Review of Particle Physics: C. Caso *et al.* (Particle Data Group), European Physical Journal **C3**, 1 (1998)

D^0

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

D^0 MASS

The fit includes $D^{\pm}$, D^0, $D_s^{\pm}$, $D^{*\pm}$, D^{*0}, and $D_s^{*\pm}$ mass and mass difference measurements.

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1864.6± 0.5 OUR FIT	Error includes scale factor of 1.1.				
1864.1± 1.0 OUR AVERAGE					
1864.6± 0.3±1.0	641	BARLAG	90C	ACCM	π^- Cu 230 GeV
1852 ± 7	16	ADAMOVICH	87	EMUL	Photoproduction
1861 ± 4		DERRICK	84	HRS	e^+e^- 29 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1856 ±36	22	ADAMOVICH	84B	EMUL	Photoproduction
1847 ± 7	1	FIORINO	81	EMUL	$\gamma N \rightarrow \overline{D}^0 +$
1863.8± 0.5		[1] SCHINDLER	81	MRK2	e^+e^- 3.77 GeV
1864.7± 0.6		[1] TRILLING	81	RVUE	e^+e^- 3.77 GeV
1863.0± 2.5	238	ASTON	80E	OMEG	$\gamma p \rightarrow \overline{D}^0$
1860 ± 2	143	[2] AVERY	80	SPEC	$\gamma N \rightarrow D^{*+}$
1869 ± 4	35	[2] AVERY	80	SPEC	$\gamma N \rightarrow D^{*+}$
1854 ± 6	94	[2] ATIYA	79	SPEC	$\gamma N \rightarrow D^0\overline{D}^0$
1850 ±15	64	BALTAY	78C	HBC	$\nu N \rightarrow K^0\pi\pi$
1863 ± 3		GOLDHABER	77	MRK1	D^0, D^+ recoil spectra
1863.3± 0.9		[1] PERUZZI	77	MRK1	e^+e^- 3.77 GeV
1868 ±11		PICCOLO	77	MRK1	e^+e^- 4.03, 4.41 GeV
1865 ±15	234	GOLDHABER	76	MRK1	$K\pi$ and $K3\pi$

[1] PERUZZI 77 and SCHINDLER 81 errors do not include the 0.13% uncertainty in the absolute SPEAR energy calibration. TRILLING 81 uses the high precision $J/\psi(1S)$ and $\psi(2S)$ measurements of ZHOLENTZ 80 to determine this uncertainty and combines the PERUZZI 77 and SCHINDLER 81 results to obtain the value quoted. TRILLING 81 enters the fit in the $D^{\pm}$ mass, and PERUZZI 77 and SCHINDLER 81 enter in the $m_{D^{\pm}} - m_{D^0}$, below.

[2] Error does not include possible systematic mass scale shift, estimated to be less than 5 MeV.

$m_{D^{\pm}} - m_{D^0}$

The fit includes $D^{\pm}$, D^0, $D_s^{\pm}$, $D^{*\pm}$, D^{*0}, and $D_s^{*\pm}$ mass and mass difference measurements.

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
4.76±0.10 OUR FIT	Error includes scale factor of 1.1.			
4.74±0.28 OUR AVERAGE				
4.7 ±0.3	[3] SCHINDLER	81	MRK2	e^+e^- 3.77 GeV
5.0 ±0.8	[3] PERUZZI	77	MRK1	e^+e^- 3.77 GeV

[3] See the footnote on TRILLING 81 in the D^0 and $D^{\pm}$ sections on the mass.

D^0 MEAN LIFE

Measurements with an error $> 0.05 \times 10^{-12}$ s are omitted from the average, and those with an error $> 0.1 \times 10^{-12}$ s or that have been superseded by later results have been removed from the Listings.

VALUE (10^{-12} s)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
0.415±0.004 OUR AVERAGE				
0.413±0.004±0.003	16k	FRABETTI 94D	E687	$K^-\pi^+$, $K^-\pi^+\pi^+\pi^-$
0.424±0.011±0.007	5118	FRABETTI 91	E687	$K^-\pi^+$, $K^-\pi^+\pi^+\pi^-$
0.417±0.018±0.015	890	ALVAREZ 90	NA14	$K^-\pi^+$, $K^-\pi^+\pi^+\pi^-$
$0.388^{+0.023}_{-0.021}$	641	[4] BARLAG 90C	ACCM	π^- Cu 230 GeV
0.48 ±0.04 ±0.03	776	ALBRECHT 88I	ARG	e^+e^- 10 GeV
0.422±0.008±0.010	4212	RAAB 88	E691	Photoproduction
0.42 ±0.05	90	BARLAG 87B	ACCM	K^- and π^- 200 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.34\ ^{+0.06}_{-0.05}$ ±0.03	58	AMENDOLIA 88	SPEC	Photoproduction
$0.46\ ^{+0.06}_{-0.05}$	145	AGUILAR-... 87D	HYBR	$\pi^- p$ and pp
0.50 ±0.07 ±0.04	317	CSORNA 87	CLEO	e^+e^- 10 GeV
0.61 ±0.09 ±0.03	50	ABE 86	HYBR	γp 20 GeV
$0.47\ ^{+0.09}_{-0.08}$ ±0.05	74	GLADNEY 86	MRK2	e^+e^- 29 GeV
$0.43\ ^{+0.07}_{-0.05}\ ^{+0.01}_{-0.02}$	58	USHIDA 86B	EMUL	ν wideband
$0.37\ ^{+0.10}_{-0.07}$	26	BAILEY 85	SILI	π^- Be 200 GeV

[4] BARLAG 90C estimate systematic error to be negligible.

