$D^{\pm}$

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

$D^{\pm}$ MASS

The fit includes $D^{\pm}$, D^0, $D_s^{\pm}$, $D^{*\pm}$, D^{*0}, $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1869.58 ± 0.09 OUR FIT					
1869.5 ± 0.4 OUR AVERAGE					
1869.53 ± 0.49 ± 0.20	110 ± 15	ANASHIN	10A	KEDR	e^+e^- at $\psi(3770)$
1870.0 ± 0.5 ± 1.0	317	BARLAG	90C	ACCM	π^- Cu 230 GeV
1869.4 ± 0.6		[1] TRILLING	81	RVUE	e^+e^- 3.77 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1875 ± 10	9	ADAMOVICH	87	EMUL	Photoproduction
1860 ± 16	6	ADAMOVICH	84	EMUL	Photoproduction
1863 ± 4		DERRICK	84	HRS	e^+e^- 29 GeV
1868.4 ± 0.5		[1] SCHINDLER	81	MRK2	e^+e^- 3.77 GeV
1874 ± 5		GOLDHABER	77	MRK1	D^0, D^+ recoil spectra
1868.3 ± 0.9		[1] PERUZZI	77	LGW	e^+e^- 3.77 GeV
1874 ± 11		PICCOLO	77	MRK1	e^+e^- 4.03, 4.41 GeV
1876 ± 15	50	PERUZZI	76	MRK1	$K^{\mp}\pi^{\pm}\pi^{\pm}$

[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.

$D^{\pm}$ MEAN LIFE

Measurements with an error $> 100 \times 10^{-15}$ s have been omitted from the Listings.

VALUE (10^{-15} s)	EVTS	DOCUMENT ID		TECN	COMMENT
1040 ± 7 OUR AVERAGE					
1039.4 ± 4.3 ± 7.0	110k	LINK	02F	FOCS	γ nucleus, $\approx$ 180 GeV
$1033.6 \pm 22.1 ^{+9.9}_{-12.7}$	3777	BONVICINI	99	CLEO	$e^+e^- \approx \Upsilon(4S)$
1048 ± 15 ± 11	9k	FRABETTI	94D	E687	$D^+ \to K^-\pi^+\pi^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1075 ± 40 ± 18	2455	FRABETTI	91	E687	γ Be, $D^+ \to K^-\pi^+\pi^+$
1030 ± 80 ± 60	200	ALVAREZ	90	NA14	γ, $D^+ \to K^-\pi^+\pi^+$
$1050 ^{+77}_{-72}$	317	[1] BARLAG	90C	ACCM	π^- Cu 230 GeV
1050 ± 80 ± 70	363	ALBRECHT	88I	ARG	e^+e^- 10 GeV
1090 ± 30 ± 25	2992	RAAB	88	E691	Photoproduction

[1] BARLAG 90C estimates the systematic error to be negligible.

D^+ DECAY MODES

Most decay modes (other than the semileptonic modes) that involve a neutral K meson are now given as K^0_S modes, not as $\overline{K}^0$ modes. Nearly always it is a K^0_S that is measured, and interference between Cabibbo-allowed and doubly Cabibbo-suppressed modes can invalidate the assumption that $2\,\Gamma(K^0_S) = \Gamma(\overline{K}^0)$.

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
	Inclusive modes		
Γ_1	e^+ semileptonic	(16.07 ± 0.30) %	
Γ_2	μ^+ anything	(17.6 ± 3.2) %	
Γ_3	K^- anything	(25.7 ± 1.4) %	
Γ_4	$\overline{K}^0$ anything + K^0 anything	(61 ± 5) %	
Γ_5	K^+ anything	(5.9 ± 0.8) %	
Γ_6	$K^*(892)^-$ anything	(6 ± 5) %	
Γ_7	$\overline{K}^*(892)^0$ anything	(23 ± 5) %	
Γ_8	$K^*(892)^0$ anything	< 6.6 %	CL=90%
Γ_9	η anything	(6.3 ± 0.7) %	
Γ_{10}	η' anything	(1.04 ± 0.18) %	
Γ_{11}	ϕ anything	(1.03 ± 0.12) %	
	Leptonic and semileptonic modes		
Γ_{12}	$e^+\nu_e$	< 8.8 $\times 10^{-6}$	CL=90%
Γ_{13}	$\mu^+\nu_\mu$	(3.74 ± 0.17) $\times 10^{-4}$	
Γ_{14}	$\tau^+\nu_\tau$	< 1.2 $\times 10^{-3}$	CL=90%
Γ_{15}	$\overline{K}^0 e^+\nu_e$	(8.90 ± 0.15) %	
Γ_{16}	$\overline{K}^0 \mu^+\nu_\mu$	(9.3 ± 0.7) %	
Γ_{17}	$K^-\pi^+ e^+\nu_e$	(3.91 ± 0.11) %	
Γ_{18}	$\overline{K}^*(892)^0 e^+\nu_e$, $\overline{K}^*(892)^0 \to K^-\pi^+$	(3.68 ± 0.10) %	
Γ_{19}	$(K^-\pi^+)_{S-wave}\, e^+\nu_e$	(2.26 ± 0.11) $\times 10^{-3}$	
Γ_{20}	$\overline{K}^*(1410)^0 e^+\nu_e$, $\overline{K}^*(1410)^0 \to K^-\pi^+$	< 6 $\times 10^{-3}$	CL=90%
Γ_{21}	$\overline{K}^*_2(1430)^0 e^+\nu_e$, $\overline{K}^*_2(1430)^0 \to K^-\pi^+$	< 5 $\times 10^{-4}$	CL=90%
Γ_{22}	$K^-\pi^+ e^+\nu_e$ nonresonant	< 7 $\times 10^{-3}$	CL=90%
Γ_{23}	$K^-\pi^+\mu^+\nu_\mu$	(3.9 ± 0.4) %	
Γ_{24}	$\overline{K}^*(892)^0 \mu^+\nu_\mu$, $\overline{K}^*(892)^0 \to K^-\pi^+$	(3.52 ± 0.10) %	
Γ_{25}	$K^-\pi^+\mu^+\nu_\mu$ nonresonant	(2.1 ± 0.5) $\times 10^{-3}$	
Γ_{26}	$K^-\pi^+\pi^0\mu^+\nu_\mu$	< 1.6 $\times 10^{-3}$	CL=90%
Γ_{27}	$\pi^0 e^+\nu_e$	(4.05 ± 0.18) $\times 10^{-3}$	

Γ_{28}	$\eta e^+ \nu_e$		$(1.14 \pm 0.10) \times 10^{-3}$	
Γ_{29}	$\rho^0 e^+ \nu_e$		$(2.18^{+0.17}_{-0.25}) \times 10^{-3}$	
Γ_{30}	$\rho^0 \mu^+ \nu_\mu$		$(2.4 \pm 0.4) \times 10^{-3}$	
Γ_{31}	$\omega e^+ \nu_e$		$(1.69 \pm 0.11) \times 10^{-3}$	
Γ_{32}	$\eta'(958) e^+ \nu_e$		$(2.2 \pm 0.5) \times 10^{-4}$	
Γ_{33}	$\phi e^+ \nu_e$		$< 1.3 \times 10^{-5}$	CL=90%

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

Γ_{34}	$\overline{K}^*(892)^0 e^+ \nu_e$		(5.52 ± 0.15) %	
Γ_{35}	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$		(5.30 ± 0.15) %	
Γ_{36}	$\overline{K}^*_0(1430)^0 \mu^+ \nu_\mu$		$< 2.5 \times 10^{-4}$	CL=90%
Γ_{37}	$\overline{K}^*(1680)^0 \mu^+ \nu_\mu$		$< 1.6 \times 10^{-3}$	CL=90%

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

Γ_{38}	$K^0_S \pi^+$		(1.53 ± 0.06) %	S=2.8
Γ_{39}	$K^0_L \pi^+$		(1.46 ± 0.05) %	
Γ_{40}	$K^- 2\pi^+$	[a]	(9.46 ± 0.24) %	S=2.0
Γ_{41}	$(K^- \pi^+)_{S-\text{wave}} \pi^+$		(7.58 ± 0.22) %	
Γ_{42}	$\overline{K}^*_0(800)^0 \pi^+$, $\overline{K}^*_0(800) \to K^- \pi^+$			
Γ_{43}	$\overline{K}^*_0(1430)^0 \pi^+$, $\overline{K}^*_0(1430)^0 \to K^- \pi^+$	[b]	(1.26 ± 0.07) %	
Γ_{44}	$\overline{K}^*(892)^0 \pi^+$, $\overline{K}^*(892)^0 \to K^- \pi^+$		(1.05 ± 0.12) %	
Γ_{45}	$\overline{K}^*(1410)^0 \pi^+$, $\overline{K}^{*0} \to K^- \pi^+$		not seen	
Γ_{46}	$\overline{K}^*_2(1430)^0 \pi^+$, $\overline{K}^*_2(1430)^0 \to K^- \pi^+$	[b]	$(2.3 \pm 0.8) \times 10^{-4}$	
Γ_{47}	$\overline{K}^*(1680)^0 \pi^+$, $\overline{K}^*(1680)^0 \to K^- \pi^+$	[b]	$(2.2 \pm 1.1) \times 10^{-4}$	
Γ_{48}	$K^- (2\pi^+)_{I=2}$		(1.47 ± 0.27) %	
Γ_{49}	$K^- 2\pi^+$ nonresonant			
Γ_{50}	$K^0_S \pi^+ \pi^0$	[a]	(7.24 ± 0.17) %	
Γ_{51}	$K^0_S \rho^+$		$(6.04^{+0.60}_{-0.34})$ %	
Γ_{52}	$K^0_S \rho(1450)^+$, $\rho^+ \to \pi^+ \pi^0$		$(1.5^{+1.2}_{-1.4}) \times 10^{-3}$	
Γ_{53}	$\overline{K}^*(892)^0 \pi^+$, $\overline{K}^*(892)^0 \to K^0_S \pi^0$		$(2.59 \pm 0.31) \times 10^{-3}$	
Γ_{54}	$\overline{K}^*_0(1430)^0 \pi^+$, $\overline{K}^{*0}_0 \to K^0_S \pi^0$		$(2.7 \pm 0.9) \times 10^{-3}$	

Γ_{55}	$\overline{K}{}^*_0(1680)^0\pi^+$, $\overline{K}{}^{*0}_0 \to K^0_S\pi^0$		$(9\ ^{+\ 7}_{-10}) \times 10^{-4}$	
Γ_{56}	$\overline{\kappa}^0\pi^+$, $\overline{\kappa}^0 \to K^0_S\pi^0$		$(6\ ^{+\ 5}_{-\ 4}) \times 10^{-3}$	
Γ_{57}	$K^0_S\pi^+\pi^0$ nonresonant		$(3\ \pm\ 4) \times 10^{-3}$	
Γ_{58}	$K^0_S\pi^+\pi^0$ nonresonant and $\overline{\kappa}^0\pi^+$		$(1.35^{+\ 0.21}_{-\ 0.40})$ %	
Γ_{59}	$(K^0_S\pi^0)_{S-\text{wave}}\pi^+$		$(1.25^{+\ 0.27}_{-\ 0.33})$ %	
Γ_{60}	$K^-2\pi^+\pi^0$	[c]	$(6.14\pm\ 0.16)$ %	
Γ_{61}	$K^0_S2\pi^+\pi^-$	[c]	$(3.05\pm\ 0.09)$ %	
Γ_{62}	$K^-3\pi^+\pi^-$	[a]	$(5.8\ \pm\ 0.5) \times 10^{-3}$	S=1.1
Γ_{63}	$\overline{K}{}^*(892)^0 2\pi^+\pi^-$, $\overline{K}{}^*(892)^0 \to K^-\pi^+$		$(1.2\ \pm\ 0.4) \times 10^{-3}$	
Γ_{64}	$\overline{K}{}^*(892)^0\rho^0\pi^+$, $\overline{K}{}^*(892)^0 \to K^-\pi^+$		$(2.3\ \pm\ 0.4) \times 10^{-3}$	
Γ_{65}	$\overline{K}{}^*(892)^0 a_1(1260)^+$	[d]	$(9.4\ \pm\ 1.9) \times 10^{-3}$	
Γ_{66}	$\overline{K}{}^*(892)^0 2\pi^+\pi^-$ no-ρ, $\overline{K}{}^*(892)^0 \to K^-\pi^+$			
Γ_{67}	$K^-\rho^0 2\pi^+$		$(1.74\pm\ 0.28) \times 10^{-3}$	
Γ_{68}	$K^-3\pi^+\pi^-$ nonresonant		$(4.1\ \pm\ 3.0) \times 10^{-4}$	
Γ_{69}	$K^+2K^0_S$		$(4.6\ \pm\ 2.1) \times 10^{-3}$	
Γ_{70}	$K^+K^-K^0_S\pi^+$		$(2.3\ \pm\ 0.5) \times 10^{-4}$	

Pionic modes

Γ_{71}	$\pi^+\pi^0$		$(1.24\pm\ 0.06) \times 10^{-3}$	
Γ_{72}	$2\pi^+\pi^-$		$(3.29\pm\ 0.20) \times 10^{-3}$	
Γ_{73}	$\rho^0\pi^+$		$(8.4\ \pm\ 1.5) \times 10^{-4}$	
Γ_{74}	$\pi^+(\pi^+\pi^-)_{S-\text{wave}}$		$(1.85\pm\ 0.17) \times 10^{-3}$	
Γ_{75}	$\sigma\pi^+$, $\sigma \to \pi^+\pi^-$		$(1.39\pm\ 0.12) \times 10^{-3}$	
Γ_{76}	$f_0(980)\pi^+$, $f_0(980) \to \pi^+\pi^-$		$(1.58\pm\ 0.34) \times 10^{-4}$	
Γ_{77}	$f_0(1370)\pi^+$, $f_0(1370) \to \pi^+\pi^-$		$(8\ \pm\ 4) \times 10^{-5}$	
Γ_{78}	$f_2(1270)\pi^+$, $f_2(1270) \to \pi^+\pi^-$		$(5.1\ \pm\ 0.9) \times 10^{-4}$	
Γ_{79}	$\rho(1450)^0\pi^+$, $\rho(1450)^0 \to \pi^+\pi^-$		$< 8 \times 10^{-5}$	CL=95%
Γ_{80}	$f_0(1500)\pi^+$, $f_0(1500) \to \pi^+\pi^-$		$(1.1\ \pm\ 0.4) \times 10^{-4}$	
Γ_{81}	$f_0(1710)\pi^+$, $f_0(1710) \to \pi^+\pi^-$		$< 5 \times 10^{-5}$	CL=95%
Γ_{82}	$f_0(1790)\pi^+$, $f_0(1790) \to \pi^+\pi^-$		$< 7 \times 10^{-5}$	CL=95%

Γ_{83}	$(\pi^+\pi^+)_{S-\text{wave}}\pi^-$		$< 1.2 \times 10^{-4}$	CL=95%
Γ_{84}	$2\pi^+\pi^-$ nonresonant		$< 1.2 \times 10^{-4}$	CL=95%
Γ_{85}	$\pi^+ 2\pi^0$		$(4.7 \pm 0.4) \times 10^{-3}$	
Γ_{86}	$2\pi^+\pi^-\pi^0$		(1.17 ± 0.08) %	
Γ_{87}	$\eta\pi^+$, $\eta \to \pi^+\pi^-\pi^0$		$(8.0 \pm 0.5) \times 10^{-4}$	
Γ_{88}	$\omega\pi^+$, $\omega \to \pi^+\pi^-\pi^0$		$< 3 \times 10^{-4}$	CL=90%
Γ_{89}	$3\pi^+ 2\pi^-$		$(1.67 \pm 0.16) \times 10^{-3}$	

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

Γ_{90}	$\eta\pi^+$		$(3.66 \pm 0.22) \times 10^{-3}$	
Γ_{91}	$\eta\pi^+\pi^0$		$(1.38 \pm 0.35) \times 10^{-3}$	
Γ_{92}	$\omega\pi^+$		$< 3.4 \times 10^{-4}$	CL=90%
Γ_{93}	$\eta'(958)\pi^+$		$(4.84 \pm 0.31) \times 10^{-3}$	
Γ_{94}	$\eta'(958)\pi^+\pi^0$		$(1.6 \pm 0.5) \times 10^{-3}$	

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

Γ_{95}	$K^+ K^0_S$		$(2.95 \pm 0.15) \times 10^{-3}$	S=2.8
Γ_{96}	$K^+ K^- \pi^+$	[a]	$(9.96 \pm 0.26) \times 10^{-3}$	S=1.3
Γ_{97}	$\phi\pi^+$, $\phi \to K^+ K^-$		$(2.77 ^{+0.09}_{-0.10}) \times 10^{-3}$	
Γ_{98}	$K^+ \overline{K}^*(892)^0$, $\overline{K}^*(892)^0 \to K^- \pi^+$		$(2.56 ^{+0.09}_{-0.15}) \times 10^{-3}$	
Γ_{99}	$K^+ \overline{K}^*_0(1430)^0$, $\overline{K}^*_0(1430)^0 \to K^- \pi^+$		$(1.9 \pm 0.4) \times 10^{-3}$	
Γ_{100}	$K^+ \overline{K}^*_2(1430)^0$, $\overline{K}^*_2 \to K^- \pi^+$		$(1.7 ^{+1.3}_{-0.8}) \times 10^{-4}$	
Γ_{101}	$K^+ \overline{K}^*_0(800)$, $\overline{K}^*_0 \to K^- \pi^+$		$(7.0 ^{+4.0}_{-2.2}) \times 10^{-4}$	
Γ_{102}	$a_0(1450)^0 \pi^+$, $a^0_0 \to K^+ K^-$		$(4.6 ^{+7.0}_{-1.9}) \times 10^{-4}$	
Γ_{103}	$\phi(1680)\pi^+$, $\phi \to K^+ K^-$		$(5.1 ^{+4.0}_{-1.9}) \times 10^{-5}$	
Γ_{104}	$K^+ K^- \pi^+$ nonresonant		not seen	
Γ_{105}	$K^+ K^0_S \pi^+ \pi^-$		$(1.71 \pm 0.18) \times 10^{-3}$	
Γ_{106}	$K^0_S K^- 2\pi^+$		$(2.34 \pm 0.17) \times 10^{-3}$	
Γ_{107}	$K^+ K^- 2\pi^+ \pi^-$		$(2.3 \pm 1.2) \times 10^{-4}$	

