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	$\gamma N \to \overline{D}^0 +$
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	$\gamma p \to \overline{D}^0$
1860 ± 2	143	[2] AVERY	80	SPEC	$\gamma N \to D^{*+}$
1869 ± 4	35	[2] AVERY	80	SPEC	$\gamma N \to D^{*+}$
1854 ± 6	94	[2] ATIYA	79	SPEC	$\gamma N \to D^0 \overline{D}^0$
1850 ±15	64	BALTAY	78C	HBC	$\nu N \to K^0 \pi\pi$
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*
4.78±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 $> 20 \times 10^{-15}$ s have been omitted from the average.

VALUE (10^{-15} s)	EVTS	DOCUMENT ID		TECN	COMMENT
410.3± 1.5 OUR AVERAGE					
409.6± 1.1± 1.5	210k	LINK	02F	FOCS	γ nucleus, $\approx$ 180 GeV
407.9± 6.0± 4.3	10k	KUSHNIR...	01	SELX	$D^0 \to K^- \pi^+$, $K^- \pi^+ \pi^+ \pi^-$
413 ± 3 ± 4	35k	AITALA	99E	E791	$K^- \pi^+$
408.5± 4.1 $^{+3.5}_{-3.4}$	25k	BONVICINI	99	CLE2	$e^+ e^- \approx \Upsilon(4S)$
413 ± 4 ± 3	16k	FRABETTI	94D	E687	$K^- \pi^+$, $K^- \pi^+ \pi^+ \pi^-$
424 ±11 ± 7	5118	FRABETTI	91	E687	$K^- \pi^+$, $K^- \pi^+ \pi^+ \pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
417 ±18 ±15	890	ALVAREZ	90	NA14	$K^- \pi^+$, $K^- \pi^+ \pi^+ \pi^-$
388 $^{+23}_{-21}$	641	[4] BARLAG	90C	ACCM	π^- Cu 230 GeV
480 ±40 ±30	776	ALBRECHT	88I	ARG	$e^+ e^-$ 10 GeV
422 ± 8 ±10	4212	RAAB	88	E691	Photoproduction
420 ±50	90	BARLAG	87B	ACCM	K^- and π^- 200 GeV

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

D^0–$\overline{D}^0$ MIXING

Revised November 2003 by D. Asner (University of Pittsburgh)

Standard Model contributions to D^0–$\overline{D}^0$ mixing are strongly suppressed by CKM and GIM factors. Thus the observation of D^0–$\overline{D}^0$ mixing might be evidence for physics beyond the Standard Model. See Burdman and Shipsey [1] for a review of D^0–$\overline{D}^0$ mixing, Nelson [2] for a compilation of mixing predictions, and Ref. [3] for subsequent predictions.

Formalism: The time evolution of the D^0–$\overline{D}^0$ system is described by the Schrödinger equation

$$i \frac{\partial}{\partial t} \begin{pmatrix} D^0(t) \\ \overline{D}^0(t) \end{pmatrix} = \left(\mathbf{M} - \frac{i}{2} \mathbf{\Gamma} \right) \begin{pmatrix} D^0(t) \\ \overline{D}^0(t) \end{pmatrix}, \quad (1)$$

where the $\mathbf{M}$ and $\mathbf{\Gamma}$ matrices are Hermitian, and CPT invariance requires $M_{11} = M_{22} \equiv M$ and $\Gamma_{11} = \Gamma_{22} \equiv \Gamma$. The off-diagonal elements of these matrices describe the dispersive and absorptive parts of D^0–$\overline{D}^0$ mixing.

The two eigenstates D_1 and D_2 of the effective Hamiltonian matrix $(\mathbf{M} - \frac{i}{2}\mathbf{\Gamma})$ are given by

$$|D_{1,2}\rangle = p|D^0\rangle \pm q|\overline{D}^0\rangle\,. \tag{2}$$

The corresponding eigenvalues are

$$\lambda_{1,2} \equiv m_{1,2} - \tfrac{i}{2}\Gamma_{1,2} = \left(M - \tfrac{i}{2}\Gamma\right) \pm \frac{q}{p}\left(M_{12} - \tfrac{i}{2}\Gamma_{12}\right)\,, \tag{3}$$

where m_1 and Γ_1 are the mass and width of the D_1, etc., and

$$\left|\frac{q}{p}\right|^2 = \frac{M_{12}^* - \frac{i}{2}\Gamma_{12}^*}{M_{12} - \frac{i}{2}\Gamma_{12}}\,. \tag{4}$$

We extend the formalism of this Review's note on "B^0–$\overline{B}^0$ Mixing" [4]. In addition to the "right-sign" instantaneous decay amplitudes $\overline{A}_f \equiv \langle f|H|\overline{D}^0\rangle$ and $A_{\overline{f}} \equiv \langle \overline{f}|H|D^0\rangle$ for CP conjugate final states f and $\overline{f}$, we include the "wrong-sign" amplitudes $\overline{A}_{\overline{f}} \equiv \langle \overline{f}|H|\overline{D}^0\rangle$ and $A_f \equiv \langle f|H|D^0\rangle$.

It is usual to normalize the wrong-sign decay distributions to the integrated rate of right-sign decays and to express time in units of the precisely measured D^0 mean lifetime, $\overline{\tau}_{D^0} = 1/\Gamma = 2/(\Gamma_1 + \Gamma_2)$. Starting from a pure $|D^0\rangle$ or $|\overline{D}^0\rangle$ state at $t = 0$, the time-dependent rates of production of the wrong-sign final states relative to the integrated right-sign states are then

$$r(t) = \frac{\left|\langle f|H|D^0(t)\rangle\right|^2}{\left|\overline{A}_f\right|^2} = \left|\frac{q}{p}\right|^2 \left|g_+(t)\,\chi_f^{-1} + g_-(t)\right|^2 \tag{5}$$

and

$$\overline{r}(t) = \frac{\left|\langle \overline{f}|H|\overline{D}^0(t)\rangle\right|^2}{\left|A_{\overline{f}}\right|^2} = \left|\frac{p}{q}\right|^2 \left|g_+(t)\,\chi_{\overline{f}} + g_-(t)\right|^2\,, \tag{6}$$

where

$$\chi_f = \frac{q\overline{A}_f}{pA_f} \tag{7}$$

and

$$g_\pm(t) = \frac{1}{2}\left(e^{-iz_1 t} \pm e^{-iz_2 t}\right) , \quad z_{1,2} = \frac{\lambda_{1,2}}{\Gamma} . \tag{8}$$

Note that a change in the convention for the relative phase of D^0 and $\overline{D}^0$ would cancel between q/p and $\overline{A}_f/A_f$ and leave χ_f invariant.

Since D^0–$\overline{D}^0$ mixing is a small effect, the identification tag of the initial particle as a D^0 or a $\overline{D}^0$ must be extremely accurate. The usual tag is the charge of the distinctive slow pion in the decay sequence $D^{*+} \to D^0\pi^+$ or $D^{*-} \to \overline{D}^0\pi^-$. In current experiments, the mis-tag probability is about one per thousand. Another tag of comparable accuracy is identification of one of the D's from $\psi(3770) \to D^0\overline{D}^0$.

We expand $r(t)$ and $\overline{r}(t)$ to second order in time for modes where the ratio of decay amplitudes $R_D = |A_f/\overline{A}_f|^2$ is very small. We define reduced mixing amplitudes x and y by

$$x \equiv \frac{2M_{12}}{\Gamma} = \frac{m_1 - m_2}{\Gamma} = \frac{\Delta m}{\Gamma} \tag{9}$$

and

$$y \equiv \frac{\Gamma_{12}}{\Gamma} = \frac{\Gamma_1 - \Gamma_2}{2\Gamma} = \frac{\Delta\Gamma}{2\Gamma} . \tag{10}$$

In these equations, the middle relation holds in the limit of CP conservation, in which case the subscripts 1 and 2 indicate the CP-even and CP-odd eigenstates, respectively.

Semileptonic decays: In semileptonic decays, $A_f = \overline{A}_{\overline{f}} = 0$ in the Standard Model. Then in the limit of weak mixing, where $|ix + y| \ll 1$, $r(t)$ is given by

$$r(t) = |g_-(t)|^2 \left|\frac{q}{p}\right|^2 \approx \frac{e^{-t}}{4}(x^2 + y^2)\, t^2 \left|\frac{q}{p}\right|^2 . \tag{11}$$

For $\overline{r}(t)$ one replaces q/p here by p/q; and in the limit of CP conservation, $r(t) = \overline{r}(t)$, and the time-integrated mixing rate relative to the time-integrated right-sign decay rate is

$$R_M = \int_0^\infty r(t)dt \approx \frac{1}{2}(x^2 + y^2)\,. \qquad (12)$$

The results from semileptonic decays are summarized in Table 1. The most sensitive mixing limit is from the FOCUS experiment [5]. Searching for the decay $D^0 \to K^+\mu^-\overline{\nu}_\mu$, it found $R_M < 1.31 \times 10^{-3}$ at the 95% C.L., assuming CP conservation. Semileptonic decays are less sensitive to mixing than are hadronic decays and thus have received less attention recently.

Table 1: Results for R_M in D^0 semileptonic decays.

Year	Exper.	Final State(s)	R_M
2002	FOCUS [5]	$K^+\mu^-\overline{\nu}_\mu$	$< 1.31 \times 10^{-3}$ (95% C.L.)
2002	CLEO [6]	$K^{*+}e^-\overline{\nu}_e$	$< 8.6 \times 10^{-3}$ (95% C.L.)
1996	E791 [7]	$K^+\ell^-\overline{\nu}_\ell$	$< 5.0 \times 10^{-3}$ (90% C.L.)

Wrong-sign decays to hadronic non-CP eigenstates: Consider the final state $f = K^+\pi^-$, where A_f is doubly Cabibbo-suppressed, and the ratio of decay amplitudes is

$$\frac{A_f}{\overline{A}_f} = -\sqrt{R_D}\, e^{-i\delta}, \qquad \left|\frac{A_f}{\overline{A}_f}\right| \sim O(\tan^2\theta_c)\,, \qquad (13)$$

where R_D is the doubly Cabibbo-suppressed decay rate relative to the Cabibbo-favored rate, and δ is a strong phase difference between doubly Cabibbo-suppressed and Cabibbo-favored processes. The minus sign originates from the sign of V_{us} relative to V_{cd}.

We characterize the violation of CP in the mixing amplitude, the decay amplitude, and the interference between mixing and decay, by real-valued parameters A_M, A_D, and ϕ. We adopt a parameterization similar to that of Nir [8] and CLEO [9] and express these quantities in a way that is convenient to describe the three types of CP violation:

$$\left|\frac{q}{p}\right| = 1 + A_M \,, \tag{14}$$

$$\chi_f^{-1} \equiv \frac{pA_f}{q\overline{A}_f} = \frac{-\sqrt{R_D}(1+A_D)}{(1+A_M)}\; e^{-i(\delta+\phi)} \,, \tag{15}$$

$$\chi_{\overline{f}} \equiv \frac{q\overline{A}_{\overline{f}}}{pA_{\overline{f}}} = \frac{-\sqrt{R_D}(1+A_M)}{(1+A_D)}\; e^{-i(\delta-\phi)} \,. \tag{16}$$

In general, $\chi_{\overline{f}}$ and χ_f^{-1} are independent complex numbers. To leading order,

$$r(t) = e^{-t} \times \Bigg[R_D(1+A_D)^2 + \sqrt{R_D}(1+A_M)(1+A_D)y'_-t + \frac{(1+A_M)^2 R_M}{2}\, t^2\Bigg] \tag{17}$$

and

$$\overline{r}(t) = e^{-t} \times \left[\frac{R_D}{(1+A_D)^2} + \frac{\sqrt{R_D}}{(1+A_D)(1+A_M)} y'_+ t + \frac{R_M}{2(1+A_M)^2}\, t^2\right], \tag{18}$$

where

$$y'_\pm \equiv\; y'\cos\phi \pm x'\sin\phi = y\cos(\delta\mp\phi) - x\sin(\delta\mp\phi) \tag{19}$$

$$y' \equiv\; y\cos\delta - x\sin\delta, \;\; x' \equiv x\cos\delta + y\sin\delta \,, \tag{20}$$

Table 2: Results for R in $D^0 \to K^+\pi^-$.

Year	Exper.	Technique	$R_D(\times 10^{-3})$	$A_D(\%)$
2003	BABAR [10]	$e^+e^- \to \Upsilon(4S)$	$3.57 \pm 0.22 \pm 0.27$	$9.5 \pm 6.1 \pm 8.3$
2002	Belle [11]	$e^+e^- \to \Upsilon(4S)$	$3.72 \pm 0.25^{+0.09}_{-0.14}$	-
2001	FOCUS [12]	γ BeO	$4.04 \pm 0.85 \pm 0.25$	-
2000	CLEO [9]	$e^+e^- \to \Upsilon(4S)$	$3.32^{+0.63}_{-0.65} \pm 0.40$	$2^{+19}_{-20} \pm 1$
1998	E791 [13]	π^-Pt	$6.8^{+3.4}_{-3.3} \pm 0.7$	-
1998	Aleph [14]	$e^+e^- \to Z^0$	$18.4 \pm 5.9 \pm 3.4$	-
1994	CLEO [15]	$e^+e^- \to \Upsilon(4S)$	$7.7 \pm 2.5 \pm 2.5$	-

and R_M is the mixing rate relative to the time-integrated right-sign rate.

The differences between the three terms in Eq. (17) and Eq. (18) probe the three fundamental types of CP violation. In the limit of CP conservation, A_M, A_D, and ϕ are all zero, and then $r(t) = \overline{r}(t)$:

$$r(t) = \overline{r}(t) = e^{-t}\left(R_D + \sqrt{R_D}\, y' t + \frac{1}{2} R_M\, t^2\right) , \qquad (21)$$

and the time-integrated wrong-sign rate relative to the integrated right-sign rate is

$$R = \int_0^\infty r(t)\, dt = R_D + \sqrt{R_D}\, y' + R_M \, . \qquad (22)$$

The ratio R of time-integrated wrong- and right-sign rates is the most readily accessible experimental quantity. The observations of non-zero R in $D^0 \to K^+\pi^-$ decay are summarized in Table 2. There has been improvement in precision since 1999, and the average, $R = (0.365 \pm 0.021)\,\%$, from recent experiments is about two standard deviations from the average of $R = (0.81 \pm 0.23)\,\%$ of the pre-1999 results. We restrict the subsequent discussion to the post-1999 experiments.

The contributions to R can be extracted by fitting the $D^0 \to K^+\pi^-$ decay rates. Comparison of results is complicated because some experiments include CP violating terms, some do not. CLEO [9] and BABAR [10] allowed for CP violation in all three terms (i.e. measure $r(t)$ and $\overline{r}(t)$), and then quote limits on the mixing amplitudes after averaging D^0 and $\overline{D}^0$. A preliminary FOCUS result [12] assumes CP conservation. The results for y' and $x'^2/2$ are summarized in Table 3. Figure 1 shows the two-dimensional allowed regions.

Table 3: Results from studies of the time dependence $r(t)$.

Year	Exper.	y' (95% C.L.)	$x'^2/2$ (95% C.L.)
2003	BABAR [10]	$-5.6 < y' < 3.9$ %	< 0.11 %
2001	FOCUS [12]	$-12.4 < y' < -0.5$ %	< 0.076 %
2000	CLEO [9]	$-5.8 < y' < 1.0$ %	< 0.041 %

Extraction of the amplitudes x and y from the results in Table 3 requires knowledge of the relative strong phase δ, a subject of theoretical discussion [16, 17]. In most cases, it appears difficult for theory to accommodate $\delta > 25°$, although the judicious placement of a $K\pi$ resonance could allow δ to be as large as $50°$.

A quantum interference effect that provides useful sensitivity to δ arises in the decay chain $\psi(3770) \to D^0\overline{D}^0 \to (f_{cp})(K^+\pi^-)$, where f_{cp} denotes a CP eigenstate from D^0 decay, such as K^+K^-[1, 18]. Here, the amplitude triangle relation

$$\sqrt{2}\, A(D_\pm \to K^-\pi^+) = A(D^0 \to K^-\pi^+) \pm A(\overline{D}^0 \to K^-\pi^+), \tag{23}$$

where $D_\pm$ denotes a CP eigenstate, implies that

$$1 \pm 2\sqrt{R_D}\,\cos\delta = 2\,\frac{B(D_\pm \to K^-\pi^+)}{B(D^0 \to K^-\pi^+)}\,, \tag{24}$$

or

$$\cos\delta = \frac{B(D_+ \to K^-\pi^+) - B(D_- \to K^-\pi^+)}{2\sqrt{R_D}\,B(D^0 \to K^-\pi^+)}\,, \tag{25}$$

neglecting CP violation and exploiting $R_D \ll \sqrt{R_D}$. Projections for 3 fb^{-1} of data at the $\psi(3770)$ indicate that δ could be measured to 20° if $|\cos\delta| \sim 1$, and to a few degrees if $\cos\delta \sim 0$ [19].

The strong phase δ might also be determined by constructing amplitude quadrangles from a complete set of branching fraction measurements of the other doubly Cabibbo-suppressed D decays to two pseudoscalars [20]. This analysis would have to assume that the amplitudes from both $\Delta I = 1$ and $\Delta I = 0$ that populate the total $I = 1/2$ $K\pi$ state have the same strong phase relative to the amplitude that populates the total $I = 3/2$ $K\pi$ state.

The Dalitz-plot analyses of doubly Cabibbo-suppressed D decays to a pseudoscalar and a vector allow the measurement of the relative strong phase between some amplitudes, providing additional contraints to the amplitude quadrangle [21] and thus the determination of the strong phase difference between the relevant doubly Cabibbo-suppressed and Cabibbo-favored amplitudes. In $D^0 \to K_S\pi\pi$, the doubly Cabibbo-suppressed and Cabibbo-favored decay amplitudes occupy the same Dalitz plot, which allows direct measurement of the relative strong phase. CLEO has measured the relative phase between $D^0 \to K^*(892)^+\pi^-$ and $D^0 \to K^*(892)^-\pi^+$ to be $(189 \pm 10 \pm 3^{+15}_{-5})^\circ$ [22], consistent with the 180° expected from Cabibbo factors and a small strong phase.

There are several results for R measured in multibody final states with nonzero strangeness. Here R, defined in Eq. (22), becomes an average over the Dalitz space, weighted by experimental efficiencies and acceptance. The results are summarized in Table 4.

Table 4: Results for R in $D^0 \to K^{(*)+}\pi^-(n\pi)$.

Year	Exper.	D^0 Final State	$R(\%)$
2002	CLEO [22]	$K^*(892)^+\pi^-$	$0.5 \pm 0.2^{+0.6}_{-0.1}$
2001	CLEO [23]	$K^+\pi^-\pi^+\pi^-$	$0.41^{+0.12}_{-0.11} \pm 0.04$
2001	CLEO [24]	$K^+\pi^-\pi^0$	$0.43^{+0.11}_{-0.10} \pm 0.07$
1998	E791 [13]	$K^+\pi^-\pi^+\pi^-$	$0.68^{+0.34}_{-0.33} \pm 0.07$

For multibody final states, Eqs. (13)–(22) apply to one point in the Dalitz space. Although x and y do not vary across the Dalitz space, knowledge of the resonant substructure is needed to extrapolate the strong phase difference δ from point to point. Both the sign and magnitude of x and y are experimentally accessible by studying the time-dependent resonant substructure in decay modes such as $D^0 \to K_S\pi^+\pi^-$ [25].

Decays to CP Eigenstates: When the final state f is a CP eigenstate, there is no distinction between f and $\overline{f}$, and then $A_f = A_{\overline{f}}$ and $\overline{A}_{\overline{f}} = \overline{A}_f$. We denote final states with CP eigenvalues ± 1 by $f_\pm$. In analogy with Eqs. (5)–(6), the decay rates to CP eigenstates are then

$$r_\pm(t) = \frac{\left|\langle f_\pm | H | D^0(t)\rangle\right|^2}{\left|\overline{A}_\pm\right|^2}$$

$$= \frac{1}{4} \left| h_{\pm}(t) \left(\frac{A_{\pm}}{\overline{A}_{\pm}} \pm \frac{q}{p} \right) + h_{\mp}(t) \left(\frac{A_{\pm}}{\overline{A}_{\pm}} \mp \frac{q}{p} \right) \right|^2,$$

$$\propto \frac{1}{|p|^2} \left| h_{\pm}(t) + \eta_{\pm} h_{\mp}(t) \right|^2, \tag{26}$$

and

$$\overline{r}_{\pm}(t) = \frac{\left| \langle f_{\pm} | H | \overline{D}^0(t) \rangle \right|^2}{\left| A_{\pm} \right|^2} \propto \frac{1}{|q|^2} \left| h_{\pm}(t) - \eta_{\pm} h_{\mp}(t) \right|^2, \tag{27}$$

where

$$h_{\pm}(t) = g_{+}(t) \pm g_{-}(t) = e^{-iz_{\pm}t}, \tag{28}$$

and

$$\eta_{\pm} \equiv \frac{pA_{\pm} \mp q\overline{A}_{\pm}}{pA_{\pm} \pm q\overline{A}_{\pm}} = \frac{1 \mp \chi_{\pm}}{1 \pm \chi_{\pm}}, \tag{29}$$

and the variable $\eta_{\pm}$ describes CP violation; $\eta_{\pm}$ can receive contributions from each of the three fundamental types of CP violation.

The quantity y may be measured by comparing the rate for decays to non-CP eigenstates such as $D^0 \to K^- \pi^+$ with decays to CP eigenstates such as $D^0 \to K^+ K^-$ [17]. A positive y would make $K^+ K^-$ decays appear to have a higher decay rate than $K^- \pi^+$ decays. The decay rate for a D^0 into a CP eigenstate is not described by a single exponential in the presence of CP violation.

In the limit of weak mixing, where $|ix + y| \ll 1$, and small CP violation, where $|A_M|$, $|A_D|$, and $|\sin\phi| \ll 1$, the time dependence of decays to CP eigenstates is proportional to a single exponential:

$$r_{\pm}(t) \propto e^{-[1 \pm \left| \frac{p}{q} \right| (y \cos\phi - x \sin\phi)]t}, \tag{30}$$

$$\overline{r}_{\pm}(t) \propto e^{-[1 \pm \left| \frac{q}{p} \right| (y \cos\phi + x \sin\phi)]t}, \tag{31}$$

$$r_{\pm}(t) + \overline{r}_{\pm}(t) \propto e^{-(1 \pm y_{CP})t}. \tag{32}$$

Here

$$y_{CP} = y\cos\phi\left[\frac{1}{2}\left(\left|\frac{p}{q}\right| + \left|\frac{q}{p}\right|\right) + \frac{A_{\rm prod}}{2}\left(\left|\frac{p}{q}\right| - \left|\frac{q}{p}\right|\right)\right] - x\sin\phi\left[\frac{1}{2}\left(\left|\frac{p}{q}\right| - \left|\frac{q}{p}\right|\right) + \frac{A_{\rm prod}}{2}\left(\left|\frac{p}{q}\right| + \left|\frac{q}{p}\right|\right)\right] , \quad (33)$$

and

$$A_{\rm prod} \equiv \frac{N(D^0) - N(\overline{D}^0)}{N(D^0) + N(\overline{D}^0)} \quad (34)$$

is defined as the production asymmetry of the D^0 and $\overline{D}^0$. Note that deviations from the decay rate measured in non-CP eigenstates does not require $y \neq 0$ but can be due to $x\sin\phi \neq 0$. This possibility is distinguished by a relative sign difference in the exponents of Eqs. (30) and (31) describing the D^0 and $\overline{D}^0$ samples, respectively.

In the limit of CP conservation, $A_\pm = \pm\overline{A}_\pm$, $\eta_\pm = 0$, $y = y_{CP}$, and

$$r_\pm(t)\left|\overline{A}_\pm\right|^2 = \overline{r}_\pm(t)\left|A_\pm\right|^2 = e^{-(1\pm y_{CP})t} . \quad (35)$$

The possibility of CP violation has not been considered in general in any of the analyses of y, although specific cases have been considered. Belle [26] and BABAR [27] have allowed CP violation in interference and mixing. Neither result considered CP violation in direct decay. All measurements are relative to the $D^0 \to K^-\pi^+$ decay rate. The current status of measurements of y is summarized in Table 5 and in Fig. 1.

Substantial work on the integrated CP asymmetries in decays to CP eigenstates indicates that A_{CP} is consistent with zero at the few percent level [32]. The expression for the

Table 5: Results for y from $D^0 \to K^+K^-$ and $\pi^+\pi^-$.

Year	Exper.	D^0 Final State(s)	$y(\%)$
2003	Belle [26]	K^+K^-	$y_{CP} = 1.15 \pm 0.69 \pm 0.38$
2003	BABAR [27]	$K^+K^-, \pi^+\pi^-$	$y\cos\phi = 0.8 \pm 0.4^{+0.5}_{-0.4}$
2001	CLEO [28]	$K^+K^-, \pi^+\pi^-$	$y_{CP} = -1.1 \pm 2.5 \pm 1.4$
2001	Belle [29]	K^+K^-	$y_{CP} = -0.5 \pm 1.0^{+0.7}_{-0.8}$
2000	FOCUS [30]	K^+K^-	$y_{CP} = 3.4 \pm 1.4 \pm 0.7$
1999	E791 [31]	K^+K^-	$y_{CP} = 0.8 \pm 2.9 \pm 1.0$

integrated CP asymmetry that includes the possibility of CP violation in mixing is

$$A_{CP} = \frac{\Gamma(D^0 \to f_\pm) - \Gamma(\overline{D}^0 \to f_\pm)}{\Gamma(D^0 \to f_\pm) + \Gamma(\overline{D}^0 \to f_\pm)} \tag{36}$$

$$= \frac{|q|^2 - |p|^2}{|q|^2 + |p|^2} + 2\mathrm{Re}(\eta_\pm)\,. \tag{37}$$

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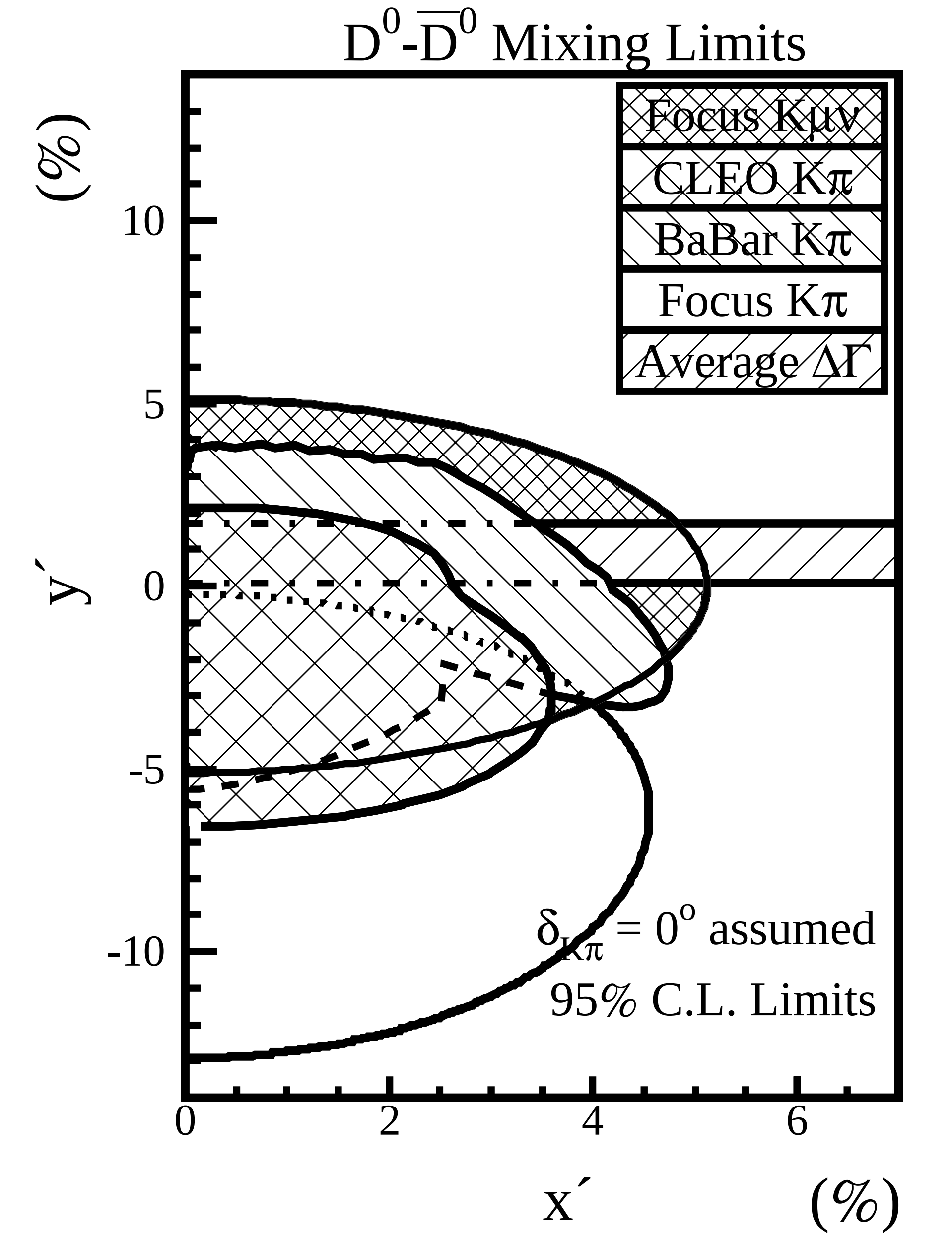

Figure 1: Current allowed regions in the plane of y' versus x'. The regions for CLEO and BaBar allow CP violation in the decay amplitude, in the mixing amplitude, and in the interference between these two processes. The FOCUS result does not allow CP violation. The allowed region for $\Delta\Gamma$ is the average of the y_{CP} [26, 28–31] results and the BABAR measurement of $y\cos\phi$ [27] and does not include $y = 0$. We

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32. See the tabulation of A_{CP} results in the decays of D^0 and D^+ in this *Review*.

