^-$	$S1$	(	3.00 $\pm$0.09)	$\times 10^{-7}$		227	DESIG=15
$\pi^+\mu^+\mu^-$	$S1$	(	9.17 $\pm$0.14)	$\times 10^{-8}$	S=1.8	172	DESIG=16
$\pi^+e^+e^-e^+e^-$	$S1$	$<$	1.4	$\times 10^{-8}$	CL=90%	227	DESIG=123
$\pi^+\nu\overline{\nu}$	$S1$	(	1.14 $^{+0.40}_{-0.33}$)	$\times 10^{-10}$		227	DESIG=20
$\pi^+\pi^0\nu\overline{\nu}$	$S1$	$<$	4.3	$\times 10^{-5}$	CL=90%	205	DESIG=50
$\mu^-\nu e^+e^+$	LF	$<$	8.1	$\times 10^{-11}$	CL=90%	236	DESIG=31
$\mu^+\nu_e$	LF	[j] $<$	4	$\times 10^{-3}$	CL=90%	236	DESIG=34
$\pi^+\mu^+e^-$	LF	$<$	1.3	$\times 10^{-11}$	CL=90%	214	DESIG=29
$\pi^0\pi^+\mu^+e^-$	LF	$<$	5.0	$\times 10^{-10}$	CL=90%	154	DESIG=127
$\pi^+\mu^-e^+$	LF	$<$	6.6	$\times 10^{-11}$	CL=90%	214	DESIG=25
$\pi^0\pi^+\mu^-e^+$	LF	$<$	3.1	$\times 10^{-10}$	CL=90%	154	DESIG=126
$\pi^-\mu^+e^+$	L	$<$	4.2	$\times 10^{-11}$	CL=90%	214	DESIG=45
$\pi^0\pi^-\mu^+e^+$	L	$<$	2.9	$\times 10^{-10}$	CL=90%	154	DESIG=125
$\pi^-e^+e^+$	L	$<$	5.3	$\times 10^{-11}$	CL=90%	227	DESIG=19
$\pi^-\mu^+\mu^+$	L	$<$	4.2	$\times 10^{-11}$	CL=90%	172	DESIG=46
$\pi^-\pi^0e^+e^+$	L	$<$	8.5	$\times 10^{-10}$	CL=90%	205	DESIG=121
$\mu^+\overline{\nu}_e$	L	[j] $<$	3.3	$\times 10^{-3}$	CL=90%	236	DESIG=35
$\pi^0e^+\overline{\nu}_e$	L	$<$	3	$\times 10^{-3}$	CL=90%	228	DESIG=36
$\pi^+\gamma$		[k] $<$	2.3	$\times 10^{-9}$	CL=90%	227	DESIG=22

K^0

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

NODE=S011

50% K_S, 50% K_L

Mass $m = 497.611 \pm 0.013$ MeV (S = 1.2)

NODE=S011M;DTYPE=M

$m_{K^0} - m_{K^\pm} = 3.934 \pm 0.020$ MeV (S = 1.6)

NODE=S011DM;DTYPE=D

Mean square charge radius

CLUMP=R

$\langle r^2 \rangle = -0.077 \pm 0.010$ fm^2

NODE=S011SCR;DTYPE=r;CLUMP=R

T-violation parameters in K^0-$\overline{K}^0$ mixing [e]

CLUMP=C

Asymmetry A_T in K^0-$\overline{K}^0$ mixing $= (6.6 \pm 1.6) \times 10^{-3}$

NODE=S011AT;DTYPE=c;CLUMP=C

CP-violation parameters

CLUMP=A

Re(ϵ) $= (1.596 \pm 0.013) \times 10^{-3}$

NODE=S011REP;DTYPE=v;CLUMP=A

CPT-violation parameters [e]

CLUMP=K

Re $\delta = (2.5 \pm 2.3) \times 10^{-4}$

NODE=S011DRE;DTYPE=k;CLUMP=K

Im $\delta = (-1.5 \pm 1.6) \times 10^{-5}$

NODE=S011DIM;DTYPE=k;CLUMP=K

Re(y), K_{e3} parameter $= (0.4 \pm 2.5) \times 10^{-3}$

NODE=S011YRE;DTYPE=k;CLUMP=K

Re(x$_-$), K_{e3} parameter $= (-2.9 \pm 2.0) \times 10^{-3}$

NODE=S011XRM;DTYPE=k;CLUMP=K

$|m_{K^0} - m_{\overline{K}^0}| \,/\, m_{\text{average}} < 6 \times 10^{-19}$, CL = 90% [l]

NODE=S011DMM;DTYPE=D

$(\Gamma_{K^0} - \Gamma_{\overline{K}^0})/m_{\text{average}} = (8 \pm 8) \times 10^{-18}$

NODE=S011DGM;DTYPE=D

Tests of $\Delta S = \Delta Q$

CLUMP=Q

Re(x$_+$), K_{e3} parameter $= (-0.9 \pm 3.0) \times 10^{-3}$

NODE=S011XRP;DTYPE=r;CLUMP=Q

K^0_S

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

NODE=S012

Mean life $\tau = (0.8954 \pm 0.0004) \times 10^{-10}$ s (S = 1.1) Assuming CPT

NODE=S012T;DTYPE=T

Mean life $\tau = (0.89564 \pm 0.00033) \times 10^{-10}$ s Not assuming CPT

NODE=S012T1;DTYPE=t;OUR EVAL; → UNCHECKED ←

$c\tau = 2.6844$ cm Assuming CPT

NODE=S012CTA;DTYPE=C;OUR EVAL

CP-violation parameters [n]