A few poorly measured branching fractions:

Γ_{108}	$\phi\pi^+\pi^0$		(2.3 ± 1.0) %	
Γ_{109}	$\phi\rho^+$		< 1.5 %	CL=90%
Γ_{110}	$K^+ K^- \pi^+ \pi^0$ non-ϕ		$(1.5 ^{+0.7}_{-0.6})$ %	
Γ_{111}	$K^*(892)^+ K^0_S$		(1.7 ± 0.8) %	

Doubly Cabibbo-suppressed modes

Γ_{112}	$K^+\pi^0$			$(1.89\pm 0.25)\times 10^{-4}$	S=1.2
Γ_{113}	$K^+\eta$			$(1.12\pm 0.18)\times 10^{-4}$	
Γ_{114}	$K^+\eta'(958)$			$(1.83\pm 0.23)\times 10^{-4}$	
Γ_{115}	$K^+\pi^+\pi^-$			$(5.46\pm 0.25)\times 10^{-4}$	
Γ_{116}	$K^+\rho^0$			$(2.1\pm 0.5)\times 10^{-4}$	
Γ_{117}	$K^*(892)^0\pi^+$, $K^*(892)^0\to K^+\pi^-$			$(2.6\pm 0.4)\times 10^{-4}$	
Γ_{118}	$K^+f_0(980)$, $f_0(980)\to\pi^+\pi^-$			$(4.9\pm 2.9)\times 10^{-5}$	
Γ_{119}	$K_2^*(1430)^0\pi^+$, $K_2^*(1430)^0\to K^+\pi^-$			$(4.4\pm 3.0)\times 10^{-5}$	
Γ_{120}	$K^+\pi^+\pi^-$ nonresonant			not seen	
Γ_{121}	$2K^+K^-$			$(9.0\pm 2.1)\times 10^{-5}$	

$\Delta C = 1$ weak neutral current (*C1*) modes, or Lepton Family number (*LF*) or Lepton number (*L*) violating modes

Γ_{122}	$\pi^+e^+e^-$	C1		$< 1.1\times 10^{-6}$	CL=90%
Γ_{123}	$\pi^+\phi$, $\phi\to e^+e^-$		[e]	$(1.7\,^{+1.4}_{-0.9})\times 10^{-6}$	
Γ_{124}	$\pi^+\mu^+\mu^-$	C1		$< 7.3\times 10^{-8}$	CL=90%
Γ_{125}	$\pi^+\phi$, $\phi\to\mu^+\mu^-$		[e]	$(1.8\pm 0.8)\times 10^{-6}$	
Γ_{126}	$\rho^+\mu^+\mu^-$	C1		$< 5.6\times 10^{-4}$	CL=90%
Γ_{127}	$K^+e^+e^-$		[f]	$< 1.0\times 10^{-6}$	CL=90%
Γ_{128}	$K^+\mu^+\mu^-$		[f]	$< 4.3\times 10^{-6}$	CL=90%
Γ_{129}	$\pi^+e^+\mu^-$	LF		$< 2.9\times 10^{-6}$	CL=90%
Γ_{130}	$\pi^+e^-\mu^+$	LF		$< 3.6\times 10^{-6}$	CL=90%
Γ_{131}	$K^+e^+\mu^-$	LF		$< 1.2\times 10^{-6}$	CL=90%
Γ_{132}	$K^+e^-\mu^+$	LF		$< 2.8\times 10^{-6}$	CL=90%
Γ_{133}	π^-2e^+	L		$< 1.1\times 10^{-6}$	CL=90%
Γ_{134}	$\pi^-2\mu^+$	L		$< 2.2\times 10^{-8}$	CL=90%
Γ_{135}	$\pi^-e^+\mu^+$	L		$< 2.0\times 10^{-6}$	CL=90%
Γ_{136}	$\rho^-2\mu^+$	L		$< 5.6\times 10^{-4}$	CL=90%
Γ_{137}	K^-2e^+	L		$< 9\times 10^{-7}$	CL=90%
Γ_{138}	$K^-2\mu^+$	L		$< 1.0\times 10^{-5}$	CL=90%
Γ_{139}	$K^-e^+\mu^+$	L		$< 1.9\times 10^{-6}$	CL=90%
Γ_{140}	$K^*(892)^-2\mu^+$	L		$< 8.5\times 10^{-4}$	CL=90%

Γ_{141}	Unaccounted decay modes			(50.2 ± 0.9) %	S=1.1

[a] 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.

[b] These subfractions of the $K^-2\pi^+$ mode are uncertain: see the Particle Listings.

[*c*] Submodes of the $D^+ \to K^- 2\pi^+ \pi^0$ and $K^0_S 2\pi^+ \pi^-$ modes were studied by ANJOS 92C and COFFMAN 92B, but with at most 142 events for the first mode and 229 for the second – not enough for precise results. With nothing new for 18 years, we refer to our 2008 edition, Physics Letters **B667** 1 (2008), for those results.

[*d*] The unseen decay modes of the resonances are included.

[*e*] This is *not* a test for the ΔC=1 weak neutral current, but leads to the $\pi^+ \ell^+ \ell^-$ final state.

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

CONSTRAINED FIT INFORMATION

An overall fit to 23 branching ratios uses 31 measurements and one constraint to determine 15 parameters. The overall fit has a $\chi^2 = 33.4$ for 17 degrees of freedom.

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

	x_{16}	x_{29}	x_{34}	x_{35}	x_{38}	x_{40}	x_{50}	x_{60}	x_{61}	x_{62}
x_{29}	0									
x_{34}	0	0								
x_{35}	22	0	0							
x_{38}	5	0	0	1						
x_{40}	18	0	0	4	26					
x_{50}	0	0	0	0	0	0				
x_{60}	0	0	0	0	0	0	0			
x_{61}	0	0	0	0	0	0	0	0		
x_{62}	5	0	0	1	8	29	0	0	0	
x_{89}	5	0	0	1	7	27	0	0	0	77
x_{95}	5	0	0	1	69	26	0	0	0	8
x_{96}	11	0	0	2	16	63	0	0	0	18
x_{112}	3	0	0	1	5	17	0	0	0	5
x_{141}	−86	−2	−17	−36	−20	−48	−20	−18	−10	−21

	x_{89}	x_{95}	x_{96}	x_{112}
x_{95}	7			
x_{96}	17	16		
x_{112}	5	5	11	
x_{141}	−19	−19	−32	−9

D^+ BRANCHING RATIOS

Some now-obsolete measurements have been omitted from these Listings.

——— c-quark decays ———

$\Gamma(c \to e^+ \text{anything})/\Gamma(c \to \text{anything})$

For the Summary Table, we only use the average of e^+ and μ^+ measurements from $Z^0 \to c\overline{c}$ decays; see the second data block below.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.103 \pm 0.009^{+0.009}_{-0.008}$	378	[1] ABBIENDI	99K	OPAL	$Z^0 \to c\overline{c}$

[1] ABBIENDI 99K uses the excess of right-sign over wrong-sign leptons opposite reconstructed $D^*(2010)^+ \to D^0\pi^+$ decays in $Z^0 \to c\overline{c}$.

$\Gamma(c \to \mu^+ \text{anything})/\Gamma(c \to \text{anything})$

For the Summary Table, we only use the average of e^+ and μ^+ measurements from $Z^0 \to c\overline{c}$ decays; see the next data block.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.082 ± 0.005 OUR AVERAGE					
$0.073 \pm 0.008 \pm 0.002$	73	KAYIS-TOPAK...	05	CHRS	ν_μ emulsion
$0.095 \pm 0.007^{+0.014}_{-0.013}$	2829	ASTIER	00D	NOMD	$\nu_\mu \text{Fe} \to \mu^- \mu^+ X$
$0.090 \pm 0.007^{+0.007}_{-0.006}$	476	[1] ABBIENDI	99K	OPAL	$Z^0 \to c\overline{c}$
$0.086 \pm 0.017^{+0.008}_{-0.007}$	69	[2] ALBRECHT	92F	ARG	$e^+e^- \approx$ 10 GeV
$0.078 \pm 0.009 \pm 0.012$		ONG	88	MRK2	e^+e^- 29 GeV
$0.078 \pm 0.015 \pm 0.02$		BARTEL	87	JADE	e^+e^- 34.6 GeV
$0.082 \pm 0.012^{+0.02}_{-0.01}$		ALTHOFF	84G	TASS	e^+e^- 34.5 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.093 \pm 0.009 \pm 0.009$	88	KAYIS-TOPAK...	02	CHRS	See KAYIS-TOPAKSU 05
$0.089 \pm 0.018 \pm 0.025$		BARTEL	85J	JADE	See BARTEL 87

[1] ABBIENDI 99K uses the excess of right-sign over wrong-sign leptons opposite reconstructed $D^*(2010)^+ \to D^0\pi^+$ decays in $Z^0 \to c\overline{c}$.

[2] ALBRECHT 92F uses the excess of right-sign over wrong-sign leptons in a sample of events tagged by fully reconstructed $D^*(2010)^+ \to D^0\pi^+$ decays.

$\Gamma(c \to \ell^+ \text{anything})/\Gamma(c \to \text{anything})$

This is an average (not a sum) of e^+ and μ^+ measurements.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.096 ± 0.004 OUR AVERAGE					
$0.0958 \pm 0.0042 \pm 0.0028$	1828	[1] ABREU	00O	DLPH	$Z^0 \to c\overline{c}$
$0.095 \pm 0.006^{+0.007}_{-0.006}$	854	[2] ABBIENDI	99K	OPAL	$Z^0 \to c\overline{c}$

[1] ABREU 00O uses leptons opposite fully reconstructed $D^*(2010)^+$, D^+, or D^0 mesons.

[2] ABBIENDI 99K uses the excess of right-sign over wrong-sign leptons opposite reconstructed $D^*(2010)^+ \to D^0\pi^+$ decays in $Z^0 \to c\overline{c}$.

$\Gamma(c \to D^*(2010)^+ \text{anything})/\Gamma(c \to \text{anything})$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.255±0.015±0.008	2371	[1] ABREU	00O	DLPH	$Z^0 \to c\overline{c}$

[1] ABREU 00O uses slow pions opposite fully reconstructed $D^*(2010)^+$, D^+, or D^0 mesons as a signal of $D^*(2010)^-$ production.

Inclusive modes

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

The sum of our $\overline{K}^0 e^+ \nu_e$, $\overline{K}^*(892)^0 e^+ \nu_e$, $\pi^0 e^+ \nu_e$, $\eta e^+ \nu_e$, $\rho^0 e^+ \nu_e$, and $\omega e^+ \nu_e$ branching fractions is 15.3 ± 0.4%.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
16.07±0.30 OUR AVERAGE					
16.13±0.10±0.29	26.2±0.2k	[1] ASNER	10	CLEO	$e^+ e^-$ at 3774 MeV
15.2 ±0.9 ±0.8	521 ± 32	ABLIKIM	07G	BES2	$e^+ e^- \approx \psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
16.13±0.20±0.33	8798±105	[2] ADAM	06A	CLEO	See ASNER 10
17.0 ±1.9 ±0.7	158	BALTRUSAIT...	85B	MRK3	$e^+ e^-$ 3.77 GeV

[1] Using the D^+ and D^0 lifetimes, ASNER 10 finds that the ratio of the D^+ and D^0 semileptonic widths is 0.985 ± 0.015 ± 0.024.

[2] Using the D^+ and D^0 lifetimes, ADAM 06A finds that the ratio of the D^+ and D^0 inclusive e^+ widths is 0.985 ± 0.028 ± 0.015, consistent with the isospin-invariance prediction of 1.

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
17.6±2.7±1.8	100 ± 12	[1] ABLIKIM	08L	BES2	$e^+ e^- \approx \psi(3772)$

[1] ABLIKIM 08L finds the ratio of $D^+ \to \mu^+ X$ and $D^0 \to \mu^+ X$ branching fractions to be 2.59 ± 0.70 ± 0.25, in accord with the ratio of D^+ and D^0 lifetimes, 2.54 ± 0.02.

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
25.7±1.4 OUR AVERAGE					
24.7±1.3±1.2	631 ± 33	ABLIKIM	07G	BES2	$e^+ e^- \approx \psi(3770)$
$27.8^{+3.6}_{-3.1}$		BARLAG	92C	ACCM	π^- Cu 230 GeV
27.1±2.3±2.4		COFFMAN	91	MRK3	$e^+ e^-$ 3.77 GeV

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
61 ±5 OUR AVERAGE					
60.5±5.5±3.3	244 ± 22	ABLIKIM	06U	BES2	$e^+ e^-$ at 3773 MeV
61.2±6.5±4.3		COFFMAN	91	MRK3	$e^+ e^-$ 3.77 GeV

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
5.9±0.8 OUR AVERAGE					
6.1±0.9±0.4	189 ± 27	ABLIKIM	07G	BES2	$e^+ e^- \approx \psi(3770)$
5.5±1.3±0.9		COFFMAN	91	MRK3	$e^+ e^-$ 3.77 GeV

$\Gamma(K^*(892)^-$ anything$)/\Gamma_{total}$ — Γ_6/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
5.7±5.2±0.7	7.2 ± 6.5	ABLIKIM	06U	BES2	e^+e^- at 3773 MeV

$\Gamma(\overline{K}^*(892)^0$ anything$)/\Gamma_{total}$ — Γ_7/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
23.2±4.5±3.0	189 ± 36	ABLIKIM	05P	BES	$e^+e^- \approx$ 3773 MeV

$\Gamma(K^*(892)^0$ anything$)/\Gamma_{total}$ — Γ_8/Γ

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<6.6	90	ABLIKIM	05P	BES	$e^+e^- \approx$ 3773 MeV

$\Gamma(\eta$ anything$)/\Gamma_{total}$ — Γ_9/Γ

This ratio includes η particles from η' decays.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
6.3±0.5±0.5	1972 ± 142	HUANG	06B	CLEO	e^+e^- at $\psi(3770)$

$\Gamma(\eta'$ anything$)/\Gamma_{total}$ — Γ_{10}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.04±0.16±0.09	82 ± 13	HUANG	06B	CLEO	e^+e^- at $\psi(3770)$

$\Gamma(\phi$ anything$)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.03±0.10±0.07	248 ± 21	HUANG	06B	CLEO	e^+e^- at $\psi(3770)$

Leptonic and semileptonic modes

$\Gamma(e^+\nu_e)/\Gamma_{total}$ — Γ_{12}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<8.8 \times 10^{-6}$	90	EISENSTEIN	08	CLEO	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.4 \times 10^{-5}$	90	ARTUSO	05A	CLEO	See EISENSTEIN 08

$\Gamma(\mu^+\nu_\mu)/\Gamma_{total}$ — Γ_{13}/Γ

See the note on "Decay Constants of Charged Pseudoscalar Mesons" in the D_s^+ Listings.

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
3.74± 0.17 OUR AVERAGE					
$3.71 \pm 0.19 \pm 0.06$	409 ± 21	[1] ABLIKIM	14F	BES3	e^+e^- at $\psi(3770)$
$3.82 \pm 0.32 \pm 0.09$	150 ± 12	[2] EISENSTEIN	08	CLEO	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$12.2 \,^{+11.1}_{-\ 5.3} \pm 1.0$	3	[3] ABLIKIM	05D	BES	$e^+e^- \approx$ 3.773 GeV
$4.40 \pm 0.66 \,^{+0.09}_{-0.12}$	47 ± 7	[4] ARTUSO	05A	CLEO	See EISENSTEIN 08
$3.5 \pm 1.4 \pm 0.6$	7	[5] BONVICINI	04A	CLEO	Incl. in ARTUSO 05A
$8 \,^{+16}_{-\ 5} \,^{+5}_{-2}$	1	[6] BAI	98B	BES	$e^+e^- \to D^{*+}D^-$

[1] ABLIKIM 14F obtain $|V_{cd}| \cdot f_{D^+}$ = (45.75 ± 1.20 ± 0.39) MeV, and using $|V_{cd}|$ = 0.22520 ± 0.00065 gets f_{D^+} = (203.2 ± 5.3 ± 1.8) MeV.

[2] EISENSTEIN 08, using the D^+ lifetime and assuming $|V_{cd}| = |V_{us}|$, gets f_{D^+} = (205.8 ± 8.5 ± 2.5) MeV from this measurement.

[3] ABLIKIM 05D finds a background-subtracted 2.67 ± 1.74 $D^+ \rightarrow \mu^+ \nu_\mu$ events, and from this obtains $f_{D^+} = 371^{+129}_{-119} \pm 25$ MeV.