$|m_{D_1^0} - m_{D_2^0}|$

The D_1^0 and D_2^0 are the mass eigenstates of the D^0 meson, as described in the note on "D^0-$\overline{D}^0$ Mixing," above.

VALUE (10^{10} $\hbar$ s^{-1})	CL%	DOCUMENT ID		TECN	COMMENT
< 7	95	[5] GODANG	00	CLE2	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<11	95	[6] AUBERT	03Z	BABR	e^+e^-, 10.6 GeV
<32	90	[7,8] AITALA	98	E791	π^- nucleus, 500 GeV
<24	90	[9] AITALA	96C	E791	π^- nucleus, 500 GeV
<21	90	[8,10] ANJOS	88C	E691	Photoproduction

[5] This GODANG 00 limit is inferred from the D^0-$\overline{D}^0$ mixing ratio $\Gamma(K^+\pi^-$ (via $\overline{D}^0$))/$\Gamma(K^-\pi^+)$ given near the end of this D^0 Listings. Decay-time information is used to distinguish DCS decays from D^0-$\overline{D}^0$ mixing. The limit allows interference between the DCS and mixing ratios, and also allows CP violation. The strong phase between $D^0 \to K^+\pi^-$ and $\overline{D}^0 \to K^+\pi^-$ is assumed to be small. If an arbitrary relative strong phase is allowed, the limit degrades by a factor of two.

[6] This AUBERT 03Z limit is inferred from the D^0-$\overline{D}^0$ mixing ratio $\Gamma(K^+\pi^-$ (via $\overline{D}^0$))/$\Gamma(K^-\pi^+)$ given near the end of this D^0 Listings. Decay-time information is used to distinguish DCS decays from D^0-$\overline{D}^0$ mixing. The limit allows interference between the DCS and mixing ratios, and also allows CP violation. The strong phase between $D^0 \to K^+\pi^-$ and $\overline{D}^0 \to K^+\pi^-$ is assumed to be small. If an arbitrary relative strong phase is allowed, the limit degrades by 20%.

[7] AITALA 98 allows interference between the doubly Cabibbo-suppressed and mixing amplitudes, and also allows CP violation in this term, but assumes that A_D=A_R=0. See the note on "D^0-$\overline{D}^0$ Mixing," above.

[8] This limit is inferred from R_M for $f = K^+\pi^-$ and $f = K^+\pi^-\pi^+\pi^-$. See the note on "D^0-$\overline{D}^0$ Mixing," above. Decay-time information is used to distinguish doubly Cabibbo-suppressed decays from D^0-$\overline{D}^0$ mixing.

[9] This limit is inferred from R_M for $f = K^+\ell^-\overline{\nu}_\ell$. See the note on "$D^0$-$\overline{D}^0$ Mixing," above.

[10] ANJOS 88C assumes that $y = 0$. See the note on "D^0-$\overline{D}^0$ Mixing," above. Without this assumption, the limit degrades by about a factor of two.

$(\Gamma_{D_1^0} - \Gamma_{D_2^0})/\Gamma = 2y$

The D_1^0 and D_2^0 are the mass eigenstates of the D^0 meson, as described in the note on "D^0-$\overline{D}^0$ Mixing," above.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.016 ±0.010 OUR AVERAGE						
0.016 $\pm$0.008 $^{+0.010}_{-0.008}$		450k	[11] AUBERT	03P	BABR	$e^+e^- \approx \Upsilon(4S)$
$-$0.010 $\pm$0.020 $^{+0.014}_{-0.016}$		18k	[12] ABE	02I	BELL	$e^+e^- \approx \Upsilon(4S)$

$-0.024 \pm 0.050 \pm 0.028$	3393	[13] CSORNA	02	CLE2	$e^+e^- \approx \Upsilon(4S)$
$0.0684 \pm 0.0278 \pm 0.0148$	10k	[12] LINK	00	FOCS	γ nucleus
$+0.016 \pm 0.058 \pm 0.021$		[12] AITALA	99E	E791	$K^-\pi^+$, K^+K^-

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

$0.016\ ^{+0.062}_{-0.128}$		[14,15] AUBERT	03Z	BABR	e^+e^-, 10.6 GeV
$-0.050\ ^{+0.028}_{-0.032} \pm 0.006$		[15] GODANG	00	CLE2	e^+e^-
$\lvert\Delta\Gamma\rvert/\Gamma < 0.26$	90	[16,17] AITALA	98	E791	π^- nucleus, 500 GeV
$\lvert\Delta\Gamma\rvert/\Gamma < 0.20$	90	[18] AITALA	96C	E791	π^- nucleus, 500 GeV
$\lvert\Delta\Gamma\rvert/\Gamma < 0.17$	90	[17,19] ANJOS	88C	E691	Photoproduction

[11] AUBERT 03P measures $Y \equiv 2\,\tau^0 / (\tau^+ + \tau^-) - 1$, where τ^0 is the $D^0 \rightarrow K^-\pi^+$ (and $\overline{D}^0 \rightarrow K^+\pi^-$) lifetime, and τ^+ and τ^- are the D^0 and $\overline{D}^0$ lifetimes to CP-even states (here K^-K^+ and $\pi^-\pi^+$). In the limit of CP conservation, $Y = y \equiv \Delta\Gamma / 2\,\Gamma$ (we list $2y = \Delta\Gamma/\Gamma$). AUBERT 03P also uses $\tau^+ - \tau^-$ to get $\Delta Y = -0.008 \pm 0.006 \pm 0.002$.

[12] LINK 00, AITALA 99E, and ABE 02I measure the lifetime difference between $D^0 \rightarrow K^-K^+$ (*CP* even) decays and $D^0 \rightarrow K^-\pi^+$ (*CP* mixed) decays, or $y_{CP} = [\Gamma(CP+) - \Gamma(CP-)]/[\Gamma(CP+) + \Gamma(CP-)]$. We list $2y_{CP} = \Delta\Gamma/\Gamma$.

[13] CSORNA 02 measures the lifetime difference between $D^0 \rightarrow K^-K^+$ and $\pi^-\pi^+$ (*CP* even) decays and $D^0 \rightarrow K^-\pi^+$ (*CP* mixed) decays, or $y_{CP} = [\Gamma(CP+) - \Gamma(CP-)]/[\Gamma(CP+) + \Gamma(CP-)]$. We list $2y_{CP} = \Delta\Gamma/\Gamma$.

[14] The range of this AUBERT 03Z measurement is for 95% confidence level.

[15] The GODANG 00 and AUBERT 03Z limits are inferred from the D^0-$\overline{D}^0$ mixing ratio $\Gamma(K^+\pi^-\ (\text{via}\ \overline{D}^0))/\Gamma(K^-\pi^+)$ given near the end of this D^0 Listings. Decay-time information is used to distinguish DCS decays from D^0-$\overline{D}^0$ mixing. The limit allows interference between the DCS and mixing ratios, and also allows *CP* violation. The phase between $D^0 \rightarrow K^+\pi^-$ and $\overline{D}^0 \rightarrow K^+\pi^-$ is assumed to be small. This is a measurement of y' and is not the same as the y_{CP} of our note above on "D^0-$\overline{D}^0$ Mixing."

[16] AITALA 98 allows interference between the doubly Cabibbo-suppressed and mixing amplitudes, and also allows *CP* violation in this term, but assumes that $A_D = A_R = 0$. See the note on "D^0-$\overline{D}^0$ Mixing," above.

[17] This limit is inferred from R_M for $f = K^+\pi^-$ and $f = K^+\pi^-\pi^+\pi^-$. See the note on "D^0-$\overline{D}^0$ Mixing," above. Decay-time information is used to distinguish doubly Cabibbo-suppressed decays from D^0-$\overline{D}^0$ mixing.

[18] This limit is inferred from R_M for $f = K^+\ell^-\overline{\nu}_\ell$. See the note on "$D^0$-$\overline{D}^0$ Mixing," above.

[19] ANJOS 88C assumes that $y = 0$. See the note on "D^0-$\overline{D}^0$ Mixing," above. Without this assumption, 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	[a]	(6.87 ± 0.28) %	
Γ_2	μ^+ anything		(6.5 ± 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	[b]	< 13 %	CL=90%
Γ_7	ϕ anything		(1.7 ± 0.8) %	

Semileptonic modes

Γ_8	$K^- \ell^+ \nu_\ell$	[c]	(3.43 ± 0.14) %	S=1.2
Γ_9	$K^- e^+ \nu_e$		(3.58 ± 0.18) %	S=1.1
Γ_{10}	$K^- \mu^+ \nu_\mu$		(3.19 ± 0.17) %	
Γ_{11}	$K^- \pi^0 e^+ \nu_e$		$(1.1 ^{+0.8}_{-0.6})$ %	S=1.6
Γ_{12}	$\overline{K}^0 \pi^- e^+ \nu_e$		(1.8 ± 0.8) %	S=1.6
Γ_{13}	$\overline{K}^*(892)^- e^+ \nu_e$ $\times$ B($K^*(892)^- \to \overline{K}^0 \pi^-$)		(1.43 ± 0.23) %	
Γ_{14}	$K^*(892)^- \ell^+ \nu_\ell$			
Γ_{15}	$\overline{K}^*(892)^0 \pi^- e^+ \nu_e$			
Γ_{16}	$K^- \pi^+ \pi^- \mu^+ \nu_\mu$		$< 1.2 \times 10^{-3}$	CL=90%
Γ_{17}	$(\overline{K}^*(892)\pi)^- \mu^+ \nu_\mu$		$< 1.4 \times 10^{-3}$	CL=90%
Γ_{18}	$\pi^- e^+ \nu_e$		$(3.6 \pm 0.6) \times 10^{-3}$	

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

Γ_{19}	$K^*(892)^- e^+ \nu_e$		(2.15 ± 0.35) %	

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

Γ_{20}	$K^- \pi^+$		(3.80 ± 0.09) %	
Γ_{21}	$\overline{K}^0 \pi^0$		(2.30 ± 0.22) %	
Γ_{22}	$\overline{K}^0 \pi^+ \pi^-$	[d]	(5.97 ± 0.35) %	S=1.1
Γ_{23}	$\overline{K}^0 \rho^0$		$(1.55 ^{+0.12}_{-0.16})$ %	
Γ_{24}	$\overline{K}^0 \omega$ $\times$ B($\omega \to \pi^+ \pi^-$)		$(3.9 \pm 0.9) \times 10^{-4}$	
Γ_{25}	$\overline{K}^0 f_0(980)$ $\times$ B($f_0(980) \to \pi^+ \pi^-$)		$(2.8 ^{+0.6}_{-0.4}) \times 10^{-3}$	
Γ_{26}	$\overline{K}^0 f_2(1270)$ $\times$ B($f_2(1270) \to \pi^+ \pi^-$)		$(2.6 ^{+2.3}_{-1.4}) \times 10^{-4}$	
Γ_{27}	$\overline{K}^0 f_0(1370)$ $\times$ B($f_0(1370) \to \pi^+ \pi^-$)		$(5.1 ^{+1.2}_{-1.3}) \times 10^{-3}$	
Γ_{28}	$K^*(892)^- \pi^+$ $\times$ B($K^*(892)^- \to \overline{K}^0 \pi^-$)		(3.9 ± 0.3) %	

Γ_{29}	$K_0^*(1430)^-\pi^+ \times B(K_0^*(1430)^- \to \overline{K}^0\pi^-)$		$(6.1\ {}^{+\ 1.2}_{-\ 0.8}) \times 10^{-3}$	
Γ_{30}	$K_2^*(1430)^-\pi^+ \times B(K_2^*(1430)^- \to \overline{K}^0\pi^-)$		$(1.0\ {}^{+\ 0.7}_{-\ 0.4}) \times 10^{-3}$	
Γ_{31}	$K^*(1680)^-\pi^+ \times B(K^*(1680)^- \to \overline{K}^0\pi^-)$		$(2.1\ {}^{+\ 1.0}_{-\ 0.9}) \times 10^{-3}$	
Γ_{32}	$K^*(892)^+\pi^- \times B(K^*(892)^+ \to K^0\pi^+)$		$(2.0\ {}^{+\ 2.6}_{-\ 0.9}) \times 10^{-4}$	
Γ_{33}	$\overline{K}^0\pi^+\pi^-$ nonresonant		$(5.4\ {}^{+12.0}_{-\ 3.4}) \times 10^{-4}$	
Γ_{34}	$K^-\pi^+\pi^0$	[d]	(13.0 ± 0.8) %	S=1.3
Γ_{35}	$K^-\rho^+$		(10.1 ± 0.8) %	
Γ_{36}	$K^-\rho(1700)^+ \times B(\rho(1700)^+ \to \pi^+\pi^0)$		$(7.4 \pm 1.6) \times 10^{-3}$	
Γ_{37}	$K^*(892)^-\pi^+ \times B(K^*(892)^- \to K^-\pi^0)$		(1.97 ± 0.13) %	
Γ_{38}	$\overline{K}^*(892)^0\pi^0 \times B(\overline{K}^*(892)^0 \to K^-\pi^+)$		(1.87 ± 0.27) %	
Γ_{39}	$K_0^*(1430)^-\pi^+ \times B(K_0^*(1430)^- \to K^-\pi^0)$		$(3.0\ {}^{+\ 0.6}_{-\ 0.4}) \times 10^{-3}$	
Γ_{40}	$\overline{K}_0^*(1430)^0\pi^0 \times B(\overline{K}_0^*(1430)^0 \to K^-\pi^+)$		$(5.3\ {}^{+\ 4.2}_{-\ 1.4}) \times 10^{-3}$	
Γ_{41}	$K^*(1680)^-\pi^+ \times B(K^*(1680)^- \to K^-\pi^0)$		$(1.1 \pm 0.5) \times 10^{-3}$	
Γ_{42}	$K^-\pi^+\pi^0$ nonresonant		$(1.04\ {}^{+\ 0.50}_{-\ 0.19})$ %	
Γ_{43}	$\overline{K}^0\pi^0\pi^0$		—	
Γ_{44}	$\overline{K}^*(892)^0\pi^0 \times B(\overline{K}^*(892)^0 \to \overline{K}^0\pi^0)$		$(9.3 \pm 1.3) \times 10^{-3}$	
Γ_{45}	$\overline{K}^0\pi^0\pi^0$ nonresonant		$(8.5 \pm 2.2) \times 10^{-3}$	
Γ_{46}	$K^-\pi^+\pi^+\pi^-$	[d]	(7.46 ± 0.31) %	
Γ_{47}	$K^-\pi^+\rho^0$ total		(6.2 ± 0.4) %	
Γ_{48}	$K^-\pi^+\rho^0$ 3-body		$(4.7 \pm 2.1) \times 10^{-3}$	
Γ_{49}	$\overline{K}^*(892)^0\rho^0 \times B(\overline{K}^*(892)^0 \to K^-\pi^+)$		$(9.7 \pm 2.1) \times 10^{-3}$	
Γ_{50}	$K^-a_1(1260)^+ \times B(a_1(1260)^+ \to \pi^+\pi^+\pi^-)$		(3.6 ± 0.6) %	
Γ_{51}	$\overline{K}^*(892)^0\pi^+\pi^-$ total $\times B(\overline{K}^*(892)^0 \to K^-\pi^+)$		(1.5 ± 0.4) %	
Γ_{52}	$\overline{K}^*(892)^0\pi^+\pi^-$ 3-body $\times B(\overline{K}^*(892)^0 \to K^-\pi^+)$		$(9.5 \pm 2.1) \times 10^{-3}$	

Γ_{53}	$K_1(1270)^-\pi^+ \times$ B$(K_1(1270)^- \to K^-\pi^+\pi^-)$	[e]	$(2.9 \pm 0.3) \times 10^{-3}$
Γ_{54}	$K^-\pi^+\pi^+\pi^-$ nonresonant		(1.74 ± 0.25) %
Γ_{55}	$\overline{K}^0\pi^+\pi^-\pi^0$	[d]	(10.9 ± 1.3) %
Γ_{56}	$\overline{K}^0\eta \times$ B$(\eta \to \pi^+\pi^-\pi^0)$		$(1.74 \pm 0.25) \times 10^{-3}$
Γ_{57}	$\overline{K}^0\omega \times$ B$(\omega \to \pi^+\pi^-\pi^0)$		(2.1 ± 0.4) %
Γ_{58}	$K^*(892)^-\rho^+ \times$ B$(K^*(892)^- \to \overline{K}^0\pi^-)$		(4.4 ± 1.7) %
Γ_{59}	$\overline{K}^*(892)^0\rho^0 \times$ B$(\overline{K}^*(892)^0 \to \overline{K}^0\pi^0)$		$(4.8 \pm 1.1) \times 10^{-3}$
Γ_{60}	$K_1(1270)^-\pi^+ \times$ B$(K_1(1270)^- \to \overline{K}^0\pi^-\pi^0)$	[e]	$(4.5 \pm 1.2) \times 10^{-3}$
Γ_{61}	$\overline{K}^*(892)^0\pi^+\pi^-$ 3-body $\times$ B$(\overline{K}^*(892)^0 \to \overline{K}^0\pi^0)$		$(4.7 \pm 1.0) \times 10^{-3}$
Γ_{62}	$\overline{K}^0\pi^+\pi^-\pi^0$ nonresonant		(2.3 ± 2.3) %
Γ_{63}	$K^-\pi^+\pi^0\pi^0$		
Γ_{64}	$K^-\pi^+\pi^+\pi^-\pi^0$		(4.0 ± 0.4) %
Γ_{65}	$\overline{K}^*(892)^0\pi^+\pi^-\pi^0 \times$ B$(\overline{K}^*(892)^0 \to K^-\pi^+)$		(1.2 ± 0.6) %
Γ_{66}	$\overline{K}^*(892)^0\eta \times$ B$(\overline{K}^*(892)^0 \to K^-\pi^+) \times$ B$(\eta \to \pi^+\pi^-\pi^0)$		$(2.7 \pm 0.6) \times 10^{-3}$
Γ_{67}	$K^-\pi^+\omega \times$ B$(\omega \to \pi^+\pi^-\pi^0)$		(2.7 ± 0.5) %
Γ_{68}	$\overline{K}^*(892)^0\omega \times$ B$(\overline{K}^*(892)^0 \to K^-\pi^+) \times$ B$(\omega \to \pi^+\pi^-\pi^0)$		$(6.5 \pm 2.4) \times 10^{-3}$
Γ_{69}	$\overline{K}^0\pi^+\pi^+\pi^-\pi^-$		$(6.4 \pm 1.8) \times 10^{-3}$
Γ_{70}	$\overline{K}^0\pi^+\pi^-\pi^0\pi^0(\pi^0)$		
Γ_{71}	$\overline{K}^0K^+K^-$		(1.03 ± 0.10) %
	In the fit as $\frac{1}{2}\Gamma_{86} + \Gamma_{73}$, where $\frac{1}{2}\Gamma_{86} = \Gamma_{72}$.		
Γ_{72}	$\overline{K}^0\phi \times$ B$(\phi \to K^+K^-)$		$(4.7 \pm 0.6) \times 10^{-3}$
Γ_{73}	$\overline{K}^0K^+K^-$ non-ϕ		$(5.6 \pm 0.9) \times 10^{-3}$
Γ_{74}	$K^0_SK^0_SK^0_S$		$(9.2 \pm 1.6) \times 10^{-4}$
Γ_{75}	$K^+K^-K^-\pi^+$		$(2.04 \pm 0.30) \times 10^{-4}$
Γ_{76}	$K^+K^-\overline{K}^*(892)^0 \times$ B$(\overline{K}^*(892)^0 \to K^-\pi^+)$		$(4.1 \pm 1.7) \times 10^{-5}$
Γ_{77}	$K^-\pi^+\phi \times$ B$(\phi \to K^+K^-)$		$(3.8 \pm 1.6) \times 10^{-5}$
Γ_{78}	$\phi\overline{K}^*(892)^0 \times$ B$(\phi \to K^+K^-) \times$ B$(\overline{K}^*(892)^0 \to K^-\pi^+)$		$(1.0 \pm 0.2) \times 10^{-4}$
Γ_{79}	$K^+K^-K^-\pi^+$ nonresonant		$(3.1 \pm 1.4) \times 10^{-5}$
Γ_{80}	$K^+K^-\overline{K}^0\pi^0$		

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_{81}	$\overline{K}^0\eta$		$(7.7 \pm 1.1) \times 10^{-3}$	
Γ_{82}	$\overline{K}^0\rho^0$		$(1.55^{+0.12}_{-0.16})$ %	
Γ_{83}	$K^-\rho^+$		(10.1 ± 0.8) %	S=1.2
Γ_{84}	$\overline{K}^0\omega$		(2.3 ± 0.4) %	
Γ_{85}	$\overline{K}^0\eta'(958)$		(1.88 ± 0.28) %	
Γ_{86}	$\overline{K}^0\phi$		$(9.4 \pm 1.1) \times 10^{-3}$	
Γ_{87}	$K^- a_1(1260)^+$		(7.2 ± 1.1) %	
Γ_{88}	$\overline{K}^0 a_1(1260)^0$		< 1.9 %	CL=90%
Γ_{89}	$\overline{K}^0 f_2(1270)$		$(4.7^{+4.1}_{-2.4}) \times 10^{-4}$	
Γ_{90}	$K^- a_2(1320)^+$		$< 2 \times 10^{-3}$	CL=90%
Γ_{91}	$K^*(892)^-\pi^+$		(5.9 ± 0.4) %	S=1.1
Γ_{92}	$\overline{K}^*(892)^0\pi^0$		(2.8 ± 0.4) %	S=1.1
Γ_{93}	$\overline{K}^*(892)^0\pi^+\pi^-$ total		(2.2 ± 0.5) %	
Γ_{94}	$\overline{K}^*(892)^0\pi^+\pi^-$ 3-body		(1.42 ± 0.31) %	
Γ_{95}	$K^-\pi^+\rho^0$ total		(6.2 ± 0.4) %	
Γ_{96}	$K^-\pi^+\rho^0$ 3-body		$(4.7 \pm 2.1) \times 10^{-3}$	
Γ_{97}	$\overline{K}^*(892)^0\rho^0$		(1.45 ± 0.32) %	
Γ_{98}	$\overline{K}^*(892)^0\rho^0$ transverse		(1.5 ± 0.5) %	
Γ_{99}	$\overline{K}^*(892)^0\rho^0$ S-wave		(2.8 ± 0.6) %	
Γ_{100}	$\overline{K}^*(892)^0\rho^0$ S-wave long.		$< 3 \times 10^{-3}$	CL=90%
Γ_{101}	$\overline{K}^*(892)^0\rho^0$ P-wave		$< 3 \times 10^{-3}$	CL=90%
Γ_{102}	$\overline{K}^*(892)^0\rho^0$ D-wave		(1.9 ± 0.6) %	
Γ_{103}	$K^*(892)^-\rho^+$		(6.6 ± 2.6) %	
Γ_{104}	$K^*(892)^-\rho^+$ longitudinal		(3.2 ± 1.3) %	
Γ_{105}	$K^*(892)^-\rho^+$ transverse		(3.4 ± 2.0) %	
Γ_{106}	$K^*(892)^-\rho^+$ P-wave		< 1.5 %	CL=90%
Γ_{107}	$K^-\pi^+ f_0(980)$			
Γ_{108}	$\overline{K}^*(892)^0 f_0(980)$			
Γ_{109}	$K_1(1270)^-\pi^+$	[e]	(1.14 ± 0.31) %	
Γ_{110}	$K_1(1400)^-\pi^+$		< 1.2 %	CL=90%
Γ_{111}	$\overline{K}_1(1400)^0\pi^0$		< 3.7 %	CL=90%
Γ_{112}	$K^*(1410)^-\pi^+$			
Γ_{113}	$K_0^*(1430)^-\pi^+$		$(9.8^{+2.0}_{-1.3}) \times 10^{-3}$	
Γ_{114}	$\overline{K}_0^*(1430)^0\pi^0$		$(8.6^{+6.8}_{-2.3}) \times 10^{-3}$	
Γ_{115}	$K_2^*(1430)^-\pi^+$		$(2.0^{+1.3}_{-0.7}) \times 10^{-3}$	
Γ_{116}	$\overline{K}_2^*(1430)^0\pi^0$		$< 3.3 \times 10^{-3}$	CL=90%
Γ_{117}	$K^*(1680)^-\pi^+$		$(8.2^{+3.9}_{-3.5}) \times 10^{-3}$	S=1.2

Γ_{118}	$\overline{K}^*(892)^0\pi^+\pi^-\pi^0$		$(1.8 \pm 0.9)\%$	
Γ_{119}	$\overline{K}^*(892)^0\eta$		$(1.8 \pm 0.4)\%$	
Γ_{120}	$K^-\pi^+\omega$		$(3.0 \pm 0.6)\%$	
Γ_{121}	$\overline{K}^*(892)^0\omega$		$(1.1 \pm 0.4)\%$	
Γ_{122}	$K^-\pi^+\eta'(958)$		$(6.9 \pm 1.8) \times 10^{-3}$	
Γ_{123}	$\overline{K}^*(892)^0\eta'(958)$		$< 1.0 \times 10^{-3}$	CL=90%
Γ_{124}	$K^-\pi^+\phi$		$(7.6 \pm 3.1) \times 10^{-5}$	
Γ_{125}	$K^+K^-\overline{K}^*(892)^0$		$(6.1 \pm 2.5) \times 10^{-5}$	
Γ_{126}	$\phi\overline{K}^*(892)^0$		$(3.0 \pm 0.6) \times 10^{-4}$	