CLUMP=V

$\mathrm{Im}(\eta_{+-0}) = -0.002 \pm 0.009$

NODE=S012E+;DTYPE=v;CLUMP=V

$\mathrm{Im}(\eta_{000}) = -0.001 \pm 0.016$

NODE=S012E0;DTYPE=v;CLUMP=V

$|\eta_{000}| = |A(K_S^0 \to 3\pi^0)/A(K_L^0 \to 3\pi^0)| < 0.0088$, CL = 90%

NODE=S012AE0;DTYPE=v;CLUMP=V

CP asymmetry A in $\pi^+\pi^- e^+ e^- = (-0.4 \pm 0.8)\%$

NODE=S012DPA;DTYPE=v;CLUMP=Y

K_S^0 DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
Hadronic modes					NODE=S012210;NODE=S012;CLUMP=A
$\pi^0\pi^0$		(30.69±0.05) %		209	DESIG=2
$\pi^+\pi^-$		(69.20±0.05) %		206	DESIG=1
$\pi^+\pi^-\pi^0$		$(3.5 \ ^{+1.1}_{-0.9}) \times 10^{-7}$		133	DESIG=8
Modes with photons or $\ell\bar{\ell}$ pairs					NODE=S012;CLUMP=B
$\pi^+\pi^-\gamma$	[g,o]	$(1.79\pm0.05) \times 10^{-3}$		206	DESIG=5
$\pi^+\pi^- e^+ e^-$		$(4.79\pm0.15) \times 10^{-5}$		206	DESIG=13
$\pi^0\gamma\gamma$	[o]	$(4.9 \pm1.8) \times 10^{-8}$		230	DESIG=14
$\gamma\gamma$		$(2.63\pm0.17) \times 10^{-6}$	S=3.1	249	DESIG=6
$\mu^+\mu^-\mu^+\mu^-$		$< 5.1 \times 10^{-12}$	CL=90%	119	DESIG=16
Semileptonic modes					NODE=S012;CLUMP=C
$\pi^\pm e^\mp \nu_e$	[p]	$(7.14\pm0.06) \times 10^{-4}$		229	DESIG=11
***CP* violating (*CP*) and $\Delta S = 1$ weak neutral current (*S1*) modes**					NODE=S012;CLUMP=F
$3\pi^0$	*CP*	$< 2.6 \times 10^{-8}$	CL=90%	139	DESIG=7
$\mu^+\mu^-$	*S1*	$< 2.1 \times 10^{-10}$	CL=90%	225	DESIG=3
$e^+ e^-$	*S1*	$< 9 \times 10^{-9}$	CL=90%	249	DESIG=4
$\pi^0 e^+ e^-$	*S1*	[o] $(3.0 \ ^{+1.5}_{-1.2}) \times 10^{-9}$		230	DESIG=10
$\pi^0\mu^+\mu^-$	*S1*	$(2.9 \ ^{+1.5}_{-1.2}) \times 10^{-9}$		177	DESIG=15

K_L^0

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

NODE=S013

$m_{K_L} - m_{K_S}$

$= (0.5293 \pm 0.0009) \times 10^{10}\ \hbar\ \mathrm{s}^{-1}$ (S = 1.3) Assuming *CPT*

NODE=S013D;DTYPE=D;CLUMP=D

$= (3.484 \pm 0.006) \times 10^{-12}$ MeV Assuming *CPT*

NODE=S013D1;DTYPE=D;CLUMP=D;OUR EVAL

$= (0.5289 \pm 0.0010) \times 10^{10}\ \hbar\ \mathrm{s}^{-1}$ Not assuming *CPT*

NODE=S013D2;DTYPE=D;CLUMP=D;OUR EVAL;→ UNCHECKED ←

Mean life $\tau = (5.116 \pm 0.021) \times 10^{-8}$ s (S = 1.1)

NODE=S013T;DTYPE=T

$c\tau = 15.34$ m

NODE=S013CTA;DTYPE=C;OUR EVAL

Slope parameters [c]

CLUMP=S

(See Particle Listings for other linear and quadratic coefficients)

$K_L^0 \to \pi^+\pi^-\pi^0$: $g = 0.678 \pm 0.008$ (S = 1.5)

NODE=S013GT0;DTYPE=s;CLUMP=S

$K_L^0 \to \pi^+\pi^-\pi^0$: $h = 0.076 \pm 0.006$

NODE=S013HT0;DTYPE=s;CLUMP=S

$K_L^0 \to \pi^+\pi^-\pi^0$: $k = 0.0099 \pm 0.0015$

NODE=S013KT0;DTYPE=s;CLUMP=S

$K_L^0 \to \pi^0\pi^0\pi^0$: $h = (0.6 \pm 1.2) \times 10^{-3}$

NODE=S013HTZ;DTYPE=s;CLUMP=S

K_L decay form factors [e]

CLUMP=F

Linear parametrization assuming μ-e universality

$\lambda_+(K_{\mu3}^0) = \lambda_+(K_{e3}^0) = (2.82 \pm 0.04) \times 10^{-2}$ (S = 1.1)

NODE=S013L+M;DTYPE=f;CLUMP=F

$\lambda_0(K_{\mu3}^0) = (1.38 \pm 0.18) \times 10^{-2}$ (S = 2.2)