[4] ARTUSO 05A obtains $f_{D^+} = 222.6 \pm 16.7^{+2.8}_{-3.4}$ MeV from this measurement.

[5] BONVICINI 04A finds eight events with an estimated background of one, and from the branching fraction obtains f_{D^+} = 202 ± 41 ± 17 MeV.

[6] BAI 98B obtains $f_{D^+} = (300^{+180}_{-150}{}^{+80}_{-40})$ MeV from this measurement.

$\Gamma(\tau^+ \nu_\tau)/\Gamma_{total}$ — Γ_{14}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.2 × 10⁻³	90	EISENSTEIN	08	CLEO	$e^+ e^-$ at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<2.1 × 10⁻³	90	RUBIN	06A	CLEO	See EISENSTEIN 08

$\Gamma(\overline{K}^0 e^+ \nu_e)/\Gamma_{total}$ — Γ_{15}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
8.90 ±0.15 OUR AVERAGE					
8.962±0.054±0.206	40k	[1] ABLIKIM	15AF	BES3	from $D^+ \rightarrow K_L e^+ \nu_e$
8.83 ±0.10 ±0.20	8.5k	[2] BESSON	09	CLEO	from $D^+ \rightarrow K_S e^+ \nu_e$
8.95 ±1.59 ±0.67	34	[3] ABLIKIM	05A	BES	from $D^+ \rightarrow K_S e^+ \nu_e$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
8.53 ±0.13 ±0.23		[4] DOBBS	08	CLEO	See BESSON 09
8.71 ±0.38 ±0.37	545	HUANG	05B	CLEO	See DOBBS 08

[1] ABLIKIM 15AF report $\Gamma(D^+ \rightarrow K_L e^+ \nu_e)/\Gamma_{total}$ = (4.481 ± 0.027 ± 0.103)%. See also the form-factor parameters near the end of this D^+ Listing.

[2] See the form-factor parameters near the end of this D^+ Listing.

[3] The ABLIKIM 05A result together with the $D^0 \rightarrow K^- e^+ \nu_e$ branching fraction of ABLIKIM 04C and Particle Data Group lifetimes gives $\Gamma(D^0 \rightarrow K^- e^+ \nu_e) / \Gamma(D^+ \rightarrow \overline{K}^0 e^+ \nu_e)$ = 1.08 ± 0.22 ± 0.07; isospin invariance predicts the ratio is 1.0.

[4] DOBBS 08 establishes $\left|\frac{V_{cd}}{V_{cs}} \cdot \frac{f_+^\pi(0)}{f_+^K(0)}\right|$ = 0.188 ± 0.008 ± 0.002 from the D^+ and D^0 decays to $\overline{K} e^+ \nu_e$ and $\pi e^+ \nu_e$. It also finds $\Gamma(D^0 \rightarrow K^- e^+ \nu_e) / \Gamma(D^+ \rightarrow \overline{K}^0 e^+ \nu_e)$ = 1.06 ± 0.02 ± 0.03; isospin invariance predicts the ratio is 1.0.

$\Gamma(\overline{K}^0 \mu^+ \nu_\mu)/\Gamma_{total}$ — Γ_{16}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.093±0.007 OUR FIT					
0.103±0.023±0.008	29 ± 6	ABLIKIM	07	BES2	$e^+ e^-$ at 3773 MeV

$\Gamma(\overline{K}^0 \mu^+ \nu_\mu)/\Gamma(K^- 2\pi^+)$ — Γ_{16}/Γ_{40}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.99 ±0.07 OUR FIT					
1.019±0.076±0.065	555 ± 39	LINK	04E	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^-\pi^+e^+\nu_e)/\Gamma_{total}$ — Γ_{17}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$3.50\pm0.75\pm0.27$	29 ± 6	ABLIKIM	06O	BES2	e^+e^- at 3773 MeV
$3.5\ ^{+1.2}_{-0.7}\ \pm0.4$	14	BAI	91	MRK3	$e^+e^-\approx$ 3.77 GeV

$\Gamma(K^-\pi^+e^+\nu_e)/\Gamma(K^-2\pi^+)$ — Γ_{17}/Γ_{40}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.4380\pm0.0036\pm0.0042$	$70\text{k}\pm363$	DEL-AMO-SA...	11I	BABR	$e^+e^-\approx$ 10.6 GeV

$\Gamma(\overline{K}^*(892)^0e^+\nu_e)/\Gamma_{total}$ — Γ_{34}/Γ

Unseen decay modes of $\overline{K}^*(892)^0$ are included. See the end of the D^+ Listings for measurements of $D^+\to\overline{K}^*(892)^0\ell^+\nu_\ell$ form-factor ratios.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.52 ± 0.15 OUR FIT					
$5.52\pm0.07\pm0.13$	≈ 5k	BRIERE	10	CLEO	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$5.06\pm1.21\pm0.40$	28 ± 7	ABLIKIM	06O	BES2	e^+e^- at 3773 MeV
$5.56\pm0.27\pm0.23$	422 ± 21	[1] HUANG	05B	CLEO	e^+e^- at $\psi(3770)$

[1] HUANG 05B finds $\Gamma(D^0\to K^{*-}e^+\nu_e)$ / $\Gamma(D^+\to\overline{K}^{*0}e^+\nu_e) = 0.98\pm0.08\pm0.04$; isospin invariance predicts the ratio is 1.0.

$\Gamma(\overline{K}^*(892)^0e^+\nu_e)/\Gamma(K^-2\pi^+)$ — Γ_{34}/Γ_{40}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included. See the end of the D^+ Listings for measurements of $D^+\to\overline{K}^*(892)^0\ell^+\nu_\ell$ form-factor ratios.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.74\pm0.04\pm0.05$		BRANDENB...	02	CLEO	$e^+e^-\approx\Upsilon(4S)$
$0.62\pm0.15\pm0.09$	35	ADAMOVICH	91	OMEG	π^- 340 GeV
$0.55\pm0.08\pm0.10$	880	ALBRECHT	91	ARG	$e^+e^-\approx$ 10.4 GeV
$0.49\pm0.04\pm0.05$		ANJOS	89B	E691	Photoproduction

$\Gamma(\overline{K}^*(892)^0e^+\nu_e,\ \overline{K}^*(892)^0\to K^-\pi^+)/\Gamma(K^-\pi^+e^+\nu_e)$ — Γ_{18}/Γ_{17}

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$94.11\pm0.74\pm0.75$	DEL-AMO-SA...	11I	BABR	$e^+e^-\approx$ 10.6 GeV

$\Gamma((K^-\pi^+)_{S-wave}e^+\nu_e)/\Gamma(K^-\pi^+e^+\nu_e)$ — Γ_{19}/Γ_{17}

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$5.79\pm0.16\pm0.15$	DEL-AMO-SA...	11I	BABR	$e^+e^-\approx$ 10.6 GeV

$\Gamma(\overline{K}^*(1410)^0e^+\nu_e,\ \overline{K}^*(1410)^0\to K^-\pi^+)/\Gamma_{total}$ — Γ_{20}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6\times10^{-3}$	90	DEL-AMO-SA...	11I	BABR	$e^+e^-\approx$ 10.6 GeV

$\Gamma(\overline{K}_2^*(1430)^0 e^+ \nu_e, \overline{K}_2^*(1430)^0 \rightarrow K^- \pi^+)/\Gamma_{total}$ — Γ_{21}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5 \times 10^{-4}$	90	DEL-AMO-SA...	11I	BABR	$e^+ e^- \approx$ 10.6 GeV

$\Gamma(K^- \pi^+ e^+ \nu_e$ nonresonant$)/\Gamma_{total}$ — Γ_{22}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.007	90	ANJOS	89B	E691	Photoproduction

$\Gamma(K^- \pi^+ \mu^+ \nu_\mu)/\Gamma(\overline{K}^0 \mu^+ \nu_\mu)$ — Γ_{23}/Γ_{16}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.417±0.030±0.023	555 ± 39	LINK	04E	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\overline{K}^*(892)^0 \mu^+ \nu_\mu)/\Gamma_{total}$ — Γ_{35}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.30±0.15 OUR FIT					
5.27±0.07±0.14	≈ 5k	BRIERE	10	CLEO	$e^+ e^-$ at $\psi(3770)$

$\Gamma(\overline{K}^*(892)^0 \mu^+ \nu_\mu)/\Gamma(\overline{K}^0 \mu^+ \nu_\mu)$ — Γ_{35}/Γ_{16}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included. See the end of the D^+ Listings for measurements of $D^+ \rightarrow \overline{K}^*(892)^0 \ell^+ \nu_\ell$ form-factor ratios.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.57 ±0.04 OUR FIT Error includes scale factor of 1.1.					
0.594±0.043±0.033	555 ± 39	LINK	04E	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\overline{K}^*(892)^0 \mu^+ \nu_\mu)/\Gamma(K^- 2\pi^+)$ — Γ_{35}/Γ_{40}

Unseen decay modes of the $\overline{K}^*(892)^0$ are included. See the end of the D^+ Listings for measurements of $D^+ \rightarrow \overline{K}^*(892)^0 \ell^+ \nu_\ell$ form-factor ratios.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.561±0.022 OUR FIT Error includes scale factor of 1.3.					
0.57 ±0.06 OUR AVERAGE Error includes scale factor of 1.2.					
0.72 ±0.10 ±0.05		BRANDENB...	02	CLEO	$e^+ e^- \approx \Upsilon(4S)$
0.56 ±0.04 ±0.06	875	FRABETTI	93E	E687	γBe $\overline{E}_\gamma \approx$ 200 GeV
0.46 ±0.07 ±0.08	224	KODAMA	92C	E653	π^- emulsion 600 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.602±0.010±0.021	12k	[1] LINK	02J	FOCS	γ nucleus, ≈ 180 GeV

[1] This LINK 02J result includes the effects of an interference of a small S-wave $K^- \pi^+$ amplitude with the dominant $\overline{K}^{*0}$ amplitude. (The interference effect is reported in LINK 02E.) This result is redundant with results of LINK 04E elsewhere in these Listings.

$\Gamma(K^- \pi^+ \mu^+ \nu_\mu$ nonresonant$)/\Gamma(K^- \pi^+ \mu^+ \nu_\mu)$ — Γ_{25}/Γ_{23}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.0530\pm0.0074^{+0.0099}_{-0.0096}$	14k	LINK	05I	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^- \pi^+ \pi^0 \mu^+ \nu_\mu)/\Gamma(K^- \pi^+ \mu^+ \nu_\mu)$ — Γ_{26}/Γ_{23}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.042	90	FRABETTI	93E	E687	γBe $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(\overline{K}^*_0(1430)^0 \mu^+ \nu_\mu)/\Gamma(K^- \pi^+ \mu^+ \nu_\mu)$ — Γ_{36}/Γ_{23}

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0064	90	LINK	05I	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\overline{K}^*(1680)^0 \mu^+ \nu_\mu)/\Gamma(K^- \pi^+ \mu^+ \nu_\mu)$ — Γ_{37}/Γ_{23}

Unseen decay modes of the $\overline{K}^*(1680)^0$ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.04	90	LINK	05I	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\pi^0 e^+ \nu_e)/\Gamma_{\text{total}}$ — Γ_{27}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.405±0.016±0.009	838	[1] BESSON	09	CLEO	$e^+ e^-$ at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.373±0.022±0.013		[2] DOBBS	08	CLEO	See BESSON 09
0.44 ±0.06 ±0.03	63 ± 9	HUANG	05B	CLEO	See DOBBS 08

[1] See the form-factor parameters near the end of this D^+ Listing.

[2] DOBBS 08 establishes $\left|\frac{V_{cd}}{V_{cs}} \cdot \frac{f_+^\pi(0)}{f_+^K(0)}\right| = 0.188 \pm 0.008 \pm 0.002$ from the D^+ and D^0 decays to $\overline{K} e^+ \nu_e$ and $\pi e^+ \nu_e$. It finds $\Gamma(D^0 \to \pi^- e^+ \nu_e)$ / $\Gamma(D^+ \to \pi^0 e^+ \nu_e) = 2.03 \pm 0.14 \pm 0.08$; isospin invariance predicts the ratio is 2.0.

$\Gamma(\eta e^+ \nu_e)/\Gamma_{\text{total}}$ — Γ_{28}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
11.4±0.9±0.4		YELTON	11	CLEO	$e^+ e^-$ at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
13.3±2.0±0.6	46 ± 8	MITCHELL	09B	CLEO	See YELTON 11

$\Gamma(\rho^0 e^+ \nu_e)/\Gamma_{\text{total}}$ — Γ_{29}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$2.18^{+0.17}_{-0.25}$ OUR FIT					
$2.17 \pm 0.12^{+0.12}_{-0.22}$	447 ± 25	[1] DOBBS	13	CLEO	$e^+ e^-$ at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.1 ±0.4 ±0.1	27 ± 6	[2] HUANG	05B	CLEO	See DOBBS 13

[1] DOBBS 13 finds $\Gamma(D^0 \to \rho^- e^+ \nu_e)$ / 2 $\Gamma(D^+ \to \rho^0 e^+ \nu_e) = 1.03 \pm 0.09^{+0.08}_{-0.02}$; isospin invariance predicts the ratio is 1.0.

[2] HUANG 05B finds $\Gamma(D^0 \to \rho^- e^+ \nu_e)$ / 2 $\Gamma(D^+ \to \rho^0 e^+ \nu_e) = 1.2^{+0.4}_{-0.3} \pm 0.1$; isospin invariance predicts the ratio is 1.0.

$\Gamma(\rho^0 e^+ \nu_e)/\Gamma(\overline{K}^*(892)^0 e^+ \nu_e)$ — Γ_{29}/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.0396^{+0.0033}_{-0.0050}$ OUR FIT					
0.045 ±0.014 ±0.009	49	[1] AITALA	97	E791	π^- nucleus, 500 GeV

[1] AITALA 97 explicitly subtracts $D^+ \to \eta' e^+ \nu_e$ and other backgrounds to get this result.

$\Gamma(\rho^0\mu^+\nu_\mu)/\Gamma(\overline{K}^*(892)^0\mu^+\nu_\mu)$ — Γ_{30}/Γ_{35}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.045±0.007 OUR AVERAGE	Error includes scale factor of 1.1.				
0.041±0.006±0.004	320 ± 44	LINK	06B	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
0.051±0.015±0.009	54	[1] AITALA	97	E791	π^- nucleus, 500 GeV
0.079±0.019±0.013	39	[2] FRABETTI	97	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV

[1] AITALA 97 explicitly subtracts $D^+ \rightarrow \eta' \mu^+ \nu_\mu$ and other backgrounds to get this result.
[2] Because the reconstruction efficiency for photons is low, this FRABETTI 97 result also includes any $D^+ \rightarrow \eta' \mu^+ \nu_\mu \rightarrow \gamma \rho^0 \mu^+ \nu_\mu$ events in the numerator.

$\Gamma(\omega e^+\nu_e)/\Gamma_{total}$ — Γ_{31}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.69±0.11 OUR AVERAGE					
1.63±0.11±0.08	491 ± 32	ABLIKIM	15W	BES3	292 fb^{-1}, 3773 MeV
1.82±0.18±0.07	129 ± 13	DOBBS	13	CLEO	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.6\ ^{+0.7}_{-0.6}\ \pm0.1$	$7.6^{+3.3}_{-2.7}$	HUANG	05B	CLEO	See DOBBS 13

$\Gamma(\eta'(958)e^+\nu_e)/\Gamma_{total}$ — Γ_{32}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
2.16±0.53±0.07		YELTON	11	CLEO	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.5	90	MITCHELL	09B	CLEO	See YELTON 11

$\Gamma(\phi e^+\nu_e)/\Gamma_{total}$ — Γ_{33}/Γ

Unseen decay modes of the ϕ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.3 × 10^{-5}	90	ABLIKIM	15W	BES3	292 fb^{-1}, 3773 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.9 × 10^{-4}	90	YELTON	11	CLEO	e^+e^- at $\psi(3770)$
<1.6 × 10^{-4}	90	MITCHELL	09B	CLEO	See YELTON 11
<0.0201	90	ABLIKIM	06P	BES2	e^+e^- at 3773 MeV
<0.0209	90	BAI	91	MRK3	$e^+e^- \approx$ 3.77 GeV

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

$\Gamma(K^0_S\pi^+)/\Gamma_{total}$ — Γ_{38}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.53 ±0.06 OUR FIT	Error includes scale factor of 2.8.				
1.578±0.013±0.025		BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.526±0.022±0.038		[1] DOBBS	07	CLEO	See MENDEZ 10
1.55 ±0.05 ±0.06	2.2k	[1] HE	05	CLEO	See DOBBS 07
1.6 ±0.3 ±0.1	161	ADLER	88C	MRK3	e^+e^- 3.77 GeV

[1] DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

$\Gamma(K^0_S\pi^+)/\Gamma(K^-2\pi^+)$ — Γ_{38}/Γ_{40}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.162 ±0.007 OUR FIT Error includes scale factor of 3.3.					
0.1530±0.0023±0.0016	10.6k	LINK	02B	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.1682±0.0012±0.0037	30k	MENDEZ	10	CLEO	See BONVICINI 14
0.174 ±0.012 ±0.011	473	[1] BISHAI	97	CLEO	$e^+e^- \approx \Upsilon(4S)$
0.137 ±0.015 ±0.016	264	ANJOS	90C	E691	Photoproduction

[1] See BISHAI 97 for an isospin analysis of $D^+ \to \overline{K}\pi$ amplitudes.