Pionic modes

Γ_{127}	$\pi^+\pi^-$		$(1.38 \pm 0.05) \times 10^{-3}$	
Γ_{128}	$\pi^0\pi^0$		$(8.4 \pm 2.2) \times 10^{-4}$	
Γ_{129}	$\pi^+\pi^-\pi^0$		$(1.1 \pm 0.4)\%$	
Γ_{130}	$\pi^+\pi^+\pi^-\pi^-$		$(7.3 \pm 0.5) \times 10^{-3}$	
Γ_{131}	$\pi^+\pi^+\pi^-\pi^-\pi^0$			
Γ_{132}	$\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-$			

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

Γ_{133}	K^+K^-		$(3.89^{+0.12}_{-0.15}) \times 10^{-3}$	S=1.2
Γ_{134}	$K^0\overline{K}^0$		$(7.1 \pm 1.9) \times 10^{-4}$	S=1.2
Γ_{135}	$K^0K^-\pi^+$		$(6.9 \pm 1.0) \times 10^{-3}$	
Γ_{136}	$\overline{K}^*(892)^0K^0$ $\times$ B($\overline{K}^{*0} \to K^-\pi^+$)		$< 1.1 \times 10^{-3}$	CL=90%
Γ_{137}	$K^*(892)^+K^-$ $\times$ B($K^{*+} \to K^0\pi^+$)		$(2.5 \pm 0.5) \times 10^{-3}$	
Γ_{138}	$K^0K^-\pi^+$ nonresonant		$(2.3 \pm 2.3) \times 10^{-3}$	
Γ_{139}	$\overline{K}^0K^+\pi^-$		$(5.3 \pm 1.0) \times 10^{-3}$	
Γ_{140}	$K^*(892)^0\overline{K}^0$ $\times$ B($K^{*0} \to K^+\pi^-$)		$< 6 \times 10^{-4}$	CL=90%
Γ_{141}	$K^*(892)^-K^+$ $\times$ B($K^{*-} \to \overline{K}^0\pi^-$)		$(1.3 \pm 0.7) \times 10^{-3}$	
Γ_{142}	$\overline{K}^0K^+\pi^-$ nonresonant		$(3.8^{+2.3}_{-1.9}) \times 10^{-3}$	
Γ_{143}	$K^+K^-\pi^0$		$(1.24 \pm 0.35) \times 10^{-3}$	
Γ_{144}	$K^0_SK^0_S\pi^0$		$< 5.9 \times 10^{-4}$	
Γ_{145}	$K^+K^-\pi^+\pi^-$	[f]	$(2.49 \pm 0.23) \times 10^{-3}$	
Γ_{146}	$\phi\pi^+\pi^-$ $\times$ B($\phi \to K^+K^-$)		$(5.3 \pm 1.4) \times 10^{-4}$	
Γ_{147}	$\phi\rho^0$ $\times$ B($\phi \to K^+K^-$)		$(2.9 \pm 1.5) \times 10^{-4}$	
Γ_{148}	$K^+K^-\rho^0$ 3-body		$(9.0 \pm 2.3) \times 10^{-4}$	
Γ_{149}	$K^*(892)^0K^-\pi^+$ + c.c. $\times$ B($K^{*0} \to K^+\pi^-$)	[g]	$< 5 \times 10^{-4}$	
Γ_{150}	$K^*(892)^0\overline{K}^*(892)^0$ $\times$ B^2($K^{*0} \to K^+\pi^-$)		$(6 \pm 2) \times 10^{-4}$	

Γ_{151}	$\quad K^+ K^- \pi^+ \pi^-$ non-ϕ				
Γ_{152}	$\quad K^+ K^- \pi^+ \pi^-$ nonresonant			$< 8 \times 10^{-4}$	CL=90%
Γ_{153}	$K^0 \overline{K}^0 \pi^+ \pi^-$			$(7.5 \pm 2.9) \times 10^{-3}$	
Γ_{154}	$K^+ K^- \pi^+ \pi^- \pi^0$			$(3.1 \pm 2.0) \times 10^{-3}$	

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

Γ_{155}	$\overline{K}^*(892)^0 K^0$			$< 1.7 \times 10^{-3}$	CL=90%
Γ_{156}	$K^*(892)^+ K^-$			$(3.8 \pm 0.8) \times 10^{-3}$	
Γ_{157}	$K^*(892)^0 \overline{K}^0$			$< 9 \times 10^{-4}$	CL=90%
Γ_{158}	$K^*(892)^- K^+$			$(2.0 \pm 1.1) \times 10^{-3}$	
Γ_{159}	$\phi \pi^0$			$(7.5 \pm 0.5) \times 10^{-4}$	
Γ_{160}	$\phi \eta$			$(1.4 \pm 0.5) \times 10^{-4}$	
Γ_{161}	$\phi \omega$			$< 2.1 \times 10^{-3}$	CL=90%
Γ_{162}	$\phi \pi^+ \pi^-$			$(1.06 \pm 0.28) \times 10^{-3}$	
Γ_{163}	$\quad \phi \rho^0$			$(5.7 \pm 3.0) \times 10^{-4}$	
Γ_{164}	$\quad \phi \pi^+ \pi^-$ 3-body			$(7 \pm 5) \times 10^{-4}$	
Γ_{165}	$K^*(892)^0 K^- \pi^+ +$ c.c.		[g]	$< 7 \times 10^{-4}$	CL=90%
Γ_{166}	$\quad K^*(892)^0 K^- \pi^+$				
Γ_{167}	$\quad \overline{K}^*(892)^0 K^+ \pi^-$				
Γ_{168}	$\quad K^*(892)^0 \overline{K}^*(892)^0$			$(1.4 \pm 0.5) \times 10^{-3}$	

Radiative modes

Γ_{169}	$\rho^0 \gamma$			$< 2.4 \times 10^{-4}$	CL=90%
Γ_{170}	$\omega \gamma$			$< 2.4 \times 10^{-4}$	CL=90%
Γ_{171}	$\phi \gamma$			$(2.5 ^{+0.7}_{-0.6}) \times 10^{-5}$	
Γ_{172}	$\overline{K}^*(892)^0 \gamma$			$< 7.6 \times 10^{-4}$	CL=90%

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

Γ_{173}	$K^+ \ell^- \overline{\nu}_\ell$ (via $\overline{D}^0$)	*C2M*		$< 1.7 \times 10^{-4}$	CL=90%
Γ_{174}	$K^+ \pi^-$	*DC*		$(1.38 \pm 0.11) \times 10^{-4}$	
Γ_{175}	$K^+ \pi^-$ (via $\overline{D}^0$)	*C2M*		$< 1.6 \times 10^{-5}$	CL=95%
Γ_{176}	$K^*(892)^+ \pi^-$			$(3.0 ^{+3.8}_{-1.3}) \times 10^{-4}$	
Γ_{177}	$K^+ \pi^- \pi^0$			$(5.6 \pm 1.7) \times 10^{-4}$	
Γ_{178}	$K^+ \pi^- \pi^+ \pi^-$	*DC*		$(3.1 \pm 1.0) \times 10^{-4}$	
Γ_{179}	$K^+ \pi^- \pi^+ \pi^-$ (via $\overline{D}^0$)	*C2M*		$< 4 \times 10^{-4}$	CL=90%
Γ_{180}	$K^+ \pi^-$ or $K^+ \pi^- \pi^+ \pi^-$ (via $\overline{D}^0$)			$< 1.0 \times 10^{-3}$	CL=90%
Γ_{181}	μ^- anything (via $\overline{D}^0$)	*C2M*		$< 4 \times 10^{-4}$	CL=90%
Γ_{182}	$\gamma \gamma$	*C1*		$< 2.8 \times 10^{-5}$	CL=90%

Γ_{183}	$e^+ e^-$	*C1*		$<$ 6.2	$\times 10^{-6}$	CL=90%
Γ_{184}	$\mu^+ \mu^-$	*C1*		$<$ 4.1	$\times 10^{-6}$	CL=90%
Γ_{185}	$\pi^0 e^+ e^-$	*C1*		$<$ 4.5	$\times 10^{-5}$	CL=90%
Γ_{186}	$\pi^0 \mu^+ \mu^-$	*C1*		$<$ 1.8	$\times 10^{-4}$	CL=90%
Γ_{187}	$\eta e^+ e^-$	*C1*		$<$ 1.1	$\times 10^{-4}$	CL=90%
Γ_{188}	$\eta \mu^+ \mu^-$	*C1*		$<$ 5.3	$\times 10^{-4}$	CL=90%
Γ_{189}	$\pi^+ \pi^- e^+ e^-$	*C1*		$<$ 3.73	$\times 10^{-4}$	CL=90%
Γ_{190}	$\rho^0 e^+ e^-$	*C1*		$<$ 1.0	$\times 10^{-4}$	CL=90%
Γ_{191}	$\pi^+ \pi^- \mu^+ \mu^-$	*C1*		$<$ 3.0	$\times 10^{-5}$	CL=90%
Γ_{192}	$\rho^0 \mu^+ \mu^-$	*C1*		$<$ 2.2	$\times 10^{-5}$	CL=90%
Γ_{193}	$\omega e^+ e^-$	*C1*		$<$ 1.8	$\times 10^{-4}$	CL=90%
Γ_{194}	$\omega \mu^+ \mu^-$	*C1*		$<$ 8.3	$\times 10^{-4}$	CL=90%
Γ_{195}	$K^- K^+ e^+ e^-$	*C1*		$<$ 3.15	$\times 10^{-4}$	CL=90%
Γ_{196}	$\phi e^+ e^-$	*C1*		$<$ 5.2	$\times 10^{-5}$	CL=90%
Γ_{197}	$K^- K^+ \mu^+ \mu^-$	*C1*		$<$ 3.3	$\times 10^{-5}$	CL=90%
Γ_{198}	$\phi \mu^+ \mu^-$	*C1*		$<$ 3.1	$\times 10^{-5}$	CL=90%
Γ_{199}	$\overline{K}^0 e^+ e^-$		[h]	$<$ 1.1	$\times 10^{-4}$	CL=90%
Γ_{200}	$\overline{K}^0 \mu^+ \mu^-$		[h]	$<$ 2.6	$\times 10^{-4}$	CL=90%
Γ_{201}	$K^- \pi^+ e^+ e^-$	*C1*		$<$ 3.85	$\times 10^{-4}$	CL=90%
Γ_{202}	$\overline{K}^*(892)^0 e^+ e^-$		[h]	$<$ 4.7	$\times 10^{-5}$	CL=90%
Γ_{203}	$K^- \pi^+ \mu^+ \mu^-$	*C1*		$<$ 3.59	$\times 10^{-4}$	CL=90%
Γ_{204}	$\overline{K}^*(892)^0 \mu^+ \mu^-$		[h]	$<$ 2.4	$\times 10^{-5}$	CL=90%
Γ_{205}	$\pi^+ \pi^- \pi^0 \mu^+ \mu^-$	*C1*		$<$ 8.1	$\times 10^{-4}$	CL=90%
Γ_{206}	$\mu^\pm e^\mp$	*LF*	[i]	$<$ 8.1	$\times 10^{-6}$	CL=90%
Γ_{207}	$\pi^0 e^\pm \mu^\mp$	*LF*	[i]	$<$ 8.6	$\times 10^{-5}$	CL=90%
Γ_{208}	$\eta e^\pm \mu^\mp$	*LF*	[i]	$<$ 1.0	$\times 10^{-4}$	CL=90%
Γ_{209}	$\pi^+ \pi^- e^\pm \mu^\mp$	*LF*	[i]	$<$ 1.5	$\times 10^{-5}$	CL=90%
Γ_{210}	$\rho^0 e^\pm \mu^\mp$	*LF*	[i]	$<$ 4.9	$\times 10^{-5}$	CL=90%
Γ_{211}	$\omega e^\pm \mu^\mp$	*LF*	[i]	$<$ 1.2	$\times 10^{-4}$	CL=90%
Γ_{212}	$K^- K^+ e^\pm \mu^\mp$	*LF*	[i]	$<$ 1.8	$\times 10^{-4}$	CL=90%
Γ_{213}	$\phi e^\pm \mu^\mp$	*LF*	[i]	$<$ 3.4	$\times 10^{-5}$	CL=90%
Γ_{214}	$\overline{K}^0 e^\pm \mu^\mp$	*LF*	[i]	$<$ 1.0	$\times 10^{-4}$	CL=90%
Γ_{215}	$K^- \pi^+ e^\pm \mu^\mp$	*LF*	[i]	$<$ 5.53	$\times 10^{-4}$	CL=90%
Γ_{216}	$\overline{K}^*(892)^0 e^\pm \mu^\mp$	*LF*	[i]	$<$ 8.3	$\times 10^{-5}$	CL=90%
Γ_{217}	$\pi^- \pi^- e^+ e^+ +$ c.c.	*L*		$<$ 1.12	$\times 10^{-4}$	CL=90%
Γ_{218}	$\pi^- \pi^- \mu^+ \mu^+ +$ c.c.	*L*		$<$ 2.9	$\times 10^{-5}$	CL=90%
Γ_{219}	$K^- \pi^- e^+ e^+ +$ c.c.	*L*		$<$ 2.06	$\times 10^{-4}$	CL=90%
Γ_{220}	$K^- \pi^- \mu^+ \mu^+ +$ c.c.	*L*		$<$ 3.9	$\times 10^{-4}$	CL=90%
Γ_{221}	$K^- K^- e^+ e^+ +$ c.c.	*L*		$<$ 1.52	$\times 10^{-4}$	CL=90%
Γ_{222}	$K^- K^- \mu^+ \mu^+ +$ c.c.	*L*		$<$ 9.4	$\times 10^{-5}$	CL=90%
Γ_{223}	$\pi^- \pi^- e^+ \mu^+ +$ c.c.	*L*		$<$ 7.9	$\times 10^{-5}$	CL=90%
Γ_{224}	$K^- \pi^- e^+ \mu^+ +$ c.c.	*L*		$<$ 2.18	$\times 10^{-4}$	CL=90%
Γ_{225}	$K^- K^- e^+ \mu^+ +$ c.c.	*L*		$<$ 5.7	$\times 10^{-5}$	CL=90%

Γ_{226}	A dummy mode used by the fit.	(10.8 ± 3.4) %	S=1.1

[*a*] The exclusive e^+ modes $K^- e^+ \nu_e$, $K^- \pi^0 e^+ \nu_e$, $\overline{K}^0 \pi^- e^+ \nu_e$ and $\pi^- e^+ \nu_e$ are constrained to equal this (well-measured) inclusive fraction.

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

[*c*] 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^+.

[*d*] 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.

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

[*f*] 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.

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

[*h*] This mode is not a useful test for a ΔC=1 weak neutral current because both quarks must change flavor in this decay.

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

CONSTRAINED FIT INFORMATION

An overall fit to 58 branching ratios uses 125 measurements and one constraint to determine 32 parameters. The overall fit has a $\chi^2 = 67.2$ for 94 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, $x_i \equiv \Gamma_i/\Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

	x_2	x_9	x_{10}	x_{11}	x_{12}	x_{18}	x_{19}	x_{20}	x_{21}	x_{22}
x_9	6									
x_{10}	31	19								
x_{11}	0	−8	−1							
x_{12}	−1	−15	−3	−91						
x_{18}	1	24	5	−4	−8					
x_{19}	1	10	3	−1	−1	2				
x_{20}	13	46	42	−3	−7	11	8			
x_{21}	1	6	5	0	−1	1	16	11		
x_{22}	2	10	8	−1	−1	2	28	18	58	
x_{34}	3	11	9	−1	−2	3	10	22	22	33
x_{46}	5	18	17	−1	−3	4	3	40	5	8
x_{55}	1	4	3	0	−1	1	12	8	24	42
x_{64}	3	9	8	−1	−1	2	2	19	2	4
x_{73}	1	4	3	0	−1	1	11	7	22	38
x_{81}	1	4	3	0	−1	1	11	7	54	40
x_{84}	1	3	3	0	−1	1	9	6	19	34
x_{86}	1	5	4	0	−1	1	14	9	29	51
x_{91}	2	9	7	−1	−1	2	25	17	51	88
x_{92}	1	5	4	0	−1	1	6	10	18	19
x_{94}	1	3	3	0	0	1	1	7	1	1
x_{98}	1	2	2	0	0	0	1	4	2	4
x_{109}	0	2	2	0	0	0	4	4	9	16
x_{113}	1	3	2	0	0	1	8	5	16	28
x_{117}	0	1	1	0	0	0	3	2	6	9
x_{119}	1	3	3	0	0	1	2	6	5	8
x_{133}	9	32	30	−2	−5	8	6	71	8	13
x_{134}	0	2	2	0	0	0	6	4	12	20
x_{135}	1	4	4	0	−1	1	9	9	19	33
x_{139}	1	4	3	0	−1	1	7	7	13	23
x_{156}	1	3	2	0	0	1	7	5	15	25
x_{226}	−28	−17	−24	0	1	−4	−30	−33	−47	−70

	x_{34}	x_{46}	x_{55}	x_{64}	x_{73}	x_{81}	x_{84}	x_{86}	x_{91}	x_{92}
x_{46}	9									
x_{55}	14	5								
x_{64}	4	28	2							
x_{73}	12	3	16	1						
x_{81}	14	3	17	1	15					
x_{84}	11	3	38	1	13	13				
x_{86}	17	4	21	2	−4	20	17			
x_{91}	36	7	37	3	33	35	30	45		
x_{92}	43	4	8	2	7	11	6	10	20	
x_{94}	2	18	1	5	1	1	1	1	1	1
x_{98}	2	10	8	3	1	2	3	2	3	1
x_{109}	5	4	37	1	6	6	14	8	14	3
x_{113}	9	2	12	1	10	11	9	14	25	5
x_{117}	7	1	4	0	3	4	3	5	9	4
x_{119}	23	2	3	1	3	3	3	4	8	10
x_{133}	16	29	6	14	5	5	4	6	12	7
x_{134}	7	2	9	1	8	8	7	10	18	4
x_{135}	11	4	14	2	12	13	11	17	29	6
x_{139}	8	3	10	1	9	9	8	12	20	5
x_{156}	8	2	11	1	9	10	8	13	22	5
x_{226}	−56	−27	−66	−20	−28	−33	−43	−37	−67	−36

	x_{94}	x_{98}	x_{109}	x_{113}	x_{117}	x_{119}	x_{133}	x_{134}	x_{135}	x_{139}
x_{98}	2									
x_{109}	1	3								
x_{113}	0	1	4							
x_{117}	0	0	1	3						
x_{119}	0	0	1	2	2					
x_{133}	5	3	3	4	2	4				
x_{134}	0	1	3	6	2	2	3			
x_{135}	1	1	5	9	3	3	6	7		
x_{139}	1	1	4	6	2	2	5	5	8	
x_{156}	0	1	4	7	2	2	4	5	8	6
x_{226}	−14	−22	−33	−25	−19	−25	−24	−15	−26	−20

	x_{156}
x_{226}	−20

D^0 BRANCHING RATIOS

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

Inclusive modes

$\Gamma(e^+ \text{anything})/\Gamma_{total}$ — $\Gamma_1/\Gamma = (\Gamma_9+\Gamma_{11}+\Gamma_{12}+\Gamma_{18})/\Gamma$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0687±0.0028 OUR FIT					
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	[20] 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

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

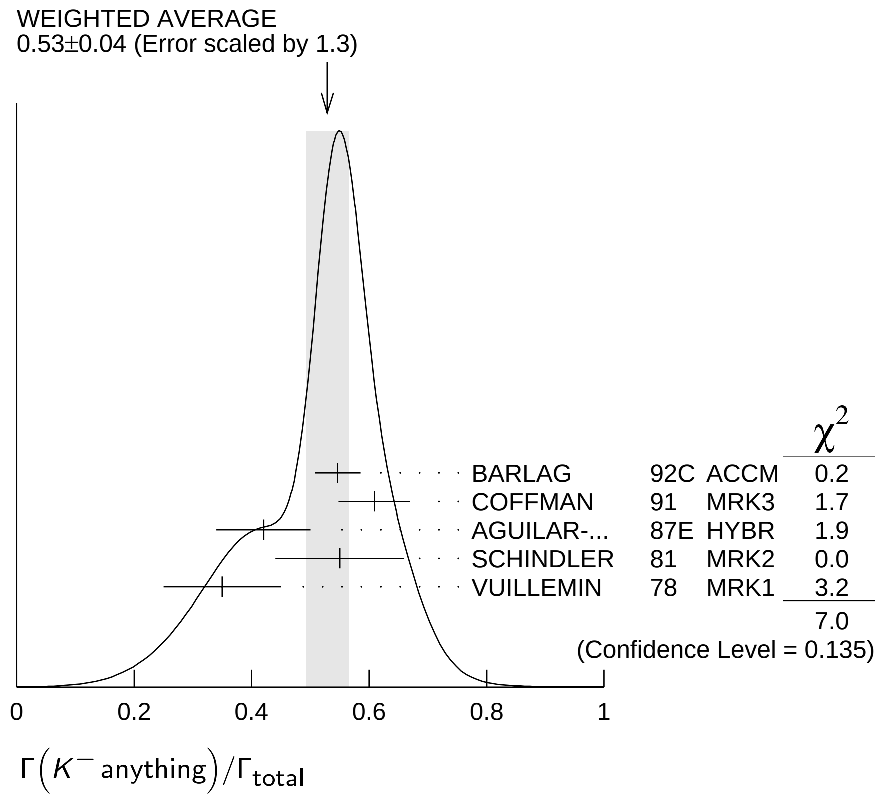
$\Gamma(\mu^+ \text{anything})/\Gamma_{total}$ — Γ_2/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.065±0.008 OUR FIT					
0.060±0.007±0.012	310	ALBRECHT	96C	ARG	$e^+e^- \approx$ 10 GeV

$\Gamma(K^- \text{anything})/\Gamma_{total}$ — 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.				
$0.546^{+0.039}_{-0.038}$		[21] 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

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



$[\Gamma(\overline{K}^0 \text{anything}) + \Gamma(K^0 \text{anything})]/\Gamma_{total}$ Γ_4/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.42 ±0.05 OUR AVERAGE					
0.455±0.050±0.032		COFFMAN	91	MRK3	e^+e^- 3.77 GeV
0.29 ±0.11	13	SCHINDLER	81	MRK2	e^+e^- 3.771 GeV
0.57 ±0.26	6	VUILLEMIN	78	MRK1	e^+e^- 3.772 GeV

$\Gamma(K^+ \text{anything})/\Gamma_{total}$ Γ_5/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.034^{+0.006}_{-0.004}$ OUR AVERAGE					
$0.034^{+0.007}_{-0.005}$		[22] BARLAG	92C	ACCM	π^- Cu 230 GeV
0.028±0.009±0.004		COFFMAN	91	MRK3	e^+e^- 3.77 GeV
$0.03^{+0.05}_{-0.02}$		AGUILAR-...	87E	HYBR	πp, pp 360, 400 GeV
0.08 ±0.03	25	SCHINDLER	81	MRK2	e^+e^- 3.771 GeV

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

$\Gamma(\phi \text{ anything})/\Gamma_{total}$ Γ_7/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.0171^{+0.0076}_{-0.0071}$±0.0017	9	[23] BAI	00C	BES	$e^+e^- \to D\overline{D}^*$, $D^*\overline{D}^*$

[23] BAI 00C finds the average (ϕ anything) branching fraction for the 4.03-GeV mix of D^+ and D^0 mesons to be (1.34 ± 0.52 ± 0.12)%.

Semileptonic modes

$\Gamma(K^- \ell^+ \nu_\ell)/\Gamma_{\text{total}}$ — Γ_8/Γ

We average our $K^- e^+ \nu_e$ and $K^- \mu^+ \nu_\mu$ branching fractions, after multiplying the latter by a phase-space factor of 1.03 to be able to use it with the $K^- e^+ \nu_e$ fraction. Hence our ℓ^+ here is really an e^+.

VALUE	DOCUMENT ID		COMMENT
0.0343±0.0014 OUR AVERAGE	Error includes scale factor of 1.2.		
0.0358±0.0018	PDG	04	Our $\Gamma(K^- e^+ \nu_e)/\Gamma_{\text{total}}$
0.0329±0.0017	PDG	04	1.03 × our $\Gamma(K^- \mu^+ \nu_\mu)/\Gamma_{\text{total}}$

$\Gamma(K^- e^+ \nu_e)/\Gamma_{\text{total}}$ — Γ_9/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0358±0.0018 OUR FIT	Error includes scale factor of 1.1.				
0.034 ±0.005 ±0.004	55	ADLER	89	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(K^- e^+ \nu_e)/\Gamma(K^- \pi^+)$ — Γ_9/Γ_{20}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.94 ±0.04 OUR FIT					
0.95 ±0.04 OUR AVERAGE					
0.978±0.027±0.044	2510	[24] BEAN	93C	CLE2	$e^+ e^- \approx \Upsilon(4S)$
0.90 ±0.06 ±0.06	584	[25] CRAWFORD	91B	CLEO	$e^+ e^- \approx$ 10.5 GeV
0.91 ±0.07 ±0.11	250	[26] ANJOS	89F	E691	Photoproduction

[24] BEAN 93C uses $K^- \mu^+ \nu_\mu$ as well as $K^- e^+ \nu_e$ events and makes a small phase-space adjustment to the number of the μ^+ events to use them as e^+ events. A pole mass of $2.00 \pm 0.12 \pm 0.18$ GeV/c^2 is obtained from the q^2 dependence of the decay rate.

[25] CRAWFORD 91B uses $K^- e^+ \nu_e$ and $K^- \mu^+ \nu_\mu$ candidates to measure a pole mass of $2.1^{+0.4}_{-0.2}{}^{+0.3}_{-0.2}$ GeV/c^2 from the q^2 dependence of the decay rate.

[26] ANJOS 89F measures a pole mass of $2.1^{+0.4}_{-0.2} \pm 0.2$ GeV/c^2 from the q^2 dependence of the decay rate.

$\Gamma(K^- \mu^+ \nu_\mu)/\Gamma(K^- \pi^+)$ — Γ_{10}/Γ_{20}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.84 ±0.04 OUR FIT					
0.84 ±0.04 OUR AVERAGE					
0.852±0.034±0.028	1897	[27] FRABETTI	95G	E687	γ Be $\overline{E}_\gamma$= 220 GeV
0.82 ±0.13 ±0.13	338	[28] FRABETTI	93I	E687	γ Be $\overline{E}_\gamma$= 221 GeV
0.79 ±0.08 ±0.09	231	[29] CRAWFORD	91B	CLEO	$e^+ e^- \approx$ 10.5 GeV

[27] FRABETTI 95G extracts the ratio of form factors $f_-(0)/f_+(0) = -1.3^{+3.6}_{-3.4} \pm 0.6$, and measures a pole mass of $1.87^{+0.11}_{-0.08}{}^{+0.07}_{-0.06}$ GeV/c^2 from the q^2 dependence of the decay rate.

[28] FRABETTI 93I measures a pole mass of $2.1^{+0.7}_{-0.3}{}^{+0.7}_{-0.3}$ GeV/c^2 from the q^2 dependence of the decay rate.

[29] CRAWFORD 91B measures a pole mass of $2.00 \pm 0.12 \pm 0.18$ GeV/c^2 from the q^2 dependence of the decay rate.