NODE=S013L0;DTYPE=f;CLUMP=F

Quadratic parametrization assuming μ-e universality

$\lambda'_+(K^0_{\mu3}) = \lambda'_+(K^0_{e3}) = (2.40 \pm 0.12) \times 10^{-2}$ (S = 1.2)

$\lambda''_+(K^0_{\mu3}) = \lambda''_+(K^0_{e3}) = (0.20 \pm 0.05) \times 10^{-2}$ (S = 1.2)

$\lambda_0(K^0_{\mu3}) = (1.16 \pm 0.09) \times 10^{-2}$ (S = 1.2)

Pole parametrization assuming μ-e universality

$M_V^\mu\ (K^0_{\mu3}) = M_V^e\ (K^0_{e3}) = 878 \pm 6$ MeV (S = 1.1)

$M_S^\mu\ (K^0_{\mu3}) = 1252 \pm 90$ MeV (S = 2.6)

Dispersive parametrization assuming μ-e universality

$\Lambda_+ = (2.51 \pm 0.06) \times 10^{-2}$ (S = 1.5)

$\ln(C) = (1.75 \pm 0.18) \times 10^{-1}$ (S = 2.0)

K^0_{e3} $|f_S/f_+| = (1.5^{+1.4}_{-1.6}) \times 10^{-2}$

K^0_{e3} $|f_T/f_+| = (5^{+4}_{-5}) \times 10^{-2}$

$K^0_{\mu3}$ $|f_T/f_+| = (12 \pm 12) \times 10^{-2}$

$K_L \to \ell^+\ell^-\gamma$, $K_L \to \ell^+\ell^-\ell'^+\ell'^-$: $\alpha_{K^*} = -0.205 \pm 0.022$ (S = 1.8)

$K^0_L \to \ell^+\ell^-\gamma$, $K^0_L \to \ell^+\ell^-\ell'^+\ell'^-$: $\alpha_{DIP} = -1.69 \pm 0.08$ (S = 1.7)

$K_L \to \pi^+\pi^- e^+ e^-$: $a_1/a_2 = -0.737 \pm 0.014$ GeV^2

$K_L \to \pi^0 2\gamma$: $a_V = -0.43 \pm 0.06$ (S = 1.5)

CP-violation parameters [n]

$A_L = (0.332 \pm 0.006)\%$

$|\eta_{00}| = (2.220 \pm 0.011) \times 10^{-3}$ (S = 1.8)

$|\eta_{+-}| = (2.232 \pm 0.011) \times 10^{-3}$ (S = 1.8)

$|\epsilon| = (2.228 \pm 0.011) \times 10^{-3}$ (S = 1.8)

$|\eta_{00}/\eta_{+-}| = 0.9950 \pm 0.0007$ [q] (S = 1.6)

$\mathrm{Re}(\epsilon'/\epsilon) = (1.66 \pm 0.23) \times 10^{-3}$ [q] (S = 1.6)

Assuming *CPT*

$\phi_{+-} = (43.51 \pm 0.05)^\circ$ (S = 1.2)

$\phi_{00} = (43.52 \pm 0.05)^\circ$ (S = 1.2)

$\phi_\epsilon = \phi_{SW} = (43.52 \pm 0.04)^\circ$ (S = 1.2)

$\mathrm{Im}(\epsilon'/\epsilon) = -(\phi_{00} - \phi_{+-})/3 = (-0.002 \pm 0.005)^\circ$ (S = 1.7)

Not assuming *CPT*

$\phi_{+-} = (43.4 \pm 0.5)^\circ$ (S = 1.2)

$\phi_{00} = (43.7 \pm 0.6)^\circ$ (S = 1.2)

$\phi_\epsilon = (43.5 \pm 0.5)^\circ$ (S = 1.3)

CP asymmetry A in $K^0_L \to \pi^+\pi^- e^+ e^- = (13.7 \pm 1.5)\%$

β_{CP} from $K^0_L \to e^+ e^- e^+ e^- = -0.19 \pm 0.07$

γ_{CP} from $K^0_L \to e^+ e^- e^+ e^- = 0.01 \pm 0.11$ (S = 1.6)