$\Gamma(K^0_L\pi^+)/\Gamma_{total}$ — Γ_{39}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.460±0.040±0.035	2023 ± 54	[1] HE	08	CLEO	e^+e^- at $\psi(3770)$

[1] The difference of CLEO $D^+ \to K^0_S\pi^+$ and $K^0_L\pi^+$ branching fractions over the sum (DOBBS 07 and HE 08) is $+0.022 \pm 0.016 \pm 0.018$.

$\Gamma(K^-2\pi^+)/\Gamma_{total}$ — Γ_{40}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
9.46 ±0.24 OUR FIT Error includes scale factor of 2.0.					
9.224±0.059±0.157		BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •					
9.14 ±0.10 ±0.17		[1] DOBBS	07	CLEO	See BONVICINI 14
9.5 ±0.2 ±0.3	15.1k	[1] HE	05	CLEO	See DOBBS 07
9.3 ±0.6 ±0.8	1502	[2] BALEST	94	CLEO	$e^+e^- \approx \Upsilon(4S)$
6.4 $^{+1.5}_{-1.4}$		[3] BARLAG	92C	ACCM	π^- Cu 230 GeV
9.1 ±1.3 ±0.4	1164	ADLER	88C	MRK3	e^+e^- 3.77 GeV
9.1 ±1.9	239	[4] SCHINDLER	81	MRK2	e^+e^- 3.771 GeV

[1] DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

[2] BALEST 94 measures the ratio of $D^+ \to K^-\pi^+\pi^+$ and $D^0 \to K^-\pi^+$ branching fractions to be $2.35 \pm 0.16 \pm 0.16$ and uses their absolute measurement of the $D^0 \to K^-\pi^+$ fraction (AKERIB 93).

[3] BARLAG 92C computes the branching fraction by topological normalization.

[4] SCHINDLER 81 (MARK-2) measures $\sigma(e^+e^- \to \psi(3770)) \times$ branching fraction to be 0.38 ± 0.05 nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 4.2 \pm 0.6 \pm 0.3$ nb.

A REVIEW GOES HERE – Check our WWW List of Reviews

$\Gamma((K^-\pi^+)_{S-wave}\pi^+)/\Gamma(K^-2\pi^+)$ — Γ_{41}/Γ_{40}

This is the "fit fraction" from the Dalitz-plot analysis. The $K^-\pi^+$ S-wave includes a broad scalar κ ($\overline{K}^*_0(800)$), the $\overline{K}^*_0(1430)^0$, and non-resonant background.

VALUE	DOCUMENT ID		TECN	COMMENT
0.801 ±0.012 OUR AVERAGE				
0.8024±0.0138±0.0043	[1] LINK	09	FOCS	MIPWA fit, 53k evts
0.838 ±0.038	[2] BONVICINI	08A	CLEO	QMIPWA fit, 141k evts
0.786 ±0.014 ±0.018	AITALA	06	E791	Dalitz fit, 15.1k events
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.8323±0.0150±0.0008	[3] LINK	07B	FOCS	See LINK 09

[1] This LINK 09 model-independent partial-wave analysis of the $K^-\pi^+$ S-wave slices the $K^-\pi^+$ mass range into 39 bins.
[2] The BONVICINI 08A QMIPWA (quasi-model-independent partial-wave analysis) of the $K^-\pi^+$ S-wave amplitude slices the $K^-\pi^+$ mass range into 26 bins but keeps the Breit-Wigner $\overline{K}_0^*(1430)^0$.
[3] This LINK 07B fit uses a K matrix. The $K^-\pi^+$ S-wave fit fraction given above breaks down into (207.3 ± 25.5 ± 12.4)% isospin-1/2 and (40.5 ± 9.6 ± 3.2)% isospin-3/2 — with large interference between the two. The isospin-1/2 component includes the κ (or $\overline{K}_0^*(800)^0$) and $\overline{K}_0^*(1430)^0$.

$\Gamma(\overline{K}_0^*(800)^0\pi^+, \overline{K}_0^*(800) \to K^-\pi^+)/\Gamma(K^-2\pi^+)$ Γ_{42}/Γ_{40}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.478±0.121±0.053	AITALA	02	E791	See AITALA 06

$\Gamma(\overline{K}^*(892)^0\pi^+, \overline{K}^*(892)^0 \to K^-\pi^+)/\Gamma(K^-2\pi^+)$ Γ_{44}/Γ_{40}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.111 ±0.012 OUR AVERAGE	Error includes scale factor of 3.7.			
0.1236±0.0034±0.0034	LINK	09	FOCS	MIPWA fit, 53k evts
0.0988±0.0046	BONVICINI	08A	CLEO	QMIPWA fit, 141k evts
0.119 ±0.002 ±0.020	AITALA	06	E791	Dalitz fit, 15.1k events
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.1361±0.0041±0.0030	[1] LINK	07B	FOCS	See LINK 09
0.123 ±0.010 ±0.009	AITALA	02	E791	See AITALA 06
0.137 ±0.006 ±0.009	FRABETTI	94G	E687	Dalitz fit, 8800 evts
0.170 ±0.009 ±0.034	ANJOS	93	E691	γBe 90–260 GeV
0.14 ±0.04 ±0.04	ALVAREZ	91B	NA14	Photoproduction
0.13 ±0.01 ±0.07	ADLER	87	MRK3	e^+e^- 3.77 GeV

[1] The statistical error on this LINK 07B value is corrected in LINK 09.

$\Gamma(\overline{K}^*(1410)^0\pi^+, \overline{K}^{*0} \to K^-\pi^+)/\Gamma(K^-2\pi^+)$ Γ_{45}/Γ_{40}

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
not seen	LINK	09	FOCS	MIPWA fit, 53k evts
not seen	BONVICINI	08A	CLEO	QMIPWA fit, 141k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.8±2.1±1.7	LINK	07B	FOCS	See LINK 09

$\Gamma(\overline{K}_0^*(1430)^0\pi^+, \overline{K}_0^*(1430)^0 \to K^-\pi^+)/\Gamma(K^-2\pi^+)$ Γ_{43}/Γ_{40}

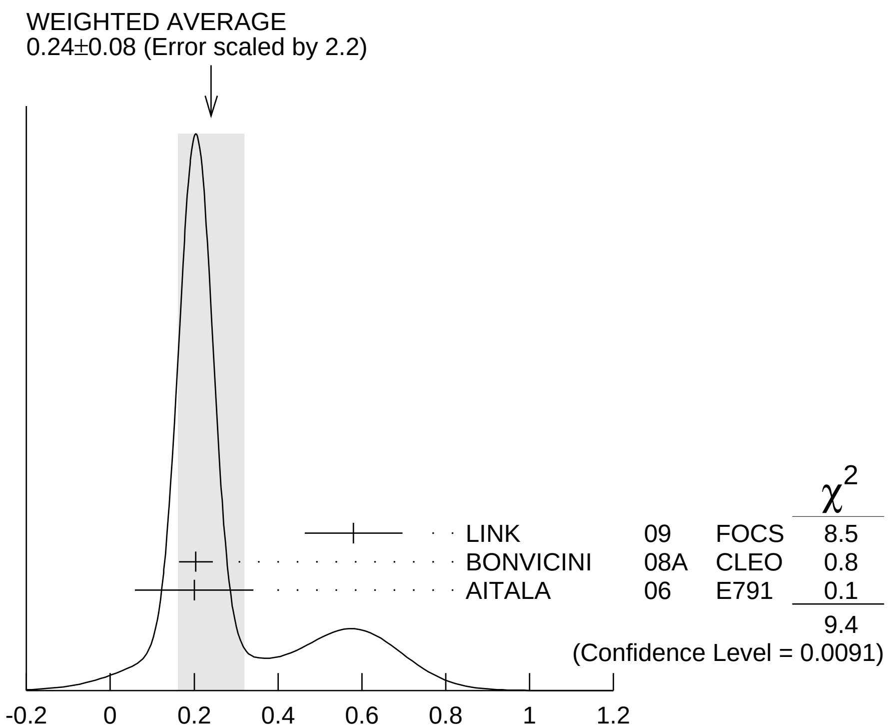
This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.1330±0.0062	BONVICINI	08A	CLEO	QMIPWA fit, 141k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.125 ±0.014 ±0.005	AITALA	02	E791	See AITALA 06
0.284 ±0.022 ±0.059	FRABETTI	94G	E687	Dalitz fit, 8800 evts
0.248 ±0.019 ±0.017	ANJOS	93	E691	γBe 90–260 GeV

$\Gamma\big(\overline{K}_2^*(1430)^0\pi^+ , \overline{K}_2^*(1430)^0 \to K^-\pi^+\big)/\Gamma\big(K^-2\pi^+\big)$ — Γ_{46}/Γ_{40}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
0.24 ±0.08 OUR AVERAGE	Error includes scale factor of 2.2. See the ideogram below.			
0.58 ±0.10 ±0.06	LINK	09	FOCS	MIPWA fit, 53k evts
0.204±0.040	BONVICINI	08A	CLEO	QMIPWA fit, 141k evts
0.2 ±0.1 ±0.1	AITALA	06	E791	Dalitz fit, 15.1k events
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.39 ±0.09 ±0.05	LINK	07B	FOCS	See LINK 09
0.5 ±0.1 ±0.2	AITALA	02	E791	See AITALA 06



$\Gamma\Big(\overline{K}_2^*(1430)^0\pi^+ , \overline{K}_2^*(1430)^0 \to K^-\pi^+\Big)/\Gamma\Big(K^-2\pi^+\Big)$ Γ_{46}/Γ_{40}
(units 10^{-2})

$\Gamma\big(\overline{K}^*(1680)^0\pi^+ , \overline{K}^*(1680)^0 \to K^-\pi^+\big)/\Gamma\big(K^-2\pi^+\big)$ — Γ_{47}/Γ_{40}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
0.23 ±0.12 OUR AVERAGE				
1.75 ±0.62 ±0.54	LINK	09	FOCS	MIPWA fit, 53k evts
0.196±0.118	BONVICINI	08A	CLEO	QMIPWA fit, 141k evts
1.2 ±0.6 ±1.2	AITALA	06	E791	Dalitz fit, 15.1k events
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.90 ±0.63 ±0.43	LINK	07B	FOCS	See LINK 09
2.5 ±0.7 ±0.3	AITALA	02	E791	See AITALA 06
4.7 ±0.6 ±0.7	FRABETTI	94G	E687	Dalitz fit, 8800 evts
3.0 ±0.4 ±1.3	ANJOS	93	E691	γBe 90–260 GeV

$\Gamma(K^-(2\pi^+)_{I=2})/\Gamma(K^-2\pi^+)$ — Γ_{48}/Γ_{40}

VALUE	DOCUMENT ID		TECN	COMMENT
0.155±0.028	BONVICINI	08A	CLEO	QMIPWA fit, 141k evts

$\Gamma(K^-2\pi^+ \text{ nonresonant})/\Gamma(K^-2\pi^+)$ — Γ_{49}/Γ_{40}

This is the "fit fraction" from the Dalitz-plot analysis. Later analyses find little need for this decay mode.

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.130±0.058±0.044	AITALA	02	E791	See AITALA 06
0.998±0.037±0.072	FRABETTI	94G	E687	Dalitz fit, 8800 evts
0.838±0.088±0.275	ANJOS	93	E691	γ Be 90–260 GeV
0.79 ±0.07 ±0.15	ADLER	87	MRK3	e^+e^- 3.77 GeV

$\Gamma(K^0_S\pi^+\pi^0)/\Gamma_{\text{total}}$ — Γ_{50}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
7.24 ±0.17 OUR FIT					
7.244±0.053±0.166		BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •					
6.99 ±0.09 ±0.25		[1] DOBBS	07	CLEO	See BONVICINI 14
7.2 ±0.2 ±0.4	5.1k	[1] HE	05	CLEO	See DOBBS 07
5.1 ±1.3 ±0.8	159	ADLER	88C	MRK3	e^+e^- 3.77 GeV

[1] DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

$\Gamma(K^0_S\rho^+)/\Gamma(K^0_S\pi^+\pi^0)$ — Γ_{51}/Γ_{50}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
$83.4\pm2.2^{+7.1}_{-3.6}$	[1] ABLIKIM	14E	BES3	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
68 ±8 ±12	ADLER	87	MRK3	e^+e^- 3.77 GeV

[1] Fit fraction from Dalitz plot analysis of 142k $D^+ \rightarrow K^0_S\pi^+\pi^0$ events.

$\Gamma(K^0_S\rho(1450)^+,\ \rho^+\rightarrow\pi^+\pi^0)/\Gamma(K^0_S\pi^+\pi^0)$ — Γ_{52}/Γ_{50}

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$2.1\pm0.3^{+1.6}_{-1.9}$	ABLIKIM	14E	BES3	e^+e^- at $\psi(3770)$

$\Gamma(\overline{K}^*(892)^0\pi^+,\ \overline{K}^*(892)^0\rightarrow K^0_S\pi^0)/\Gamma(K^0_S\pi^+\pi^0)$ — Γ_{53}/Γ_{50}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
$3.58\pm0.17^{+0.39}_{-0.38}$	[1] ABLIKIM	14E	BES3	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
19 ±6 ±6	ADLER	87	MRK3	e^+e^- 3.77 GeV

[1] Fit fraction from Dalitz plot analysis of 142k $D^+ \rightarrow K^0_S\pi^+\pi^0$ events.

$\Gamma(\overline{K}_0^*(1430)^0\pi^+,\ \overline{K}_0^{*0} \to K_S^0\pi^0)/\Gamma(K_S^0\pi^+\pi^0)$ — Γ_{54}/Γ_{50}

VALUE (%)	DOCUMENT ID		TECN	COMMENT
3.7±0.6±1.1	ABLIKIM	14E	BES3	e^+e^- at $\psi(3770)$

$\Gamma(\overline{K}_0^*(1680)^0\pi^+,\ \overline{K}_0^{*0} \to K_S^0\pi^0)/\Gamma(K_S^0\pi^+\pi^0)$ — Γ_{55}/Γ_{50}

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.3\pm0.2^{+0.9}_{-1.3}}$	ABLIKIM	14E	BES3	e^+e^- at $\psi(3770)$

$\Gamma(\overline{\kappa}^0\pi^+,\ \overline{\kappa}^0 \to K_S^0\pi^0)/\Gamma(K_S^0\pi^+\pi^0)$ — Γ_{56}/Γ_{50}

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$\mathbf{7.7\pm1.2^{+6.5}_{-4.8}}$	ABLIKIM	14E	BES3	e^+e^- at $\psi(3770)$

$\Gamma(K_S^0\pi^+\pi^0 \text{ nonresonant})/\Gamma(K_S^0\pi^+\pi^0)$ — Γ_{57}/Γ_{50}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
$\mathbf{4.6\pm0.7^{+5.4}_{-5.1}}$	[1] ABLIKIM	14E	BES3	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
13 ±7 ±8	ADLER	87	MRK3	e^+e^- 3.77 GeV

[1] Fit fraction from Dalitz plot analysis of 142k $D^+ \to K_S^0\pi^+\pi^0$ events.

$\Gamma(K_S^0\pi^+\pi^0 \text{ nonresonant and } \overline{\kappa}^0\pi^+)/\Gamma(K_S^0\pi^+\pi^0)$ — Γ_{58}/Γ_{50}

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$\mathbf{18.6\pm1.7^{+2.3}_{-4.6}}$	ABLIKIM	14E	BES3	e^+e^- at $\psi(3770)$

$\Gamma((K_S^0\pi^0)_{S-\text{wave}}\pi^+)/\Gamma(K_S^0\pi^+\pi^0)$ — Γ_{59}/Γ_{50}

The numerator here is the coherent sum of the $\overline{K}_0^*(1430)^0\pi^+$, $\overline{\kappa}^0\pi^+$, and nonresonant contributions.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$\mathbf{17.3\pm1.4^{+3.4}_{-4.3}}$	ABLIKIM	14E	BES3	e^+e^- at $\psi(3770)$

$\Gamma(K^-2\pi^+\pi^0)/\Gamma_{\text{total}}$ — Γ_{60}/Γ

See our 2008 Review (Physics Letters **B667** 1 (2008)) for measurements of submodes of this mode. There is nothing new since 1992, and the two papers, ANJOS 92C, with 91 ± 12 events above background, and COFFMAN 92B, with 142 ± 20 such events, could not determine submode fractions with much accuracy.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
6.14 ±0.16 OUR FIT					
6.142±0.045±0.154		BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.98 ±0.08 ±0.16		[1] DOBBS	07	CLEO	See BONVICINI 14
6.0 ±0.2 ±0.2	4.8k	[1] HE	05	CLEO	See DOBBS 07
5.8 ±1.2 ±1.2	142	COFFMAN	92B	MRK3	e^+e^- 3.77 GeV
$6.3\ ^{+1.4}_{-1.3}\ \pm1.2$	175	BALTRUSAIT...	86E	MRK3	See COFFMAN 92B

[1] DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

$\Gamma(K^0_S 2\pi^+\pi^-)/\Gamma_{total}$ — Γ_{61}/Γ

See our 2008 Review (Physics Letters **B667** 1 (2008)) for measurements of submodes of this mode. There is nothing new since 1992, and the two papers, ANJOS 92C, with 229 ± 17 events above background, and COFFMAN 92B, with 209 ± 20 such events, could not determine submode fractions with much accuracy.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
3.05 ±0.09 OUR FIT					
3.051±0.027±0.082		BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3.122±0.046±0.096		[1] DOBBS	07	CLEO	See BONVICINI 14
3.2 ±0.1 ±0.2	3.2k	[1] HE	05	CLEO	See DOBBS 07
2.1 $^{+1.0}_{-0.9}$		[2] BARLAG	92C	ACCM	π^- Cu 230 GeV
3.3 ±0.8 ±0.2	168	ADLER	88C	MRK3	e^+e^- 3.77 GeV

[1] DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

[2] BARLAG 92C computes the branching fraction by topological normalization.