$\left|m_{D^0_1} - m_{D^0_2}\right|$

The D^0_1 and D^0_2 are the mass eigenstates of the D^0 meson. To calculate the following limits, we use $\Delta m = [2r/(1-r)]^{1/2}\hbar/4.15 \times 10^{-13}$ s, where r is the experimental D^0-$\overline{D}^0$ mixing ratio.

VALUE (10^{10} $\hbar$ s^{-1})	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
<24	90	[5] AITALA 96C	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<32	90	[6,7] AITALA 98	E791	π^- nucleus, 500 GeV
<21	90	[7,8] ANJOS 88C	E691	Photoproduction

[5] This limit is inferred from the D^0-$\overline{D}^0$ mixing ratio $\Gamma(K^+\ell^-\overline{\nu}_\ell(\text{via } \overline{D}^0))/\Gamma(K^-\ell^+\nu_\ell)$ given near the end of the D^0 Listings.

[6] AITALA 98 allows interference between the doubly Cabibbo-suppressed and mixing amplitudes, and also allows *CP* violation in this term.

[7] This limit is inferred from the D^0-$\overline{D}^0$ mixing ratio $\Gamma(K^+\pi^-$ or $K^+\pi^-\pi^+\pi^-$ (via $\overline{D}^0))/\Gamma(K^-\pi^+$ or $K^-\pi^+\pi^+\pi^-)$ near the end of the D^0 Listings. Decay-time information is used to distinguish doubly Cabibbo-suppressed decays from D^0-$\overline{D}^0$ mixing.

[8] ANJOS 88C assumes no interference between doubly Cabibbo-suppressed and mixing amplitudes. When interference is allowed, the limit degrades by about a factor of two.

$\left|\Gamma_{D^0_1} - \Gamma_{D^0_2}\right|/\Gamma_{D^0}$ MEAN LIFE DIFFERENCE/AVERAGE

The D^0_1 and D^0_2 are the mass eigenstates of the D^0 meson. To calculate the following limits, we use $\Delta\Gamma/\Gamma = [8r/(1+r)]^{1/2}$, where r is the experimental D^0-$\overline{D}{}^0$ mixing ratio.

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
<0.20	90	[9] AITALA 96C	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.26	90	[10,11] AITALA 98	E791	π^- nucleus, 500 GeV
<0.17	90	[11,12] ANJOS 88C	E691	Photoproduction

[9] This limit is inferred from the D^0-$\overline{D}{}^0$ mixing ratio $\Gamma(K^+\ell^-\overline{\nu}_\ell(\text{via }\overline{D}{}^0))/\Gamma(K^-\ell^+\nu_\ell)$ given near the end of the D^0 Listings.

[10] AITALA 98 allows interference between the doubly Cabibbo-suppressed and mixing amplitudes, and also allows *CP* violation in this term.

[11] This limit is inferred from the D^0-$\overline{D}{}^0$ mixing ratio $\Gamma(K^+\pi^-\text{ or }K^+\pi^-\pi^+\pi^-(\text{via }\overline{D}{}^0))/\Gamma(K^-\pi^+\text{ or }K^-\pi^+\pi^+\pi^-)$ near the end of the D^0 Listings. Decay-time information is used to distinguish doubly Cabibbo-suppressed decays from D^0-$\overline{D}{}^0$ mixing.

[12] ANJOS 88C assumes no interference between doubly Cabibbo-suppressed and mixing amplitudes. When interference is allowed, the limit degrades by about a factor of two.

D^0 DECAY MODES

$\overline{D}{}^0$ modes are charge conjugates of the modes below.

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
	Inclusive modes		
Γ_1	e^+ anything	(6.75±0.29) %	
Γ_2	μ^+ anything	(6.6 ±0.8) %	
Γ_3	K^- anything	(53 ±4) %	S=1.3
Γ_4	$\overline{K}{}^0$ anything + K^0 anything	(42 ±5) %	
Γ_5	K^+ anything	($3.4^{+0.6}_{-0.4}$) %	
Γ_6	η anything	[a] < 13 %	CL=90%
	Semileptonic modes		
Γ_7	$K^-\ell^+\nu_\ell$	[b] (3.50±0.17) %	S=1.3
Γ_8	$K^-e^+\nu_e$	(3.66±0.18) %	
Γ_9	$K^-\mu^+\nu_\mu$	(3.23±0.17) %	
Γ_{10}	$K^-\pi^0e^+\nu_e$	($1.6^{+1.3}_{-0.5}$) %	
Γ_{11}	$\overline{K}{}^0\pi^-e^+\nu_e$	($2.8^{+1.7}_{-0.9}$) %	

Γ_{12}	$\overline{K}^*(892)^- e^+ \nu_e$ $\times$ B$(K^{*-} \to \overline{K}^0 \pi^-)$		(1.35 ± 0.22) %	
Γ_{13}	$K^*(892)^- \ell^+ \nu_\ell$		—	
Γ_{14}	$\overline{K}^*(892)^0 \pi^- e^+ \nu_e$		—	
Γ_{15}	$K^- \pi^+ \pi^- \mu^+ \nu_\mu$		$< 1.2 \times 10^{-3}$	CL=90%
Γ_{16}	$(\overline{K}^*(892)\pi)^- \mu^+ \nu_\mu$		$< 1.4 \times 10^{-3}$	CL=90%
Γ_{17}	$\pi^- e^+ \nu_e$		$(3.7 \pm 0.6) \times 10^{-3}$	

A fraction of the following resonance mode has already appeared above as a submode of a charged-particle mode.