j for $K^0_L \to \pi^+\pi^-\pi^0 = 0.0012 \pm 0.0008$

f for $K^0_L \to \pi^+\pi^-\pi^0 = 0.004 \pm 0.006$

$|\eta_{+-\gamma}| = (2.35 \pm 0.07) \times 10^{-3}$

$\phi_{+-\gamma} = (44 \pm 4)^\circ$

$|\epsilon'_{+-\gamma}|/\epsilon < 0.3$, CL = 90%

$|g_{E1}|$ for $K^0_L \to \pi^+\pi^-\gamma < 0.21$, CL = 90%

NODE=S013LPM;DTYPE=f;CLUMP=G

NODE=S013LQM;DTYPE=f;CLUMP=G

NODE=S013LZ;DTYPE=f;CLUMP=G

NODE=S013MVM;DTYPE=f;CLUMP=J

NODE=S013MS1;DTYPE=f;CLUMP=J;OUR EVAL;→ UNCHECKED ←

NODE=S013LAM;DTYPE=f;CLUMP=L

NODE=S013LCM;DTYPE=f;CLUMP=L

NODE=S013FS;DTYPE=f;CLUMP=H

NODE=S013FT;DTYPE=f;CLUMP=H

NODE=S013FTM;DTYPE=f;CLUMP=H

NODE=S013ALA;DTYPE=f;CLUMP=H

NODE=S013ADA;DTYPE=f;CLUMP=H

NODE=S013A12;DTYPE=f;CLUMP=H

NODE=S013AV;DTYPE=f;CLUMP=H

CLUMP=V

NODE=S013AL;DTYPE=v;CLUMP=V

NODE=S013E00;DTYPE=v;CLUMP=V

NODE=S013E+-;DTYPE=v;CLUMP=V

NODE=S013EP;DTYPE=v;CLUMP=V

NODE=S013ER;DTYPE=v;CLUMP=V

NODE=S013EPS;DTYPE=v;CLUMP=V

NODE=S013F+-;DTYPE=v;CLUMP=Z

NODE=S013FOO;DTYPE=v;CLUMP=Z

NODE=S013EPH;DTYPE=v;CLUMP=Z

NODE=S013EPI;DTYPE=v;CLUMP=Z

NODE=S013F+2;DTYPE=v;CLUMP=W;OUR EVAL;→ UNCHECKED ←

NODE=S013FO2;DTYPE=v;CLUMP=W;OUR EVAL;→ UNCHECKED ←

NODE=S013EP1;DTYPE=v;CLUMP=W;OUR EVAL;→ UNCHECKED ←

NODE=S013DPA;DTYPE=v;CLUMP=Y

NODE=S013BCP;DTYPE=v;CLUMP=Y

NODE=S013GCP;DTYPE=v;CLUMP=Y

NODE=S013JT0;DTYPE=v;CLUMP=Y

NODE=S013FT0;DTYPE=v;CLUMP=Y

NODE=S013E+G;DTYPE=v;CLUMP=Y

NODE=S013P+G;DTYPE=v;CLUMP=Y

NODE=S013EPG;DTYPE=v;CLUMP=Y

NODE=S013GE1;DTYPE=v;CLUMP=Y

T-violation parameters CLUMP=T

Im(ξ) in $K^0_{\mu 3} = -0.007 \pm 0.026$ NODE=S013IXI;DTYPE=f;CLUMP=T

CPT invariance tests CLUMP=X

$\phi_{00} - \phi_{+-} = (0.34 \pm 0.32)^\circ$ NODE=S013DF1;DTYPE=v;CLUMP=X;
OUR EVAL;→ UNCHECKED ←
Re($\frac{2}{3}\eta_{+-} + \frac{1}{3}\eta_{00}) - \frac{A_L}{2} = (-3 \pm 35) \times 10^{-6}$ NODE=S013CPT;DTYPE=v;CLUMP=X