$\Gamma(K^-3\pi^+\pi^-)/\Gamma(K^-2\pi^+)$ — Γ_{62}/Γ_{40}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.061±0.005 OUR FIT Error includes scale factor of 1.1.					
0.062±0.008 OUR AVERAGE Error includes scale factor of 1.3.					
0.058±0.002±0.006	2923	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
0.077±0.008±0.010	239	FRABETTI	97C	E687	γBe, $\overline{E}_\gamma \approx$ 200 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.09 ±0.01 ±0.01	113	ANJOS	90D	E691	Photoproduction

$\Gamma(\overline{K}^*(892)^0 2\pi^+\pi^-, \overline{K}^*(892)^0 \to K^-\pi^+)/\Gamma(K^-3\pi^+\pi^-)$ — Γ_{63}/Γ_{62}

VALUE	DOCUMENT ID		TECN	COMMENT
0.21±0.04±0.06	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\overline{K}^*(892)^0 \rho^0\pi^+, \overline{K}^*(892)^0 \to K^-\pi^+)/\Gamma(K^-3\pi^+\pi^-)$ — Γ_{64}/Γ_{62}

VALUE	DOCUMENT ID		TECN	COMMENT
0.40±0.03±0.06	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\overline{K}^*(892)^0 \rho^0\pi^+, \overline{K}^*(892)^0 \to K^-\pi^+)/\Gamma(K^-2\pi^+)$ — Γ_{64}/Γ_{40}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.016±0.007±0.004	FRABETTI	97C	E687	γBe, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(\overline{K}^*(892)^0 2\pi^+\pi^-$ no-ρ, $\overline{K}^*(892)^0 \to K^-\pi^+)/\Gamma(K^-2\pi^+)$ — Γ_{66}/Γ_{40}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.032±0.010±0.008	FRABETTI	97C	E687	γBe, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(K^-\rho^0 2\pi^+)/\Gamma(K^-3\pi^+\pi^-)$ — Γ_{67}/Γ_{62}

VALUE	DOCUMENT ID		TECN	COMMENT
0.30±0.04±0.01	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^-\rho^0 2\pi^+)/\Gamma(K^- 2\pi^+)$ — Γ_{67}/Γ_{40}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.034\pm0.009\pm0.005$	FRABETTI	97C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(\overline{K}^*(892)^0 a_1(1260)^+)/\Gamma(K^- 2\pi^+)$ — Γ_{65}/Γ_{40}

Unseen decay modes of the $\overline{K}^*(892)^0$ and $a_1(1260)^+$ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
$0.099\pm0.008\pm0.018$	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^- 3\pi^+\pi^-$ nonresonant$)/\Gamma(K^- 3\pi^+\pi^-)$ — Γ_{68}/Γ_{62}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$0.07\pm0.05\pm0.01$		LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.026	90	FRABETTI	97C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(K^+ 2K^0_S)/\Gamma(K^- 2\pi^+)$ — Γ_{69}/Γ_{40}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.049 ± 0.022 OUR AVERAGE	Error includes scale factor of 2.4.				
$0.035\pm0.010\pm0.005$	39 ± 9	ALBRECHT	94I	ARG	$e^+e^- \approx 10$ GeV
0.085 ± 0.018	70 ± 12	AMMAR	91	CLEO	$e^+e^- \approx$ 10.5 GeV

$\Gamma(K^+K^-K^0_S\pi^+)/\Gamma(K^0_S 2\pi^+\pi^-)$ — Γ_{70}/Γ_{61}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$7.7\pm1.5\pm0.9$	35 ± 7	LINK	01C	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

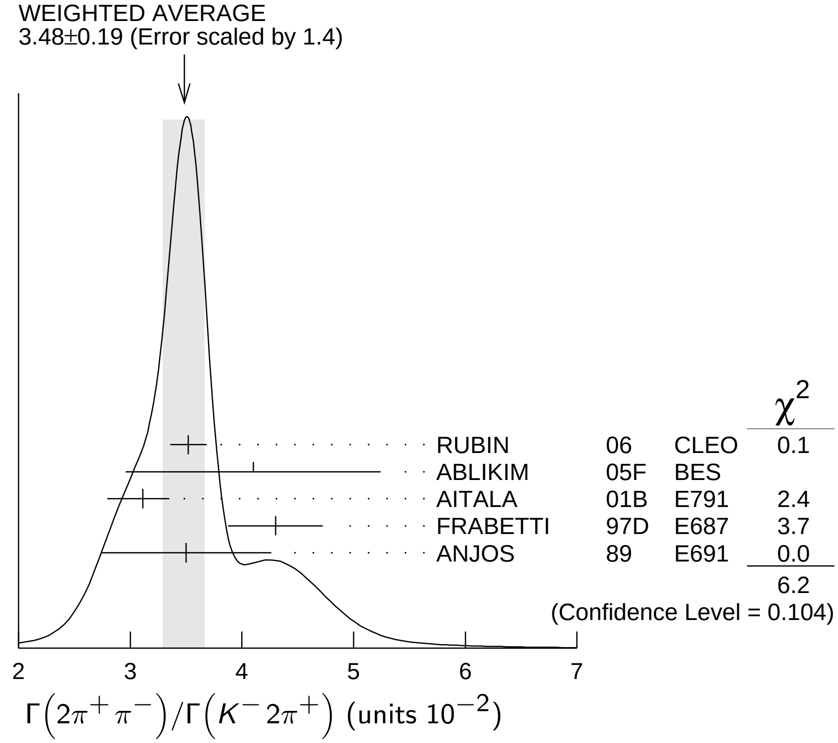
Pionic modes

$\Gamma(\pi^+\pi^0)/\Gamma(K^- 2\pi^+)$ — Γ_{71}/Γ_{40}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.31 ± 0.06 OUR AVERAGE					
$1.29\pm0.04\pm0.05$	2649 ± 76	MENDEZ	10	CLEO	e^+e^- at 3774 MeV
$1.33\pm0.11\pm0.09$	1229 ± 99	AUBERT,B	06F	BABR	$e^+e^- \approx \Upsilon(4S)$
$1.44\pm0.19\pm0.10$	171 ± 22	ARMS	04	CLEO	$e^+e^- \approx$ 10 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.33\pm0.07\pm0.06$	914 ± 46	RUBIN	06	CLEO	See MENDEZ 10

$\Gamma(2\pi^+\pi^-)/\Gamma(K^- 2\pi^+)$ — Γ_{72}/Γ_{40}

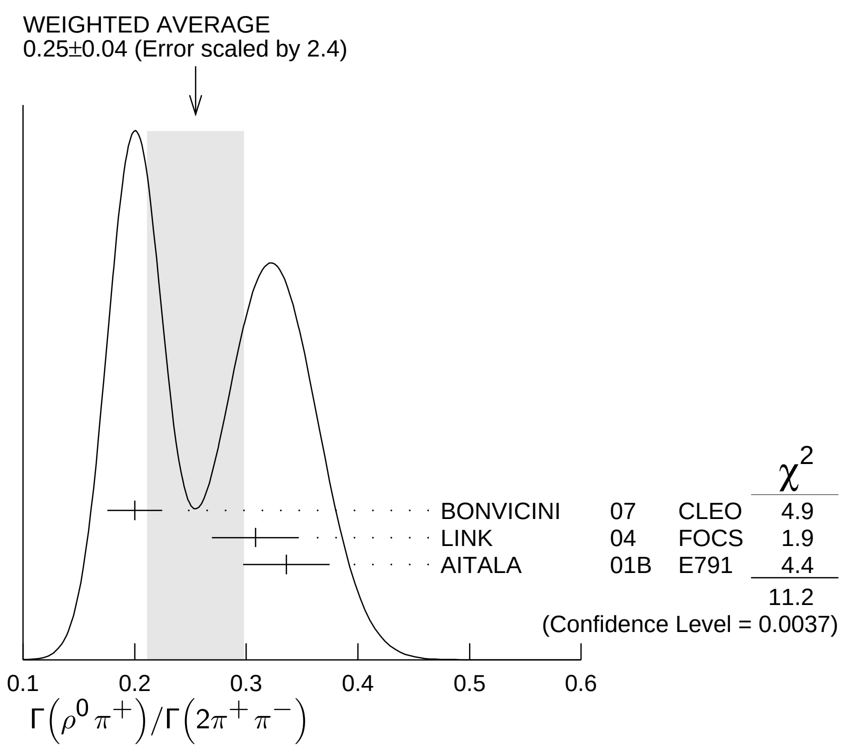
VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
3.48 ± 0.19 OUR AVERAGE	Error includes scale factor of 1.4. See the ideogram below.				
$3.52\pm0.11\pm0.12$	3303 ± 95	RUBIN	06	CLEO	e^+e^- at $\psi(3770)$
$4.1\pm1.1\pm0.3$	85 ± 22	ABLIKIM	05F	BES	$e^+e^- \approx \psi(3770)$
$3.11\pm0.18^{+0.16}_{-0.26}$	1172	AITALA	01B	E791	π^- nucleus, 500 GeV
$4.3\pm0.3\pm0.3$	236	FRABETTI	97D	E687	γ Be $\approx$ 200 GeV
$3.5\pm0.7\pm0.3$	83	ANJOS	89	E691	Photoproduction



$\Gamma(\rho^0\pi^+)/\Gamma(2\pi^+\pi^-)$ Γ_{73}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.25 ±0.04 OUR AVERAGE	Error includes scale factor of 2.4. See the ideogram below.			
0.200 ±0.023 ±0.009	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts
0.3082±0.0314±0.0230	LINK	04	FOCS	Dalitz fit, 1527 ± 51 evts
0.336 ±0.032 ±0.022	AITALA	01B	E791	Dalitz fit, 1172 evts



$\Gamma(\pi^+(\pi^+\pi^-)_{S-\text{wave}})/\Gamma(2\pi^+\pi^-)$ — Γ_{74}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis. See also the next three data blocks.

VALUE	DOCUMENT ID		TECN	COMMENT
0.5600±0.0324±0.0214	[1] LINK	04	FOCS	Dalitz fit, 1527 ± 51 evts

[1] LINK 04 borrows a K-matrix parametrization from ANISOVICH 03 of the full π-π S-wave isoscalar scattering amplitude to describe the $\pi^+\pi^-$ S-wave component of the $\pi^+\pi^+\pi^-$ state. The fit fraction given above is a sum over five f_0 mesons, the $f_0(980)$, $f_0(1300)$, $f_0(1200–1600)$, $f_0(1500)$, and $f_0(1750)$. See LINK 04 for details and discussion.

$\Gamma(\sigma\pi^+, \sigma\to\pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{75}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.422±0.027 OUR AVERAGE				
0.418±0.014±0.025	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts
0.463±0.090±0.021	AITALA	01B	E791	Dalitz fit, 1172 evts

$\Gamma(f_0(980)\pi^+, f_0(980)\to\pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{76}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.048±0.010 OUR AVERAGE	Error includes scale factor of 1.3.			
0.041±0.009±0.003	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts
0.062±0.013±0.004	AITALA	01B	E791	Dalitz fit, 1172 evts

$\Gamma(f_0(1370)\pi^+, f_0(1370)\to\pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{77}/Γ_{72}

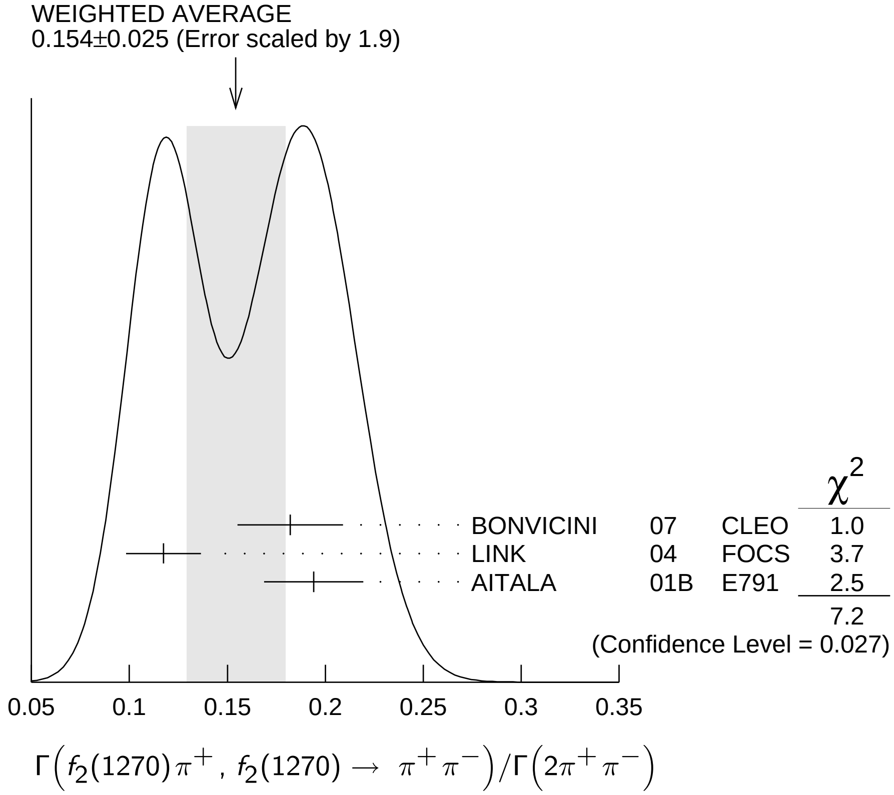
This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.024±0.013 OUR AVERAGE				
0.026±0.018±0.006	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts
0.023±0.015±0.008	AITALA	01B	E791	Dalitz fit, 1172 evts

$\Gamma(f_2(1270)\pi^+, f_2(1270)\to\pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{78}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.154 ±0.025 OUR AVERAGE	Error includes scale factor of 1.9. See the ideogram below.			
0.182 ±0.026 ±0.007	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts
0.1174±0.0190±0.0029	LINK	04	FOCS	Dalitz fit, 1527 ± 51 evts
0.194 ±0.025 ±0.004	AITALA	01B	E791	Dalitz fit, 1172 evts



$\Gamma\big(\rho(1450)^0\pi^+,\ \rho(1450)^0 \to \pi^+\pi^-\big)/\Gamma\big(2\pi^+\pi^-\big)$ Γ_{79}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.024	95	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.007 \pm 0.007 \pm 0.003$		AITALA	01B	E791	Dalitz fit, 1172 evts

$\Gamma\big(f_0(1500)\pi^+,\ f_0(1500) \to \pi^+\pi^-\big)/\Gamma\big(2\pi^+\pi^-\big)$ Γ_{80}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
$0.034 \pm 0.010 \pm 0.008$	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts

$\Gamma\big(f_0(1710)\pi^+,\ f_0(1710) \to \pi^+\pi^-\big)/\Gamma\big(2\pi^+\pi^-\big)$ Γ_{81}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.016	95	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts

$\Gamma\big(f_0(1790)\pi^+,\ f_0(1790) \to \pi^+\pi^-\big)/\Gamma\big(2\pi^+\pi^-\big)$ Γ_{82}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.02	95	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts

$\Gamma\big((\pi^+\pi^+)_{S-\text{wave}}\pi^-\big)/\Gamma\big(2\pi^+\pi^-\big)$ Γ_{83}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.037	95	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts

$\Gamma(2\pi^+\pi^-$ nonresonant$)/\Gamma(2\pi^+\pi^-)$ — Γ_{84}/Γ_{72}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.035	95	BONVICINI	07	CLEO	Dalitz fit, ≈ 2240 evts
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.078\pm0.060\pm0.027$		AITALA	01B	E791	Dalitz fit, 1172 evts

$\Gamma(\pi^+2\pi^0)/\Gamma(K^-2\pi^+)$ — Γ_{85}/Γ_{40}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{5.0\pm0.3\pm0.3}$	1535 ± 89	RUBIN	06	CLEO	e^+e^- at $\psi(3770)$

$\Gamma(2\pi^+\pi^-\pi^0)/\Gamma(K^-2\pi^+)$ — Γ_{86}/Γ_{40}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{12.4\pm0.5\pm0.6}$	5701 ± 205	RUBIN	06	CLEO	e^+e^- at $\psi(3770)$

$\Gamma(\eta\pi^+)/\Gamma_{total}$ — Γ_{90}/Γ

Unseen decay modes of the η are included.