Γ_{18}	$K^*(892)^- e^+ \nu_e$		(2.02 ± 0.33) %	

Hadronic modes with a $\overline{K}$ or $\overline{K}K\overline{K}$

Γ_{19}	$K^- \pi^+$		(3.85 ± 0.09) %	
Γ_{20}	$\overline{K}^0 \pi^0$		(2.12 ± 0.21) %	S=1.1
Γ_{21}	$\overline{K}^0 \pi^+ \pi^-$	[c]	(5.4 ± 0.4) %	S=1.2
Γ_{22}	$\overline{K}^0 \rho^0$		(1.21 ± 0.17) %	
Γ_{23}	$\overline{K}^0 f_0(980)$ $\times$ B$(f_0 \to \pi^+ \pi^-)$		$(3.0 \pm 0.8) \times 10^{-3}$	
Γ_{24}	$\overline{K}^0 f_2(1270)$ $\times$ B$(f_2 \to \pi^+ \pi^-)$		$(2.4 \pm 0.9) \times 10^{-3}$	
Γ_{25}	$\overline{K}^0 f_0(1370)$ $\times$ B$(f_0 \to \pi^+ \pi^-)$		$(4.3 \pm 1.3) \times 10^{-3}$	
Γ_{26}	$K^*(892)^- \pi^+$ $\times$ B$(K^{*-} \to \overline{K}^0 \pi^-)$		(3.4 ± 0.3) %	
Γ_{27}	$K_0^*(1430)^- \pi^+$ $\times$ B$(K_0^*(1430)^- \to \overline{K}^0 \pi^-)$		$(6.4 \pm 1.6) \times 10^{-3}$	
Γ_{28}	$\overline{K}^0 \pi^+ \pi^-$ nonresonant		(1.47 ± 0.24) %	
Γ_{29}	$K^- \pi^+ \pi^0$	[c]	(13.9 ± 0.9) %	S=1.3
Γ_{30}	$K^- \rho^+$		(10.8 ± 1.0) %	
Γ_{31}	$K^*(892)^- \pi^+$ $\times$ B$(K^{*-} \to K^- \pi^0)$		(1.7 ± 0.2) %	
Γ_{32}	$\overline{K}^*(892)^0 \pi^0$ $\times$ B$(\overline{K}^{*0} \to K^- \pi^+)$		(2.1 ± 0.3) %	
Γ_{33}	$K^- \pi^+ \pi^0$ nonresonant		$(6.9 \pm 2.5) \times 10^{-3}$	
Γ_{34}	$\overline{K}^0 \pi^0 \pi^0$		—	
Γ_{35}	$\overline{K}^*(892)^0 \pi^0$ $\times$ B$(\overline{K}^{*0} \to \overline{K}^0 \pi^0)$		(1.1 ± 0.2) %	
Γ_{36}	$\overline{K}^0 \pi^0 \pi^0$ nonresonant		$(7.9 \pm 2.1) \times 10^{-3}$	
Γ_{37}	$K^- \pi^+ \pi^+ \pi^-$	[c]	(7.6 ± 0.4) %	S=1.1
Γ_{38}	$K^- \pi^+ \rho^0$ total		(6.3 ± 0.4) %	
Γ_{39}	$K^- \pi^+ \rho^0$ 3-body		$(4.8 \pm 2.1) \times 10^{-3}$	
Γ_{40}	$\overline{K}^*(892)^0 \rho^0$ $\times$ B$(\overline{K}^{*0} \to K^- \pi^+)$		$(9.8 \pm 2.2) \times 10^{-3}$	