$\Gamma(K^- \mu^+ \nu_\mu)/\Gamma(\mu^+ \text{anything})$ — Γ_{10}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.49 ±0.06 OUR FIT					
0.472±0.051±0.040	232	KODAMA	94	E653	π^- emulsion 600 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.32 ±0.05 ±0.05	124	KODAMA	91	EMUL	pA 800 GeV

$\Gamma(K^- \pi^0 e^+ \nu_e)/\Gamma_{\text{total}}$ — Γ_{11}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.011^{+0.008}_{-0.006}$ OUR FIT Error includes scale factor of 1.6.					
$0.016^{+0.013}_{-0.005}\pm0.002$	4	[30] BAI	91	MRK3	$e^+e^- \approx$ 3.77 GeV

[30] BAI 91 finds that a fraction $0.79^{+0.15}_{-0.17}{}^{+0.09}_{-0.03}$ of combined D^+ and D^0 decays to $\overline{K}\pi e^+\nu_e$ (24 events) are $\overline{K}^*(892) e^+ \nu_e$. BAI 91 uses 56 $K^- e^+ \nu_e$ events to measure a pole mass of $1.8 \pm 0.3 \pm 0.2$ GeV/c^2 from the q^2 dependence of the decay rate.

$\Gamma(\overline{K}^0 \pi^- e^+ \nu_e)/\Gamma_{\text{total}}$ — Γ_{12}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.018±0.008 OUR FIT Error includes scale factor of 1.6.					
$0.028^{+0.017}_{-0.008}\pm0.003$	6	[31] BAI	91	MRK3	$e^+e^- \approx$ 3.77 GeV

[31] BAI 91 finds that a fraction $0.79^{+0.15}_{-0.17}{}^{+0.09}_{-0.03}$ of combined D^+ and D^0 decays to $\overline{K}\pi e^+\nu_e$ (24 events) are $\overline{K}^*(892) e^+ \nu_e$.

$\Gamma(K^*(892)^- e^+ \nu_e)/\Gamma(K^- e^+ \nu_e)$ — Γ_{19}/Γ_9

Unseen decay modes of the $K^*(892)^-$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.60±0.10 OUR FIT				
0.51±0.18±0.06	CRAWFORD	91B	CLEO	$e^+e^- \approx$ 10.5 GeV

$\Gamma(K^*(892)^- e^+ \nu_e)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{19}/Γ_{22}

Unseen decay modes of the $\overline{K}^*(892)^-$ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.36±0.06 OUR FIT					
0.38±0.06±0.03	152	[32] BEAN	93C	CLE2	$e^+e^- \approx \Upsilon(4S)$

[32] BEAN 93C uses $K^{*-} \mu^+ \nu_\mu$ as well as $K^{*-} e^+ \nu_e$ events and makes a small phase-space adjustment to the number of the μ^+ events to use them as e^+ events.

$\Gamma(K^*(892)^- \ell^+ \nu_\ell)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{14}/Γ_{22}

This an average of the $K^*(892)^- e^+ \nu_e$ and $K^*(892)^- \mu^+ \nu_\mu$ ratios. Unseen decay modes of the $K^*(892)^-$ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.24±0.07±0.06	137	[33] ALEXANDER	90B	CLEO	e^+e^- 10.5–11 GeV

[33] ALEXANDER 90B cannot exclude extra π^0's in the final state. See nearby data blocks for more detailed results.

$\Gamma(\overline{K}^*(892)^0 \pi^- e^+ \nu_e)/\Gamma(K^*(892)^- e^+ \nu_e)$ Γ_{15}/Γ_{19}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.64	90	[34] CRAWFORD	91B	CLEO	$e^+ e^- \approx$ 10.5 GeV

[34] The limit on $(\overline{K}^*(892)\pi)^- \mu^+ \nu_\mu$ below is much stronger.

$\Gamma(K^- \pi^+ \pi^- \mu^+ \nu_\mu)/\Gamma(K^- \mu^+ \nu_\mu)$ Γ_{16}/Γ_{10}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.037	90	KODAMA	93B	E653	π^- emulsion 600 GeV

$\Gamma((\overline{K}^*(892)\pi)^- \mu^+ \nu_\mu)/\Gamma(K^- \mu^+ \nu_\mu)$ Γ_{17}/Γ_{10}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.043	90	[35] KODAMA	93B	E653	π^- emulsion 600 GeV

[35] KODAMA 93B searched in $K^- \pi^+ \pi^- \mu^+ \nu_\mu$, but the limit includes other $(\overline{K}^*(892)\pi)^-$ charge states.

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0036±0.0006 OUR FIT					
$\mathbf{0.0039^{+0.0023}_{-0.0011}\pm0.0004}$	7	[36] ADLER	89	MRK3	$e^+ e^-$ 3.77 GeV

[36] This result of ADLER 89 gives $|\frac{V_{cd}}{V_{cs}} \cdot \frac{f_+^\pi(0)}{f_+^K(0)}|^2 = 0.057^{+0.038}_{-0.015} \pm 0.005$.

$\Gamma(\pi^- e^+ \nu_e)/\Gamma(K^- e^+ \nu_e)$ Γ_{18}/Γ_9

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.101±0.017 OUR FIT					
0.101±0.018 OUR AVERAGE					
0.101±0.020±0.003	91	[37] FRABETTI	96B	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV
0.103±0.039±0.013	87	[38] BUTLER	95	CLE2	< 0.156 (90% CL)

[37] FRABETTI 96B uses both e and μ events, and makes a small correction to the μ events to make them effectively e events. This result gives $|\frac{V_{cd}}{V_{cs}} \cdot \frac{f_+^\pi(0)}{f_+^K(0)}|^2 = 0.050 \pm 0.011 \pm 0.002$.

[38] BUTLER 95 has 87 ± 33 $\pi^- e^+ \nu_e$ events. The result gives $|\frac{V_{cd}}{V_{cs}} \cdot \frac{f_+^\pi(0)}{f_+^K(0)}|^2 = 0.052 \pm 0.020 \pm 0.007$.

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

$\Gamma(K^- \pi^+)/\Gamma_{total}$ Γ_{20}/Γ

We list measurements *before* radiative corrections are made.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0380±0.0009 OUR FIT					
0.0385±0.0009 OUR AVERAGE					
0.0382±0.0007±0.0012		[39] ARTUSO	98	CLE2	CLEO average
0.0390±0.0009±0.0012	5392	[40] BARATE	97C	ALEP	From Z decays
0.045 ±0.006 ±0.004		[41] ALBRECHT	94	ARG	$e^+ e^- \approx \Upsilon(4S)$
0.0341±0.0012±0.0028	1173	[40] ALBRECHT	94F	ARG	$e^+ e^- \approx \Upsilon(4S)$

$0.0362 \pm 0.0034 \pm 0.0044$		[40]	DECAMP	91J	ALEP	From Z decays
$0.045 \pm 0.008 \pm 0.005$	56	[40]	ABACHI	88	HRS	e^+e^- 29 GeV
$0.042 \pm 0.004 \pm 0.004$	930		ADLER	88C	MRK3	e^+e^- 3.77 GeV
0.041 ± 0.006	263	[42]	SCHINDLER	81	MRK2	e^+e^- 3.771 GeV
0.043 ± 0.010	130	[43]	PERUZZI	77	MRK1	e^+e^- 3.77 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$0.0381 \pm 0.0015 \pm 0.0016$	1165	[44]	ARTUSO	98	CLE2	e^+e^- at $\Upsilon(4S)$
$0.0369 \pm 0.0011 \pm 0.0016$		[45]	COAN	98	CLE2	See ARTUSO 98
$0.0391 \pm 0.0008 \pm 0.0017$	4208	[40,46]	AKERIB	93	CLE2	See ARTUSO 98

[39] This combines the CLEO results of ARTUSO 98, COAN 98, and AKERIB 93.

[40] ABACHI 88, DECAMP 91J, AKERIB 93, ALBRECHT 94F, and BARATE 97C use $D^*(2010)^+ \rightarrow D^0\pi^+$ decays. The π^+ is both slow and of low p_T with respect to the event thrust axis or nearest jet ($\approx D^{*+}$ direction). The excess number of such π^+'s over background gives the number of $D^*(2010)^+ \rightarrow D^0\pi^+$ events, and the fraction with $D^0 \rightarrow K^-\pi^+$ gives the $D^0 \rightarrow K^-\pi^+$ branching fraction.

[41] ALBRECHT 94 uses D^0 mesons from $\overline{B}^0 \rightarrow D^{*+}\ell^-\overline{\nu}_\ell$ decays. This is a different set of events than used by ALBRECHT 94F.

[42] SCHINDLER 81 (MARK-2) measures $\sigma(e^+e^- \rightarrow \psi(3770)) \times$ branching fraction to be 0.24 ± 0.02 nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.

[43] PERUZZI 77 (MARK-1) measures $\sigma(e^+e^- \rightarrow \psi(3770)) \times$ branching fraction to be 0.25 ± 0.05 nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.

[44] ARTUSO 98, following ALBRECHT 94, uses D^0 mesons from $\overline{B}^0 \rightarrow D^*(2010)^+ X \ell^- \overline{\nu}_\ell$ decays. Our average uses the CLEO average of this value with the values of COAN 98 and AKERIB 93.

[45] COAN 98 assumes that $\Gamma(B \rightarrow \overline{D} X \ell^+ \nu)/\Gamma(B \rightarrow X \ell^+ \nu) = 1.0 - 3|V_{ub}/V_{cb}|^2 - 0.010 \pm 0.005$, the last term accounting for $\overline{B} \rightarrow D_s^+ K X \ell^- \overline{\nu}$. COAN 98 is included in the CLEO average in ARTUSO 98.

[46] This AKERIB 93 value does not include radiative corrections; with them, the value is $0.0395 \pm 0.0008 \pm 0.0017$. AKERIB 93 is included in the CLEO average in ARTUSO 98.

$\Gamma(\overline{K}^0\pi^0)/\Gamma(K^-\pi^+)$ — Γ_{21}/Γ_{20}

VALUE	EVTS		DOCUMENT ID		TECN	COMMENT
0.60±0.06 OUR FIT						
1.36±0.23±0.22	119		ANJOS	92B	E691	γ Be 80–240 GeV

$\Gamma(\overline{K}^0\pi^0)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{21}/Γ_{22}

VALUE	EVTS		DOCUMENT ID		TECN	COMMENT
0.385±0.031 OUR FIT						
0.378±0.033 OUR AVERAGE						
$0.44 \pm 0.02 \pm 0.05$	1942		PROCARIO	93B	CLE2	e^+e^- 10.36–10.7 GeV
$0.34 \pm 0.04 \pm 0.02$	92	[47]	ALBRECHT	92P	ARG	$e^+e^- \approx$ 10 GeV
$0.36 \pm 0.04 \pm 0.08$	104		KINOSHITA	91	CLEO	$e^+e^- \sim$ 10.7 GeV

[47] This value is calculated from numbers in Table 1 of ALBRECHT 92P.

$\Gamma(\overline{K}^0\pi^+\pi^-)/\Gamma_{total}$ — Γ_{22}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0597±0.0035 OUR FIT Error includes scale factor of 1.1.					
0.055 ±0.005 OUR AVERAGE					
0.0503±0.0039±0.0049	284	[48] ALBRECHT	94F	ARG	$e^+e^- \approx \Upsilon(4S)$
0.064 ±0.005 ±0.010		ADLER	87	MRK3	e^+e^- 3.77 GeV
0.052 ±0.016	32	[49] SCHINDLER	81	MRK2	e^+e^- 3.771 GeV
0.079 ±0.023	28	[50] PERUZZI	77	MRK1	e^+e^- 3.77 GeV

[48] See the footnote on the ALBRECHT 94F measurement of $\Gamma(K^-\pi^+)/\Gamma_{total}$ for the method used.

[49] SCHINDLER 81 (MARK-2) measures $\sigma(e^+e^- \rightarrow \psi(3770)) \times$ branching fraction to be 0.30 ± 0.08 nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.

[50] PERUZZI 77 (MARK-1) measures $\sigma(e^+e^- \rightarrow \psi(3770)) \times$ branching fraction to be 0.46 ± 0.12 nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.

$\Gamma(\overline{K}^0\pi^+\pi^-)/\Gamma(K^-\pi^+)$ — Γ_{22}/Γ_{20}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.57±0.09 OUR FIT Error includes scale factor of 1.1.					
1.65±0.17 OUR AVERAGE					
1.61±0.10±0.15	856	FRABETTI	94J	E687	γ Be $\overline{E}_\gamma$=220 GeV
1.7 ±0.8	35	AVERY	80	SPEC	$\gamma N \rightarrow D^{*+}$
2.8 ±1.0	116	PICCOLO	77	MRK1	e^+e^- 4.03, 4.41 GeV

$\Gamma(\overline{K}^0\rho^0)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{23}/Γ_{22}

VALUE	DOCUMENT ID		TECN	COMMENT
$0.259^{+0.014}_{-0.023}$ OUR AVERAGE Error includes scale factor of 1.1.				
$0.264\pm0.009^{+0.010}_{-0.026}$	MURAMATSU	02	CLE2	$e^+e^- \approx$ 10 GeV
0.350±0.028±0.067	FRABETTI	94G	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
0.227±0.032±0.009	ALBRECHT	93D	ARG	$e^+e^- \approx$ 10 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.215±0.051±0.037	ANJOS	93	E691	γ Be 90–260 GeV
0.20 ±0.06 ±0.03	FRABETTI	92B	E687	γ Be $\overline{E}_\gamma$= 221 GeV
0.12 ±0.01 ±0.07	ADLER	87	MRK3	e^+e^- 3.77 GeV

$\Gamma(\overline{K}^0 f_0(980) \times B(f_0 \rightarrow \pi^+\pi^-))/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{25}/Γ_{22}

This includes only $\pi^+\pi^-$ decays of the $f_0(980)$, because branching fractions of this resonance are not known.

VALUE	DOCUMENT ID		TECN	COMMENT
$0.047^{+0.010}_{-0.007}$ OUR AVERAGE				
$0.043\pm0.005^{+0.012}_{-0.006}$	MURAMATSU	02	CLE2	$e^+e^- \approx$ 10 GeV
0.068±0.016±0.018	FRABETTI	94G	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
0.046±0.018±0.006	ALBRECHT	93D	ARG	$e^+e^- \approx$ 10 GeV

$\Gamma(\overline{K}^0 f_2(1270))/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{89}/Γ_{22}

Unseen decay modes of the $f_2(1270)$ are included. Note the large difference between MURAMATSU 02 and earlier measurements.

VALUE	DOCUMENT ID		TECN	COMMENT
$0.008^{+0.007}_{-0.004}$ OUR AVERAGE				
$0.0048\pm0.0027^{+0.0065}_{-0.0029}$	MURAMATSU	02	CLE2	$e^+e^- \approx$ 10 GeV
$0.065\ \pm0.025\ \pm0.030$	FRABETTI	94G	E687	γBe, $\overline{E}_\gamma \approx$ 220 GeV
$0.088\ \pm0.037\ \pm0.014$	ALBRECHT	93D	ARG	$e^+e^- \approx$ 10 GeV

$\Gamma(\overline{K}^0 f_0(1370) \times B(f_0 \to \pi^+\pi^-))/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{27}/Γ_{22}

This includes only $\pi^+\pi^-$ decays of the $f_0(1370)$, because branching fractions of this resonance are not known.

VALUE	DOCUMENT ID		TECN	COMMENT
$0.085^{+0.019}_{-0.021}$ OUR AVERAGE				
$0.099\pm0.011^{+0.028}_{-0.044}$	MURAMATSU	02	CLE2	$e^+e^- \approx$ 10 GeV
$0.077\pm0.022\pm0.031$	FRABETTI	94G	E687	γBe, $\overline{E}_\gamma \approx$ 220 GeV
$0.082\pm0.028\pm0.013$	ALBRECHT	93D	ARG	$e^+e^- \approx$ 10 GeV

$\Gamma(K^*(892)^-\pi^+)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{91}/Γ_{22}

Unseen decay modes of the $K^*(892)^-$ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.997^{+0.030}_{-0.034}$ OUR FIT					
$0.991^{+0.028}_{-0.040}$ OUR AVERAGE					
$0.986\pm0.020^{+0.027}_{-0.063}$		MURAMATSU	02	CLE2	$e^+e^- \approx$ 10 GeV
$0.938\pm0.054\pm0.038$		FRABETTI	94G	E687	γBe, $\overline{E}_\gamma \approx$ 220 GeV
$1.08\ \pm0.063\pm0.045$		ALBRECHT	93D	ARG	$e^+e^- \approx$ 10 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.720\pm0.145\pm0.185$		ANJOS	93	E691	γBe 90–260 GeV
$0.96\ \pm0.12\ \pm0.075$		FRABETTI	92B	E687	γBe $\overline{E}_\gamma$= 221 GeV
$0.84\ \pm0.06\ \pm0.08$		ADLER	87	MRK3	e^+e^- 3.77 GeV
$1.05\ ^{+0.23}_{-0.26}\ ^{+0.07}_{-0.09}$	25	SCHINDLER	81	MRK2	e^+e^- 3.771 GeV

$\Gamma(K_0^*(1430)^-\pi^+)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{113}/Γ_{22}

Unseen decay modes of the $K_0^*(1430)^-$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
$0.165^{+0.033}_{-0.021}$ OUR FIT				
$0.154^{+0.034}_{-0.019}$ OUR AVERAGE				
$0.118\pm0.011^{+0.050}_{-0.018}$	MURAMATSU	02	CLE2	$e^+e^- \approx$ 10 GeV
$0.176\pm0.044\pm0.047$	FRABETTI	94G	E687	γBe, $\overline{E}_\gamma \approx$ 220 GeV
$0.208\pm0.055\pm0.034$	ALBRECHT	93D	ARG	$e^+e^- \approx$ 10 GeV

$\Gamma(K_2^*(1430)^-\pi^+)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{115}/Γ_{22}

Unseen decay modes of the $K_2^*(1430)^-$ are included.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$0.033\pm0.006^{+0.020}_{-0.010}$		MURAMATSU 02	CLE2	$e^+e^- \approx$ 10 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.15	90	ALBRECHT 93D	ARG	$e^+e^- \approx$ 10 GeV

$\Gamma(K^*(1680)^-\pi^+)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{117}/Γ_{22}

Unseen decay modes of the $K^*(1680)^-$ are included.

VALUE	DOCUMENT ID	TECN	COMMENT
$0.14^{+0.07}_{-0.06}$ OUR FIT Error includes scale factor of 1.2.			
$0.085\pm0.016^{+0.069}_{-0.059}$	MURAMATSU 02	CLE2	$e^+e^- \approx$ 10 GeV

$\Gamma(\overline{K}^0\pi^+\pi^-$ nonresonant$)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{33}/Γ_{22}

Neither FRABETTI 94G nor ALBRECHT 93D sees evidence for a nonresonant component.

VALUE	DOCUMENT ID	TECN	COMMENT
$0.009\pm0.004^{+0.020}_{-0.004}$	MURAMATSU 02	CLE2	$e^+e^- \approx$ 10 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.263\pm0.024\pm0.041$	ANJOS 93	E691	γ Be 90–260 GeV
$0.26\pm0.08\pm0.05$	FRABETTI 92B	E687	γ Be $\overline{E}_\gamma$= 221 GeV
$0.33\pm0.05\pm0.10$	ADLER 87	MRK3	e^+e^- 3.77 GeV

$\Gamma(K^-\pi^+\pi^0)/\Gamma_{total}$ — Γ_{34}/Γ

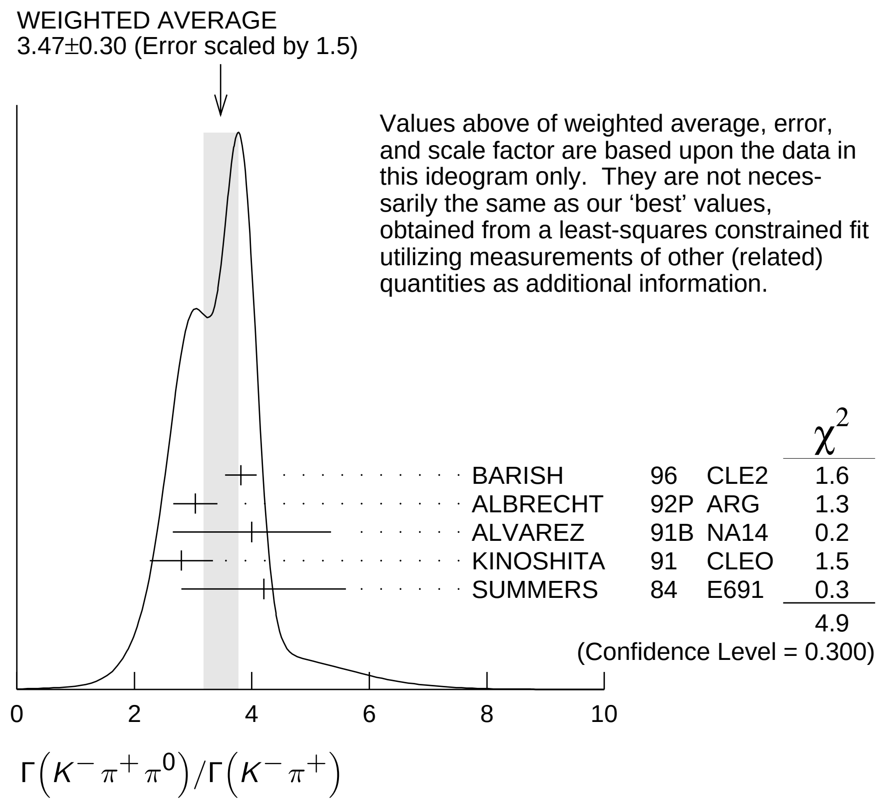
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.130 ± 0.008 OUR FIT Error includes scale factor of 1.3.				
0.131 ± 0.016 OUR AVERAGE				
$0.133\pm0.012\pm0.013$	931	ADLER 88C	MRK3	e^+e^- 3.77 GeV
0.117 ± 0.043	37	[51] SCHINDLER 81	MRK2	e^+e^- 3.771 GeV

[51] SCHINDLER 81 (MARK-2) measures $\sigma(e^+e^- \rightarrow \psi(3770)) \times$ branching fraction to be 0.68 ± 0.23 nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.

$\Gamma(K^-\pi^+\pi^0)/\Gamma(K^-\pi^+)$ — Γ_{34}/Γ_{20}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
3.42 ± 0.22 OUR FIT Error includes scale factor of 1.3.				
3.47 ± 0.30 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.				
$3.81\pm0.07\pm0.26$	10k	BARISH 96	CLE2	$e^+e^- \approx \Upsilon(4S)$
$3.04\pm0.16\pm0.34$	931	[52] ALBRECHT 92P	ARG	$e^+e^- \approx$ 10 GeV
$4.0\pm0.9\pm1.0$	69	ALVAREZ 91B	NA14	Photoproduction
$2.8\pm0.14\pm0.52$	1050	KINOSHITA 91	CLEO	$e^+e^- \sim$ 10.7 GeV
4.2 ± 1.4	41	SUMMERS 84	E691	Photoproduction

[52] This value is calculated from numbers in Table 1 of ALBRECHT 92P.



$\Gamma(K^-\rho^+)/\Gamma(K^-\pi^+\pi^0)$ Γ_{35}/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.78 ±0.04 OUR AVERAGE					
0.788±0.019±0.048		KOPP	01	CLE2	$e^+e^- \approx$ 10.6 GeV
0.765±0.041±0.054		FRABETTI	94G	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.647±0.039±0.150		ANJOS	93	E691	γ Be 90–260 GeV
0.81 ±0.03 ±0.06		ADLER	87	MRK3	e^+e^- 3.77 GeV
$0.31\ ^{+0.20}_{-0.14}$	13	SUMMERS	84	E691	Photoproduction
$0.85\ ^{+0.11}_{-0.15}\ ^{+0.09}_{-0.10}$	31	SCHINDLER	81	MRK2	e^+e^- 3.771 GeV

$\Gamma(K^-\rho(1700)^+ \times B(\rho(1700)^+ \to \pi^+\pi^0))/\Gamma(K^-\pi^+\pi^0)$ Γ_{36}/Γ_{34}

This only includes $\pi^+\pi^0$ decays of the $\rho(1700)^+$, because branching fractions of this resonance are not known.