$\Delta S = -\Delta Q$ in $K^0_{\ell 3}$ decay CLUMP=Q

Re $x = -0.002 \pm 0.006$ NODE=S013REX;DTYPE=Q;CLUMP=Q

Im $x = 0.0012 \pm 0.0021$ NODE=S013IMX;DTYPE=Q;CLUMP=Q

K^0_L DECAY MODES			Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
Semileptonic modes						NODE=S013215;NODE=S013;CLUMP=A
$\pi^\pm e^\mp \nu_e$ Called K^0_{e3}.		[p]	(40.55 ±0.11) %	S=1.7	229	DESIG=4
$\pi^\pm \mu^\mp \nu_\mu$ Called $K^0_{\mu 3}$.		[p]	(27.04 ±0.07) %	S=1.1	216	DESIG=3
$(\pi\mu\text{atom})\nu$			(1.05 ±0.11) × 10^{-7}		188	DESIG=19
$\pi^0\pi^\pm e^\mp \nu$		[p]	(5.20 ±0.11) × 10^{-5}		207	DESIG=18
$\pi^\pm e^\mp \nu e^+ e^-$		[p]	(1.26 ±0.04) × 10^{-5}		229	DESIG=51
Hadronic modes, including Charge conjugation×Parity Violating (CPV) modes						NODE=S013;CLUMP=B
$3\pi^0$			(19.52 ±0.12) %	S=1.6	139	DESIG=1
$\pi^+\pi^-\pi^0$			(12.54 ±0.05) %		133	DESIG=2
$\pi^+\pi^-$	CPV	[r]	(1.967±0.010) × 10^{-3}	S=1.5	206	DESIG=5
$\pi^0\pi^0$	CPV		(8.64 ±0.06) × 10^{-4}	S=1.8	209	DESIG=11
Semileptonic modes with photons						NODE=S013;CLUMP=C
$\pi^\pm e^\mp \nu_e \gamma$		[g,p,s]	(3.79 ±0.06) × 10^{-3}		229	DESIG=12
$\pi^\pm \mu^\mp \nu_\mu \gamma$			(5.65 ±0.23) × 10^{-4}		216	DESIG=34
Hadronic modes with photons or $\ell\bar{\ell}$ pairs						NODE=S013;CLUMP=D
$\pi^0\pi^0\gamma$			< 2.43 × 10^{-7}	CL=90%	209	DESIG=33
$\pi^+\pi^-\gamma$		[g,s]	(4.15 ±0.15) × 10^{-5}	S=2.8	206	DESIG=10
$\pi^+\pi^-\gamma$(DE)			(2.84 ±0.11) × 10^{-5}	S=2.0	206	DESIG=50
$\pi^0 2\gamma$		[s]	(1.273±0.033) × 10^{-6}		230	DESIG=13
$\pi^0\gamma e^+ e^-$			(1.62 ±0.17) × 10^{-8}		230	DESIG=46
Other modes with photons or $\ell\bar{\ell}$ pairs						NODE=S013;CLUMP=E
2γ			(5.47 ±0.04) × 10^{-4}	S=1.1	249	DESIG=9
3γ			< 7.4 × 10^{-8}	CL=90%	249	DESIG=45
$e^+e^-\gamma$			(9.4 ±0.4) × 10^{-6}	S=2.0	249	DESIG=14
$\mu^+\mu^-\gamma$			(3.59 ±0.11) × 10^{-7}	S=1.3	225	DESIG=15
$\mu^+\mu^-\mu^+\mu^-$			< 2.3 × 10^{-9}	CL=90%	119	DESIG=56
$e^+e^-\gamma\gamma$		[s]	(5.95 ±0.33) × 10^{-7}		249	DESIG=23
$\mu^+\mu^-\gamma\gamma$		[s]	(1.0 $^{+0.8}_{-0.6}$) × 10^{-8}		225	DESIG=47
Charge conjugation × Parity (CP) or Lepton Family number (LF) violating modes, or $\Delta S = 1$ weak neutral current ($S1$) modes						NODE=S013;CLUMP=F
$\mu^+\mu^-$	$S1$		(6.84 ±0.11) × 10^{-9}		225	DESIG=6
e^+e^-	$S1$		(9 $^{+6}_{-4}$) × 10^{-12}		249	DESIG=7
$\pi^+\pi^- e^+ e^-$	$S1$	[s]	(3.11 ±0.19) × 10^{-7}		206	DESIG=17
$\pi^0\pi^0 e^+ e^-$	$S1$		< 6.6 × 10^{-9}	CL=90%	209	DESIG=48
$\pi^0\pi^0\mu^+\mu^-$	$S1$		< 9.2 × 10^{-11}	CL=90%	57	DESIG=54
$\mu^+\mu^- e^+ e^-$	$S1$		(2.69 ±0.27) × 10^{-9}		225	DESIG=21
$e^+e^- e^+ e^-$	$S1$		(3.56 ±0.21) × 10^{-8}		249	DESIG=22
$\pi^0\mu^+\mu^-$	$CP,S1$	[t]	< 3.8 × 10^{-10}	CL=90%	177	DESIG=16
$\pi^0 e^+ e^-$	$CP,S1$	[t]	< 2.8 × 10^{-10}	CL=90%	230	DESIG=20
$\pi^0\nu\bar{\nu}$	$CP,S1$	[u]	< 3.0 × 10^{-9}	CL=90%	230	DESIG=43
$\pi^0\pi^0\nu\bar{\nu}$	$S1$		< 8.1 × 10^{-7}	CL=90%	209	DESIG=52
$e^\pm\mu^\mp$	LF	[p]	< 4.7 × 10^{-12}	CL=90%	238	DESIG=8
$e^\pm e^\pm \mu^\mp \mu^\mp$	LF	[p]	< 4.12 × 10^{-11}	CL=90%	225	DESIG=24
$\pi^0\mu^\pm e^\mp$	LF	[p]	< 7.6 × 10^{-11}	CL=90%	217	DESIG=36
$\pi^0\pi^0\mu^\pm e^\mp$	LF		< 1.7 × 10^{-10}	CL=90%	159	DESIG=53

Lorentz invariance violating modes

$\pi^0\gamma$	$<$ 1.7	$\times 10^{-7}$	CL=90%	230	NODE=S013;CLUMP=H DESIG=55

$K_0^*(700)$ $I(J^P) = \frac{1}{2}(0^+)$

NODE=M174

also known as κ; was $K_0^*(800)$

See the review on "Scalar Mesons below 1 GeV."

Mass (T-Matrix Pole $\sqrt{s}$) = (630–730) $- i$ (260–340) MeV — NODE=M174TMP;DTYPE=M;OUR EST; → UNCHECKED ←

Mass (Breit-Wigner) = 838 ± 11 MeV — NODE=M174M;DTYPE=M

Full width (Breit-Wigner) = 463 ± 27 MeV — NODE=M174W;DTYPE=G

$K_0^*(700)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K\pi$	100 %	250	NODE=M174215;DESIG=1;OUR EVAL; → UNCHECKED ←

$K^*(892)$ $I(J^P) = \frac{1}{2}(1^-)$

NODE=M018

Mass (T-Matrix Pole $\sqrt{s}$) = (890 ± 14) $- i$ (26 ± 6) MeV — NODE=M018TMP;DTYPE=M;OUR EST; → UNCHECKED ←

$K^*(892)^\pm$ hadroproduced mass m = 891.67 ± 0.26 MeV — NODE=M018M1;DTYPE=M

$K^*(892)^\pm$ in τ decays mass m = 895.5 ± 0.8 MeV — NODE=M018MCT;DTYPE=M

$K^*(892)^0$ mass m = 895.55 ± 0.20 MeV (S = 1.7) — NODE=M018M2;DTYPE=M

$K^*(892)^\pm$ hadroproduced full width Γ = 51.4 ± 0.8 MeV — NODE=M018W1;DTYPE=G

$K^*(892)^\pm$ in τ decays full width Γ = 46.2 ± 1.3 MeV — NODE=M018W5;DTYPE=G

$K^*(892)^0$ full width Γ = 47.3 ± 0.5 MeV (S = 2.0) — NODE=M018W2;DTYPE=G

$K^*(892)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$K\pi$	$\sim$ 100 %		289	NODE=M018220;DESIG=1;OUR EVAL; → UNCHECKED ←
$K^0\gamma$	(2.46±0.21) $\times 10^{-3}$		307	DESIG=4
$K^\pm\gamma$	(9.8 ±0.9) $\times 10^{-4}$		309	DESIG=3
$K\pi\pi$	$<$ 7 $\times 10^{-4}$	95%	223	DESIG=2