Γ_{41}	$K^- a_1(1260)^+ \times \mathrm{B}(a_1(1260)^+ \to \pi^+\pi^+\pi^-)$		$(3.6 \pm 0.6)\,\%$
Γ_{42}	$\overline{K}^*(892)^0 \pi^+\pi^-$ total $\times \mathrm{B}(\overline{K}^{*0} \to K^-\pi^+)$		$(1.5 \pm 0.4)\,\%$
Γ_{43}	$\overline{K}^*(892)^0 \pi^+\pi^-$ 3-body $\times \mathrm{B}(\overline{K}^{*0} \to K^-\pi^+)$		$(9.5 \pm 2.1) \times 10^{-3}$
Γ_{44}	$K_1(1270)^- \pi^+ \times \mathrm{B}(K_1(1270)^- \to K^-\pi^+\pi^-)$	[*d*]	$(3.6 \pm 1.0) \times 10^{-3}$
Γ_{45}	$K^-\pi^+\pi^+\pi^-$ nonresonant		$(1.76 \pm 0.25)\,\%$
Γ_{46}	$\overline{K}^0 \pi^+\pi^-\pi^0$	[*c*]	$(10.0 \pm 1.2)\,\%$
Γ_{47}	$\overline{K}^0 \eta \times \mathrm{B}(\eta \to \pi^+\pi^-\pi^0)$		$(1.6 \pm 0.3) \times 10^{-3}$
Γ_{48}	$\overline{K}^0 \omega \times \mathrm{B}(\omega \to \pi^+\pi^-\pi^0)$		$(1.9 \pm 0.4)\,\%$
Γ_{49}	$K^*(892)^- \rho^+ \times \mathrm{B}(K^{*-} \to \overline{K}^0\pi^-)$		$(4.1 \pm 1.6)\,\%$
Γ_{50}	$\overline{K}^*(892)^0 \rho^0 \times \mathrm{B}(\overline{K}^{*0} \to \overline{K}^0\pi^0)$		$(4.9 \pm 1.1) \times 10^{-3}$
Γ_{51}	$K_1(1270)^- \pi^+ \times \mathrm{B}(K_1(1270)^- \to \overline{K}^0\pi^-\pi^0)$	[*d*]	$(5.1 \pm 1.4) \times 10^{-3}$
Γ_{52}	$\overline{K}^*(892)^0 \pi^+\pi^-$ 3-body $\times \mathrm{B}(\overline{K}^{*0} \to \overline{K}^0\pi^0)$		$(4.8 \pm 1.1) \times 10^{-3}$
Γ_{53}	$\overline{K}^0 \pi^+\pi^-\pi^0$ nonresonant		$(2.1 \pm 2.1)\,\%$
Γ_{54}	$K^-\pi^+\pi^0\pi^0$		$(15 \pm 5)\,\%$
Γ_{55}	$K^-\pi^+\pi^+\pi^-\pi^0$		$(4.1 \pm 0.4)\,\%$
Γ_{56}	$\overline{K}^*(892)^0 \pi^+\pi^-\pi^0 \times \mathrm{B}(\overline{K}^{*0} \to K^-\pi^+)$		$(1.2 \pm 0.6)\,\%$
Γ_{57}	$\overline{K}^*(892)^0 \eta \times \mathrm{B}(\overline{K}^{*0} \to K^-\pi^+) \times \mathrm{B}(\eta \to \pi^+\pi^-\pi^0)$		$(2.9 \pm 0.8) \times 10^{-3}$
Γ_{58}	$K^-\pi^+\omega \times \mathrm{B}(\omega \to \pi^+\pi^-\pi^0)$		$(2.7 \pm 0.5)\,\%$
Γ_{59}	$\overline{K}^*(892)^0 \omega \times \mathrm{B}(\overline{K}^{*0} \to K^-\pi^+) \times \mathrm{B}(\omega \to \pi^+\pi^-\pi^0)$		$(7 \pm 3) \times 10^{-3}$
Γ_{60}	$\overline{K}^0 \pi^+\pi^+\pi^-\pi^-$		$(5.8 \pm 1.6) \times 10^{-3}$
Γ_{61}	$\overline{K}^0 \pi^+\pi^-\pi^0\pi^0(\pi^0)$		$(10.6\ ^{+7.3}_{-3.0})\,\%$
Γ_{62}	$\overline{K}^0 K^+K^-$		$(9.4 \pm 1.0) \times 10^{-3}$
	In the fit as $\frac{1}{2}\Gamma_{74} + \Gamma_{64}$, where $\frac{1}{2}\Gamma_{74} = \Gamma_{63}$.		
Γ_{63}	$\overline{K}^0 \phi \times \mathrm{B}(\phi \to K^+K^-)$		$(4.3 \pm 0.5) \times 10^{-3}$
Γ_{64}	$\overline{K}^0 K^+K^-$ non-ϕ		$(5.1 \pm 0.8) \times 10^{-3}$
Γ_{65}	$K^0_S K^0_S K^0_S$		$(8.4 \pm 1.5) \times 10^{-4}$
Γ_{66}	$K^+K^-K^-\pi^+$		$(2.1 \pm 0.5) \times 10^{-4}$
Γ_{67}	$K^+K^-\overline{K}^0\pi^0$		$(7.2\ ^{+4.8}_{-3.5}) \times 10^{-3}$

Fractions of many of the following modes with resonances have already appeared above as submodes of particular charged-particle modes. (Modes for which there are only upper limits and $\overline{K}^*(892)\rho$ submodes only appear below.)