VALUE	DOCUMENT ID		TECN	COMMENT
0.057±0.008±0.009	KOPP	01	CLE2	$e^+e^- \approx$ 10.6 GeV

$\Gamma\big(K^*(892)^-\pi^+\big)/\Gamma\big(K^-\pi^+\pi^0\big)$ — Γ_{91}/Γ_{34}

Unseen decay modes of the $K^*(892)^-$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.457±0.034 OUR FIT Error includes scale factor of 1.2.				
0.48 $^{+0.08}_{-0.04}$ OUR AVERAGE				
$0.483\pm0.021^{+0.081}_{-0.032}$	KOPP	01	CLE2	$e^+e^- \approx$ 10.6 GeV
$0.444\pm0.084\pm0.147$	FRABETTI	94G	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.252\pm0.033\pm0.035$	ANJOS	93	E691	γ Be 90–260 GeV
$0.36\pm0.06\pm0.09$	ADLER	87	MRK3	e^+e^- 3.77 GeV

$\Gamma\big(\overline{K}^*(892)^0\pi^0\big)/\Gamma\big(K^-\pi^+\pi^0\big)$ — Γ_{92}/Γ_{34}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.214±0.027 OUR FIT Error includes scale factor of 1.1.				
0.204±0.025 OUR AVERAGE				
$0.191\pm0.014\pm0.024$	KOPP	01	CLE2	$e^+e^- \approx$ 10.6 GeV
$0.248\pm0.047\pm0.023$	FRABETTI	94G	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.213\pm0.027\pm0.035$	ANJOS	93	E691	γ Be 90–260 GeV
$0.20\pm0.03\pm0.05$	ADLER	87	MRK3	e^+e^- 3.77 GeV

$\Gamma\big(K_0^*(1430)^-\pi^+\big)/\Gamma\big(K^-\pi^+\pi^0\big)$ — Γ_{113}/Γ_{34}

Unseen decay modes of the $K_0^*(1430)^-$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.075$^{+0.016}_{-0.010}$ OUR FIT				
0.107±0.019±0.045	KOPP	01	CLE2	$e^+e^- \approx$ 10.6 GeV

$\Gamma\big(\overline{K}_0^*(1430)^0\pi^0\big)/\Gamma\big(K^-\pi^+\pi^0\big)$ — Γ_{114}/Γ_{34}

Unseen decay modes of the $\overline{K}_0^*(1430)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.066±0.010$^{+0.051}_{-0.014}$	KOPP	01	CLE2	$e^+e^- \approx$ 10.6 GeV

$\Gamma\big(K^*(1680)^-\pi^+\big)/\Gamma\big(K^-\pi^+\pi^0\big)$ — Γ_{117}/Γ_{34}

Unseen decay modes of the $K^*(1680)^-$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.063$^{+0.031}_{-0.027}$ OUR FIT Error includes scale factor of 1.2.				
0.101±0.023±0.033	KOPP	01	CLE2	$e^+e^- \approx$ 10.6 GeV

$\Gamma(K^-\pi^+\pi^0 \text{ nonresonant})/\Gamma(K^-\pi^+\pi^0)$ — Γ_{42}/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.080^{+0.038}_{-0.014}$ OUR AVERAGE					
$0.075\pm0.009^{+0.056}_{-0.011}$		KOPP	01	CLE2	$e^+e^- \approx$ 10.6 GeV
$0.101\pm0.033\pm0.040$		FRABETTI	94G	E687	γBe, $\overline{E}_\gamma \approx$ 220 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.036\pm0.004\pm0.018$		ANJOS	93	E691	γBe 90–260 GeV
$0.09\pm0.02\pm0.04$		ADLER	87	MRK3	e^+e^- 3.77 GeV
0.51 ± 0.22	21	SUMMERS	84	E691	Photoproduction

$\Gamma(\overline{K}^*(892)^0\pi^0)/\Gamma(\overline{K}^0\pi^0)$ — Γ_{92}/Γ_{21}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.22±0.20 OUR FIT Error includes scale factor of 1.2.					
$1.65^{+0.39}_{-0.31}\pm0.20$	122	PROCARIO	93B	CLE2	$\overline{K}^0\pi^0\pi^0$ Dalitz plot

$\Gamma(\overline{K}_2^*(1430)^0\pi^0)/\Gamma(\overline{K}^*(892)^0\pi^0)$ — Γ_{116}/Γ_{92}

Unseen decay modes of the $\overline{K}_2^*(1430)^0$ and $\overline{K}^*(892)^0$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.12	90	PROCARIO	93B	CLE2	$\overline{K}^0\pi^0\pi^0$ Dalitz plot

$\Gamma(\overline{K}^0\pi^0\pi^0 \text{ nonresonant})/\Gamma(\overline{K}^0\pi^0)$ — Γ_{45}/Γ_{21}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.37±0.08±0.04	76	PROCARIO	93B	CLE2	$\overline{K}^0\pi^0\pi^0$ Dalitz plot

$\Gamma(K^-\pi^+\pi^+\pi^-)/\Gamma_{total}$ — Γ_{46}/Γ

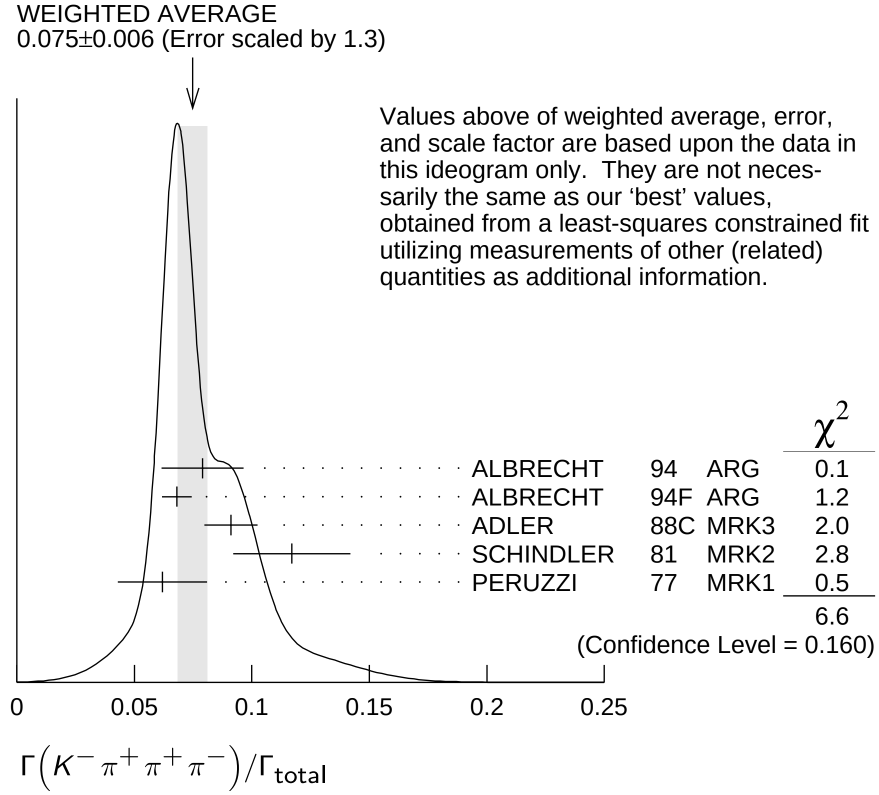
VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0746±0.0031 OUR FIT					
0.075 ±0.006 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.					
$0.079\pm0.015\pm0.009$		[53] ALBRECHT	94	ARG	$e^+e^- \approx \Upsilon(4S)$
$0.0680\pm0.0027\pm0.0057$	1430	[54] ALBRECHT	94F	ARG	$e^+e^- \approx \Upsilon(4S)$
$0.091\pm0.008\pm0.008$	992	ADLER	88C	MRK3	e^+e^- 3.77 GeV
0.117 ± 0.025	185	[55] SCHINDLER	81	MRK2	e^+e^- 3.771 GeV
0.062 ± 0.019	44	[56] PERUZZI	77	MRK1	e^+e^- 3.77 GeV

[53] ALBRECHT 94 uses D^0 mesons from $\overline{B}^0 \to D^{*+}\ell^-\overline{\nu}_\ell$ decays. This is a different set of events than used by ALBRECHT 94F.

[54] See the footnote on the ALBRECHT 94F measurement of $\Gamma(K^-\pi^+)/\Gamma_{total}$ for the method used.

[55] SCHINDLER 81 (MARK-2) measures $\sigma(e^+e^- \to \psi(3770)) \times$ branching fraction to be 0.68 ± 0.11 nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.

[56] PERUZZI 77 (MARK-1) measures $\sigma(e^+e^- \to \psi(3770)) \times$ branching fraction to be 0.36 ± 0.10 nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.



$\Gamma(K^-\pi^+\pi^+\pi^-)/\Gamma(K^-\pi^+)$ Γ_{46}/Γ_{20}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.96±0.08 OUR FIT					
1.97±0.09 OUR AVERAGE					
$1.94\pm0.07{}^{+0.09}_{-0.11}$		JUN	00	SELX	Σ^- nucleus, 600 GeV
$1.7\ \pm0.2\ \pm0.2$	1745	ANJOS	92C	E691	γ Be 90–260 GeV
$1.90\pm0.25\pm0.20$	337	ALVAREZ	91B	NA14	Photoproduction
$2.12\pm0.16\pm0.09$		BORTOLETTO	88	CLEO	e^+e^- 10.55 GeV
$2.0\ \pm0.9$	48	BAILEY	86	ACCM	π^- Be fixed target
$2.17\pm0.28\pm0.23$		ALBRECHT	85F	ARG	e^+e^- 10 GeV
$2.0\ \pm1.0$	10	BAILEY	83B	SPEC	π^- Be $\rightarrow D^0$
$2.2\ \pm0.8$	214	PICCOLO	77	MRK1	e^+e^- 4.03, 4.41 GeV

$\Gamma(K^-\pi^+\rho^0\text{total})/\Gamma(K^-\pi^+\pi^+\pi^-)$ Γ_{47}/Γ_{46}

This includes $K^- a_1(1260)^+$, $\overline{K}^*(892)^0\rho^0$, etc. The next entry gives the specifically 3-body fraction. We rely on the MARK III and E691 full amplitude analyses of the $K^-\pi^+\pi^+\pi^-$ channel for values of the resonant substructure.

VALUE	DOCUMENT ID		TECN	COMMENT
0.835±0.035 OUR AVERAGE				
$0.80\ \pm0.03\ \pm0.05$	ANJOS	92C	E691	γ Be 90–260 GeV
$0.855\pm0.032\pm0.030$	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.98\ \pm0.12\ \pm0.10$	ALVAREZ	91B	NA14	Photoproduction

$\Gamma(K^-\pi^+\rho^0 \text{3-body})/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{48}/Γ_{46}

We rely on the MARK III and E691 full amplitude analyses of the $K^-\pi^+\pi^+\pi^-$ channel for values of the resonant substructure.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.063±0.028 OUR AVERAGE					
0.05 ±0.03 ±0.02		ANJOS	92C	E691	γBe 90–260 GeV
0.084±0.022±0.04		COFFMAN	92B	MRK3	e^+e^- 3.77 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.77 ±0.06 ±0.06		[57] ALVAREZ	91B	NA14	Photoproduction
0.85 $^{+0.11}_{-0.22}$	180	PICCOLO	77	MRK1	e^+e^- 4.03, 4.41 GeV

[57] This value is for ρ^0 $(K^-\pi^+)$-nonresonant. ALVAREZ 91B cannot determine what fraction of this is $K^- a_1(1260)^+$.

$\Gamma(\overline{K}^*(892)^0\rho^0)/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{97}/Γ_{46}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included. We rely on the MARK III and E691 full amplitude analyses of the $K^-\pi^+\pi^+\pi^-$ channel for values of the resonant substructure.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.195±0.03±0.03		ANJOS	92C	E691	γBe 90–260 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.34 ±0.09±0.09		ALVAREZ	91B	NA14	Photoproduction
0.75 ±0.3	5	BAILEY	83B	SPEC	πBe $\rightarrow$ D^0
0.15 $^{+0.16}_{-0.15}$	20	PICCOLO	77	MRK1	e^+e^- 4.03, 4.41 GeV

$\Gamma(\overline{K}^*(892)^0\rho^0 \text{transverse})/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{98}/Γ_{46}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.21 ±0.07 OUR FIT				
0.213±0.024±0.075	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV

$\Gamma(\overline{K}^*(892)^0\rho^0 \text{ S-wave})/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{99}/Γ_{46}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.375±0.045±0.06	ANJOS	92C	E691	γBe 90–260 GeV

$\Gamma(\overline{K}^*(892)^0\rho^0 \text{ S-wave long.})/\Gamma_{total}$ — Γ_{100}/Γ

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.003	90	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV

$\Gamma(\overline{K}^*(892)^0\rho^0 \text{ P-wave})/\Gamma_{total}$ — Γ_{101}/Γ

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.003	90	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.009	90	ANJOS	92C	E691	γBe 90–260 GeV

$\Gamma(\overline{K}^*(892)^0 \rho^0 \text{ D-wave})/\Gamma(K^- \pi^+ \pi^+ \pi^-)$ — Γ_{102}/Γ_{46}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.255±0.045±0.06	ANJOS	92C	E691	γ Be 90–260 GeV

$\Gamma(K^- \pi^+ f_0(980))/\Gamma_{total}$ — Γ_{107}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.011	90	ANJOS	92C	E691	γ Be 90–260 GeV

$\Gamma(\overline{K}^*(892)^0 f_0(980))/\Gamma_{total}$ — Γ_{108}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.007	90	ANJOS	92C	E691	γ Be 90–260 GeV

$\Gamma(K^- a_1(1260)^+)/\Gamma(K^- \pi^+ \pi^+ \pi^-)$ — Γ_{87}/Γ_{46}

Unseen decay modes of the $a_1(1260)^+$ are included, assuming that the $a_1(1260)^+$ decays entirely to $\rho\pi$ [or at least to $(\pi\pi)_{I=1}\ \pi$].

VALUE	DOCUMENT ID		TECN	COMMENT
0.97 ±0.14 OUR AVERAGE				
0.94 ±0.13 ±0.20	ANJOS	92C	E691	γ Be 90–260 GeV
0.984±0.048±0.16	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(K^- a_2(1320)^+)/\Gamma_{total}$ — Γ_{90}/Γ

Unseen decay modes of the $a_2(1320)^+$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.002	90	ANJOS	92C	E691	γ Be 90–260 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.006	90	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(K_1(1270)^- \pi^+)/\Gamma(K^- \pi^+ \pi^+ \pi^-)$ — Γ_{109}/Γ_{46}

Unseen decay modes of the $K_1(1270)^-$ are included. The MARK3 and E691 experiments disagree considerably here.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
0.15 ±0.04 OUR FIT					
0.194±0.056±0.088		COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.013	90	ANJOS	92C	E691	γ Be 90–260 GeV

$\Gamma(K_1(1400)^- \pi^+)/\Gamma_{total}$ — Γ_{110}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.012	90	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(K^*(1410)^- \pi^+)/\Gamma_{total}$ — Γ_{112}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.012	90	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(\overline{K}^*(892)^0\pi^+\pi^-\text{total})/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{93}/Γ_{46}

This includes $\overline{K}^*(892)^0\rho^0$, *etc.* The next entry gives the specifically 3-body fraction. Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.30±0.06±0.03	ANJOS	92C	E691	γBe 90–260 GeV

$\Gamma(\overline{K}^*(892)^0\pi^+\pi^-\text{3-body})/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{94}/Γ_{46}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.19 ±0.04 OUR FIT				
0.18 ±0.04 OUR AVERAGE				
0.165±0.03 ±0.045	ANJOS	92C	E691	γBe 90–260 GeV
0.210±0.027±0.06	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV

$\Gamma(K^-\pi^+\pi^+\pi^-\text{nonresonant})/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{54}/Γ_{46}

VALUE	DOCUMENT ID		TECN	COMMENT
0.233±0.032 OUR AVERAGE				
0.23 ±0.02 ±0.03	ANJOS	92C	E691	γBe 90–260 GeV
0.242±0.025±0.06	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV

$\Gamma(\overline{K}^0\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ — Γ_{55}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.109±0.013 OUR FIT					
0.103±0.022±0.025	140	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.134^{+0.032}_{-0.033}$		[58] BARLAG	92C	ACCM	π^- Cu 230 GeV

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

$\Gamma(\overline{K}^0\pi^+\pi^-\pi^0)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{55}/Γ_{22}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.82±0.20 OUR FIT					
1.86±0.23 OUR AVERAGE					
1.80±0.20±0.21	190	[59] ALBRECHT	92P	ARG	$e^+e^- \approx$ 10 GeV
2.8 ±0.8 ±0.8	46	ANJOS	92C	E691	γBe 90–260 GeV
1.85±0.26±0.30	158	KINOSHITA	91	CLEO	$e^+e^- \sim$ 10.7 GeV

[59] This value is calculated from numbers in Table 1 of ALBRECHT 92P.

$\Gamma(\overline{K}^0\eta)/\Gamma(K^-\pi^+)$ — Γ_{81}/Γ_{20}

Unseen decay modes of the η are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.64	90	ALBRECHT	89D	ARG	e^+e^- 10 GeV

$\Gamma(\overline{K}^0\eta)/\Gamma(\overline{K}^0\pi^0)$ — Γ_{81}/Γ_{21}

Unseen decay modes of the η are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.33±0.04 OUR FIT					
0.32±0.04±0.03	225	PROCARIO	93B	CLE2	$\eta \to \gamma\gamma$

$\Gamma(\overline{K}^0\eta)/\Gamma(\overline{K}^0\pi^+\pi^-)$ Γ_{81}/Γ_{22}

Unseen decay modes of the η are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.128±0.017 OUR FIT					
0.14 ±0.02 ±0.02	80	PROCARIO	93B	CLE2	$\eta \rightarrow \pi^+\pi^-\pi^0$

$\Gamma(\overline{K}^0\omega)/\Gamma(K^-\pi^+)$ Γ_{84}/Γ_{20}

Unseen decay modes of the ω are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.60±0.09 OUR FIT				
1.00±0.36±0.20	ALBRECHT	89D	ARG	e^+e^- 10 GeV

$\Gamma(\overline{K}^0\omega)/\Gamma(\overline{K}^0\pi^+\pi^-)$ Γ_{84}/Γ_{22}

Unseen decay modes of the ω are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.39±0.06 OUR FIT					
0.36±0.07 OUR AVERAGE					
$0.42\pm0.13^{+0.06}_{-0.05}$		MURAMATSU	02	CLE2	$e^+e^- \approx$ 10 GeV
0.29±0.08±0.05	16	[60] ALBRECHT	92P	ARG	$e^+e^- \approx$ 10 GeV
0.54±0.14±0.16	40	KINOSHITA	91	CLEO	$e^+e^- \sim$ 10.7 GeV

[60] This value is calculated from numbers in Table 1 of ALBRECHT 92P.

$\Gamma(\overline{K}^0\omega)/\Gamma(\overline{K}^0\pi^+\pi^-\pi^0)$ Γ_{84}/Γ_{55}

Unseen decay modes of the ω are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.212±0.034 OUR FIT				
0.220±0.048±0.0116	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV

$\Gamma(\overline{K}^0\eta'(958))/\Gamma(\overline{K}^0\pi^+\pi^-)$ Γ_{85}/Γ_{22}

Unseen decay modes of the $\eta'(958)$ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.32±0.04 OUR AVERAGE					
0.31±0.02±0.04	594	PROCARIO	93B	CLE2	$\eta' \rightarrow \eta\pi^+\pi^-$, $\rho^0\gamma$
0.37±0.13±0.06	18	[61] ALBRECHT	92P	ARG	$e^+e^- \approx$ 10 GeV

[61] This value is calculated from numbers in Table 1 of ALBRECHT 92P.

$\Gamma(K^*(892)^-\rho^+)/\Gamma(\overline{K}^0\pi^+\pi^-\pi^0)$ Γ_{103}/Γ_{55}

Unseen decay modes of the $K^*(892)^-$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.606±0.188±0.126	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV

$\Gamma(K^*(892)^-\rho^+ \text{ longitudinal})/\Gamma(\overline{K}^0\pi^+\pi^-\pi^0)$ Γ_{104}/Γ_{55}

Unseen decay modes of the $K^*(892)^-$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.290±0.111	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV

$\Gamma(K^*(892)^-\rho^+ \text{ transverse})/\Gamma(\overline{K}^0\pi^+\pi^-\pi^0)$ Γ_{105}/Γ_{55}

Unseen decay modes of the $K^*(892)^-$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.317±0.180	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV

$\Gamma(K^*(892)^- \rho^+ P\text{-wave})/\Gamma_{total}$ — Γ_{106}/Γ

Unseen decay modes of the $K^*(892)^-$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.015	90	[62] COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

[62] Obtained using other $\overline{K}^*(892)\rho P$-wave limits and isospin relations.

$\Gamma(\overline{K}^*(892)^0 \rho^0 \text{transverse})/\Gamma(\overline{K}^0 \pi^+ \pi^- \pi^0)$ — Γ_{98}/Γ_{55}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.14 ±0.05 OUR FIT				
0.126±0.111	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(\overline{K}^0 a_1(1260)^0)/\Gamma_{total}$ — Γ_{88}/Γ

Unseen decay modes of the $a_1(1260)^+$ are included, assuming that the $a_1(1260)^+$ decays entirely to $\rho\pi$ [or at least to $(\pi\pi)_{I=1}\ \pi$].

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.019	90	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(K_1(1270)^- \pi^+)/\Gamma(\overline{K}^0 \pi^+ \pi^- \pi^0)$ — Γ_{109}/Γ_{55}

Unseen decay modes of the $K_1(1270)^-$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.105±0.028 OUR FIT				
0.10 ±0.03	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(\overline{K}_1(1400)^0 \pi^0)/\Gamma_{total}$ — Γ_{111}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.037	90	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(\overline{K}^*(892)^0 \pi^+ \pi^- \text{3-body})/\Gamma(\overline{K}^0 \pi^+ \pi^- \pi^0)$ — Γ_{94}/Γ_{55}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.130±0.034 OUR FIT Error includes scale factor of 1.1.				
0.191±0.105	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(\overline{K}^0 \pi^+ \pi^- \pi^0 \text{nonresonant})/\Gamma(\overline{K}^0 \pi^+ \pi^- \pi^0)$ — Γ_{62}/Γ_{55}

VALUE	DOCUMENT ID		TECN	COMMENT
0.210±0.147±0.150	COFFMAN	92B	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(K^- \pi^+ \pi^0 \pi^0)/\Gamma_{total}$ — Γ_{63}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.177±0.029		[63] BARLAG	92C	ACCM	π^- Cu 230 GeV
0.149±0.037±0.030	24	[64] ADLER	88C	MRK3	$e^+ e^-$ 3.77 GeV
$0.209^{+0.074}_{-0.043}\pm0.012$	9	[63] AGUILAR-...	87F	HYBR	πp, $p p$ 360, 400 GeV

[63] AGUILAR-BENITEZ 87F and BARLAG 92C compute the branching fraction using topological normalization. They do not distinguish the presence of a third π^0, and thus are not included in the average.

[64] ADLER 88C uses an absolute normalization method finding this decay channel opposite a detected $\overline{D}^0 \to K^+ \pi^-$ in pure $D\overline{D}$ events.

$\Gamma(K^-\pi^+\pi^+\pi^-\pi^0)/\Gamma(K^-\pi^+)$ — Γ_{64}/Γ_{20}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.06±0.10 OUR FIT					
0.98±0.11±0.11	225	[65] ALBRECHT	92P	ARG	$e^+e^- \approx$ 10 GeV

[65] This value is calculated from numbers in Table 1 of ALBRECHT 92P.

$\Gamma(K^-\pi^+\pi^+\pi^-\pi^0)/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{64}/Γ_{46}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.54±0.05 OUR FIT					
0.56±0.07 OUR AVERAGE					
$0.55\pm0.07^{+0.12}_{-0.09}$	167	KINOSHITA	91	CLEO	$e^+e^- \sim$ 10.7 GeV
0.57±0.06±0.05	180	ANJOS	90D	E691	Photoproduction

$\Gamma(\overline{K}^*(892)^0\pi^+\pi^-\pi^0)/\Gamma(K^-\pi^+\pi^+\pi^-\pi^0)$ — Γ_{118}/Γ_{64}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.45±0.15±0.15	ANJOS	90D	E691	Photoproduction

$\Gamma(\overline{K}^*(892)^0\eta)/\Gamma(K^-\pi^+)$ — Γ_{119}/Γ_{20}

Unseen decay modes of the $\overline{K}^*(892)^0$ and η are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.46±0.12 OUR FIT					
$\mathbf{0.58\pm0.19^{+0.24}_{-0.28}}$	46	KINOSHITA	91	CLEO	$e^+e^- \sim$ 10.7 GeV

$\Gamma(\overline{K}^*(892)^0\eta)/\Gamma(K^-\pi^+\pi^0)$ — Γ_{119}/Γ_{34}

Unseen decay modes of the $\overline{K}^*(892)^0$ and η are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.135±0.034 OUR FIT					
0.13 ±0.02 ±0.03	214	PROCARIO	93B	CLE2	$\overline{K}^{*0}\eta \to K^-\pi^+/\gamma\gamma$

$\Gamma(K^-\pi^+\omega)/\Gamma(K^-\pi^+)$ — Γ_{120}/Γ_{20}

Unseen decay modes of the ω are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.78±0.12±0.10	99	[66] ALBRECHT	92P	ARG	$e^+e^- \approx$ 10 GeV

[66] This value is calculated from numbers in Table 1 of ALBRECHT 92P.

$\Gamma(\overline{K}^*(892)^0\omega)/\Gamma(K^-\pi^+)$ — Γ_{121}/Γ_{20}

Unseen decay modes of the $\overline{K}^*(892)^0$ and ω are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.28±0.11±0.04	17	[67] ALBRECHT	92P	ARG	$e^+e^- \approx$ 10 GeV

[67] This value is calculated from numbers in Table 1 of ALBRECHT 92P.

$\Gamma(\overline{K}^*(892)^0\omega)/\Gamma(K^-\pi^+\pi^+\pi^-\pi^0)$ — Γ_{121}/Γ_{64}

Unseen decay modes of the $\overline{K}^*(892)^0$ and ω are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.44	90	[68] ANJOS	90D	E691	Photoproduction

[68] Recovered from the published limit, $\Gamma(\overline{K}^*(892)^0\omega)/\Gamma_{total}$, in order to make our normalization consistent.

$\Gamma(K^-\pi^+\eta'(958))/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{122}/Γ_{46}

Unseen decay modes of the $\eta'(958)$ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.093±0.014±0.019	286	PROCARIO	93B	CLE2	$\eta' \to \eta\pi^+\pi^-$, $\rho^0\gamma$

$\Gamma(\overline{K}^*(892)^0\eta'(958))/\Gamma(K^-\pi^+\eta'(958))$ — $\Gamma_{123}/\Gamma_{122}$

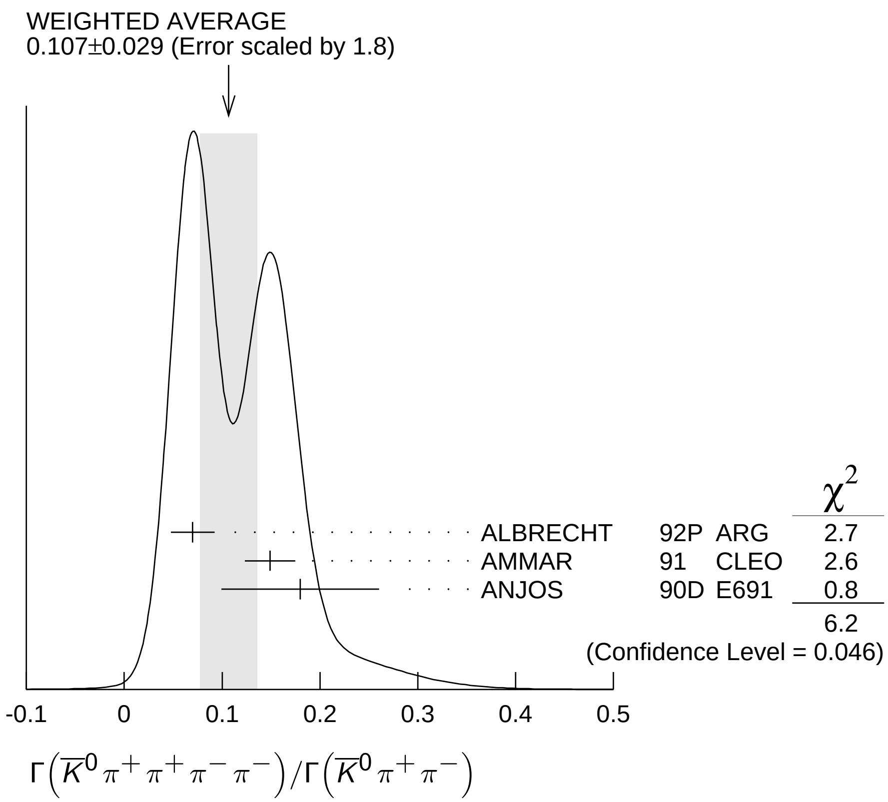
Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	CL%	DOCUMENT ID		TECN
<0.15	90	PROCARIO	93B	CLE2

$\Gamma(\overline{K}^0\pi^+\pi^+\pi^-\pi^-)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{69}/Γ_{22}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.107±0.029 OUR AVERAGE	Error includes scale factor of 1.8. See the ideogram below.				
0.07 ±0.02 ±0.01	11	[69] ALBRECHT	92P	ARG	$e^+e^- \approx$ 10 GeV
0.149±0.026	56	AMMAR	91	CLEO	$e^+e^- \approx$ 10.5 GeV
0.18 ±0.07 ±0.04	6	ANJOS	90D	E691	Photoproduction

[69] This value is calculated from numbers in Table 1 of ALBRECHT 92P.



$\Gamma(\overline{K}^0\pi^+\pi^-\pi^0\pi^0(\pi^0))/\Gamma_{total}$ — Γ_{70}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.106^{+0.073}_{-0.029}\pm0.006$	4	[70] AGUILAR-...	87F	HYBR	πp, pp 360, 400 GeV

[70] AGUILAR-BENITEZ 87F computes the branching fraction using topological normalization, and does not distinguish the presence of a third π^0.