$K_1(1270)$ $I(J^P) = \frac{1}{2}(1^+)$

NODE=M028

Mass m = 1253 ± 7 MeV (S = 2.2) — NODE=M028MX;DTYPE=M

Full width Γ = 90 ± 20 MeV [v] — NODE=M028WX;DTYPE=G;OUR EST; → UNCHECKED ←

$K_1(1270)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor	p (MeV/c)	
$K\rho$	(38 ±13) %	2.2	†	NODE=M028215;DESIG=2
$K_0^*(1430)\pi$	(28 ± 4) %		†	DESIG=7
$K^*(892)\pi$	(21 ±10) %	2.2	286	DESIG=1
$K\omega$	(11.0± 2.0) %		†	DESIG=5
$Kf_0(1370)$	(3.0± 2.0) %		†	DESIG=8
γK^0	seen		528	DESIG=9;OUR EST;→ UNCHECKED ←

$K_1(1400)$ $I(J^P) = \frac{1}{2}(1^+)$

NODE=M064

Mass m = 1403 ± 7 MeV — NODE=M064M;DTYPE=M

Full width Γ = 174 ± 13 MeV (S = 1.6) — NODE=M064W;DTYPE=G

$K_1(1400)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K^*(892)\pi$	(94 ±6) %	402	NODE=M064215;DESIG=1
$K\rho$	(3.0±3.0) %	293	DESIG=2
$Kf_0(1370)$	(2.0±2.0) %	†	DESIG=8
$K\omega$	(1.0±1.0) %	284	DESIG=5
$K_0^*(1430)\pi$	not seen	†	DESIG=7;OUR EST;→ UNCHECKED ←
γK^0	seen	613	DESIG=9;OUR EST;→ UNCHECKED ←
$K\phi$	seen	†	DESIG=10

$K^*(1410)$

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

NODE=M094

T-matrix pole $\sqrt{s} = (1368 \pm 38) - i\ (106^{+48}_{-59})$ MeV
Mass $m = 1414 \pm 15$ MeV (S = 1.3)
Full width $\Gamma = 232 \pm 21$ MeV (S = 1.1)

NODE=M094PP;DTYPE=p;OUR EST;→ UNCHECKED ←
NODE=M094M;DTYPE=M
NODE=M094W;DTYPE=G

$K^*(1410)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$K^*(892)\pi$	> 40 %	95%	410	NODE=M094215;DESIG=2
$K\pi$	(6.6±1.3) %		612	DESIG=1
$K\rho$	< 7 %	95%	306	DESIG=3;OUR EST;→ UNCHECKED ←
γK^0	< 2.3 $\times 10^{-4}$	90%	619	DESIG=4
$K\phi$	seen		†	DESIG=5

$K_0^*(1430)$

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

NODE=M019

T-matrix pole $\sqrt{s} = (1431 \pm 6) - i\ (110 \pm 19)$ MeV
Mass $m = 1425 \pm 50$ MeV [v]
Full width $\Gamma = 270 \pm 80$ MeV [v]

NODE=M019PP;DTYPE=p;OUR EST;→ UNCHECKED ←
NODE=M019M;DTYPE=M;OUR EST;→ UNCHECKED ←
NODE=M019W;DTYPE=G;OUR EST;→ UNCHECKED ←

$K_0^*(1430)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K\pi$	(93 ±10) %	619	NODE=M019215;DESIG=1
$K\eta$	(8.6$^{+\ 2.7}_{-\ 3.4}$) %	486	DESIG=2
$K\eta'(958)$	seen	†	DESIG=3

$K_2^*(1430)$

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

NODE=M022

T-matrix pole $\sqrt{s} = (1424 \pm 4) - i\ (66 \pm 2)$ MeV
$K_2^*(1430)^\pm$ mass $m = 1427.3 \pm 1.5$ MeV (S = 1.3)
$K_2^*(1430)^0$ mass $m = 1432.4 \pm 1.3$ MeV
$K_2^*(1430)^\pm$ full width $\Gamma = 100.0 \pm 2.2$ MeV (S = 1.1)
$K_2^*(1430)^0$ full width $\Gamma = 109 \pm 5$ MeV (S = 1.9)

NODE=M022PP;DTYPE=p;OUR EST;→ UNCHECKED ←
NODE=M022M1;DTYPE=M
NODE=M022M4;DTYPE=M
NODE=M022W1;DTYPE=G
NODE=M022W4;DTYPE=G

$K_2^*(1430)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
$K\pi$	(49.9±1.2) %		620	NODE=M022215;DESIG=1
$K^*(892)\pi$	(24.7±1.5) %		420	DESIG=2
$K^*(892)\pi\pi$	(13.4±2.2) %		373	DESIG=6
$K\rho$	(8.7±0.8) %	S=1.2	320	DESIG=3
$K\omega$	(2.9±0.8) %		313	DESIG=4
$K^+\gamma$	(2.4±0.5) $\times 10^{-3}$	S=1.1	628	DESIG=8
$K\eta$	(1.5$^{+3.4}_{-1.0}$) $\times 10^{-3}$	S=1.3	488	DESIG=5
$K\omega\pi$	< 7.2 $\times 10^{-4}$	CL=95%	106	DESIG=7
$K^0\gamma$	< 9 $\times 10^{-4}$	CL=90%	627	DESIG=10;OUR EVAL;→ UNCHECKED ←