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$34.3\pm1.4\pm1.7$	1033 ± 42	ARTUSO	08	CLEO	See MENDEZ 10

$\Gamma(\eta\pi^+)/\Gamma(K^-2\pi^+)$ — Γ_{90}/Γ_{40}

Unseen decay modes of the η are included.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{3.87\pm0.09\pm0.19}$	2940 ± 68	MENDEZ	10	CLEO	e^+e^- at 3774 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$3.81\pm0.26\pm0.21$	377 ± 26	RUBIN	06	CLEO	See ARTUSO 08

$\Gamma(\omega\pi^+)/\Gamma_{total}$ — Γ_{92}/Γ

Unseen decay modes of the ω are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<3.4\times10^{-4}}$	90	RUBIN	06	CLEO	e^+e^- at $\psi(3770)$

$\Gamma(3\pi^+2\pi^-)/\Gamma(K^-2\pi^+)$ — Γ_{89}/Γ_{40}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.77\pm0.17}$ **OUR FIT**					
$\mathbf{1.73\pm0.20\pm0.17}$	732 ± 77	RUBIN	06	CLEO	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2.3\pm0.4\pm0.2$	58	FRABETTI	97C	E687	γBe, $\overline{E}_\gamma\approx$ 200 GeV

$\Gamma(3\pi^+2\pi^-)/\Gamma(K^-3\pi^+\pi^-)$ — Γ_{89}/Γ_{62}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.289\pm0.019}$ **OUR FIT**					
$\mathbf{0.290\pm0.017\pm0.011}$	835	LINK	03D	FOCS	γ A, $\overline{E}_\gamma\approx$ 180 GeV

$\Gamma(\eta\pi^+\pi^0)/\Gamma_{total}$ — Γ_{91}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{13.8\pm3.1\pm1.6}$	149 ± 34	ARTUSO	08	CLEO	e^+e^- at $\psi(3770)$

$\Gamma(\eta'(958)\pi^+)/\Gamma_{total}$ — Γ_{93}/Γ

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
44.2±2.5±2.9	352 ± 20	ARTUSO	08	CLEO	See MENDEZ 10

$\Gamma(\eta'(958)\pi^+)/\Gamma(K^-2\pi^+)$ — Γ_{93}/Γ_{40}

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.12±0.17±0.25	1037 ± 35	MENDEZ	10	CLEO	e^+e^- at 3774 MeV

$\Gamma(\eta'(958)\pi^+\pi^0)/\Gamma_{total}$ — Γ_{94}/Γ

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
15.7±4.3±2.5	33 ± 9	ARTUSO	08	CLEO	e^+e^- at $\psi(3770)$

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

$\Gamma(K^+K^0_S)/\Gamma_{total}$ — Γ_{95}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3.14±0.09±0.08	1971 ± 51	BONVICINI	08	CLEO	See MENDEZ 10

$\Gamma(K^+K^0_S)/\Gamma(K^0_S\pi^+)$ — Γ_{95}/Γ_{38}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.193 ±0.007 OUR FIT Error includes scale factor of 3.1.					
0.1901±0.0024 OUR AVERAGE					
0.1899±0.0011±0.0022	101k±561	WON	09	BELL	e^+e^- at $\Upsilon(4S)$
0.1892±0.0155±0.0073	278 ± 21	ARMS	04	CLEO	$e^+e^- \approx$ 10 GeV
0.1996±0.0119±0.0096	949	LINK	02B	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.222 ±0.037 ±0.013	63 ± 10	ABLIKIM	05F	BES	$e^+e^- \approx \psi(3770)$
0.222 ±0.041 ±0.019	70	BISHAI	97	CLEO	See ARMS 04
0.25 ±0.04 ±0.02	129	FRABETTI	95	E687	γBe $\overline{E}_\gamma \approx$ 200 GeV
0.271 ±0.065 ±0.039	69	ANJOS	90C	E691	γBe
0.317 ±0.086 ±0.048	31	BALTRUSAIT...	85E	MRK3	e^+e^- 3.77 GeV
0.25 ±0.15	6	SCHINDLER	81	MRK2	e^+e^- 3.771 GeV

$\Gamma(K^+K^0_S)/\Gamma(K^-2\pi^+)$ — Γ_{95}/Γ_{40}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
3.12±0.16 OUR FIT Error includes scale factor of 3.2.					
3.35±0.06±0.07	5161 ± 86	MENDEZ	10	CLEO	e^+e^- at 3774 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3.02±0.18±0.15	949	[1] LINK	02B	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

[1] This LINK 02B result is redundant with a result in the previous datablock.

$\Gamma(K^+K^-\pi^+)/\Gamma_{total}$ — Γ_{96}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.996±0.026 OUR FIT Error includes scale factor of 1.3.					
0.981±0.010±0.032		BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.935±0.017±0.024		[1] DOBBS	07	CLEO	See BONVICINI 14
0.97 ±0.04 ±0.04	1250 ± 40	[1] HE	05	CLEO	See DOBBS 07

[1] DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

$\Gamma(K^+K^-\pi^+)/\Gamma(K^-2\pi^+)$ — Γ_{96}/Γ_{40}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.1053±0.0024 OUR FIT Error includes scale factor of 1.3.					
0.1058±0.0029 OUR AVERAGE Error includes scale factor of 1.4.					
0.117 ±0.013 ±0.007	181 ± 20	ABLIKIM	05F	BES	$e^+e^- \approx \psi(3770)$
0.107 ±0.001 ±0.002	43k	AUBERT	05S	BABR	$e^+e^- \approx \Upsilon(4S)$
0.093 ±0.010 $^{+0.008}_{-0.006}$		JUN	00	SELX	Σ^- nucleus, 600 GeV
0.0976±0.0042±0.0046		FRABETTI	95B	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(\phi\pi^+, \phi \to K^+K^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{97}/Γ_{96}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
27.8±0.4$^{+0.2}_{-0.5}$	RUBIN	08	CLEO	Dalitz fit, 19,458±163 evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
29.2±3.1±3.0	FRABETTI	95B	E687	Dalitz fit, 915 evts

$\Gamma(K^+\overline{K}^*(892)^0, \overline{K}^*(892)^0 \to K^-\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{98}/Γ_{96}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
25.7±0.5$^{+0.4}_{-1.2}$	RUBIN	08	CLEO	Dalitz fit, 19,458±163 evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
30.1±2.0±2.5	FRABETTI	95B	E687	Dalitz fit, 915 evts

$\Gamma(K^+\overline{K}^*_0(1430)^0, \overline{K}^*_0(1430)^0 \to K^-\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{99}/Γ_{96}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
18.8±1.2$^{+3.3}_{-3.4}$	RUBIN	08	CLEO	Dalitz fit, 19,458±163 evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
37.0±3.5±1.8	FRABETTI	95B	E687	Dalitz fit, 915 evts

$\Gamma(K^+\overline{K}^*_2(1430)^0, \overline{K}^*_2 \to K^-\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{100}/Γ_{96}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
1.7±0.4$^{+1.2}_{-0.7}$	RUBIN	08	CLEO	Dalitz fit, 19,458±163 evts

$\Gamma(K^+ \overline{K}^*_0(800),\ \overline{K}^*_0 \to K^- \pi^+)/\Gamma(K^+ K^- \pi^+)$ — Γ_{101}/Γ_{96}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$7.0 \pm 0.8^{+3.5}_{-2.0}$	RUBIN	08	CLEO	Dalitz fit, 19,458 ± 163 evts

$\Gamma(a_0(1450)^0 \pi^+,\ a^0_0 \to K^+ K^-)/\Gamma(K^+ K^- \pi^+)$ — Γ_{102}/Γ_{96}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$4.6 \pm 0.6^{+7.2}_{-1.8}$	RUBIN	08	CLEO	Dalitz fit, 19,458 ± 163 evts

$\Gamma(\phi(1680) \pi^+,\ \phi \to K^+ K^-)/\Gamma(K^+ K^- \pi^+)$ — Γ_{103}/Γ_{96}

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$0.51 \pm 0.11^{+0.37}_{-0.16}$	RUBIN	08	CLEO	Dalitz fit, 19,458 ± 163 evts

$\Gamma(K^*(892)^+ K^0_S)/\Gamma(K^0_S \pi^+)$ — Γ_{111}/Γ_{38}

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$1.1 \pm 0.3 \pm 0.4$	67	FRABETTI	95	E687	γ Be $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(\phi \pi^+ \pi^0)/\Gamma_{\text{total}}$ — Γ_{108}/Γ

Unseen decay modes of the ϕ are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.023 ± 0.010	[1] BARLAG	92C	ACCM	π^- Cu 230 GeV

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

$\Gamma(\phi \rho^+)/\Gamma(K^- 2\pi^+)$ — Γ_{109}/Γ_{40}

Unseen decay modes of the ϕ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.16	90	DAOUDI	92	CLEO	$e^+ e^- \approx$ 10.5 GeV

$\Gamma(K^+ K^- \pi^+ \pi^0\ \text{non-}\phi)/\Gamma_{\text{total}}$ — Γ_{110}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$0.015^{+0.007}_{-0.006}$	[1] BARLAG	92C	ACCM	π^- Cu 230 GeV

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

$\Gamma(K^+ K^- \pi^+ \pi^0\ \text{non-}\phi)/\Gamma(K^- 2\pi^+)$ — Γ_{110}/Γ_{40}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.25	90	ANJOS	89E	E691	Photoproduction

$\Gamma(K^+ K^0_S \pi^+ \pi^-)/\Gamma(K^0_S 2\pi^+ \pi^-)$ — Γ_{105}/Γ_{61}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$5.62 \pm 0.39 \pm 0.40$	469 ± 32	LINK	01C	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^0_S K^- 2\pi^+)/\Gamma(K^0_S 2\pi^+ \pi^-)$ — Γ_{106}/Γ_{61}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
7.68±0.41±0.32	670 ± 35	LINK	01C	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^+ K^- 2\pi^+ \pi^-)/\Gamma(K^- 3\pi^+ \pi^-)$ — Γ_{107}/Γ_{62}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.040±0.009±0.019	38	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

Doubly Cabibbo-suppressed modes

$\Gamma(K^+ \pi^0)/\Gamma_{total}$ — Γ_{112}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.89±0.25 OUR FIT	Error includes scale factor of 1.2.				
2.52±0.47±0.26	189 ± 37	AUBERT,B	06F	BABR	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.28±0.36±0.17	148 ± 23	DYTMAN	06	CLEO	See MENDEZ 10

$\Gamma(K^+ \pi^0)/\Gamma(K^- 2\pi^+)$ — Γ_{112}/Γ_{40}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
2.00±0.26 OUR FIT	Error includes scale factor of 1.3.				
1.9 ±0.2 ±0.1	343 ± 37	MENDEZ	10	CLEO	$e^+ e^-$ at 3774 MeV

$\Gamma(K^+ \eta)/\Gamma(\eta \pi^+)$ — Γ_{113}/Γ_{90}

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
3.06±0.43±0.14	166 ± 23	WON	11	BELL	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(K^+ \eta)/\Gamma(K^- 2\pi^+)$ — Γ_{113}/Γ_{40}

Unseen decay modes of the η are included.

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.15	90	MENDEZ	10	CLEO	$e^+ e^-$ at 3774 MeV

$\Gamma(K^+ \eta'(958))/\Gamma(\eta'(958) \pi^+)$ — Γ_{114}/Γ_{93}

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
3.77±0.39±0.10	180 ± 19	WON	11	BELL	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(K^+ \eta'(958))/\Gamma(K^- 2\pi^+)$ — Γ_{114}/Γ_{40}

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

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.20	90	MENDEZ	10	CLEO	$e^+ e^-$ at 3774 MeV

$\Gamma(K^+ \pi^+ \pi^-)/\Gamma(K^- 2\pi^+)$ — Γ_{115}/Γ_{40}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
5.77±0.22 OUR AVERAGE					
5.69±0.18±0.14	2638 ± 84	KO	09	BELL	$e^+ e^-$ at $\Upsilon(4S)$
6.5 ±0.8 ±0.4	189 ± 24	LINK	04F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
7.7 ±1.7 ±0.8	59 ± 13	AITALA	97C	E791	π^- A, 500 GeV
7.2 ±2.3 ±1.7	21	FRABETTI	95E	E687	γBe, $\overline{E}_\gamma$= 220 GeV

$\Gamma(K^+\rho^0)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{116}/\Gamma_{115}$

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.39 ±0.09 OUR AVERAGE				
0.3943±0.0787±0.0815	LINK	04F	FOCS	Dalitz fit, 189 evts
0.37 ±0.14 ±0.07	AITALA	97C	E791	Dalitz fit, 59 evts

$\Gamma(K^+ f_0(980), f_0(980) \to \pi^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{118}/\Gamma_{115}$

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.0892±0.0333±0.0412	LINK	04F	FOCS	Dalitz fit, 189 evts

$\Gamma(K^*(892)^0\pi^+, K^*(892)^0 \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{117}/\Gamma_{115}$

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.47 ±0.08 OUR AVERAGE				
0.5220±0.0684±0.0638	LINK	04F	FOCS	Dalitz fit, 189 evts
0.35 ±0.14 ±0.01	AITALA	97C	E791	Dalitz fit, 59 evts

$\Gamma(K_2^*(1430)^0\pi^+, K_2^*(1430)^0 \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{119}/\Gamma_{115}$

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
0.0803±0.0372±0.0391	LINK	04F	FOCS	Dalitz fit, 189 evts

$\Gamma(K^+\pi^+\pi^-$ nonresonant$)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{120}/\Gamma_{115}$

This is the "fit fraction" from the Dalitz-plot analysis.

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.36±0.14±0.07	[1] AITALA	97C	E791	Dalitz fit, 59 evts

[1] LINK 04F, with three times as many events, finds no need for a nonresonant amplitude.

$\Gamma(2K^+K^-)/\Gamma(K^-2\pi^+)$ — Γ_{121}/Γ_{40}

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
9.49±2.17±0.22	65	[1] LINK	02I	FOCS	γ nucleus, ≈ 180 GeV

[1] LINK 02I finds little evidence for ϕK^+ or $f_0(980) K^+$ submodes.

Rare or forbidden modes

$\Gamma(\pi^+ e^+ e^-)/\Gamma_{total}$ — Γ_{122}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.1 \times 10^{-6}$	90	LEES	11G	BABR	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5.9 \times 10^{-6}$	90	[1] RUBIN	10	CLEO	e^+e^- at $\psi(3770)$
$<7.4 \times 10^{-6}$	90	HE	05A	CLEO	See RUBIN 10
$<5.2 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$<1.1 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<6.6 \times 10^{-5}$	90	AITALA	96	E791	$\pi^- N$ 500 GeV
$<2.5 \times 10^{-3}$	90	WEIR	90B	MRK2	e^+e^- 29 GeV
$<2.6 \times 10^{-3}$	90	HAAS	88	CLEO	e^+e^- 10 GeV

[1] This RUBIN 10 limit is for the e^+e^- mass in the continuum away from the $\phi(1020)$. See the next data block.

$\Gamma(\pi^+\phi, \phi\to e^+e^-)/\Gamma_{total}$ Γ_{123}/Γ

This is *not* a test for the $\Delta C = 1$ weak neutral current, but leads to the $\pi^+ e^+ e^-$ final state.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{(1.7^{+1.4}_{-0.9}\pm0.1)\times10^{-6}}$	4	[1] RUBIN	10	CLEO	e^+e^- at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$(2.7^{+3.6}_{-1.8}\pm0.2)\times10^{-6}$	2	HE	05A	CLEO	See RUBIN 10

[1] This RUBIN 10 result is consistent with the known $D^+ \to \phi\pi^+$ and $\phi \to e^+e^-$ fractions.

$\Gamma(\pi^+\mu^+\mu^-)/\Gamma_{total}$ Γ_{124}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<7.3\times10^{-8}}$	90	AAIJ	13AF	LHCB	pp at 7 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<6.5\times10^{-6}$	90	LEES	11G	BABR	$e^+e^- \approx \Upsilon(4S)$
$<3.9\times10^{-6}$	90	[1] ABAZOV	08D	D0	$p\overline{p}$, E_{cm} = 1.96 TeV
$<8.8\times10^{-6}$	90	LINK	03F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
$<1.5\times10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$<8.9\times10^{-5}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<1.8\times10^{-5}$	90	AITALA	96	E791	$\pi^- N$ 500 GeV
$<2.2\times10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV
$<5.9\times10^{-3}$	90	WEIR	90B	MRK2	e^+e^- 29 GeV
$<2.9\times10^{-3}$	90	HAAS	88	CLEO	e^+e^- 10 GeV

[1] This ABAZOV 08D limit is for the $\mu^+\mu^-$ mass in the continuum away from the $\phi(1020)$. See the next data block.

$\Gamma(\pi^+\phi, \phi\to \mu^+\mu^-)/\Gamma_{total}$ Γ_{125}/Γ

This is *not* a test for the $\Delta C = 1$ weak neutral current, but leads to the $\pi^+\mu^+\mu^-$ final state.

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{(1.8\pm0.5\pm0.6)\times10^{-6}}$	[1] ABAZOV	08D	D0	$p\overline{p}$, E_{cm} = 1.96 TeV

[1] This ABAZOV 08D value is consistent with the known $D^+ \to \phi\pi^+$ and $\phi \to \mu^+\mu^-$ fractions.