$\Gamma(\overline{K}^0 K^+ K^-)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — $\Gamma_{71}/\Gamma_{22} = (\Gamma_{73}+\frac{1}{2}\Gamma_{86})/\Gamma_{22}$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.172±0.014 OUR FIT					
0.178±0.019 OUR AVERAGE					
0.20 ±0.05 ±0.04	47	FRABETTI	92B	E687	γ Be $\overline{E}_\gamma$= 221 GeV
0.170±0.022	136	AMMAR	91	CLEO	$e^+e^- \approx$ 10.5 GeV
0.24 ±0.08		BEBEK	86	CLEO	e^+e^- near $\Upsilon(4S)$
0.185±0.055	52	ALBRECHT	85B	ARG	e^+e^- 10 GeV

$\Gamma(\overline{K}^0 \phi)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{86}/Γ_{22}

Unseen decay modes of the ϕ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.158±0.016 OUR FIT					
0.156±0.017 OUR AVERAGE					
0.13 ±0.06 ±0.02	13	FRABETTI	92B	E687	γ Be $\overline{E}_\gamma$= 221 GeV
0.163±0.023	63	AMMAR	91	CLEO	$e^+e^- \approx$ 10.5 GeV
0.155±0.033	56	ALBRECHT	87E	ARG	e^+e^- 10 GeV
0.14 ±0.05	29	BEBEK	86	CLEO	e^+e^- near $\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.186±0.052	26	ALBRECHT	85B	ARG	See ALBRECHT 87E

$\Gamma(\overline{K}^0 K^+ K^- \text{non-}\phi)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{73}/Γ_{22}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.093±0.014 OUR FIT					
0.088±0.019 OUR AVERAGE					
0.11 ±0.04 ±0.03	20	FRABETTI	92B	E687	γ Be $\overline{E}_\gamma$= 221 GeV
0.084±0.020		ALBRECHT	87E	ARG	e^+e^- 10 GeV

$\Gamma(K^0_S K^0_S K^0_S)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{74}/Γ_{22}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0154±0.0025 OUR AVERAGE					
0.0139±0.0019±0.0024	61	ASNER	96B	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.035 ±0.012 ±0.006	10	FRABETTI	94J	E687	γ Be $\overline{E}_\gamma$=220 GeV
0.016 ±0.005	22	AMMAR	91	CLEO	$e^+e^- \approx$ 10.5 GeV
0.017 ±0.007 ±0.005	5	ALBRECHT	90C	ARG	$e^+e^- \approx$ 10 GeV

$\Gamma(K^+ K^- K^- \pi^+)/\Gamma(K^- \pi^+ \pi^+ \pi^-)$ — Γ_{75}/Γ_{46}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0027 ±0.0004 OUR AVERAGE Error includes scale factor of 1.1.					
0.00257±0.00034±0.00024	143	LINK	03G	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
0.0054 ±0.0016 ±0.0008	18	AITALA	01D	E791	π^- nucleus, 500 GeV
0.0028 ±0.0007 ±0.0001	20	FRABETTI	95C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(\phi \overline{K}^*(892)^0)/\Gamma(K^+ K^- K^- \pi^+)$ — Γ_{126}/Γ_{75}

Unseen decay modes of the ϕ and $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
1.46±0.18±0.03	LINK	03G	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^-\pi^+\phi)/\Gamma(K^+K^-K^-\pi^+)$ — Γ_{124}/Γ_{75}

Unseen decay modes of the ϕ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.37±0.12±0.08		LINK	03G	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.4 ±0.6	13	[71] AITALA	01D	E791	π^- nucleus, 500 GeV

[71] This AITALA 01D result is from a projection fit, not a full amplitude analysis.

$\Gamma(K^+K^-\overline{K}^*(892)^0)/\Gamma(K^+K^-K^-\pi^+)$ — Γ_{125}/Γ_{75}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.30±0.11±0.03	LINK	03G	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^+K^-K^-\pi^+ \text{nonresonant})/\Gamma(K^+K^-K^-\pi^+)$ — Γ_{79}/Γ_{75}

VALUE	DOCUMENT ID		TECN	COMMENT
0.15±0.06±0.02	LINK	03G	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^+K^-\overline{K}^0\pi^0)/\Gamma_{total}$ — Γ_{80}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.0072^{+0.0048}_{-0.0035}$	[72] BARLAG	92C	ACCM	π^- Cu 230 GeV

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

Pionic modes

$\Gamma(\pi^+\pi^-)/\Gamma(K^-\pi^+)$ — Γ_{127}/Γ_{20}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0362±0.0010 OUR AVERAGE					
0.0353±0.0012±0.0006	3453	LINK	03	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
0.0351±0.0016±0.0017	710	CSORNA	02	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.040 ±0.002 ±0.003	2043	AITALA	98C	E791	π^- nucleus, 500 GeV
0.043 ±0.007 ±0.003	177	FRABETTI	94C	E687	γBe $\overline{E}_\gamma$= 220 GeV
0.0348±0.0030±0.0023	227	SELEN	93	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.055 ±0.008 ±0.005	120	ANJOS	91D	E691	Photoproduction
0.050 ±0.007 ±0.005	110	ALEXANDER	90	CLEO	e^+e^- 10.5–11 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.048 ±0.013 ±0.008	51	ADAMOVICH	92	OMEG	π^- 340 GeV
0.040 ±0.007 ±0.006	57	ALBRECHT	90C	ARG	$e^+e^- \approx$ 10 GeV
0.033 ±0.010 ±0.006	39	BALTRUSAIT...	85E	MRK3	e^+e^- 3.77 GeV
0.033 ±0.015		ABRAMS	79D	MRK2	e^+e^- 3.77 GeV

$\Gamma(\pi^0\pi^0)/\Gamma(K^-\pi^+)$ — Γ_{128}/Γ_{20}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.022±0.004±0.004	40	SELEN	93	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{129}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.011 ±0.004 ±0.002	10	[73] BALTRUSAIT...85E	MRK3	e^+e^- 3.77 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.0390^{+0.0100}_{-0.0095}$		[74] BARLAG 92C	ACCM	π^- Cu 230 GeV

[73] All the BALTRUSAITIS 85E events are consistent with $\rho^0\pi^0$.
[74] BARLAG 92C computes the branching fraction using topological normalization. Possible contamination by extra π^0's may partly explain the unexpectedly large value.

$\Gamma(\pi^+\pi^+\pi^-\pi^-)/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{130}/Γ_{46}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.098±0.006 OUR AVERAGE				
0.095±0.007±0.002	814	FRABETTI 95C	E687	γBe, $\overline{E}_\gamma \approx$ 200 GeV
0.115±0.023±0.016	64	ADAMOVICH 92	OMEG	π^- 340 GeV
0.108±0.024±0.008	79	FRABETTI 92	E687	γBe
0.102±0.013	345	[75] AMMAR 91	CLEO	$e^+e^- \approx$ 10.5 GeV
0.096±0.018±0.007	66	ANJOS 91	E691	γBe 80–240 GeV

[75] AMMAR 91 finds 1.25 ± 0.25 ± 0.25 ρ^0's per $\pi^+\pi^+\pi^-\pi^-$ decay, but can't untangle the resonant substructure ($\rho^0\rho^0$, $a_1^\pm\pi^\mp$, $\rho^0\pi^+\pi^-$).

$\Gamma(\pi^+\pi^+\pi^-\pi^-\pi^0)/\Gamma_{total}$ — Γ_{131}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.0192^{+0.0041}_{-0.0038}$	[76] BARLAG 92C	ACCM	π^- Cu 230 GeV

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

$\Gamma(\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-)/\Gamma_{total}$ — Γ_{132}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.0004±0.0003	[77] BARLAG 92C	ACCM	π^- Cu 230 GeV

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

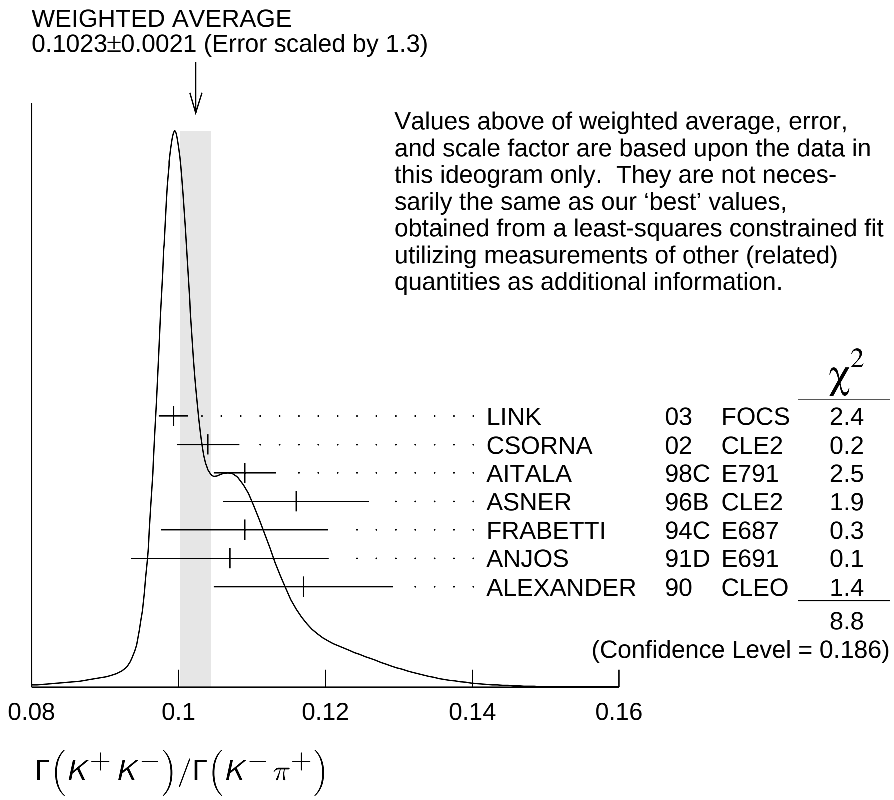
Hadronic modes with a $K\overline{K}$ pair

$\Gamma(K^+K^-)/\Gamma(K^-\pi^+)$ — Γ_{133}/Γ_{20}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$0.1023^{+0.0022}_{-0.0027}$ OUR FIT Error includes scale factor of 1.4.				
0.1023±0.0021 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.				
0.0993±0.0014±0.0014	11k	LINK 03	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
0.1040±0.0033±0.0027	1900	CSORNA 02	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.109 ±0.003 ±0.003	3317	AITALA 98C	E791	π^- nucleus, 500 GeV
0.116 ±0.007 ±0.007	1102	ASNER 96B	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.109 ±0.007 ±0.009	581	FRABETTI 94C	E687	γBe $\overline{E}_\gamma$= 220 GeV
0.107 ±0.010 ±0.009	193	ANJOS 91D	E691	Photoproduction
0.117 ±0.010 ±0.007	249	ALEXANDER 90	CLEO	e^+e^- 10.5–11 GeV

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

0.107	±0.029	±0.015	103	ADAMOVICH	92	OMEG	π^- 340 GeV
0.138	±0.027	±0.010	155	FRABETTI	92	E687	γ Be
0.16	±0.05		34	ALVAREZ	91B	NA14	Photoproduction
0.10	±0.02	±0.01	131	ALBRECHT	90C	ARG	$e^+e^- \approx$ 10 GeV
0.122	±0.018	±0.012	118	BALTRUSAIT...	85E	MRK3	e^+e^- 3.77 GeV
0.113	±0.030			ABRAMS	79D	MRK2	e^+e^- 3.77 GeV



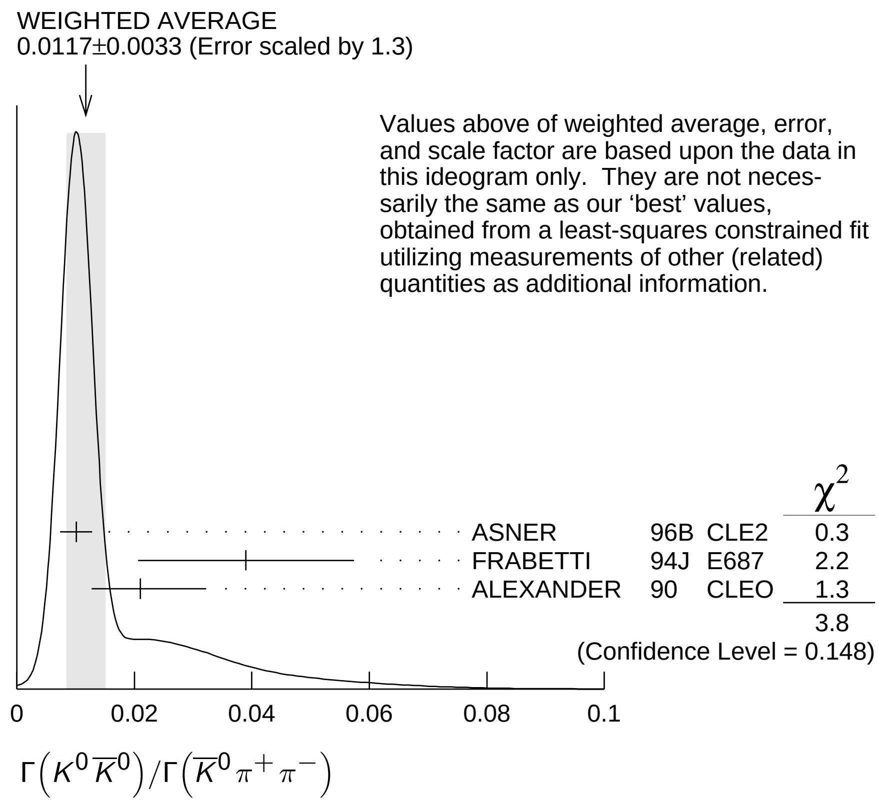
$\Gamma(K^+K^-)/\Gamma(\pi^+\pi^-)$ $\Gamma_{133}/\Gamma_{127}$

The unused results here are redundant with $\Gamma(K^+K^-)/\Gamma(K^-\pi^+)$ and $\Gamma(\pi^+\pi^-)/\Gamma(K^-\pi^+)$ measurements by the same experiments.

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.81±0.10±0.06		LINK	03	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
2.96±0.16±0.15	710	CSORNA	02	CLE2	$e^+e^- \approx \Upsilon(4S)$
2.75±0.15±0.16		AITALA	98C	E791	π^- nucleus, 500 GeV
2.53±0.46±0.19		FRABETTI	94C	E687	γ Be $\overline{E}_\gamma$= 220 GeV
2.23±0.81±0.46		ADAMOVICH	92	OMEG	π^- 340 GeV
1.95±0.34±0.22		ANJOS	91D	E691	Photoproduction
2.5 ±0.7		ALBRECHT	90C	ARG	$e^+e^- \approx$ 10 GeV
2.35±0.37±0.28		ALEXANDER	90	CLEO	e^+e^- 10.5–11 GeV

$\Gamma(K^0\overline{K}^0)/\Gamma(\overline{K}^0\pi^+\pi^-)$ — Γ_{134}/Γ_{22}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0119±0.0033 OUR FIT Error includes scale factor of 1.3.					
0.0117±0.0033 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.					
0.0101±0.0022±0.0016	26	ASNER	96B	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.039 ±0.013 ±0.013	20	FRABETTI	94J	E687	γBe $\overline{E}_\gamma$=220 GeV
0.021 $^{+0.011}_{-0.008}$ ±0.002	5	ALEXANDER	90	CLEO	e^+e^- 10.5–11 GeV



$\Gamma(K^0\overline{K}^0)/\Gamma(K^+K^-)$ — $\Gamma_{134}/\Gamma_{133}$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.18±0.05 OUR FIT Error includes scale factor of 1.3.					
0.24±0.16	4	[78] CUMALAT	88	SPEC	nN 0–800 GeV

[78] Includes a correction communicated to us by the authors of CUMALAT 88.

$\Gamma(K^0K^-\pi^+)/\Gamma(K^-\pi^+)$ — Γ_{135}/Γ_{20}

VALUE	DOCUMENT ID		TECN	COMMENT
0.183±0.027 OUR FIT				
0.16 ±0.06	[79] ANJOS	91	E691	γBe 80–240 GeV

[79] The factor 100 at the top of column 2 of Table I of ANJOS 91 should be omitted.

$\Gamma(K^0 K^- \pi^+)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{135}/Γ_{22}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.116±0.017 OUR FIT Error includes scale factor of 1.1.					
0.119±0.021 OUR AVERAGE Error includes scale factor of 1.3.					
0.108±0.019	61	AMMAR	91	CLEO	$e^+ e^- \approx$ 10.5 GeV
0.16 ±0.03 ±0.02	39	ALBRECHT	90C	ARG	$e^+ e^- \approx$ 10 GeV

$\Gamma(\overline{K}^*(892)^0 K^0)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{155}/Γ_{22}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.029	90	AMMAR	91	CLEO	$e^+ e^- \approx$ 10.5 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.03	90	ALBRECHT	90C	ARG	$e^+ e^- \approx$ 10 GeV

$\Gamma(K^*(892)^+ K^-)/\Gamma(K^- \pi^+)$ — Γ_{156}/Γ_{20}

Unseen decay modes of the $K^*(892)^+$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.100±0.021 OUR FIT				
0.16 $^{+0.08}_{-0.06}$	[80] ANJOS	91	E691	γ Be 80–240 GeV

[80] The factor 100 at the top of column 2 of Table I of ANJOS 91 should be omitted.

$\Gamma(K^*(892)^+ K^-)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{156}/Γ_{22}

Unseen decay modes of the $K^*(892)^+$ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.064±0.013 OUR FIT					
0.058±0.014 OUR AVERAGE					
0.064±0.018	23	AMMAR	91	CLEO	$e^+ e^- \approx$ 10.5 GeV
0.05 ±0.02 ±0.01	15	ALBRECHT	90C	ARG	$e^+ e^- \approx$ 10 GeV

$\Gamma(K^0 K^- \pi^+ \text{nonresonant})/\Gamma(K^- \pi^+)$ — Γ_{138}/Γ_{20}

VALUE	DOCUMENT ID		TECN	COMMENT
0.06±0.06	[81] ANJOS	91	E691	γ Be 80–240 GeV

[81] The factor 100 at the top of column 2 of Table I of ANJOS 91 should be omitted.

$\Gamma(\overline{K}^0 K^+ \pi^-)/\Gamma(K^- \pi^+)$ — Γ_{139}/Γ_{20}

VALUE	DOCUMENT ID		TECN	COMMENT
0.139±0.027 OUR FIT				
0.10 ±0.05	[82] ANJOS	91	E691	γ Be 80–240 GeV

[82] The factor 100 at the top of column 2 of Table I of ANJOS 91 should be omitted.

$\Gamma(\overline{K}^0 K^+ \pi^-)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{139}/Γ_{22}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.088±0.017 OUR FIT					
0.098±0.020	55	AMMAR	91	CLEO	$e^+ e^- \approx$ 10.5 GeV

$\Gamma(K^*(892)^0 \overline{K}^0)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{157}/Γ_{22}

Unseen decay modes of the $K^*(892)^0$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.015	90	AMMAR	91	CLEO	$e^+ e^- \approx$ 10.5 GeV

$\Gamma(K^*(892)^- K^+)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{158}/Γ_{22}

Unseen decay modes of the $K^*(892)^-$ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.034±0.019	12	AMMAR	91	CLEO	$e^+ e^- \approx$ 10.5 GeV

$\Gamma(\overline{K}^0 K^+ \pi^-$ nonresonant$)/\Gamma(K^- \pi^+)$ — Γ_{142}/Γ_{20}

VALUE	DOCUMENT ID		TECN	COMMENT
$0.10^{+0.06}_{-0.05}$	[83] ANJOS	91	E691	γ Be 80–240 GeV

[83] The factor 100 at the top of column 2 of Table I of ANJOS 91 should be omitted.

$\Gamma(K^+ K^- \pi^0)/\Gamma(K^- \pi^+ \pi^0)$ — Γ_{143}/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0095±0.0026	151	ASNER	96B	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(K^0_S K^0_S \pi^0)/\Gamma_{total}$ — Γ_{144}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
<0.00059	ASNER	96B	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\phi \pi^0)/\Gamma_{total}$ — Γ_{159}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.0014	90	ALBRECHT	94I	ARG	$e^+ e^- \approx$ 10 GeV

$\Gamma(\phi \pi^0)/\Gamma(K^+ K^-)$ — $\Gamma_{159}/\Gamma_{133}$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.194±0.006±0.009	1254	TAJIMA	04	BELL	$e^+ e^-$ at $\Upsilon(4S)$

$\Gamma(\phi \eta)/\Gamma_{total}$ — Γ_{160}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.0028	90	ALBRECHT	94I	ARG	$e^+ e^- \approx$ 10 GeV

$\Gamma(\phi \eta)/\Gamma(K^+ K^-)$ — $\Gamma_{160}/\Gamma_{133}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
3.59±1.14±0.18	31	TAJIMA	04	BELL	$e^+ e^-$ at $\Upsilon(4S)$

$\Gamma(\phi \omega)/\Gamma_{total}$ — Γ_{161}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0021	90	ALBRECHT	94I	ARG	$e^+ e^- \approx$ 10 GeV

$\Gamma(K^+ K^- \pi^+ \pi^-)/\Gamma(K^- \pi^+ \pi^+ \pi^-)$ — Γ_{145}/Γ_{46}

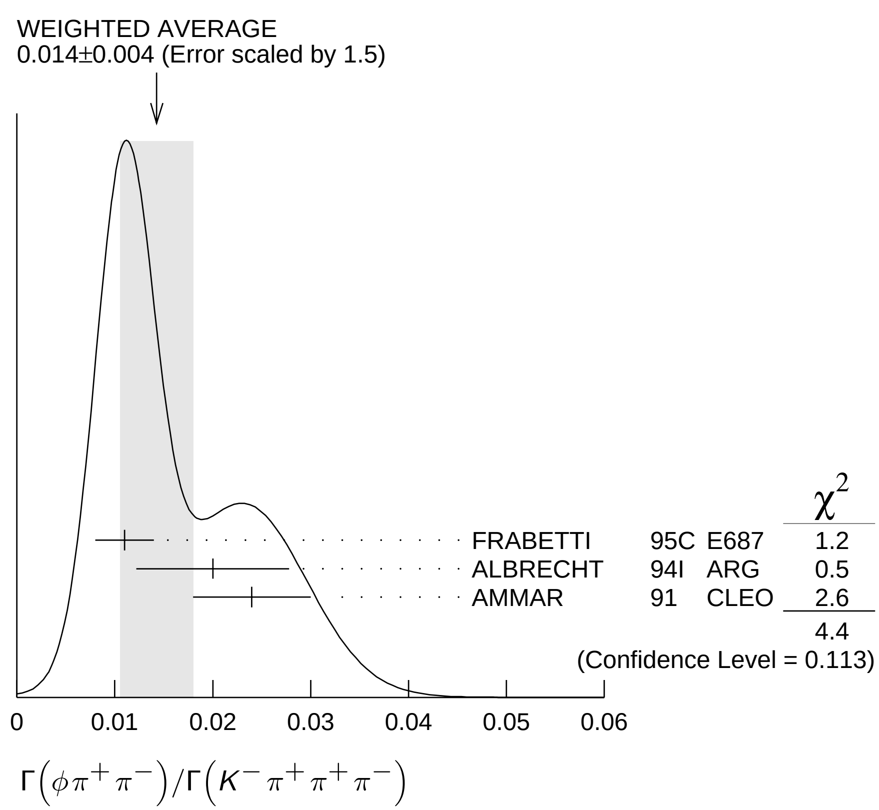
VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0334±0.0028 OUR AVERAGE					
0.0313±0.0037±0.0036	136	AITALA	98D	E791	π^- nucleus, 500 GeV
0.035 ±0.004 ±0.002	244	FRABETTI	95C	E687	γBe, $\overline{E}_\gamma \approx$ 200 GeV
0.041 ±0.007 ±0.005	114	ALBRECHT	94I	ARG	$e^+e^- \approx$ 10 GeV
0.0314±0.010	89	AMMAR	91	CLEO	$e^+e^- \approx$ 10.5 GeV
0.028 $^{+0.008}_{-0.007}$		ANJOS	91	E691	γBe 80–240 GeV

$\Gamma(\phi\pi^+\pi^-)/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{162}/Γ_{46}

Unseen decay modes of the ϕ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.014 ±0.004 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.					
0.011 ±0.003		FRABETTI	95C	E687	γBe, $\overline{E}_\gamma \approx$ 200 GeV
0.020 ±0.006 ±0.005	28	ALBRECHT	94I	ARG	$e^+e^- \approx$ 10 GeV
0.024 ±0.006	34	[84] AMMAR	91	CLEO	$e^+e^- \approx$ 10.5 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0076$^{+0.0066}_{-0.0049}$	3	ANJOS	91	E691	γBe 80–240 GeV

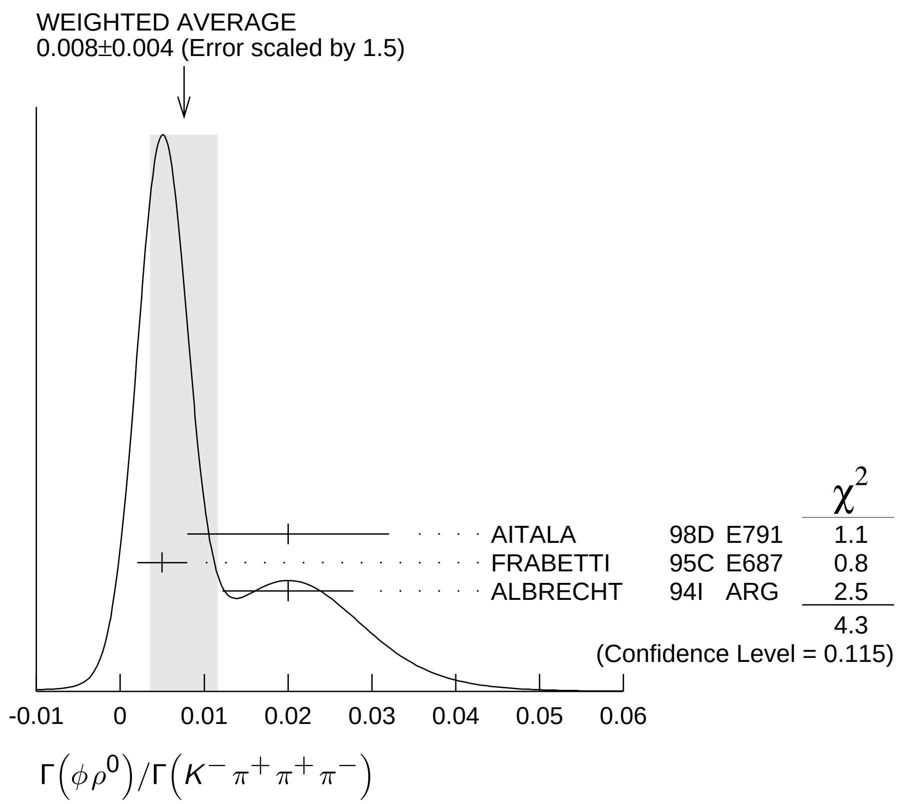
[84] AMMAR 91 measures $\phi\rho^0$, but notes that $\phi\rho^0$ dominates $\phi\pi^+\pi^-$. We put the measurement here to keep from having more $\phi\rho^0$ than $\phi\pi^+\pi^-$.



$\Gamma(\phi\rho^0)/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{163}/Γ_{46}

Unseen decay modes of the ϕ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.008±0.004 OUR AVERAGE		Error includes scale factor of 1.5. See the ideogram below.			
0.02 ±0.009±0.008		AITALA	98D	E791	π^- nucleus, 500 GeV
0.005±0.003		FRABETTI	95C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV
0.020±0.006±0.005	28	ALBRECHT	94I	ARG	$e^+e^- \approx$ 10 GeV



$\Gamma(\phi\pi^+\pi^-\text{ 3-body})/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{164}/Γ_{46}

Unseen decay modes of the ϕ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
0.009±0.004±0.005		AITALA	98D	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.006	90	FRABETTI	95C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(K^+K^-\rho^0\text{ 3-body})/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{148}/Γ_{46}

VALUE	DOCUMENT ID		TECN	COMMENT
0.012 ±0.003	FRABETTI	95C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(K^*(892)^0K^-\pi^+ + \text{c.c.})/\Gamma(K^-\pi^+\pi^+\pi^-)$ — Γ_{165}/Γ_{46}

Unseen decay modes of the $K^*(892)^0$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.01	90	[85] AITALA	98D	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					

<0.017	90	[85] FRABETTI	95C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV
$0.010^{+0.016}_{-0.010}$		ANJOS	91	E691	γ Be 80–240 GeV

[85] These upper limits are in conflict with values in the next two data blocks.