$K(1460)$

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

NODE=M021

$K(1460)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K^*(892)\pi$	seen	–	NODE=M021215;DESIG=1;OUR EST; → UNCHECKED ←
$K\rho$	seen	–	DESIG=2;OUR EST;→ UNCHECKED ←
$K_0^*(1430)\pi$	seen	–	DESIG=3;OUR EST;→ UNCHECKED ←
$K\phi$	seen	–	DESIG=4

$K_1(1650)$ $I(J^P) = \frac{1}{2}(1^+)$

NODE=M099

Mass $m = 1650 \pm 50$ MeV
NODE=M099M;DTYPE=M
Full width $\Gamma = 150 \pm 50$ MeV
NODE=M099W;DTYPE=G

$K^*(1680)$ $I(J^P) = \frac{1}{2}(1^-)$

NODE=M095

Mass $m = 1718 \pm 18$ MeV
NODE=M095M;DTYPE=M
Full width $\Gamma = 320 \pm 110$ MeV (S = 4.2)
NODE=M095W;DTYPE=G

$K^*(1680)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K\pi$	(38.7±2.5) %	782	NODE=M095215;DESIG=1
$K\rho$	$(31.4^{+5.0}_{-2.1})$ %	571	DESIG=3
$K^*(892)\pi$	$(29.9^{+2.2}_{-5.0})$ %	618	DESIG=2
$K\phi$	seen	387	DESIG=4
$K\eta$	$(\ 1.4^{+1.0}_{-0.8})$ %	683	DESIG=6

$K_2(1770)$ [x] $I(J^P) = \frac{1}{2}(2^-)$

NODE=M023

ERROR=1

Mass $m = 1773 \pm 8$ MeV
NODE=M023M;DTYPE=M
Full width $\Gamma = 186 \pm 14$ MeV
NODE=M023W;DTYPE=G

$K_2(1770)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K\pi\pi$		794	NODE=M023215;DESIG=1;OUR EST; → UNCHECKED ←
$K_2^*(1430)\pi$	seen	287	DESIG=2;OUR EST;→ UNCHECKED ←
$K^*(892)\pi$	seen	654	DESIG=4;OUR EST;→ UNCHECKED ←
$Kf_2(1270)$	seen	53	DESIG=9;OUR EST;→ UNCHECKED ←
$Kf_0(980)$	possibly seen	466	DESIG=11;OUR EVAL;→ UNCHECKED ←
$K\phi$	seen	441	DESIG=10
$K\omega$	seen	607	DESIG=8

$K_3^*(1780)$ $I(J^P) = \frac{1}{2}(3^-)$

NODE=M060

T-matrix pole $\sqrt{s} = (1754 \pm 13) - i\ (119 \pm 14)$ MeV
NODE=M060PP;DTYPE=p;OUR EVAL; → UNCHECKED ←
Mass $m = 1779 \pm 8$ MeV (S = 1.2)
NODE=M060M;DTYPE=M
Full width $\Gamma = 161 \pm 17$ MeV (S = 1.1)
NODE=M060W;DTYPE=G

$K_3^*(1780)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$K\rho$	(31 ± 9) %		616	NODE=M060215;DESIG=3
$K^*(892)\pi$	(20 ± 5) %		657	DESIG=2
$K\pi$	(18.8± 1.0) %		815	DESIG=1
$K\eta$	(30 ±13) %		721	DESIG=6
$K_2^*(1430)\pi$	< 16 %	95%	292	DESIG=4

$K_2(1820)$ [x]

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

NODE=M146

ERROR=2

Mass $m = 1819 \pm 12$ MeV
NODE=M146M;DTYPE=M

Full width $\Gamma = 264 \pm 34$ MeV
NODE=M146W;DTYPE=G

$K_2(1820)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K\pi\pi$	seen	819	NODE=M146215;DESIG=5;OUR EVAL;
$K_2^*(1430)\pi$	seen	328	⇒ UNCHECKED ← DESIG=1;OUR EVAL;→ UNCHECKED ←
$K^*(892)\pi$	seen	683	DESIG=2;OUR EVAL;→ UNCHECKED ←
$Kf_2(1270)$	seen	191	DESIG=3;OUR EVAL;→ UNCHECKED ←
$K\omega$	seen	640	DESIG=6;OUR EVAL;→ UNCHECKED ←
$K\phi$	seen	483	DESIG=7

$K_0^*(1950)$

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

NODE=M134

Mass $m = 1957 \pm 14$ MeV
NODE=M134M;DTYPE=M

Full width $\Gamma = 170 \pm 50$ MeV (S = 2.2)
NODE=M134W;DTYPE=G

$K_0^*(1950)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K^-\pi^+$	(52±14) %	911	NODE=M134215;DESIG=1

$K_2^*(1980)$

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

NODE=M104

Mass $m = 1990^{+60}_{-50}$ MeV (S = 2.8)
NODE=M104M;DTYPE=M

Full width $\Gamma = 348^{+50}_{-30}$ MeV (S = 1.3)
NODE=M104W;DTYPE=G

$K_2^*(1980)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K^*(892)\pi$	possibly seen	791	NODE=M104215;DESIG=2
$K\rho$	possibly seen	762	DESIG=3
$Kf_2(1270)$	possibly seen	424	DESIG=4
$K\phi$	seen	627	DESIG=5
$K\eta$	seen	850	DESIG=6