Γ_{68}	$\overline{K}^0\eta$		$(7.1 \pm 1.0) \times 10^{-3}$	
Γ_{69}	$\overline{K}^0\rho^0$		(1.21 ± 0.17) %	
Γ_{70}	$K^-\rho^+$		(10.8 ± 1.0) %	S=1.2
Γ_{71}	$\overline{K}^0\omega$		(2.1 ± 0.4) %	
Γ_{72}	$\overline{K}^0\eta'(958)$		(1.72 ± 0.26) %	
Γ_{73}	$\overline{K}^0 f_0(980)$		$(5.7 \pm 1.6) \times 10^{-3}$	
Γ_{74}	$\overline{K}^0\phi$		$(8.6 \pm 1.0) \times 10^{-3}$	
Γ_{75}	$K^- a_1(1260)^+$		(7.3 ± 1.1) %	
Γ_{76}	$\overline{K}^0 a_1(1260)^0$		< 1.9 %	CL=90%
Γ_{77}	$\overline{K}^0 f_2(1270)$		$(4.2 \pm 1.5) \times 10^{-3}$	
Γ_{78}	$K^- a_2(1320)^+$		$< 2 \times 10^{-3}$	CL=90%
Γ_{79}	$\overline{K}^0 f_0(1370)$		$(7.0 \pm 2.1) \times 10^{-3}$	
Γ_{80}	$K^*(892)^-\pi^+$		(5.1 ± 0.4) %	S=1.2
Γ_{81}	$\overline{K}^*(892)^0\pi^0$		(3.2 ± 0.4) %	
Γ_{82}	$\overline{K}^*(892)^0\pi^+\pi^-$ total		(2.3 ± 0.5) %	
Γ_{83}	$\overline{K}^*(892)^0\pi^+\pi^-$ 3-body		(1.43 ± 0.32) %	
Γ_{84}	$K^-\pi^+\rho^0$ total		(6.3 ± 0.4) %	
Γ_{85}	$K^-\pi^+\rho^0$ 3-body		$(4.8 \pm 2.1) \times 10^{-3}$	
Γ_{86}	$\overline{K}^*(892)^0\rho^0$		(1.47 ± 0.33) %	
Γ_{87}	$\overline{K}^*(892)^0\rho^0$ transverse		(1.5 ± 0.5) %	
Γ_{88}	$\overline{K}^*(892)^0\rho^0$ *S*-wave		(2.8 ± 0.6) %	
Γ_{89}	$\overline{K}^*(892)^0\rho^0$ *S*-wave long.		$< 3 \times 10^{-3}$	CL=90%
Γ_{90}	$\overline{K}^*(892)^0\rho^0$ *P*-wave		$< 3 \times 10^{-3}$	CL=90%
Γ_{91}	$\overline{K}^*(892)^0\rho^0$ *D*-wave		(1.9 ± 0.6) %	
Γ_{92}	$K^*(892)^-\rho^+$		(6.1 ± 2.4) %	
Γ_{93}	$K^*(892)^-\rho^+$ longitudinal		(2.9 ± 1.2) %	
Γ_{94}	$K^*(892)^-\rho^+$ transverse		(3.2 ± 1.8) %	
Γ_{95}	$K^*(892)^-\rho^+$ *P*-wave		< 1.5 %	CL=90%
Γ_{96}	$K^-\pi^+ f_0(980)$		< 1.1 %	CL=90%
Γ_{97}	$\overline{K}^*(892)^0 f_0(980)$		$< 7 \times 10^{-3}$	CL=90%
Γ_{98}	$K_1(1270)^-\pi^+$	[*d*]	(1.06 ± 0.29) %	
Γ_{99}	$K_1(1400)^-\pi^+$		< 1.2 %	CL=90%
Γ_{100}	$\overline{K}_1(1400)^0\pi^0$		< 3.7 %	CL=90%
Γ_{101}	$K^*(1410)^-\pi^+$		< 1.2 %	CL=90%
Γ_{102}	$K_0^*(1430)^-\pi^+$		(1.04 ± 0.26) %	
Γ_{103}	$K_2^*(1430)^-\pi^+$		$< 8 \times 10^{-3}$	CL=90%
Γ_{104}	$\overline{K}_2^*(1430)^0\pi^0$		$< 4 \times 10^{-3}$	CL=90%
Γ_{105}	$\overline{K}^*(892)^0\pi^+\pi^-\pi^0$		(1.8 ± 0.9) %	

Γ_{106}	$\overline{K}^*(892)^0\eta$		(1.9 ± 0.5) %	
Γ_{107}	$K^-\pi^+\omega$		(3.0 ± 0.6) %	
Γ_{108}	$\overline{K}^*(892)^0\omega$		(1.1 ± 0.5) %	
Γ_{109}	$K^-\pi^+\eta'(958)$		$(7.0 \pm 1.8) \times 10^{-3}$	
Γ_{110}	$\overline{K}^*(892)^0\eta'(958)$		$< 1.1 \times 10^{-3}$	CL=90%

Pionic modes

Γ_{111}	$\pi^+\pi^-$		$(1.53 \pm 0.09) \times 10^{-3}$	
Γ_{112}	$\pi^0\pi^0$		$(8.5 \pm 2.2) \times 10^{-4}$	
Γ_{113}	$\pi^+\pi^-\pi^0$		(1.6 ± 1.1) %	S=2.7
Γ_{114}	$\pi^+\pi^+\pi^-\pi^-$		$(7.4 \pm 0.6) \times 10^{-3}$	
Γ_{115}	$\pi^+\pi^+\pi^-\pi^-\pi^0$		(1.9 ± 0.4) %	
Γ_{116}	$\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-$		$(4.0 \pm 3.0) \times 10^{-4}$	