$\Gamma(K^*(892)^0 K^- \pi^+)/\Gamma(K^- \pi^+ \pi^+ \pi^-)$ — Γ_{166}/Γ_{46}

The $K^{*0} K^- \pi^+$ and $\overline{K}^{*0} K^+ \pi^-$ modes are distinguished by the charge of the pion in $D^*(2010)^\pm \to D^0 \pi^\pm$ decays. Unseen decay modes of the $K^*(892)^0$ are included.

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.043±0.014±0.009	55	[86] ALBRECHT	94I	ARG	$e^+ e^- \approx$ 10 GeV

[86] This ALBRECHT 94I value is in conflict with upper limits given above.

$\Gamma(\overline{K}^*(892)^0 K^+ \pi^-)/\Gamma(K^- \pi^+ \pi^+ \pi^-)$ — Γ_{167}/Γ_{46}

The $K^{*0} K^- \pi^+$ and $\overline{K}^{*0} K^+ \pi^-$ modes are distinguished by the charge of the pion in $D^*(2010)^\pm \to D^0 \pi^\pm$ decays. Unseen decay modes of the $\overline{K}^*(892)^0$ are included.

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.023±0.013±0.009	30	[87] ALBRECHT	94I	ARG	$e^+ e^- \approx$ 10 GeV

[87] This ALBRECHT 94I value is in conflict with upper limits given above.

$\Gamma(K^*(892)^0 \overline{K}^*(892)^0)/\Gamma(K^- \pi^+ \pi^+ \pi^-)$ — Γ_{168}/Γ_{46}

Unseen decay modes of the $K^*(892)^0$ and $\overline{K}^*(892)^0$ are included.

VALUE	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.018±0.007 OUR AVERAGE			Error includes scale factor of 1.2.			
0.016±0.006			FRABETTI	95C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV
$0.036^{+0.020}_{-0.016}$		11	ANJOS	91	E691	γ Be 80–240 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.02	90		AITALA	98D	E791	π^- nucleus, 500 GeV
<0.033	90		[88] AMMAR	91	CLEO	$e^+ e^- \approx$ 10.5 GeV

[88] A corrected value (G. Moneti, private communication).

$\Gamma(K^+ K^- \pi^+ \pi^- \text{ non-}\phi)/\Gamma_{total}$ — Γ_{151}/Γ

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0017±0.0005	[89] BARLAG	92C	ACCM	π^- Cu 230 GeV

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

$\Gamma(K^+ K^- \pi^+ \pi^- \text{ nonresonant})/\Gamma(K^- \pi^+ \pi^+ \pi^-)$ — Γ_{152}/Γ_{46}

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.011	90	FRABETTI	95C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.001^{+0.011}_{-0.001}$		ANJOS	91	E691	γ Be 80–240 GeV

$\Gamma(K^0 \overline{K}^0 \pi^+ \pi^-)/\Gamma(\overline{K}^0 \pi^+ \pi^-)$ — Γ_{153}/Γ_{22}

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.126±0.038±0.030	25	ALBRECHT	94I	ARG	$e^+ e^- \approx$ 10 GeV

$\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma_{total}$ — Γ_{154}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.0031±0.0020	[90] BARLAG	92C	ACCM	π^- Cu 230 GeV

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

Radiative modes

$\Gamma(\rho^0 \gamma)/\Gamma_{total}$ — Γ_{169}/Γ

VALUE	CL%	DOCUMENT ID		TECN
<2.4 × 10^{-4}	90	ASNER	98	CLE2

$\Gamma(\omega \gamma)/\Gamma_{total}$ — Γ_{170}/Γ

VALUE	CL%	DOCUMENT ID		TECN
<2.4 × 10^{-4}	90	ASNER	98	CLE2

$\Gamma(\phi \gamma)/\Gamma_{total}$ — Γ_{171}/Γ

VALUE	CL%	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<1.9 \times 10^{-4}$	90	ASNER	98	CLE2

$\Gamma(\phi \gamma)/\Gamma(K^+ K^-)$ — $\Gamma_{171}/\Gamma_{133}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$6.31^{+1.70}_{-1.48}{}^{+0.30}_{-0.36}$	28	TAJIMA	04	BELL	$e^+ e^-$ at $\Upsilon(4S)$

$\Gamma(\overline{K}^*(892)^0 \gamma)/\Gamma_{total}$ — Γ_{172}/Γ

VALUE	CL%	DOCUMENT ID		TECN
<7.6 × 10^{-4}	90	ASNER	98	CLE2

Rare or forbidden modes

$\Gamma(K^+ \ell^- \overline{\nu}_\ell (\text{via } \overline{D}^0))/\Gamma(K^- \ell^+ \nu_\ell)$ — Γ_{173}/Γ_8

This is a limit on R_M without the complications of possible doubly-Cabibbo-suppressed decays that occur when using hadronic modes. For the limits on $|m_1 - m_2|$ and $(\Gamma_1 - \Gamma_2)/\Gamma$ that come from the best mixing limit, see near the beginning of these D^0 Listings.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.005	90	[91] AITALA	96C	E791	π^- nucleus, 500 GeV

[91] AITALA 96C uses $D^{*+} \rightarrow D^0 \pi^+$ (and charge conjugate) decays to identify the charm at production and $D^0 \rightarrow K^- \ell^+ \nu_\ell$ (and charge conjugate) decays to identify the charm at decay.

$\Gamma(K^+\pi^-)/\Gamma(K^-\pi^+)$ Γ_{174}/Γ_{20}

This is R_D in the note on "D^0-$\overline{D}^0$ Mixing," near the start of the D^0 Listings. The experiments here use the charge of the pion in $D^*(2010)^\pm \to (D^0$ or $\overline{D}^0)\ \pi^\pm$ decay to tell whether a D^0 or a $\overline{D}^0$ was born. The $D^0 \to K^+\pi^-$ decay can occur directly by doubly Cabibbo-suppressed (DCS) decay, or indirectly by $D^0 \to \overline{D}^0$ mixing followed by $\overline{D}^0 \to K^+\pi^-$ decay. Some of the experiments can use the decay-time information to disentangle the two mechanisms. Here, we list the experimental branching ratio, which if there is no mixing is the DCS ratio. See the next data block for limits on the mixing ratio R_M, see the section on CP-violating asymmetries near the end of this D^0 Listing for values of A_D, and see the note on "D^0-$\overline{D}^0$ Mixing" for limits on x' and y'.

Some early limits have been omitted from this Listing; see our 1998 edition (EPJ **C3** 1).

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.00362±0.00029 OUR AVERAGE					
$0.00359\pm0.00020\pm0.00027$			[92] AUBERT 03Z	BABR	e^+e^-, 10.6 GeV
$0.00404\pm0.00085\pm0.00025$		149	[93] LINK 01	FOCS	γ nucleus
$0.00332^{+0.00063}_{-0.00065}\pm0.00040$		45	[94] GODANG 00	CLE2	e^+e^-
$0.0068\ ^{+0.0034}_{-0.0033}\pm0.0007$		34	[95] AITALA 98	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.0184\ \pm0.0059\ \pm0.0034$		19	[96] BARATE 98W	ALEP	e^+e^- at Z^0
$0.0077\ \pm0.0025\ \pm0.0025$		19	[97] CINABRO 94	CLE2	$e^+e^- \approx \Upsilon(4S)$
<0.011	90		[97] AMMAR 91	CLEO	$e^+e^- \approx$ 10.5 GeV
<0.015	90	1 ± 6	[98] ANJOS 88C	E691	Photoproduction
<0.014	90		[97] ALBRECHT 87K	ARG	e^+e^- 10 GeV

[92] This AUBERT 03Z result is for no mixing or CP violation. If CP violation but no mixing is allowed, R_D=0.00357 ± 0.00022 ± 0.00027. If only mixing is allowed, the 95% confidence-level interval is $(2.4 < R_D < 4.9)\times10^{-3}$. If both mixing and CP violation are allowed, this interval becomes $(2.3 < R_D < 5.2)\times10^{-3}$.

[93] This LINK 01 result assumes no mixing or CP violation; see Fig. 4 of the paper for the DCS value as a function of the (unknown) mixing parameters x' and y'. See also the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings for results on x' and y' from FOCUS and other experiments.

[94] This GODANG 00 result assumes no D^0-$\overline{D}^0$ mixing (R_M=0 in the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings) but allows CP violation. The DCS ratio becomes 0.0048 ± 0.0012 ± 0.0004 when mixing is allowed.

[95] This AITALA 98 result assumes no CP violation or mixing (R_M=0 in the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings). The DCS ratio becomes $0.0090^{+0.0120}_{-0.0109}\pm 0.0044$ when mixing is allowed.

[96] BARATE 98W gets $0.0177^{+0.0060}_{-0.0056}\pm0.0031$ for the DCS ratio when mixing is allowed, assuming no interference between the DCS and mixing amplitudes ($y'=0$ in the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings).

[97] CINABRO 94, AMMAR 91, and ALBRECHT 87K cannot distinguish between doubly Cabibbo-suppressed decay and D^0-$\overline{D}^0$ mixing.

[98] ANJOS 88C allows mixing but assumes no interference between the DCS and mixing amplitudes ($y'=0$ in the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings). When interference is allowed, the limit degrades to 0.049.

$\Gamma(K^+\pi^-(\text{via}\ \overline{D}^0))/\Gamma(K^-\pi^+)$ — Γ_{175}/Γ_{20}

This is R_M in the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings. The experiments here (1) use the charge of the pion in $D^*(2010)^\pm \to (D^0$ or $\overline{D}^0)$ $\pi^\pm$ decay to tell whether a D^0 or a $\overline{D}^0$ was born; and (2) use the decay-time distribution to disentangle doubly Cabibbo-suppressed decay and mixing. For the limits on $|m_1 - m_2|$ and $(\Gamma_1 - \Gamma_2)/\Gamma$ that come from the best mixing limit, see near the beginning of these D^0 Listings.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<0.00041	95		[99] GODANG	00	CLE2	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.0013	95		[100] AUBERT	03Z	BABR	e^+e^-, 10.6 GeV
<0.0092	95		[101] BARATE	98W	ALEP	e^+e^- at Z^0
<0.005	90	1 ± 4	[102] ANJOS	88C	E691	Photoproduction

[99] This GODANG 00 result allows CP violation and assumes that the strong phase between $D^0 \to K^+\pi^-$ and $\overline{D}^0 \to K^+\pi^-$ is small, and limits only $D^0 \to \overline{D}^0$ transitions via off-shell intermediate states. The limit on transitions via on-shell intermediate states is 0.0017.

[100] This AUBERT 03Z result allows CP violation and assumes that the strong phase between $D^0 \to K^+\pi^-$ and $\overline{D}^0 \to K^+\pi^-$ is small, and limits only $D^0 \to \overline{D}^0$ transitions via off-shell intermediate states. The limit on transitions via on-shell intermediate states is 0.0016.

[101] This BARATE 98W result assumes no interference between the DCS and mixing amplitudes ($y' = 0$ in the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings). When interference is allowed, the limit degrades to 0.036 (95%CL).

[102] This ANJOS 88C result assumes no interference between the DCS and mixing amplitudes ($y' = 0$ in the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings). When interference is allowed, the limit degrades to 0.019.

$\Gamma(K^*(892)^+\pi^-)/\Gamma(K^*(892)^-\pi^+)$ — Γ_{176}/Γ_{91}

Unseen decay modes of the $K^*(892)^+$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.005 \pm 0.002\ ^{+0.006}_{-0.001}}$	MURAMATSU	02	CLE2	$e^+e^- \approx$ 10 GeV

$\Gamma(K^+\pi^-\pi^0)/\Gamma(K^-\pi^+\pi^0)$ — Γ_{177}/Γ_{34}

The experiments here use the charge of the pion in $D^*(2010)^\pm \to (D^0$ or $\overline{D}^0)$ $\pi^\pm$ decay to tell whether a D^0 or a $\overline{D}^0$ was born. The $D^0 \to K^+\pi^-\pi^0$ decay can occur directly by doubly Cabibbo-suppressed (DCS) decay, or indirectly by $D^0 \to \overline{D}^0$ mixing followed by $\overline{D}^0 \to K^+\pi^-\pi^0$ decay.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.0043^{+0.0011}_{-0.0010} \pm 0.0007}$	38	[103] BRANDENB...	01	CLE2	$e^+e^- \approx \Upsilon(4S)$

[103] BRANDENBURG 01 does not distinguish between doubly Cabbibbo-suppressed decay and D^0-$\overline{D}^0$ mixing.

$\Gamma(K^+\pi^-\pi^+\pi^-)/\Gamma(K^-\pi^+\pi^+\pi^-)$ Γ_{178}/Γ_{46}

The experiments here use the charge of the pion in $D^*(2010)^\pm \to (D^0$ or $\overline{D}^0)\ \pi^\pm$ decay to tell whether a D^0 or a $\overline{D}^0$ was born. The $D^0 \to K^+\pi^-\pi^+\pi^-$ decay can occur directly by doubly Cabibbo-suppressed (DCS) decay, or indirectly by $D^0 \to \overline{D}^0$ mixing followed by $\overline{D}^0 \to K^+\pi^-\pi^+\pi^-$ decay. Some of the experiments can use the decay-time information to disentangle the two mechanisms. Here, we list the experimental branching ratio, which if there is no mixing is the DCS ratio; in the next data block we give the limits on the mixing ratio.

Some early limits have been omitted from this Listing; see our 1998 edition (EPJ **C3** 1).

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.0042±0.0013 OUR AVERAGE						
$0.0044^{+0.0013}_{-0.0012}\pm0.0006$		54	[104] DYTMAN	01	CLE2	$e^+e^- \approx \Upsilon(4S)$
$0.0025^{+0.0036}_{-0.0034}\pm0.0003$			[105] AITALA	98	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.018	90		[104] AMMAR	91	CLEO	$e^+e^- \approx$ 10.5 GeV
<0.018	90	5 ± 12	[106] ANJOS	88C	E691	Photoproduction

[104] AMMAR 91 cannot and DYTMAN 01 does not distinguish between doubly Cabibbo-suppressed decay and D^0-$\overline{D}^0$ mixing.

[105] This AITALA 98 result assumes no D^0-$\overline{D}^0$ mixing (R_M in the note on "D^0-$\overline{D}^0$ Mixing"). It becomes $-0.0020^{+0.0117}_{-0.0106} \pm 0.0035$ when mixing is allowed and decay-time information is used to distinguish doubly Cabibbo-suppressed decays from mixing.

[106] ANJOS 88C uses decay-time information to distinguish doubly Cabibbo-suppressed (DCS) decays from D^0-$\overline{D}^0$ mixing. However, the result assumes no interference between the DCS and mixing amplitudes ($y' = 0$ in the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings). When interference is allowed, the limit degrades to 0.033.

$\Gamma(K^+\pi^-\pi^+\pi^-\ (\text{via}\ \overline{D}^0))/\Gamma(K^-\pi^+\pi^+\pi^-)$ Γ_{179}/Γ_{46}

This is a D^0-$\overline{D}^0$ mixing limit. The experiments here (1) use the charge of the pion in $D^*(2010)^\pm \to (D^0$ or $\overline{D}^0)\ \pi^\pm$ decay to tell whether a D^0 or a $\overline{D}^0$ was born; and (2) use the decay-time distribution to disentangle doubly Cabibbo-suppressed decay and mixing. For the limits on $|m_{D^0_1} - m_{D^0_2}|$ and $(\Gamma_{D^0_1} - \Gamma_{D^0_2})/\Gamma_{D^0}$ that come from the best mixing limit, see near the beginning of these D^0 Listings.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<0.005	90	0 ± 4	[107] ANJOS	88C	E691	Photoproduction

[107] ANJOS 88C uses decay-time information to distinguish doubly Cabibbo-suppressed (DCS) decays from D^0-$\overline{D}^0$ mixing. However, the result assumes no interference between the DCS and mixing amplitudes ($y' = 0$ in the note on "D^0-$\overline{D}^0$ Mixing" near the start of the D^0 Listings). When interference is allowed, the limit degrades to 0.007.

$\Gamma\big(K^+\pi^-$ or $K^+\pi^-\pi^+\pi^-$ (via $\overline{D}^0)\big)/\Gamma\big(K^-\pi^+$ or $K^-\pi^+\pi^+\pi^-\big)$ — Γ_{180}/Γ_0

This is a D^0-$\overline{D}^0$ mixing limit. For the limits on $|m_{D_1^0} - m_{D_2^0}|$ and $(\Gamma_{D_1^0} - \Gamma_{D_2^0})/\Gamma_{D^0}$ that come from the best mixing limit, see near the beginning of these D^0 Listings.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0085	90	[108] AITALA	98	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.0037	90	[109] ANJOS	88C	E691	Photoproduction

[108] AITALA 98 uses decay-time information to distinguish doubly Cabibbo-suppressed decays from D^0-$\overline{D}^0$ mixing. The fit allows interference between the two amplitudes, and also allows CP violation in this term. The central value obtained is $0.0039^{+0.0036}_{-0.0032} \pm 0.0016$. When interference is disallowed, the result becomes $0.0021 \pm 0.0009 \pm 0.0002$.

[109] This combines results of ANJOS 88C on $K^+\pi^-$ and $K^+\pi^-\pi^+\pi^-$ (via $\overline{D}^0$) reported in the data block above (see footnotes there). It assumes no interference.

$\Gamma\big(\mu^-$ anything (via $\overline{D}^0)\big)/\Gamma\big(\mu^+$ anything$\big)$ — Γ_{181}/Γ_2

This is a D^0-$\overline{D}^0$ mixing limit. See the somewhat better limits above.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0056	90	LOUIS	86	SPEC	π^- W 225 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.012	90	BENVENUTI	85	CNTR	μC, 200 GeV
<0.044	90	BODEK	82	SPEC	π^-, pFe $\rightarrow$ D^0

$\Gamma(\gamma\gamma)/\Gamma(\pi^0\pi^0)$ — $\Gamma_{182}/\Gamma_{128}$

$D^0 \rightarrow \gamma\gamma$ is a flavor-changing neutral-current decay, forbidden in the Standard Model at the tree level.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.033	90	COAN	03	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(e^+e^-)/\Gamma_{\rm total}$ — Γ_{183}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by first-order weak interaction combined with electromagnetic interaction.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<6.2 × 10^{-6}	90		AITALA	99G	E791	π^- N 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<8.19 \times 10^{-6}$	90		PRIPSTEIN	00	E789	p nucleus, 800 GeV
$<1.3 \times 10^{-5}$	90	0	FREYBERGER	96	CLE2	$e^+e^- \approx \Upsilon(4S)$
$<1.3 \times 10^{-4}$	90		ADLER	88	MRK3	e^+e^- 3.77 GeV
$<1.7 \times 10^{-4}$	90	7	ALBRECHT	88G	ARG	e^+e^- 10 GeV
$<2.2 \times 10^{-4}$	90	8	HAAS	88	CLEO	e^+e^- 10 GeV

$\Gamma(\mu^+\mu^-)/\Gamma_{\rm total}$ — Γ_{184}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by first-order weak interaction combined with electromagnetic interaction.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<4.1 × 10^{-6}	90		ADAMOVICH	97	BEAT	π^- Cu, W 350 GeV

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

$<1.56 \times 10^{-5}$	90		PRIPSTEIN	00	E789	p nucleus, 800 GeV
$<5.2 \times 10^{-6}$	90		AITALA	99G	E791	π^- N 500 GeV
$<4.2 \times 10^{-6}$	90		ALEXOPOU...	96	E771	p Si, 800 GeV
$<3.4 \times 10^{-5}$	90	1	FREYBERGER	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$
$<7.6 \times 10^{-6}$	90	0	ADAMOVICH	95	BEAT	See ADAMOVICH 97
$<4.4 \times 10^{-5}$	90	0	KODAMA	95	E653	π^- emulsion 600 GeV
$<3.1 \times 10^{-5}$	90		[110] MISHRA	94	E789	-4.1 ± 4.8 events
$<7.0 \times 10^{-5}$	90	3	ALBRECHT	88G	ARG	$e^+ e^-$ 10 GeV
$<1.1 \times 10^{-5}$	90		LOUIS	86	SPEC	π^- W 225 GeV
$<3.4 \times 10^{-4}$	90		AUBERT	85	EMC	Deep inelast. $\mu^- N$

[110] Here MISHRA 94 uses "the statistical approach advocated by the PDG." For an alternate approach, giving a limit of 9×10^{-6} at 90% confidence level, see the paper.

$\Gamma(\pi^0 e^+ e^-)/\Gamma_{total}$ — Γ_{185}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<4.5 \times 10^{-5}$	90	0	FREYBERGER	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\pi^0 \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{186}/Γ

A test for the ΔC=1 weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<1.8 \times 10^{-4}$	90	2	KODAMA	95	E653	π^- emulsion 600 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<5.4 \times 10^{-4}$	90	3	FREYBERGER	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\eta e^+ e^-)/\Gamma_{total}$ — Γ_{187}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<1.1 \times 10^{-4}$	90	0	FREYBERGER	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\eta \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{188}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<5.3 \times 10^{-4}$	90	0	FREYBERGER	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\pi^+ \pi^- e^+ e^-)/\Gamma_{total}$ — Γ_{189}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<3.73 \times 10^{-4}$	90	9	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(\rho^0 e^+ e^-)/\Gamma_{total}$ — Γ_{190}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<1.0 \times 10^{-4}$	90	2	[111] FREYBERGER	96	CLE2	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<1.24 \times 10^{-4}$	90	1	AITALA	01C	E791	π^- nucleus, 500 GeV
$<4.5 \times 10^{-4}$	90	2	HAAS	88	CLEO	e^+e^- 10 GeV

[111] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 1.8 \times 10^{-4}$ using a photon pole amplitude model.

$\Gamma(\pi^+\pi^-\mu^+\mu^-)/\Gamma_{total}$ — Γ_{191}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<3.0 \times 10^{-5}$	90	2	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(\rho^0 \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{192}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<2.2 \times 10^{-5}$	90	0	AITALA	01C	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<4.9 \times 10^{-4}$	90	1	[112] FREYBERGER	96	CLE2	$e^+e^- \approx \Upsilon(4S)$
$<2.3 \times 10^{-4}$	90	0	KODAMA	95	E653	π^- emulsion 600 GeV
$<8.1 \times 10^{-4}$	90	5	HAAS	88	CLEO	e^+e^- 10 GeV

[112] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 4.5 \times 10^{-4}$ using a photon pole amplitude model.

$\Gamma(\omega e^+ e^-)/\Gamma_{total}$ — Γ_{193}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<1.8 \times 10^{-4}$	90	1	[113] FREYBERGER	96	CLE2	$e^+e^- \approx \Upsilon(4S)$

[113] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 2.7 \times 10^{-4}$ using a photon pole amplitude model.

$\Gamma(\omega \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{194}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<8.3 \times 10^{-4}$	90	0	[114] FREYBERGER	96	CLE2	$e^+e^- \approx \Upsilon(4S)$

[114] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 6.5 \times 10^{-4}$ using a photon pole amplitude model.

$\Gamma(K^- K^+ e^+ e^-)/\Gamma_{total}$ — Γ_{195}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<3.15 \times 10^{-4}$	90	9	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(\phi e^+ e^-)/\Gamma_{total}$ Γ_{196}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<5.2 × 10^{-5}	90	2	[115] FREYBERGER 96	CLE2	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5.9 \times 10^{-5}$	90	0	AITALA 01C	E791	π^- nucleus, 500 GeV

[115] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 7.6 \times 10^{-5}$ using a photon pole amplitude model.

$\Gamma(K^- K^+ \mu^+ \mu^-)/\Gamma_{total}$ Γ_{197}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<3.3 × 10^{-5}	90	0	AITALA 01C	E791	π^- nucleus, 500 GeV

$\Gamma(\phi \mu^+ \mu^-)/\Gamma_{total}$ Γ_{198}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<3.1 × 10^{-5}	90	0	AITALA 01C	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<4.1 \times 10^{-4}$	90	0	[116] FREYBERGER 96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

[116] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 2.4 \times 10^{-4}$ using a photon pole amplitude model.

$\Gamma(\overline{K}^0 e^+ e^-)/\Gamma_{total}$ Γ_{199}/Γ

Not a useful test for ΔC =1 weak neutral current because both quarks must change flavor.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<1.1 × 10^{-4}	90	0	FREYBERGER 96	CLE2	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.7 \times 10^{-3}$	90		ADLER 89C	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(\overline{K}^0 \mu^+ \mu^-)/\Gamma_{total}$ Γ_{200}/Γ

Not a useful test for ΔC =1 weak neutral current because both quarks must change flavor.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<2.6 × 10^{-4}	90	2	KODAMA 95	E653	π^- emulsion 600 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<6.7 \times 10^{-4}$	90	1	FREYBERGER 96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(K^- \pi^+ e^+ e^-)/\Gamma_{total}$ Γ_{201}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<3.85 × 10^{-4}	90	6	AITALA 01C	E791	π^- nucleus, 500 GeV

$\Gamma(\overline{K}^*(892)^0 e^+ e^-)/\Gamma_{total}$ — Γ_{202}/Γ

Not a useful test for ΔC =1 weak neutral current because both quarks must change flavor.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<4.7 \times 10^{-5}$	90	2	AITALA	01C	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<1.4 \times 10^{-4}$	90	1	[117] FREYBERGER	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

[117] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 2.0 \times 10^{-4}$ using a photon pole amplitude model.

$\Gamma(K^- \pi^+ \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{203}/Γ

A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<3.59 \times 10^{-4}$	90	12	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(\overline{K}^*(892)^0 \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{204}/Γ

Not a useful test for ΔC =1 weak neutral current because both quarks must change flavor.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<2.4 \times 10^{-5}$	90	3	AITALA	01C	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<1.18 \times 10^{-3}$	90	1	[118] FREYBERGER	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

[118] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 1.0 \times 10^{-3}$ using a photon pole amplitude model.

$\Gamma(\pi^+ \pi^- \pi^0 \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{205}/Γ

A test for the ΔC=1 weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<8.1 \times 10^{-4}$	90	1	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(\mu^\pm e^\mp)/\Gamma_{total}$ — Γ_{206}/Γ

A test of lepton family number conservation.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$< 8.1 \times 10^{-6}$	90		AITALA	99G	E791	$\pi^- N$ 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$< 1.72 \times 10^{-5}$	90		PRIPSTEIN	00	E789	p nucleus, 800 GeV
$< 1.9 \times 10^{-5}$	90	2	[119] FREYBERGER	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$
$< 1.0 \times 10^{-4}$	90	4	ALBRECHT	88G	ARG	$e^+ e^-$ 10 GeV
$< 2.7 \times 10^{-4}$	90	9	HAAS	88	CLEO	$e^+ e^-$ 10 GeV
$< 1.2 \times 10^{-4}$	90		BECKER	87C	MRK3	$e^+ e^-$ 3.77 GeV
$< 9 \times 10^{-4}$	90		PALKA	87	SILI	200 GeV πp
$<21 \times 10^{-4}$	90	0	[120] RILES	87	MRK2	$e^+ e^-$ 29 GeV

[119] This is the corrected result given in the erratum to FREYBERGER 96.

[120] RILES 87 assumes B($D \rightarrow K\pi$) = 3.0% and has production model dependency.