$K_4^*(2045)$

$I(J^P) = \frac{1}{2}(4^+)$

NODE=M035

Mass $m = 2048^{+8}_{-9}$ MeV (S = 1.1)
NODE=M035M;DTYPE=M

Full width $\Gamma = 199^{+27}_{-19}$ MeV
NODE=M035W;DTYPE=G

$K_4^*(2045)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$K\pi$	(9.9±1.2) %	960	NODE=M035215;DESIG=1
$K^*(892)\pi\pi$	(9 ±5) %	804	DESIG=2
$K^*(892)\pi\pi\pi$	(7 ±5) %	770	DESIG=5
$\rho K\pi$	(5.7±3.2) %	744	DESIG=3
$\omega K\pi$	(5.0±3.0) %	740	DESIG=4
$\phi K\pi$	(2.8±1.4) %	597	DESIG=6
$\phi K^*(892)$	(1.4±0.7) %	368	DESIG=7

NOTES

[*a*] See the note in the $K^{\pm}$ Particle Listings. LINKAGE=KM

[*b*] Neglecting photon channels. See, *e.g.*, A. Pais and S.B. Treiman, Phys. Rev. **D12**, 2744 (1975). LINKAGE=CH

[*c*] The definition of the slope parameters of the $K \to 3\pi$ Dalitz plot is as follows (see also "Note on Dalitz Plot Parameters for $K \to 3\pi$ Decays" in the $K^{\pm}$ Particle Listings): LINKAGE=SY

$$|M|^2 = 1 + g(s_3 - s_0)/m^2_{\pi^+} + \cdots .$$

[*d*] See the review on "Form Factors for Radiative Pion and Kaon Decays" for definitions and details. LINKAGE=SWK

[*e*] For more details and definitions of parameters see the Particle Listings. LINKAGE=SXK

[*f*] See the $K^{\pm}$ Particle Listings for the energy limits used in this measurement. LINKAGE=KD+

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

[*h*] Structure-dependent part. LINKAGE=SH

[*i*] Direct-emission branching fraction. LINKAGE=SJ

[*j*] Derived from an analysis of neutrino-oscillation experiments. LINKAGE=CL

[*k*] Violates angular-momentum conservation. LINKAGE=AM

[*l*] Derived from measured values of ϕ_{+-}, ϕ_{00}, $|\eta|$, $|m_{K^0_L} - m_{K^0_S}|$, and $\tau_{K^0_S}$, as described in the introduction to "Tests of Conservation Laws." LINKAGE=CG

[*n*] The *CP*-violation parameters are defined as follows (see also "Note on *CP* Violation in $K_S \to 3\pi$" and "Note on *CP* Violation in K^0_L Decay" in the Particle Listings): LINKAGE=SZ

$$\eta_{+-} = |\eta_{+-}|e^{i\phi_{+-}} = \frac{A(K^0_L \to \pi^+\pi^-)}{A(K^0_S \to \pi^+\pi^-)} = \epsilon + \epsilon'$$

$$\eta_{00} = |\eta_{00}|e^{i\phi_{00}} = \frac{A(K^0_L \to \pi^0\pi^0)}{A(K^0_S \to \pi^0\pi^0)} = \epsilon - 2\epsilon'$$

$$\delta = \frac{\Gamma(K^0_L \to \pi^-\ell^+\nu) - \Gamma(K^0_L \to \pi^+\ell^-\nu)}{\Gamma(K^0_L \to \pi^-\ell^+\nu) + \Gamma(K^0_L \to \pi^+\ell^-\nu)} ,$$

$$\mathrm{Im}(\eta_{+-0})^2 = \frac{\Gamma(K^0_S \to \pi^+\pi^-\pi^0)^{CP \text{ viol.}}}{\Gamma(K^0_L \to \pi^+\pi^-\pi^0)} ,$$

$$\mathrm{Im}(\eta_{000})^2 = \frac{\Gamma(K^0_S \to \pi^0\pi^0\pi^0)}{\Gamma(K^0_L \to \pi^0\pi^0\pi^0)} .$$

where for the last two relations *CPT* is assumed valid, *i.e.*, $\mathrm{Re}(\eta_{+-0}) \simeq 0$ and $\mathrm{Re}(\eta_{000}) \simeq 0$.

[*o*] See the K^0_S Particle Listings for the energy limits used in this measurement. LINKAGE=KDS

[*p*] The value is for the sum of the charge states or particle/antiparticle states indicated. LINKAGE=SG

[*q*] $\mathrm{Re}(\epsilon'/\epsilon) = \epsilon'/\epsilon$ to a very good approximation provided the phases satisfy *CPT* invariance. LINKAGE=SAA

[*r*] This mode includes gammas from inner bremsstrahlung but not the direct emission mode $K^0_L \to \pi^+\pi^-\gamma$(DE). LINKAGE=IBR

[*s*] See the K^0_L Particle Listings for the energy limits used in this measurement. LINKAGE=KDL

[*t*] Allowed by higher-order electroweak interactions. LINKAGE=CE

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

[v] Our estimate. See the Particle Listings for details. LINKAGE=BH

[x] See our minireview under the $K_2(1770)$ in the 2004 edition of this *Review*. LINKAGE=MBD