$\Gamma(\rho^+\mu^+\mu^-)/\Gamma_{total}$ Γ_{126}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<5.6\times10^{-4}}$	90	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(K^+e^+e^-)/\Gamma_{total}$ Γ_{127}/Γ

Both quarks would have to change flavor for this decay to occur.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.0\times10^{-6}}$	90	LEES	11G	BABR	$e^+e^- \approx \Upsilon(4S)$

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

$<3.0 \times 10^{-6}$	90	RUBIN	10	CLEO	$e^+ e^-$ at $\psi(3770)$
$<6.2 \times 10^{-6}$	90	HE	05A	CLEO	See RUBIN 10
$<2.0 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$<2.0 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<4.8 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

$\Gamma(K^+ \mu^+ \mu^-)/\Gamma_{total}$ Γ_{128}/Γ

Both quarks would have to change flavor for this decay to occur.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<4.3 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<9.2 \times 10^{-6}$	90	LINK	03F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
$<4.4 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$<9.7 \times 10^{-5}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<3.2 \times 10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV
$<9.2 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

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

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.9 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.1 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<3.3 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

$\Gamma(\pi^+ e^- \mu^+)/\Gamma_{total}$ Γ_{130}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.6 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.3 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<3.3 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

$\Gamma(K^+ e^+ \mu^-)/\Gamma_{total}$ Γ_{131}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.2 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.3 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<3.4 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

$\Gamma(K^+ e^- \mu^+)/\Gamma_{total}$ Γ_{132}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.8 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.2 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<3.4 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

$\Gamma(\pi^- 2e^+)/\Gamma_{total}$ — Γ_{133}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.1 \times 10^{-6}$	90	RUBIN	10	CLEO	$e^+ e^-$ at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.9 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
$<3.6 \times 10^{-6}$	90	HE	05A	CLEO	See RUBIN 10
$<9.6 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$<1.1 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<4.8 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

$\Gamma(\pi^- 2\mu^+)/\Gamma_{total}$ — Γ_{134}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.2 \times 10^{-8}$	90	AAIJ	13AF	LHCB	pp at 7 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.0 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
$<4.8 \times 10^{-6}$	90	LINK	03F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
$<1.7 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$<8.7 \times 10^{-5}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<2.2 \times 10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV
$<6.8 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

$\Gamma(\pi^- e^+ \mu^+)/\Gamma_{total}$ — Γ_{135}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.0 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5.0 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$<1.1 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<3.7 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

$\Gamma(\rho^- 2\mu^+)/\Gamma_{total}$ — Γ_{136}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.6 \times 10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(K^- 2e^+)/\Gamma_{total}$ — Γ_{137}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<0.9 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<3.5 \times 10^{-6}$	90	RUBIN	10	CLEO	$e^+ e^-$ at $\psi(3770)$
$<4.5 \times 10^{-6}$	90	HE	05A	CLEO	See RUBIN 10
$<1.2 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<9.1 \times 10^{-3}$	90	WEIR	90B	MRK2	$e^+ e^-$ 29 GeV

$\Gamma(K^- 2\mu^+)/\Gamma_{total}$ — Γ_{138}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<10 × 10^−6	90	LEES	11G	BABR	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 1.3 \times 10^{-5}$	90	LINK	03F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
$< 1.2 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$< 3.2 \times 10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV
$< 4.3 \times 10^{-3}$	90	WEIR	90B	MRK2	e^+e^- 29 GeV

$\Gamma(K^- e^+ \mu^+)/\Gamma_{total}$ — Γ_{139}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.9 × 10^−6	90	LEES	11G	BABR	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.3 \times 10^{-4}$	90	FRABETTI	97B	E687	γ Be, $\overline{E}_\gamma \approx$ 220 GeV
$<4.0 \times 10^{-3}$	90	WEIR	90B	MRK2	e^+e^- 29 GeV

$\Gamma(K^*(892)^- 2\mu^+)/\Gamma_{total}$ — Γ_{140}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<8.5 × 10^−4	90	KODAMA	95	E653	π^- emulsion 600 GeV

$D^\pm$ CP-VIOLATING DECAY-RATE ASYMMETRIES

This is the difference between D^+ and D^- partial widths for the decay to state f, divided by the sum of the widths:
$A_{CP}(f) = [\Gamma(D^+ \to f) - \Gamma(D^- \to \overline{f})]/[\Gamma(D^+ \to f) + \Gamma(D^- \to \overline{f})]$.

$A_{CP}(\mu^\pm \nu)$ in $D^+ \to \mu^+ \nu_\mu$, $D^- \to \mu^- \overline{\nu}_\mu$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
+8±8	EISENSTEIN	08	CLEO	e^+e^- at $\psi(3770)$

$A_{CP}(K^0_L e^\pm \nu)$ in $D^+ \to K^0_L e^+ \nu_e$, $D^- \to K^0_L e^- \overline{\nu}_e$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−0.59±0.60±1.48	ABLIKIM	15AF	BES3	e^+e^- 3773 MeV

$A_{CP}(K^0_S \pi^\pm)$ in $D^\pm \to K^0_S \pi^\pm$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
−0.41 ±0.09 OUR AVERAGE					
−1.1 ±0.6 ±0.2		BONVICINI	14	CLEO	All CLEO-c runs
−0.363±0.094±0.067	1738k	[1] KO	12A	BELL	$e^+e^- \approx \Upsilon(nS)$
−0.44 ±0.13 ±0.10	807k	DEL-AMO-SA...	11H	BABR	$e^+e^- \approx \Upsilon(4S)$
−1.6 ±1.5 ±0.9	10.6k	[2] LINK	02B	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
−0.71 ±0.19 ±0.20		KO	10	BELL	See KO 12A
−1.3 ±0.7 ±0.3	30k	MENDEZ	10	CLEO	See BONVICINI 14
−0.6 ±1.0 ±0.3		DOBBS	07	CLEO	See MENDEZ 10

[1] KO 12A finds that after subtracting the contribution due to $K^0 - \overline{K}^0$ mixing, the CP asymmetry due to the change of charm is $(-0.024 \pm 0.094 \pm 0.067)\%$, consistent with zero.

[2] LINK 02B measures $N(D^+ \to K^0_S \pi^+)/N(D^+ \to K^-\pi^+\pi^+)$, the ratio of numbers of events observed, and similarly for the D^-.

$A_{CP}(K^\mp 2\pi^\pm)$ in $D^+ \to K^- 2\pi^+$, $D^- \to K^+ 2\pi^-$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
−0.18±0.16 OUR AVERAGE					
−0.16±0.15±0.09	2.3M	ABAZOV	14L	D0	$p\overline{p}$, $\sqrt{s} = 1.96$ TeV
−0.3 ±0.2 ±0.4		BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •					
−0.1 ±0.4 ±0.9	231k	MENDEZ	10	CLEO	See BONVICINI 14
−0.5 ±0.4 ±0.9		DOBBS	07	CLEO	See MENDEZ 10

$A_{CP}(K^\mp \pi^\pm \pi^\pm \pi^0)$ in $D^+ \to K^- \pi^+ \pi^+ \pi^0$, $D^- \to K^+ \pi^- \pi^- \pi^0$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−0.3±0.6±0.4	BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.0±0.9±0.9	DOBBS	07	CLEO	See BONVICINI 14

$A_{CP}(K^0_S \pi^\pm \pi^0)$ in $D^+ \to K^0_S \pi^+ \pi^0$, $D^- \to K^0_S \pi^- \pi^0$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−0.1±0.7±0.2	BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.3±0.9±0.3	DOBBS	07	CLEO	See BONVICINI 14

$A_{CP}(K^0_S \pi^\pm \pi^+ \pi^-)$ in $D^+ \to K^0_S \pi^+ \pi^+ \pi^-$, $D^- \to K^0_S \pi^- \pi^- \pi^+$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
0.0±1.2±0.3	BONVICINI	14	CLEO	All CLEO-c runs
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.1±1.1±0.6	DOBBS	07	CLEO	See BONVICINI 14

$A_{CP}(\pi^\pm \pi^0)$ in $D^\pm \to \pi^\pm \pi^0$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
+2.9±2.9±0.3	2.6k	MENDEZ	10	CLEO	e^+e^- at 3774 MeV

$A_{CP}(\pi^\pm \eta)$ in $D^\pm \to \pi^\pm \eta$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.0 ±1.5 OUR AVERAGE	Error includes scale factor of 1.4.				
+1.74±1.13±0.19		WON	11	BELL	$e^+e^- \approx \Upsilon(4S)$
−2.0 ±2.3 ±0.3	2.9k	MENDEZ	10	CLEO	e^+e^- at 3774 MeV

$A_{CP}(\pi^\pm \eta'(958))$ in $D^\pm \to \pi^\pm \eta'(958)$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
−0.5 ±1.2 OUR AVERAGE	Error includes scale factor of 1.1.				
−0.12±1.12±0.17		WON	11	BELL	$e^+e^- \approx \Upsilon(4S)$
−4.0 ±3.4 ±0.3	1.0k	MENDEZ	10	CLEO	e^+e^- at 3774 MeV

$A_{CP}(\overline{K}^0/K^0 K^{\pm})$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.11±0.17 OUR AVERAGE					
0.03±0.17±0.14	1.0M	[1] AAIJ	14BD	LHCB	pp at 7, 8 TeV
0.08±0.28±0.14	277k	KO	13	BELL	e^+e^- at $\Upsilon(4S)$
0.46±0.36±0.25	159k	LEES	13E	BABR	e^+e^- at $\Upsilon(4S)$

[1] AAIJ 14BD reports its result as $A_{CP}(D^{\pm} \to K^0_S \pi^{\pm})$ with CP-violation effects in the $K^0 - \overline{K}^0$ system subtracted. It also measures $A_{CP}(D^{\pm} \to \overline{K}^0/K^0 K^{\pm}) + A_{CP}(D^{\pm}_s \to \overline{K}^0/K^0 \pi^{\pm}) = (0.41 \pm 0.49 \pm 0.26)\%$.

$A_{CP}(K^0_S K^{\pm})$ in $D^{\pm} \to K^0_S K^{\pm}$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
−0.11±0.25 OUR AVERAGE					
−0.25±0.28±0.14	277k	KO	13	BELL	e^+e^- at Υ(nS)
0.13±0.36±0.25	159k	LEES	13E	BABR	e^+e^- at $\Upsilon(4S)$
−0.2 ±1.5 ±0.9	5.2k	MENDEZ	10	CLEO	e^+e^- at 3774 MeV
7.1 ±6.1 ±1.2	949	[1] LINK	02B	FOCS	γ nucleus, $\overline{E}_{\gamma} \approx 180$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
−0.16±0.58±0.25		KO	10	BELL	$e^+e^- \approx \Upsilon(4S)$
6.9 ±6.0 ±1.5	949	[2] LINK	02B	FOCS	γ nucleus, $\overline{E}_{\gamma} \approx 180$ GeV

[1] LINK 02B measures $N(D^+ \to K^0_S K^+)/N(D^+ \to K^0_S \pi^+)$, the ratio of numbers of events observed, and similarly for the D^-.

[2] LINK 02B measures $N(D^+ \to K^0_S K^+)/N(D^+ \to K^- \pi^+ \pi^+)$, the ratio of numbers of events observed, and similarly for the D^-.

$A_{CP}(K^+K^-\pi^{\pm})$ in $D^{\pm} \to K^+K^-\pi^{\pm}$

See also AAIJ 11G for a search for CP asymmetry in the $D^{\pm} \to K^+K^-\pi^{\pm}$ Dalitz plots using 370k decays and four different binning schemes. No evidence for CP asymmetry was found.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.37±0.29 OUR AVERAGE					
0.37±0.30±0.15	224k	[1] LEES	13F	BABR	e^+e^- at $\Upsilon(4S)$
−0.03±0.84±0.29		RUBIN	08	CLEO	e^+e^- at 3774 MeV
1.4 ±1.0 ±0.8	43k	[2] AUBERT	05S	BABR	e^+e^- at $\Upsilon(4S)$
0.6 ±1.1 ±0.5	14k	[3] LINK	00B	FOCS	
−1.4 ±2.9		[3] AITALA	97B	E791	$-0.062 < A_{CP} < +0.034$ (90% CL)
−3.1 ±6.8		[3] FRABETTI	94I	E687	$-0.14 < A_{CP} < +0.081$ (90% CL)
• • • We do not use the following data for averages, fits, limits, etc. • • •					
−0.1 ±0.9 ±0.4		[4] BONVICINI	14	CLEO	See RUBIN 08
−0.1 ±1.5 ±0.8		DOBBS	07	CLEO	See BONVICINI 14 and RUBIN 08

[1] This is the integrated CP asymmetry. LEES 13F also searches for CP asymmetries in four regions of the Dalitz plots (two of which are listed below); in comparisons of binned D^+ and D^- Dalitz plots; in parametrized fits to those plots, including 2-body submodes; and in comparisons of Legendre-polynomial distributions for the K^+K^- and $K^-\pi^+$ systems.

[2] AUBERT 05S measures $N(D^+ \rightarrow K^+K^-\pi^+)/N(D_s^+ \rightarrow K^+K^-\pi^+)$, the ratio of the numbers of events observed, and similarly for the D^-.

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

[4] RUBIN 08 performs a dedicated analysis of this decay mode on the same dataset, with slightly better precision. We therefore take it that BONVICINI 14 does not supersede RUBIN 08's A_{CP} result.

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
− 0.3± 0.4 OUR AVERAGE					
− 0.3± 0.4±0.2	73k	[1] LEES	13F	BABR	e^+e^- at $\Upsilon(4S)$
− 0.4± 2.0±0.6		RUBIN	08	CLEO	Fit-fraction asymmetry
+ 0.9± 1.7±0.7	11k	[2] AUBERT	05S	BABR	e^+e^- at $\Upsilon(4S)$
− 1.0± 5.0		[3] AITALA	97B	E791	$-0.092 < A_{CP} < +0.072$ (90% CL)
−12 ±13		[3] FRABETTI	94I	E687	$-0.33 < A_{CP} < +0.094$ (90% CL)

[1] This LEES 13F result is for the $K^\mp\pi^\pm$ mass-squared between 0.4 and 1.0 GeV^2, and does not actually separate out the K^*.

[2] AUBERT 05S measures $N(D^+ \rightarrow K^+\overline{K}^{*0})/N(D_s^+ \rightarrow K^+K^-\pi^+)$, the ratio of the numbers of events observed, and similarly for the D^-.

[3] FRABETTI 94I and AITALA 97B measure $N(D^+ \rightarrow K^+\overline{K}^*(892)^0)/N(D^+ \rightarrow K^-\pi^+\pi^+)$, the ratio of numbers of events observed, and similarly for the D^-.

$A_{CP}(\phi\pi^\pm)$ in $D^\pm \rightarrow \phi\pi^\pm$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.09±0.19 OUR AVERAGE	Error includes scale factor of 1.2.				
−0.04±0.14±0.14	1.58M	AAIJ	13W	LHCB	pp at 7 TeV
−0.3 ±0.3 ±0.5	97k	[1] LEES	13F	BABR	e^+e^- at $\Upsilon(4S)$
+0.51±0.28±0.05	237k	STARIC	12	BELL	Mainly at $\Upsilon(4S)$
$-1.8 \pm 1.6 {}^{+0.2}_{-0.4}$		RUBIN	08	CLEO	Fit-fraction asymmetry
+0.2 ±1.5 ±0.6	10k	[2] AUBERT	05S	BABR	e^+e^- at $\Upsilon(4S)$
−2.8 ±3.6		[3] AITALA	97B	E791	$-0.087 < A_{CP} < +0.031$ (90% CL)
+6.6 ±8.6		[3] FRABETTI	94I	E687	$-0.075 < A_{CP} < +0.21$ (90% CL)

[1] This LEES 13F result is for the K^+K^- mass-squared less than 1.3 GeV^2 and the $K^\mp\pi^\pm$ mass-squared above 1.0 GeV^2, and does not actually separate out the ϕ.

[2] AUBERT 05S measures $N(D^+ \rightarrow \phi\pi^+)/N(D_s^+ \rightarrow K^+K^-\pi^+)$, the ratio of the numbers of events observed, and similarly for the D^-.

[3] FRABETTI 94I and AITALA 97B measure $N(D^+ \rightarrow \phi\pi^+)/N(D^+ \rightarrow K^-\pi^+\pi^+)$, the ratio of numbers of events observed, and similarly for the D^-.

$A_{CP}(K^\pm K_0^*(1430)^0)$ in $D^+ \to K^+ \overline{K}_0^*(1430)^0$, $D^- \to K^- K_0^*(1430)^0$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$+8\pm6^{+4}_{-2}$	RUBIN	08	CLEO	Fit-fraction asymmetry

$A_{CP}(K^\pm K_2^*(1430)^0)$ in $D^+ \to K^+ \overline{K}_2^*(1430)^0$, $D^- \to K^- K_2^*(1430)^0$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$+43\pm19^{+5}_{-18}$	RUBIN	08	CLEO	Fit-fraction asymmetry

$A_{CP}(K^\pm K_0^*(800))$ in $D^+ \to K^+ \overline{K}_0^*(800)$, $D^- \to K^- K_0^*(800)$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$-12\pm11^{+14}_{-6}$	RUBIN	08	CLEO	Fit-fraction asymmetry

$A_{CP}(a_0(1450)^0\pi^\pm)$ in $D^\pm \to a_0(1450)^0\pi^\pm$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$-19\pm12^{+8}_{-11}$	RUBIN	08	CLEO	Fit-fraction asymmetry

$A_{CP}(\phi(1680)\pi^\pm)$ in $D^\pm \to \phi(1680)\pi^\pm$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
$-9\pm22\pm14$	RUBIN	08	CLEO	Fit-fraction asymmetry

$A_{CP}(\pi^+\pi^-\pi^\pm)$ in $D^\pm \to \pi^+\pi^-\pi^\pm$

See also AAIJ 14C for a search for CP violation in $D^\pm \to \pi^+\pi^-\pi^\pm$ Dalitz plots using model-independent binned and unbinned methods. No evidence was found.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
-1.7 ± 4.2	[1] AITALA	97B	E791	$-0.086 < A_{CP} < +0.052$ (90% CL)

[1] AITALA 97B measure $N(D^+ \to \pi^+\pi^-\pi^+)/N(D^+ \to K^-\pi^+\pi^+)$, the ratio of numbers of events observed, and similarly for the D^-.