$\Gamma(\pi^0 e^\pm \mu^\mp)/\Gamma_{total}$ — Γ_{207}/Γ

A test of lepton family number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<8.6 × 10^{-5}	90	2	FREYBERGER 96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\eta e^\pm \mu^\mp)/\Gamma_{total}$ — Γ_{208}/Γ

A test of lepton family number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<1.0 × 10^{-4}	90	0	FREYBERGER 96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\pi^+ \pi^- e^\pm \mu^\mp)/\Gamma_{total}$ — Γ_{209}/Γ

A test of lepton family-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<1.5 × 10^{-5}	90	1	AITALA 01C	E791	π^- nucleus, 500 GeV

$\Gamma(\rho^0 e^\pm \mu^\mp)/\Gamma_{total}$ — Γ_{210}/Γ

A test of lepton family number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<4.9 × 10^{-5}	90	0	[121] FREYBERGER 96	CLE2	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<6.6 × 10^{-5}	90	1	AITALA 01C	E791	π^- nucleus, 500 GeV

[121] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 5.0 \times 10^{-5}$ using a photon pole amplitude model.

$\Gamma(\omega e^\pm \mu^\mp)/\Gamma_{total}$ — Γ_{211}/Γ

A test of lepton family number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<1.2 × 10^{-4}	90	0	[122] FREYBERGER 96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

[122] This FREYBERGER 96 limit is obtained using a phase-space model. The same limit is obtained using a photon pole amplitude model.

$\Gamma(K^- K^+ e^\pm \mu^\mp)/\Gamma_{total}$ — Γ_{212}/Γ

A test of lepton family-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<1.8 × 10^{-4}	90	5	AITALA 01C	E791	π^- nucleus, 500 GeV

$\Gamma(\phi e^\pm \mu^\mp)/\Gamma_{total}$ — Γ_{213}/Γ

A test of lepton family number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<3.4 × 10^{-5}	90	0	[123] FREYBERGER 96	CLE2	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<4.7 × 10^{-5}	90	0	AITALA 01C	E791	π^- nucleus, 500 GeV

[123] This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 3.3 \times 10^{-5}$ using a photon pole amplitude model.

$\Gamma(\overline{K}^0 e^{\pm} \mu^{\mp})/\Gamma_{total}$ — Γ_{214}/Γ

A test of lepton family number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<1.0 × 10^{-4}	90	0	FREYBERGER	96	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(K^- \pi^+ e^{\pm} \mu^{\mp})/\Gamma_{total}$ — Γ_{215}/Γ

A test of lepton family-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<5.53 × 10^{-4}	90	15	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(\overline{K}^*(892)^0 e^{\pm} \mu^{\mp})/\Gamma_{total}$ — Γ_{216}/Γ

A test of lepton family number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<8.3 × 10^{-5}	90	9	AITALA	01C	E791	π^- nucleus, 500 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<1.0 × 10^{-4}	90	0	[124] FREYBERGER	96	CLE2	$e^+e^- \approx \Upsilon(4S)$

[124] This FREYBERGER 96 limit is obtained using a phase-space model. The same limit is obtained using a photon pole amplitude model.

$\Gamma(\pi^- \pi^- e^+ e^+ + \text{c.c.})/\Gamma_{total}$ — Γ_{217}/Γ

A test of lepton-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<1.12 × 10^{-4}	90	1	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(\pi^- \pi^- \mu^+ \mu^+ + \text{c.c.})/\Gamma_{total}$ — Γ_{218}/Γ

A test of lepton-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<2.9 × 10^{-5}	90	1	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(K^- \pi^- e^+ e^+ + \text{c.c.})/\Gamma_{total}$ — Γ_{219}/Γ

A test of lepton-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<2.06 × 10^{-4}	90	2	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(K^- \pi^- \mu^+ \mu^+ + \text{c.c.})/\Gamma_{total}$ — Γ_{220}/Γ

A test of lepton-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<3.9 × 10^{-4}	90	14	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(K^- K^- e^+ e^+ + \text{c.c.})/\Gamma_{total}$ — Γ_{221}/Γ

A test of lepton-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<1.52 × 10^{-4}	90	2	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(K^- K^- \mu^+ \mu^+ + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{222}/Γ

A test of lepton-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<9.4 × 10^{-5}	90	1	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(\pi^- \pi^- e^+ \mu^+ + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{223}/Γ

A test of lepton-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<7.9 × 10^{-5}	90	4	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(K^- \pi^- e^+ \mu^+ + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{224}/Γ

A test of lepton-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<2.18 × 10^{-4}	90	7	AITALA	01C	E791	π^- nucleus, 500 GeV

$\Gamma(K^- K^- e^+ \mu^+ + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{225}/Γ

A test of lepton-number conservation. The value is for the sum of the two charge states.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<5.7 × 10^{-5}	90	0	AITALA	01C	E791	π^- nucleus, 500 GeV

D^0 CP-VIOLATING DECAY-RATE ASYMMETRIES

$A_{CP}(K^+ K^-)$ in $D^0, \overline{D}^0 \rightarrow K^+ K^-$

This is the difference between D^0 and $\overline{D}^0$ partial widths for these modes divided by the sum of the widths. The D^0 and $\overline{D}^0$ are distinguished by the charge of the parent D^*: $D^{*+} \rightarrow D^0 \pi^+$ and $D^{*-} \rightarrow \overline{D}^0 \pi^-$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.005±0.016 OUR AVERAGE					
0.000±0.022±0.008	3023	[125] CSORNA	02	CLE2	$e^+ e^- \approx \Upsilon(4S)$
−0.001±0.022±0.015	3330	[125] LINK	00B	FOCS	
−0.010±0.049±0.012	609	[125] AITALA	98C	E791	$-0.093 < A_{CP} < +0.073$ (90% CL)
+0.080±0.061		BARTELT	95	CLE2	$-0.022 < A_{CP} < +0.18$ (90%CL)
+0.024±0.084		[125] FRABETTI	94I	E687	$-0.11 < A_{CP} < +0.16$ (90% CL)

[125] FRABETTI 94I, AITALA 98C, LINK 00B, and CSORNA 02 measure $N(D^0 \rightarrow K^+ K^-)/N(D^0 \rightarrow K^- \pi^+)$, the ratio of numbers of events observed, and similarly for the $\overline{D}^0$.

$A_{CP}(K^0_S K^0_S)$ in $D^0, \overline{D}^0 \rightarrow K^0_S K^0_S$

This is the difference between D^0 and $\overline{D}^0$ partial widths for these modes divided by the sum of the widths. The D^0 and $\overline{D}^0$ are distinguished by the charge of the parent D^*: $D^{*+} \rightarrow D^0 \pi^+$ and $D^{*-} \rightarrow \overline{D}^0 \pi^-$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
−0.23±0.19	65	BONVICINI	01	CLE2	$e^+ e^- \approx$ 10.6 GeV

$A_{CP}(\pi^+\pi^-)$ in D^0, $\overline{D}^0 \to \pi^+\pi^-$

This is the difference between D^0 and $\overline{D}^0$ partial widths for these modes divided by the sum of the widths. The D^0 and $\overline{D}^0$ are distinguished by the charge of the parent D^*: $D^{*+} \to D^0\pi^+$ and $D^{*-} \to \overline{D}^0\pi^-$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.021±0.026 OUR AVERAGE					
0.019±0.032±0.008	1136	[126] CSORNA	02	CLE2	$e^+e^- \approx \Upsilon(4S)$
+0.048±0.039±0.025	1177	[126] LINK	00B	FOCS	
−0.049±0.078±0.030	343	[126] AITALA	98C	E791	$-0.186 < A_{CP} < +0.088$ (90% CL)

[126] AITALA 98C, LINK 00B, and CSORNA 02 measure $N(D^0 \to \pi^+\pi^-)/N(D^0 \to K^-\pi^+)$, the ratio of numbers of events observed, and similarly for the $\overline{D}^0$.

$A_{CP}(\pi^0\pi^0)$ in D^0, $\overline{D}^0 \to \pi^0\pi^0$

This is the difference between D^0 and $\overline{D}^0$ partial widths for these modes divided by the sum of the widths. The D^0 and $\overline{D}^0$ are distinguished by the charge of the parent D^*: $D^{*+} \to D^0\pi^+$ and $D^{*-} \to \overline{D}^0\pi^-$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
+0.001±0.048	810	BONVICINI	01	CLE2	$e^+e^- \approx$ 10.6 GeV

$A_{CP}(K^0_S\phi)$ in D^0, $\overline{D}^0 \to K^0_S\phi$

This is the difference between D^0 and $\overline{D}^0$ partial widths for these modes divided by the sum of the widths. The D^0 and $\overline{D}^0$ are distinguished by the charge of the parent D^*: $D^{*+} \to D^0\pi^+$ and $D^{*-} \to \overline{D}^0\pi^-$.

VALUE	DOCUMENT ID		TECN	COMMENT
−0.028±0.094	BARTELT	95	CLE2	$-0.182 < A_{CP} < +0.126$ (90%CL)

$A_{CP}(K^0_S\pi^0)$ in D^0, $\overline{D}^0 \to K^0_S\pi^0$

This is the difference between D^0 and $\overline{D}^0$ partial widths for these modes divided by the sum of the widths. The D^0 and $\overline{D}^0$ are distinguished by the charge of the parent D^*: $D^{*+} \to D^0\pi^+$ and $D^{*-} \to \overline{D}^0\pi^-$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
+0.001±0.013	9099	BONVICINI	01	CLE2	$e^+e^- \approx$ 10.6 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
−0.018±0.030		BARTELT	95	CLE2	See BONVICINI 01

$A_{CP}(K^\pm\pi^\mp)$ in $D^0 \to K^+\pi^-$, $\overline{D}^0 \to K^-\pi^+$

This is the difference between D^0 and $\overline{D}^0$ partial widths for these modes divided by the sum of the widths. The D^0 and $\overline{D}^0$ are distinguished by the charge of the parent D^*: $D^{*+} \to D^0\pi^+$ and $D^{*-} \to \overline{D}^0\pi^-$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.08 ±0.09 OUR AVERAGE					
+0.095±0.061±0.083		[127] AUBERT	03Z	BABR	e^+e^-, 10.6 GeV
$+0.02\ ^{+0.19}_{-0.20}\ \pm0.01$	45	[128] GODANG	00	CLE2	$-0.43 < A_{CP} < +0.34$ (95%CL)

[127] This AUBERT 03Z limit assumes no mixing. If mixing is allowed, the 95% confidence-level interval is $(-2.8 < A_D < 4.9)\times10^{-3}$.

[128] This GODANG 00 result assumes no D^0-$\overline{D}^0$ mixing; it becomes $-0.01^{+0.16}_{-0.17} \pm 0.01$ when mixing is allowed.

$A_{CP}(K^{\mp}\pi^{\pm}\pi^0)$ in $D^0 \to K^-\pi^+\pi^0$, $\overline{D}^0 \to K^+\pi^-\pi^0$

This is the difference between D^0 and $\overline{D}^0$ partial widths for these modes divided by the sum of the widths. The D^0 and $\overline{D}^0$ are distinguished by the charge of the parent D^*: $D^{*+} \to D^0\pi^+$ and $D^{*-} \to \overline{D}^0\pi^-$.

VALUE	DOCUMENT ID		TECN	COMMENT
−0.031±0.086	[129] KOPP	01	CLE2	$e^+e^- \approx$ 10.6 GeV

[129] KOPP 01 fits separately the D^0 and $\overline{D}^0$ Dalitz plots and then calculates the integrated difference of normalized densities divided by the integrated sum.

$A_{CP}(K^{\pm}\pi^{\mp}\pi^0)$ in $D^0 \to K^+\pi^-\pi^0$, $\overline{D}^0 \to K^-\pi^+\pi^0$

This is the difference between D^0 and $\overline{D}^0$ partial widths for these modes divided by the sum of the widths. The D^0 and $\overline{D}^0$ are distinguished by the charge of the parent D^*: $D^{*+} \to D^0\pi^+$ and $D^{*-} \to \overline{D}^0\pi^-$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{+0.09^{+0.25}_{-0.22}}$	38	BRANDENB...	01	CLE2	$e^+e^- \approx \Upsilon(4S)$

D^0 *CPT*-VIOLATING DECAY-RATE ASYMMETRIES

$A_{CPT}(K^{\mp}\pi^{\pm})$ in $D^0 \to K^-\pi^+$, $\overline{D}^0 \to K^+\pi^-$

A_{CPT}(t) is defined in terms of the time-dependent decay probabilities $P(D^0 \to K^-\pi^+)$ and $\overline{P}(\overline{D}^0 \to K^+\pi^-)$ by $A_{CPT}(t) = (\overline{P} - P)/(\overline{P} + P)$. For small mixing parameters $x \equiv \Delta m/\Gamma$ and $y \equiv \Delta\Gamma/2\Gamma$ (as is the case), and times t, A_{CPT}(t) reduces to [y $Re\,\xi$ - x $Im\,\xi$] Γt, where ξ is the *CPT*-violating parameter.

The following is actually y $Re\,\xi$ - x $Im\,\xi$.

VALUE	DOCUMENT ID		TECN	COMMENT
0.0083±0.0065±0.0041	LINK	03B	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

D^0 PRODUCTION CROSS SECTION AT $\psi(3770)$

A compilation of the cross sections for the direct production of D^0 mesons at or near the $\psi(3770)$ peak in e^+e^- production.

VALUE (nanobarns)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.8 ±0.5 ±0.6	[130] ADLER	88C	MRK3	e^+e^- 3.768 GeV
7.3 ±1.3	[131] PARTRIDGE	84	CBAL	e^+e^- 3.771 GeV
8.00±0.95±1.21	[132] SCHINDLER	80	MRK2	e^+e^- 3.771 GeV
11.5 ±2.5	[133] PERUZZI	77	MRK1	e^+e^- 3.774 GeV

[130] This measurement compares events with one detected D to those with two detected D mesons, to determine the the absolute cross section. ADLER 88C find the ratio of cross sections (neutral to charged) to be 1.36 ± 0.23 ± 0.14.

[131] This measurement comes from a scan of the $\psi(3770)$ resonance and a fit to the cross section. PARTRIDGE 84 measures 6.4 ± 1.15 nb for the cross section. We take the phase space division of neutral and charged D mesons in $\psi(3770)$ decay to be 1.33, and we assume that the $\psi(3770)$ is an isosinglet to evaluate the cross sections. The noncharm decays (e.g. radiative) of the $\psi(3770)$ are included in this measurement and may amount to a few percent correction.

[132] This measurement comes from a scan of the $\psi(3770)$ resonance and a fit to the cross section. SCHINDLER 80 assume the phase space division of neutral and charged D mesons in $\psi(3770)$ decay to be 1.33, and that the $\psi(3770)$ is an isosinglet. The noncharm decays (e.g. radiative) of the $\psi(3770)$ are included in this measurement and may amount to a few percent correction.

[133] This measurement comes from a scan of the $\psi(3770)$ resonance and a fit to the cross section. The phase space division of neutral and charged D mesons in $\psi(3770)$ decay is taken to be 1.33, and $\psi(3770)$ is assumed to be an isosinglet. The noncharm decays (e.g. radiative) of the $\psi(3770)$ are included in this measurement and may amount to a few percent correction. We exclude this measurement from the average because of uncertainties in the contamination from τ lepton pairs. Also see RAPIDIS 77.

D^0 REFERENCES

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TAJIMA	04	PRL 92 101803	O. Tajima *et al.*	(BELLE Collab.)
AUBERT	03P	PRL 91 121801	B. Aubert *et al.*	(BaBar Collab.)
AUBERT	03Z	PRL 91 171801	B. Aubert *et al.*	(BaBar Collab.)
COAN	03	PRL 90 101801	T.E. Coan *et al.*	(CLEO Collab.)
LINK	03	PL B555 167	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	03B	PL B556 7	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	03G	PL B575 190	J.M. Link *et al.*	(FNAL FOCUS Collab.)
ABE	02I	PRL 88 162001	K. Abe *et al.*	(KEK BELLE Collab.)
CSORNA	02	PR D65 092001	S.E. Csorna *et al.*	(CLEO Collab.)
LINK	02F	PL B537 192	J.M. Link *et al.*	(FNAL FOCUS Collab.)
MURAMATSU	02	PRL 89 251802	H. Muramatsu *et al.*	(CLEO Collab.)
Also	03	PRL 90 059901 (erratum)	H. Muramatsu *et al.*	(CLEO Collab.)
AITALA	01C	PRL 86 3969	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	01D	PR D64 112003	E.M. Aitala *et al.*	(FNAL E791 Collab.)
BONVICINI	01	PR D63 071101R	G. Bonvicini *et al.*	(CLEO Collab.)
BRANDENB...	01	PRL 87 071802	G. Brandenburg *et al.*	(CLEO Collab.)
DYTMAN	01	PR D64 111101 (R)	S.A. Dytman *et al.*	(CLEO Collab.)
KOPP	01	PR D63 092001	S. Kopp *et al.*	(CLEO Collab.)
KUSHNIR...	01	PRL 86 5243	A. Kushnirenko *et al.*	(FNAL SELEX Collab.)
LINK	01	PRL 86 2955	J.M. Link *et al.*	(FNAL FOCUS Collab.)
BAI	00C	PR D62 052001	J.Z. Bai *et al.*	(BEPC BES Collab.)
GODANG	00	PRL 84 5038	R. Godang *et al.*	(CLEO Collab.)
JUN	00	PRL 84 1857	S.Y. Jun *et al.*	(FNAL SELEX Collab.)
LINK	00	PL B485 62	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	00B	PL B491 232	J.M. Link *et al.*	(FNAL FOCUS Collab.)
Also	00D	PL B495 443 (errata)	J.M. Link *et al.*	(FNAL FOCUS Collab.)
PRIPSTEIN	00	PR D61 032005	D. Pripstein *et al.*	(FNAL E789 Collab.)
AITALA	99E	PRL 83 32	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	99G	PL B462 401	E.M. Aitala *et al.*	(FNAL E791 Collab.)
BONVICINI	99	PRL 82 4586	G. Bonvicini *et al.*	(CLEO Collab.)
AITALA	98	PR D57 13	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	98C	PL B421 405	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	98D	PL B423 185	E.M. Aitala *et al.*	(FNAL E791 Collab.)
ARTUSO	98	PRL 80 3193	M. Artuso *et al.*	(CLEO Collab.)
ASNER	98	PR D58 092001	D.M. Asner *et al.*	(CLEO Collab.)
BARATE	98W	PL B436 211	R. Barate *et al.*	(ALEPH Collab.)
COAN	98	PRL 80 1150	T.E. Coan *et al.*	(CLEO Collab.)
ADAMOVICH	97	PL B408 469	M.I. Adamovich *et al.*	(CERN BEATRICE Collab.)
BARATE	97C	PL B403 367	R. Barate *et al.*	(ALEPH Collab.)
AITALA	96C	PRL 77 2384	E.M. Aitala *et al.*	(FNAL E791 Collab.)
ALBRECHT	96C	PL B374 249	H. Albrecht *et al.*	(ARGUS Collab.)
ALEXOPOU...	96	PRL 77 2380	T. Alexopoulos *et al.*	(FNAL E771 Collab.)
ASNER	96B	PR D54 4211	D.M. Asner *et al.*	(CLEO Collab.)
BARISH	96	PL B373 334	B.C. Barish *et al.*	(CLEO Collab.)
FRABETTI	96B	PL B382 312	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FREYBERGER	96	PRL 76 3065	A. Freyberger *et al.*	(CLEO Collab.)
Also	96B	PRL 77 2147 (errata)	A. Freyberger *et al.*	(CLEO Collab.)
KUBOTA	96B	PR D54 2994	Y. Kubota *et al.*	(CLEO Collab.)
ADAMOVICH	95	PL B353 563	M.I. Adamovich *et al.*	(CERN BEATRICE Collab.)
BARTELT	95	PR D52 4860	J.E. Bartelt *et al.*	(CLEO Collab.)
BUTLER	95	PR D52 2656	F. Butler *et al.*	(CLEO Collab.)
FRABETTI	95C	PL B354 486	P.L. Frabetti *et al.*	(FNAL E687 Collab.)

FRABETTI	95G	PL B364 127	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
KODAMA	95	PL B345 85	K. Kodama *et al.*	(FNAL E653 Collab.)
ALBRECHT	94	PL B324 249	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	94F	PL B340 125	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	94I	ZPHY C64 375	H. Albrecht *et al.*	(ARGUS Collab.)
CINABRO	94	PRL 72 1406	D. Cinabro *et al.*	(CLEO Collab.)
FRABETTI	94C	PL B321 295	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
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FRABETTI	94G	PL B331 217	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FRABETTI	94I	PR D50 R2953	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
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KODAMA	94	PL B336 605	K. Kodama *et al.*	(FNAL E653 Collab.)
MISHRA	94	PR D50 R9	C.S. Mishra *et al.*	(FNAL E789 Collab.)
AKERIB	93	PRL 71 3070	D.S. Akerib *et al.*	(CLEO Collab.)
ALBRECHT	93D	PL B308 435	H. Albrecht *et al.*	(ARGUS Collab.)
ANJOS	93	PR D48 56	J.C. Anjos *et al.*	(FNAL E691 Collab.)
BEAN	93C	PL B317 647	A. Bean *et al.*	(CLEO Collab.)
FRABETTI	93I	PL B315 203	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
KODAMA	93B	PL B313 260	K. Kodama *et al.*	(FNAL E653 Collab.)
PROCARIO	93B	PR D48 4007	M. Procario *et al.*	(CLEO Collab.)
SELEN	93	PRL 71 1973	M.A. Selen *et al.*	(CLEO Collab.)
ADAMOVICH	92	PL B280 163	M.I. Adamovich *et al.*	(CERN WA82 Collab.)
ALBRECHT	92P	ZPHY C56 7	H. Albrecht *et al.*	(ARGUS Collab.)
ANJOS	92B	PR D46 R1	J.C. Anjos *et al.*	(FNAL E691 Collab.)
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BARLAG	92C	ZPHY C55 383	S. Barlag *et al.*	(ACCMOR Collab.)
Also	90D	ZPHY C48 29	S. Barlag *et al.*	(ACCMOR Collab.)
COFFMAN	92B	PR D45 2196	D.M. Coffman *et al.*	(Mark III Collab.)
Also	90	PRL 64 2615	J. Adler *et al.*	(Mark III Collab.)
FRABETTI	92	PL B281 167	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
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ALVAREZ	91B	ZPHY C50 11	M.P. Alvarez *et al.*	(CERN NA14/2 Collab.)
AMMAR	91	PR D44 3383	R. Ammar *et al.*	(CLEO Collab.)
ANJOS	91	PR D43 R635	J.C. Anjos *et al.*	(FNAL-TPS Collab.)
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BAI	91	PRL 66 1011	Z. Bai *et al.*	(Mark III Collab.)
COFFMAN	91	PL B263 135	D.M. Coffman *et al.*	(Mark III Collab.)
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KINOSHITA	91	PR D43 2836	K. Kinoshita *et al.*	(CLEO Collab.)
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ALBRECHT	90C	ZPHY C46 9	H. Albrecht *et al.*	(ARGUS Collab.)
ALEXANDER	90	PRL 65 1184	J. Alexander *et al.*	(CLEO Collab.)
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ANJOS	90D	PR D42 2414	J.C. Anjos *et al.*	(FNAL E691 Collab.)
BARLAG	90C	ZPHY C46 563	S. Barlag *et al.*	(ACCMOR Collab.)
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ALBRECHT	89D	ZPHY C43 181	H. Albrecht *et al.*	(ARGUS Collab.)
ANJOS	89F	PRL 62 1587	J.C. Anjos *et al.*	(FNAL E691 Collab.)
ABACHI	88	PL B205 411	S. Abachi *et al.*	(HRS Collab.)
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ALBRECHT	88G	PL B209 380	H. Albrecht *et al.*	(ARGUS Collab.)
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BORTOLETTO	88	PR D37 1719	D. Bortoletto *et al.*	(CLEO Collab.)
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ADAMOVICH	87	EPL 4 887	M.I. Adamovich *et al.*	(Photon Emulsion Collab.)
ADLER	87	PL B196 107	J. Adler *et al.*	(Mark III Collab.)
AGUILAR-...	87E	ZPHY C36 551	M. Aguilar-Benitez *et al.*	(LEBC-EHS Collab.)
Also	88B	ZPHY C40 321	M. Aguilar-Benitez *et al.*	(LEBC-EHS Collab.)
AGUILAR-...	87F	ZPHY C36 559	M. Aguilar-Benitez *et al.*	(LEBC-EHS Collab.)
Also	88	ZPHY C38 520 erratum	M. Aguilar-Benitez *et al.*	(LEBC-EHS Collab.)
ALBRECHT	87E	ZPHY C33 359	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	87K	PL B199 447	H. Albrecht *et al.*	(ARGUS Collab.)

BARLAG	87B	ZPHY C37 17	S. Barlag *et al.*	(ACCMOR Collab.)
BECKER	87C	PL B193 147	J.J. Becker *et al.*	(Mark III Collab.)
Also	87D	PL B198 590 erratum	J.J. Becker *et al.*	(Mark III Collab.)
PALKA	87	PL B189 238	H. Palka *et al.*	(ACCMOR Collab.)
RILES	87	PR D35 2914	K. Riles *et al.*	(Mark II Collab.)
BAILEY	86	ZPHY C30 51	R. Bailey *et al.*	(ACCMOR Collab.)
BEBEK	86	PRL 56 1893	C. Bebek *et al.*	(CLEO Collab.)
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ALBRECHT	85B	PL 158B 525	H. Albrecht *et al.*	(ARGUS Collab.)
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BENVENUTI	85	PL 158B 531	A.C. Benvenuti *et al.*	(BCDMS Collab.)
ADAMOVICH	84B	PL 140B 123	M.I. Adamovich *et al.*	(CERN WA58 Collab.)
DERRICK	84	PRL 53 1971	M. Derrick *et al.*	(HRS Collab.)
PARTRIDGE	84	Thesis CALT-68-1150	R.A. Partridge	(Crystal Ball Collab.)
SUMMERS	84	PRL 52 410	D.J. Summers *et al.*	(UCSB, CARL, COLO+)
BAILEY	83B	PL 132B 237	R. Bailey *et al.*	(ACCMOR Collab.)
BODEK	82	PL 113B 82	A. Bodek *et al.*	(ROCH, CIT, CHIC, FNAL+)
FIORINO	81	LNC 30 166	A. Fiorino *et al.*	
SCHINDLER	81	PR D24 78	R.H. Schindler *et al.*	(Mark II Collab.)
TRILLING	81	PRPL 75 57	G.H. Trilling	(LBL, UCB) J
ASTON	80E	PL 94B 113	D. Aston *et al.*	(BONN, CERN, EPOL, GLAS+)
AVERY	80	PRL 44 1309	P. Avery *et al.*	(ILL, FNAL, COLU)
SCHINDLER	80	PR D21 2716	R.H. Schindler *et al.*	(Mark II Collab.)
ZHOLENTZ	80	PL 96B 214	A.A. Zholents *et al.*	(NOVO)
Also	81	SJNP 34 814	A.A. Zholents *et al.*	(NOVO)
		Translated from YAF 34 1471.		
ABRAMS	79D	PRL 43 481	G.S. Abrams *et al.*	(Mark II Collab.)
ATIYA	79	PRL 43 414	M.S. Atiya *et al.*	(COLU, ILL, FNAL)
BALTAY	78C	PRL 41 73	C. Baltay *et al.*	(COLU, BNL)
VUILLEMIN	78	PRL 41 1149	V. Vuillemin *et al.*	(Mark I Collab.)
GOLDHABER	77	PL 69B 503	G. Goldhaber *et al.*	(Mark I Collab.)
PERUZZI	77	PRL 39 1301	I. Peruzzi *et al.*	(Mark I Collab.)
PICCOLO	77	PL 70B 260	M. Piccolo *et al.*	(Mark I Collab.)
RAPIDIS	77	PRL 39 526	P.A. Rapidis *et al.*	(Mark I Collab.)
GOLDHABER	76	PRL 37 255	G. Goldhaber *et al.*	(Mark I Collab.)

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