Hadronic modes with a $K\overline{K}$ pair

Γ_{117}	K^+K^-		$(4.27 \pm 0.16) \times 10^{-3}$	
Γ_{118}	$K^0\overline{K}^0$		$(6.5 \pm 1.8) \times 10^{-4}$	S=1.2
Γ_{119}	$K^0K^-\pi^+$		$(6.4 \pm 1.0) \times 10^{-3}$	S=1.1
Γ_{120}	$\overline{K}^*(892)^0K^0$ $\times$ B($\overline{K}^{*0} \to K^-\pi^+$)		$< 1.1 \times 10^{-3}$	CL=90%
Γ_{121}	$K^*(892)^+K^-$ $\times$ B($K^{*+} \to K^0\pi^+$)		$(2.3 \pm 0.5) \times 10^{-3}$	
Γ_{122}	$K^0K^-\pi^+$ nonresonant		$(2.3 \pm 2.3) \times 10^{-3}$	
Γ_{123}	$\overline{K}^0K^+\pi^-$		$(5.0 \pm 1.0) \times 10^{-3}$	
Γ_{124}	$K^*(892)^0\overline{K}^0$ $\times$ B($K^{*0} \to K^+\pi^-$)		$< 5 \times 10^{-4}$	CL=90%
Γ_{125}	$K^*(892)^-K^+$ $\times$ B($K^{*-} \to \overline{K}^0\pi^-$)		$(1.2 \pm 0.7) \times 10^{-3}$	
Γ_{126}	$\overline{K}^0K^+\pi^-$ nonresonant		$(3.9\ ^{+2.3}_{-1.9}) \times 10^{-3}$	
Γ_{127}	$K^+K^-\pi^0$		$(1.3 \pm 0.4) \times 10^{-3}$	
Γ_{128}	$K^0_SK^0_S\pi^0$		$< 5.9 \times 10^{-4}$	
Γ_{129}	$K^+K^-\pi^+\pi^-$	[e]	$(2.52 \pm 0.24) \times 10^{-3}$	
Γ_{130}	$\phi\pi^+\pi^- \times$ B($\phi \to K^+K^-$)		$(5.3 \pm 1.4) \times 10^{-4}$	
Γ_{131}	$\phi\rho^0 \times$ B($\phi \to K^+K^-$)		$(3.0 \pm 1.6) \times 10^{-4}$	
Γ_{132}	$K^+K^-\rho^0$ 3-body		$(9.1 \pm 2.3) \times 10^{-4}$	
Γ_{133}	$K^*(892)^0K^-\pi^+$+c.c. $\times$ B($K^{*0} \to K^+\pi^-$)	[f]	$< 5 \times 10^{-4}$	
Γ_{134}	$K^*(892)^0\overline{K}^*(892)^0$ $\times$ B^2($K^{*0} \to K^+\pi^-$)		$(6 \pm 2) \times 10^{-4}$	
Γ_{135}	$K^+K^-\pi^+\pi^-$ non-ϕ		—	
Γ_{136}	$K^+K^-\pi^+\pi^-$ nonresonant		$< 8 \times 10^{-4}$	CL=90%
Γ_{137}	$K^0\overline{K}^0\pi^+\pi^-$		$(6.9 \pm 2.7) \times 10^{-3}$	
Γ_{138}	$K^+K^-\pi^+\pi^-\pi^0$		$(3.1 \pm 2.0) \times 10^{-3}$	

Fractions of most of the following modes with resonances have already appeared above as submodes of particular charged-particle modes.

Γ_{139}	$\overline{K}^*(892)^0 K^0$		$< 1.6 \times 10^{-3}$	CL=90%
Γ_{140}	$K^*(892)^+ K^-$		$(3.5 \pm 0.8) \times 10^{-3}$	
Γ_{141}	$K^*(892)^0 \overline{K}^0$		$< 8 \times 10^{-4}$	CL=90%
Γ_{142}	$K^*(892)^- K^+$		$(1.8 \pm 1.0) \times 10^{-3}$	
Γ_{143}	$\phi\pi^0$		$< 1.4 \times 10^{-3}$	CL=90%
Γ_{144}	$\phi\eta$		$< 2.8 \times 10^{-3}$	CL=90%
Γ_{145}	$\phi\omega$		$< 2.1 \times 10^{-3}$	CL=90%
Γ_{146}	$\phi\pi^+\pi^-$		$(1.08 \pm 0.29) \times 10^{-3}$	
Γ_{147}	$\phi\rho^0$		$(6 \pm 3) \times 10^{-4}$	
Γ_{148}	$\phi\pi^+\pi^-$ 3-body		$(7 \pm 5) \times 10^{-4}$	
Γ_{149}	$K^*(892)^0 K^-\pi^+ +$ c.c.	[f]	$< 8 \times 10^{-4}$	CL=90%
Γ_{150}	$K^*(892)^0 K^-\pi^+$			
Γ_{151}	$\overline{K}^*(892)^0 K^+\pi^-$			
Γ_{152}	$K^*(892)^0 \overline{K}^*(892)^0$		$(1.4 \pm 0.5) \times 10^{-3}$	

Doubly Cabibbo suppressed (*DC*) modes, $\Delta C = 2$ forbidden via mixing (*C2M*) modes, $\Delta C = 1$ weak neutral current (*C1*) modes, or Lepton Family number (*LF*) violating modes

