Meson Full Listings

K_L^0

$\Gamma(\pi^+\pi^-)/[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^\pm\mu^\mp\nu)+\Gamma(\pi^\pm e^\mp\nu)]$ $\Gamma_{16}/(\Gamma_2+\Gamma_3+\Gamma_6)$

Violates CP conservation.

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
2.60 ±0.05 OUR FIT		Error includes scale factor of 1.1.			
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.60 ±0.07	4200	[27] MESSNER	73	ASPK	η_{+-} = 2.23 ± 0.05
1.93 ±0.26		[28] BASILE	66	OSPK	η_{+-} = 1.92 ± 0.13
1.993±0.080		[28] BOTT-...	66	OSPK	η_{+-} = 1.95 ± 0.04
2.08 ±0.35	54	[28] GALBRAITH	65	OSPK	η_{+-} = 1.99 ± 0.16
2.0 ±0.4	45	[28] CHRISTENS...	64	OSPK	η_{+-} = 1.95 ± 0.20

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

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

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

Violates CP conservation.

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.914±0.034 OUR FIT		Error includes scale factor of 1.8.			
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.5 ±0.8	189	[29] GAILLARD	69	OSPK	η_{00}=3.6 ± 0.6
1.2 $^{+1.5}_{-1.2}$	7	[30] CRIEGEE	66	OSPK	

[29] Latest result of this experiment given by FAISSNER 70 $\Gamma(\pi^0\pi^0)/\Gamma(3\pi^0)$.

[30] CRIEGEE 66 experiment not designed to measure $2\pi^0$ decay mode.

$\Gamma(\pi^0\pi^0)/\Gamma(3\pi^0)$ Γ_{17}/Γ_1

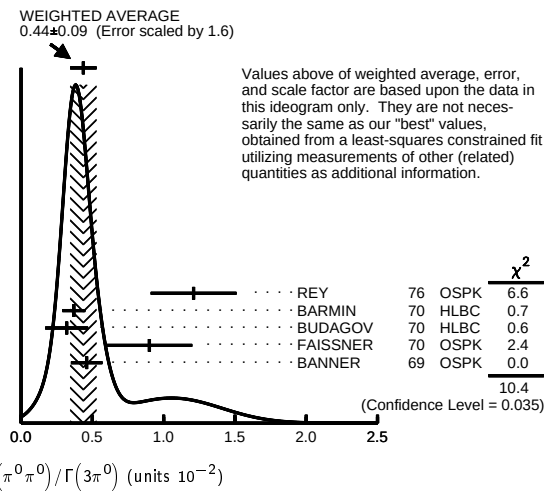
Violates CP conservation.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.422±0.023 OUR FIT		Error includes scale factor of 1.6.			
0.44 ±0.09 OUR AVERAGE		Error includes scale factor of 1.6. See the ideogram below.			
1.21 ±0.30	150	[31] REY	76	OSPK	η_{00}=3.8 ± 0.5
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
0.90 ±0.30	172	[32] FAISSNER	70	OSPK	η_{00}=3.2 ± 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. • • •					
1.31 ±0.31	133	[31] CENCE	69	OSPK	η_{00}=3.7 ± 0.5
1.89 ±0.31	109	[33] CRONIN	67	OSPK	η_{00}=4.9 ± 0.5
1.36 ±0.18		[33] CRONIN	67B	OSPK	η_{00}=3.92 ± 0.3

[31] CENCE 69 events are included in REY 76.

[32] FAISSNER 70 contains same $2\pi^0$ events as GAILLARD 69 $\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$.

[33] CRONIN 67B is further analysis of CRONIN 67, now both withdrawn.



$\Gamma(\pi^0\pi^0)/\Gamma(\pi^+\pi^-)$ Γ_{17}/Γ_{16}

Violates CP conservation.

VALUE	DOCUMENT ID		
0.451 ±0.015 OUR FIT	Error includes scale factor of 2.4.		
0.4539±0.0061	[34] ETAFIT	94	

[34] This ETAFIT value is computed from fitted values of $|\eta_{00}/\eta_{+-}|$ and the $\Gamma(K_S^0 \to \pi^+\pi^-)/\Gamma(K_S^0 \to \pi^0\pi^0)$ branching fraction. See the discussion in the "Note on CP violation in K_L^0 decay."

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

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_{18}/Γ_{16}

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

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
3.64±0.18 OUR AVERAGE						
3.9 ±0.3 ±0.1		178	[35] AKAGI	91B	SPEC	
3.45±0.18±0.13		368	[36] HEINSON	91	SPEC	
4.0 $^{+1.4}_{-0.9}$		15	SHOCHET	79	SPEC	
4.2 $^{+5.1}_{-2.6}$		3	[37] FUKUSHIMA	76	SPEC	
5.8 $^{+2.3}_{-1.5}$		9	[38] CARITHERS	73	SPEC	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
4.1 ±0.5		54	INAGAKI	89	SPEC	In AKAGI 91B
2.8 ±0.3 ±0.2		87	MATHIAZHA...	89B	SPEC	In HEINSON 91
< 1.53	90	0	[39] CLARK	71	SPEC	
< 18.	90	0	DARRIULAT	70	SPEC	
<140.	90	0	FOETH	69	SPEC	

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

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

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

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

[39] 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_{19}/Γ

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

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN
0.28±0.28		1	[40] CARROLL	80D	SPEC
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<7.81	90		[41] DONALDSON	74	SPEC

[40] Uses $K_L^0 \to \pi^+\pi^-\pi^0/(\text{all } K_L^0)$ decays = 0.1239.

[41] Uses $K_L^0 \to \pi^+\pi^-\pi^0/(\text{all } K_L^0)$ decays = 0.126.

$\Gamma(e^+e^-)/\Gamma_{\text{total}}$ Γ_{20}/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
< 0.41	90	0	[42] ARISAKA	93B	SPEC	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 1.6	90	1	AKAGI	91	SPEC	
< 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		[43] CLARK	71	ASPK	
<1500	90	0	FOETH	69	ASPK	

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

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

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

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. • • •				
< 23.0	90	BOTT-...	67	OSPK
< 200.0	90	ALFF-...	66B	OSPK
<1000.0		ANIKINA	65	CC

$\Gamma(e^+e^-\gamma)/\Gamma_{\text{total}}$ Γ_{21}/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±0.4 $^{+0.6}_{-0.5}$		919	OHL	90B	B845
• • • We do not use the following data for averages, fits, limits, etc. • • •					
17.4±8.7		4	[44] CARROLL	80D	SPEC
<27	90	0	[45] BARMIN	72	HLBC

[44] Uses $K_L^0 \to \pi^+\pi^-\pi^0/(\text{all } K_L^0)$ decays = 0.1239.

[45] Uses $K_L^0 \to 3\pi^0/\text{total} = 0.214$.