Γ_{153}	$K^+\ell^-\overline{\nu}_\ell$(via $\overline{D}^0$)	*C2M*	$< 1.7 \times 10^{-4}$	CL=90%
Γ_{154}	$K^+\pi^-$ or $K^+\pi^-\pi^+\pi^-$ (via $\overline{D}^0$)	*C2M*	$< 1.0 \times 10^{-3}$	CL=90%
Γ_{155}	$K^+\pi^-$	*DC*	$(2.8 \pm 0.9) \times 10^{-4}$	
Γ_{156}	$K^+\pi^-$ (via $\overline{D}^0$)		$< 1.9 \times 10^{-4}$	CL=90%
Γ_{157}	$K^+\pi^-\pi^+\pi^-$	*DC*	$(1.9 \pm 2.7) \times 10^{-4}$	
Γ_{158}	$K^+\pi^-\pi^+\pi^-$ (via $\overline{D}^0$)		$< 4 \times 10^{-4}$	CL=90%
Γ_{159}	μ^- anything (via $\overline{D}^0$)		$< 4 \times 10^{-4}$	CL=90%
Γ_{160}	e^+e^-	*C1*	$< 1.3 \times 10^{-5}$	CL=90%
Γ_{161}	$\mu^+\mu^-$	*C1*	$< 4.1 \times 10^{-6}$	CL=90%
Γ_{162}	$\pi^0 e^+e^-$	*C1*	$< 4.5 \times 10^{-5}$	CL=90%
Γ_{163}	$\pi^0 \mu^+\mu^-$	*C1*	$< 1.8 \times 10^{-4}$	CL=90%
Γ_{164}	ηe^+e^-	*C1*	$< 1.1 \times 10^{-4}$	CL=90%
Γ_{165}	$\eta \mu^+\mu^-$	*C1*	$< 5.3 \times 10^{-4}$	CL=90%
Γ_{166}	$\rho^0 e^+e^-$	*C1*	$< 1.0 \times 10^{-4}$	CL=90%
Γ_{167}	$\rho^0 \mu^+\mu^-$	*C1*	$< 2.3 \times 10^{-4}$	CL=90%
Γ_{168}	ωe^+e^-	*C1*	$< 1.8 \times 10^{-4}$	CL=90%
Γ_{169}	$\omega \mu^+\mu^-$	*C1*	$< 8.3 \times 10^{-4}$	CL=90%
Γ_{170}	ϕe^+e^-	*C1*	$< 5.2 \times 10^{-5}$	CL=90%
Γ_{171}	$\phi \mu^+\mu^-$	*C1*	$< 4.1 \times 10^{-4}$	CL=90%

Γ_{172}	$\overline{K}^0 e^+ e^-$		[*g*]	< 1.1	$\times 10^{-4}$	CL=90%
Γ_{173}	$\overline{K}^0 \mu^+ \mu^-$		[*g*]	< 2.6	$\times 10^{-4}$	CL=90%
Γ_{174}	$\overline{K}^*(892)^0 e^+ e^-$		[*g*]	< 1.4	$\times 10^{-4}$	CL=90%
Γ_{175}	$\overline{K}^*(892)^0 \mu^+ \mu^-$		[*g*]	< 1.18	$\times 10^{-3}$	CL=90%
Γ_{176}	$\pi^+ \pi^- \pi^0 \mu^+ \mu^-$	*C1*		< 8.1	$\times 10^{-4}$	CL=90%
Γ_{177}	$\mu^\pm e^\mp$	*LF*	[*h*]	< 1.9	$\times 10^{-5}$	CL=90%
Γ_{178}	$\pi^0 e^\pm \mu^\mp$	*LF*	[*h*]	< 8.6	$\times 10^{-5}$	CL=90%
Γ_{179}	$\eta e^\pm \mu^\mp$	*LF*	[*h*]	< 1.0	$\times 10^{-4}$	CL=90%
Γ_{180}	$\rho^0 e^\pm \mu^\mp$	*LF*	[*h*]	< 4.9	$\times 10^{-5}$	CL=90%
Γ_{181}	$\omega e^\pm \mu^\mp$	*LF*	[*h*]	< 1.2	$\times 10^{-4}$	CL=90%
Γ_{182}	$\phi e^\pm \mu^\mp$	*LF*	[*h*]	< 3.4	$\times 10^{-5}$	CL=90%
Γ_{183}	$\overline{K}^0 e^\pm \mu^\mp$	*LF*	[*h*]	< 1.0	$\times 10^{-4}$	CL=90%
Γ_{184}	$\overline{K}^*(892)^0 e^\pm \mu^\mp$	*LF*	[*h*]	< 1.0	$\times 10^{-4}$	CL=90%

Γ_{185}	A dummy mode used by the fit.	(16.9 ± 3.5) %	S=1.1

[*a*] This is a weighted average of $D^\pm$ (44%) and D^0 (56%) branching fractions. See "D^+ and $D^0 \to$ (η anything) / (total D^+ and D^0)" under "D^+ Branching Ratios" in these Particle Listings.

[*b*] This value averages the e^+ and μ^+ branching fractions, after making a small phase-space adjustment to the μ^+ fraction to be able to use it as an e^+ fraction; hence our ℓ^+ here is really an e^+.

[*c*] The branching fraction for this mode may differ from the sum of the submodes that contribute to it, due to interference effects. See the relevant papers.

[*d*] The two experiments measuring this fraction are in serious disagreement. See the Particle Listings.

[*e*] The experiments on the division of this charge mode amongst its submodes disagree, and the submode branching fractions here add up to considerably more than the charged-mode fraction.

[*f*] However, these upper limits are in serious disagreement with values obtained in another experiment.

[*g*] This mode is not a useful test for a $\Delta C=1$ weak neutral current because both quarks must change flavor in this decay.

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

CONSTRAINED FIT INFORMATION

An overall fit to 51 branching ratios uses 122 measurements and one constraint to determine 28 parameters. The overall fit has a $\chi^2 = 64.8$ for 95 degrees of freedom.

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

	x_2	x_8	x_9	x_{17}	x_{18}	x_{19}	x_{20}	x_{21}	x_{29}	x_{37}
x_8	6									
x_9	32	19								
x_{17}	1	24	5							
x_{18}	1	8	3	2						
x_{19}	13	46	42	11	6					
x_{20}	1	5	3	1	24	8				
x_{21}	1	6	4	2	36	10	66			
x_{29}	3	11	10	3	7	23	16	18		
x_{37}	3	12	11	3	2	26	3	3	6	
x_{46}	1	3	2	1	18	5	33	51	9	3
x_{55}	2	8	7	2	1	17	1	2	4	32
x_{64}	1	3	2	1	16	5	30	46	8	2
x_{68}	1	3	2	1	17	5	58	47	11	2
x_{71}	1	2	2	1	13	4	24	37	7	2
x_{74}	1	4	2	1	21	6	39	60	10	2
x_{80}	1	6	4	1	30	9	56	84	18	3
x_{81}	1	5	4	1	7	10	24	18	43	3
x_{83}	1	3	2	1	0	5	1	1	1	21
x_{87}	0	2	1	0	2	3	3	5	1	11
x_{98}	0	2	1	0	7	3	13	20	4	3
x_{106}	1	3	3	1	2	6	4	4	23	2
x_{117}	8	28	26	7	4	61	5	6	14	16
x_{118}	0	2	1	0	9	2	17	25	4	1
x_{119}	1	4	3	1	14	6	26	39	7	2
x_{123}	1	3	2	1	11	6	20	30	6	2
x_{140}	0	2	1	0	11	3	20	30	5	1
x_{185}	−28	−20	−23	−7	−34	−31	−53	−70	−50	−26

x_{55}	1									
x_{64}	23	1								
x_{68}	24	1	21							
x_{71}	43	1	17	17						
x_{74}	30	1	7	28	22					
x_{80}	43	2	38	40	31	50				
x_{81}	9	2	8	14	7	11	17			
x_{83}	1	7	0	0	0	0	1	1		
x_{87}	9	4	2	2	4	3	4	1	2	
x_{98}	40	1	9	9	17	12	17	4	1	4
x_{106}	2	1	2	2	2	2	4	10	0	0
x_{117}	3	10	3	3	2	4	6	6	3	2
x_{118}	13	0	11	12	9	15	21	5	0	1
x_{119}	20	1	18	18	14	23	33	7	0	2
x_{123}	15	1	14	14	11	18	25	6	0	2
x_{140}	15	1	14	14	11	18	25	6	0	1
x_{185}	−68	−21	−33	−38	−45	−43	−64	−38	−14	−23
	x_{46}	x_{55}	x_{64}	x_{68}	x_{71}	x_{74}	x_{80}	x_{81}	x_{83}	x_{87}

x_{106}	1						
x_{117}	2	4					
x_{118}	5	1	2				
x_{119}	8	2	4	10			
x_{123}	6	1	3	8	12		
x_{140}	6	1	2	8	12	9	
x_{185}	−34	−25	−19	−18	−30	−24	−23
	x_{98}	x_{106}	x_{117}	x_{118}	x_{119}	x_{123}	x_{140}

D^0 BRANCHING RATIOS

See the "Note on *D* Mesons" in the $D^{\pm}$ Listings.

Some older now obsolete results have been omitted from these Listings.

Inclusive modes

$\Gamma(e^+ \text{anything})/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
0.0675±0.0029 OUR AVERAGE				
0.069 ±0.003 ±0.005	1670	ALBRECHT 96C	ARG	$e^+e^- \approx$ 10 GeV
0.0664±0.0018±0.0029	4609	[13] KUBOTA 96B	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.075 ±0.011 ±0.004	137	BALTRUSAIT...85B	MRK3	e^+e^- 3.77 GeV

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

0.15 ±0.05		AGUILAR-... 87E	HYBR	πp, $p p$ 360, 400 GeV
0.055 ±0.037	12	SCHINDLER 81	MRK2	e^+e^- 3.771 GeV

[13] KUBOTA 96B uses $D^{*+} \rightarrow D^0 \pi^+$ (and charge conjugate) events in which the D^0 subsequently decays to $X e^+ \nu_e$.

$\Gamma(\mu^+ \text{anything})/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.066±0.008 OUR FIT				
0.060±0.007±0.012	310	ALBRECHT 96C	ARG	$e^+e^- \approx$ 10 GeV

$\Gamma(K^- \text{anything})/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.53 ±0.04 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.			
$0.546^{+0.039}_{-0.038}$		[14] BARLAG 92C	ACCM	π^- Cu 230 GeV
0.609±0.032±0.052		COFFMAN 91	MRK3	e^+e^- 3.77 GeV
0.42 ±0.08		AGUILAR-... 87E	HYBR	πp, $p p$ 360, 400 GeV
0.55 ±0.11	121	SCHINDLER 81	MRK2	e^+e^- 3.771 GeV
0.35 ±0.10	19	VUILLEMIN 78	MRK1	e^+e^- 3.772 GeV

[14] BARLAG 92C computes the branching fraction using topological normalization.