$A_{CP}(K_S^0 K^\pm\pi^+\pi^-)$ in $D^\pm \to K_S^0 K^\pm\pi^+\pi^-$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
$-4.2\pm6.4\pm2.2$	523 ± 32	LINK	05E	FOCS	γ A, $\overline{E}_\gamma \approx 180$ GeV

$A_{CP}(K^\pm\pi^0)$ in $D^\pm \to K^\pm\pi^0$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
$-3.5\pm10.7\pm0.9$	343 ± 37	MENDEZ	10	CLEO	e^+e^- at 3774 MeV

$D^\pm$ χ^2 TESTS OF CP-VIOLATION (CPV)

We list model-independent searches for local CP violation in phase-space distributions of multi-body decays.

Most of these searches divide phase space (Dalitz plot for 3-body decays, five-dimensional equivalent for 4-body decays) into bins, and perform a χ^2 test comparing normalised yields N_i, $\overline{N}_i$ in CP-conjugate bin pairs i: $\chi^2 = \Sigma_i(N_i - \alpha\,\overline{N}_i)/\sigma(N_i - \alpha\,\overline{N}_i)$. The factor $\alpha = (\Sigma_i N_i)/(\Sigma_i \overline{N}_i)$ removes the dependence on phase-space-integrated rate asymmetries. The result is used to obtain the probability (p-value) to obtain the measured χ^2 or larger under the assumption of CP conservation [AUBERT 08AO, BEDIAGA 09]. Alternative methods obtain p-values from other test variables based on unbinned analyses [WILLIAMS 11, AAIJ 14C]. Results can be combined using Fisher's method [MOSTELLER 48].

Local *CPV* in $D^{\pm} \to \pi^+\pi^-\pi^{\pm}$

p-value (%)	EVTS	DOCUMENT ID		TECN	COMMENT
78.1	3.1M	[1] AAIJ	14C	LHCB	χ^2

[1] AAIJ 14C uses binned and unbinned methods, and finds slightly better sensitivity with the former. We took the first value in the table of results for the binned method.

Local *CPV* in $D^{\pm} \to K^+K^-\pi^{\pm}$

p-value (%)	EVTS	DOCUMENT ID		TECN	COMMENT
31 OUR EVALUATION					
72	224k	LEES	13F	BABR	χ^2
12.7	370k	[1] AAIJ	11G	LHCB	χ^2

[1] AAIJ 11G publishes results for several binning schemes. We picked the first value in their table of results.

CP VIOLATING ASYMMETRIES OF *P*-ODD (*T*-ODD) MOMENTS

$A_{Tviol}(K^0_S K^{\pm}\pi^+\pi^-)$ in $D^{\pm} \to K^0_S K^{\pm}\pi^+\pi^-$

$C_T \equiv \vec{p}_{K^+} \cdot (\vec{p}_{\pi^+} \times \vec{p}_{\pi^-})$ is a parity-odd correlation of the K^+, π^+, and π^- momenta for the D^+. $\overline{C}_T \equiv \vec{p}_{K^-} \cdot (\vec{p}_{\pi^-} \times \vec{p}_{\pi^+})$ is the corresponding quantity for the D^-. Then
$A_T \equiv [\Gamma(C_T > 0) - \Gamma(C_T < 0)] \, / \, [\Gamma(C_T > 0) + \Gamma(C_T < 0)]$, and
$\overline{A}_T \equiv [\Gamma(-\overline{C}_T > 0) - \Gamma(-\overline{C}_T < 0)] \, / \, [\Gamma(-\overline{C}_T > 0) + \Gamma(-\overline{C}_T < 0)]$, and
$A_{Tviol} \equiv \frac{1}{2}(A_T - \overline{A}_T)$. C_T and $\overline{C}_T$ are commonly referred to as *T*-odd moments, because they are odd under *T* reversal. However, the *T*-conjugate process $K^0_S K^{\pm}\pi^+\pi^- \to D^{\pm}$ is not accessible, while the *P*-conjugate process is.

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
−12.0±10.0± 4.6	21.2±0.4k	LEES	11E	BABR	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
23 ±62 ±22	523 ± 32	LINK	05E	FOCS	γ A, $\overline{E}_{\gamma} \approx$ 180 GeV

$D^+ \to (\overline{K}^0/\pi^0/\eta/\omega/\rho^0/\overline{K}^{*0})\ell^+\nu_{\ell}$ FORM FACTORS

$f_+(0)|V_{cs}|$ in $D^+ \to \overline{K}^0\ell^+\nu_{\ell}$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.725±0.015 OUR AVERAGE	Error includes scale factor of 1.7.				
0.737±0.006±0.009	40k	[1] ABLIKIM	15AF	BES3	$K_L e^+\nu_e$ 3-parameter fit
0.707±0.010±0.009		[2] BESSON	09	CLEO	$K_S e^+\nu_e$ 3-parameter fit

[1] ABLIKIM 15AF finds 0.728 ± 0.006 ± 0.011 for a 2-parameter fit.
[2] BESSON 09 finds 0.716 ± 0.007 ± 0.009 for a 2-parameter fit.

$r_1 \equiv a_1/a_0$ in $D^+ \to \overline{K}^0\ell^+\nu_{\ell}$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
−1.8 ±0.4 OUR AVERAGE					
−2.23±0.42±0.53	40k	[1] ABLIKIM	15AF	BES3	$K_L e^+\nu_e$ 3-parameter fit
−1.66±0.44±0.10		[2] BESSON	09	CLEO	$K_S e^+\nu_e$ 3-parameter fit

[1] ABLIKIM 15AF finds $r_1 = -1.91 \pm 0.33 \pm 0.28$ for a 2-parameter fit.
[2] BESSON 09 finds $r_1 = -2.10 \pm 0.25 \pm 0.08$ for 2-parameter fit.

$r_2 \equiv a_2/a_0$ in $D^+ \to \overline{K}^0 \ell^+ \nu_\ell$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
− 3±12 OUR AVERAGE	Error includes scale factor of 1.5.				
+11± 9±9	40k	ABLIKIM	15AF	BES3	$K_L e^+ \nu_e$ 3-parameter fit
−14±11±1		BESSON	09	CLEO	$K_S e^+ \nu_e$ 3-parameter fit

$f_+(0)|V_{cd}|$ in $D^+ \to \pi^0 \ell^+ \nu_\ell$

VALUE	DOCUMENT ID		TECN	COMMENT
0.146±0.007±0.002	BESSON	09	CLEO	$\pi^0 e^+ \nu_e$ 3-parameter fit

$r_1 \equiv a_1/a_0$ in $D^+ \to \pi^0 \ell^+ \nu_\ell$

VALUE	DOCUMENT ID		TECN	COMMENT
−1.37±0.88±0.24	BESSON	09	CLEO	$\pi^0 e^+ \nu_e$ 3-parameter fit

$r_2 \equiv a_2/a_0$ in $D^+ \to \pi^0 \ell^+ \nu_\ell$

VALUE	DOCUMENT ID		TECN	COMMENT
−4±5±1	BESSON	09	CLEO	$\pi^0 e^+ \nu_e$ 3-parameter fit

$f_+(0)|V_{cd}|$ in $D^+ \to \eta e^+ \nu_e$

VALUE	DOCUMENT ID		TECN	COMMENT
0.086±0.006±0.001	YELTON	11	CLEO	z expansion

$r_1 \equiv a_1/a_0$ in $D^+ \to \eta e^+ \nu_e$

VALUE	DOCUMENT ID		TECN	COMMENT
−1.83±2.23±0.28	YELTON	11	CLEO	z expansion

$r_v \equiv V(0)/A_1(0)$ in $D^+ \to \omega e^+ \nu_e$

VALUE	DOCUMENT ID		TECN	COMMENT
1.24±0.09±0.06	ABLIKIM	15W	BES3	292 fb^{-1}, 3773 MeV

$r_2 \equiv A_2(0)/A_1(0)$ in $D^+ \to \omega e^+ \nu_e$

VALUE	DOCUMENT ID		TECN	COMMENT
1.06±0.15±0.05	ABLIKIM	15W	BES3	292 fb^{-1}, 3773 MeV

$r_v \equiv V(0)/A_1(0)$ in $D^+,D^0 \to \rho e^+ \nu_e$

VALUE	DOCUMENT ID		TECN	COMMENT
1.48±0.15±0.05	[1] DOBBS	13	CLEO	$e^+ e^-$ at $\psi(3770)$

[1] Uses both D^+ and D^0 events. Using PDG 10 values of V_{cd} and lifetimes, DOBBS 13 gets $A_1(0) = 0.56 \pm 0.01^{+0.02}_{-0.03}$, $A_2(0) = 0.47 \pm 0.06 \pm 0.04$, and $V(0) = 0.84 \pm 0.09^{+0.05}_{-0.06}$.

$r_2 \equiv A_2(0)/A_1(0)$ in $D^+,D^0 \to \rho e^+ \nu_e$

VALUE	DOCUMENT ID		TECN	COMMENT
0.83±0.11±0.04	[1] DOBBS	13	CLEO	$e^+ e^-$ at $\psi(3770)$

[1] Uses both D^+ and D^0 events. Using PDG 10 values of V_{cd} and lifetimes, DOBBS 13 gets $A_1(0) = 0.56 \pm 0.01^{+0.02}_{-0.03}$, $A_2(0) = 0.47 \pm 0.06 \pm 0.04$, and $V(0) = 0.84 \pm 0.09^{+0.05}_{-0.06}$.

$r_v \equiv V(0)/A_1(0)$ in $D^+ \rightarrow \overline{K}^*(892)^0 \ell^+ \nu_\ell$

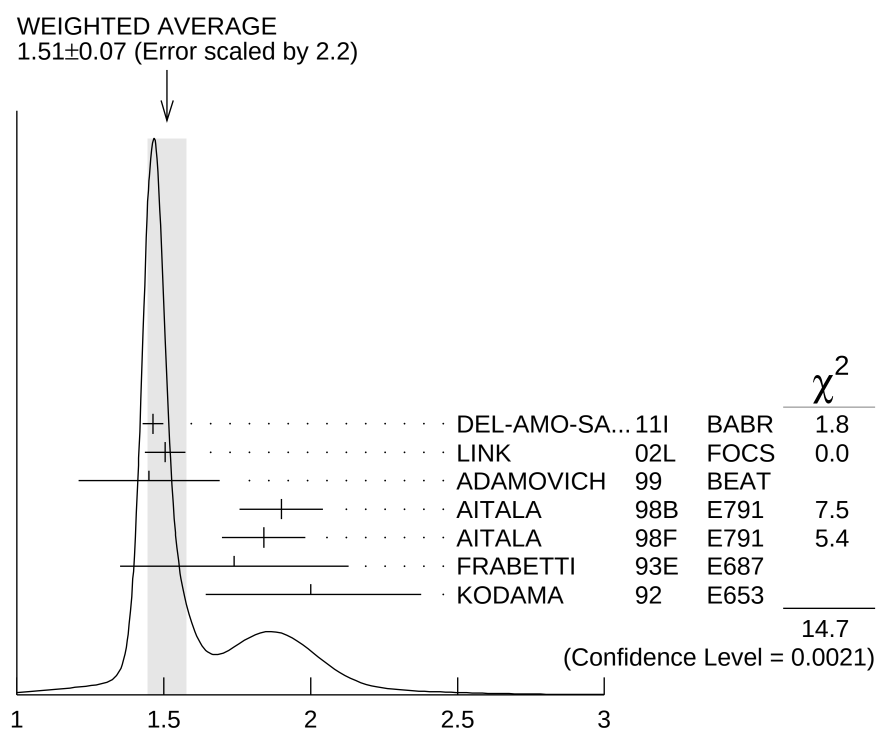
See also BRIERE 10 for $\overline{K}^* \ell^+ \nu_\ell$ helicity-basis form-factor measurements.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
1.51 ±0.07 OUR AVERAGE		Error includes scale factor of 2.2. See the ideogram below.		
1.463±0.017±0.031		[1] DEL-AMO-SA..11I	BABR	
1.504±0.057±0.039	15k	[2] LINK 02L	FOCS	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
1.45 ±0.23 ±0.07	763	ADAMOVICH 99	BEAT	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
1.90 ±0.11 ±0.09	3000	[3] AITALA 98B	E791	$\overline{K}^*(892)^0 e^+ \nu_e$
1.84 ±0.11 ±0.09	3034	AITALA 98F	E791	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
1.74 ±0.27 ±0.28	874	FRABETTI 93E	E687	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
2.00 $^{+0.34}_{-0.32}$ ±0.16	305	KODAMA 92	E653	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.0 ±0.6 ±0.3	183	ANJOS 90E	E691	$\overline{K}^*(892)^0 e^+ \nu_e$

[1] DEL-AMO-SANCHEZ 11I finds the pole mass $m_A = (2.63 \pm 0.10 \pm 0.13)$ GeV (m_V is fixed at 2 GeV).

[2] LINK 02L includes the effects of interference with an S-wave background. This much improves the goodness of fit, but does not much shift the values of the form factors.

[3] This is slightly different from the AITALA 98B value: see ref. [5] in AITALA 98F.



$r_v \equiv V(0)/A_1(0)$ in $D^+ \rightarrow \overline{K}^*(892)^0 \ell^+ \nu_\ell$

$r_2 \equiv A_2(0)/A_1(0)$ in $D^+ \rightarrow \overline{K}^*(892)^0 \ell^+ \nu_\ell$

See also BRIERE 10 for $\overline{K}^* \ell^+ \nu_\ell$ helicity-basis form-factor measurements.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.807±0.025 OUR AVERAGE					
0.801±0.020±0.020		[1] DEL-AMO-SA..	11I	BABR	
0.875±0.049±0.064	15k	[2] LINK	02L	FOCS	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
1.00 ±0.15 ±0.03	763	ADAMOVICH	99	BEAT	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
0.71 ±0.08 ±0.09	3000	AITALA	98B	E791	$\overline{K}^*(892)^0 e^+ \nu_e$
0.75 ±0.08 ±0.09	3034	AITALA	98F	E791	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
0.78 ±0.18 ±0.10	874	FRABETTI	93E	E687	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
0.82 $^{+0.22}_{-0.23}$ ±0.11	305	KODAMA	92	E653	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0 ±0.5 ±0.2	183	ANJOS	90E	E691	$\overline{K}^*(892)^0 e^+ \nu_e$

[1] DEL-AMO-SANCHEZ 11I finds the pole mass $m_A = (2.63 \pm 0.10 \pm 0.13)$ GeV (m_V is fixed at 2 GeV).

[2] LINK 02L includes the effects of interference with an S-wave background. This much improves the goodness of fit, but does not much shift the values of the form factors.

$r_3 \equiv A_3(0)/A_1(0)$ in $D^+ \rightarrow \overline{K}^*(892)^0 \ell^+ \nu_\ell$

See also BRIERE 10 for $\overline{K}^* \ell^+ \nu_\ell$ helicity-basis form-factor measurements.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.04±0.33±0.29	3034	AITALA	98F	E791	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$

Γ_L/Γ_T in $D^+ \rightarrow \overline{K}^*(892)^0 \ell^+ \nu_\ell$

See also BRIERE 10 for $\overline{K}^* \ell^+ \nu_\ell$ helicity-basis form-factor measurements.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.13±0.08 OUR AVERAGE					
1.09±0.10±0.02	763	ADAMOVICH	99	BEAT	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
1.20±0.13±0.13	874	FRABETTI	93E	E687	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
1.18±0.18±0.08	305	KODAMA	92	E653	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.8 $^{+0.6}_{-0.4}$ ±0.3	183	ANJOS	90E	E691	$\overline{K}^*(892)^0 e^+ \nu_e$

Γ_+/Γ_- in $D^+ \rightarrow \overline{K}^*(892)^0 \ell^+ \nu_\ell$

See also BRIERE 10 for $\overline{K}^* \ell^+ \nu_\ell$ helicity-basis form-factor measurements.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.22±0.06 OUR AVERAGE Error includes scale factor of 1.6.					
0.28±0.05±0.02	763	ADAMOVICH	99	BEAT	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
0.16±0.05±0.02	305	KODAMA	92	E653	$\overline{K}^*(892)^0 \mu^+ \nu_\mu$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.15$^{+0.07}_{-0.05}$±0.03	183	ANJOS	90E	E691	$\overline{K}^*(892)^0 e^+ \nu_e$

$D^{\pm}$ REFERENCES

ABLIKIM	15AF	PR D92 112008	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	15W	PR D92 071101	M. Ablikiim *et al.*	(BES III Collab.)
AAIJ	14BD	JHEP 1410 025	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14C	PL B728 585	R. Aaij *et al.*	(LHCb Collab.)
ABAZOV	14L	PR D90 111102	V. M. Abazov *et al.*	(D0 Collab.)
ABLIKIM	14E	PR D89 052001	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	14F	PR D89 051104	M. Ablikim *et al.*	(BES III Collab.)
BONVICINI	14	PR D89 072002	G. Bonvicini *et al.*	(CLEO Collab.)
AAIJ	13AF	PL B724 203	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	13W	JHEP 1306 112	R. Aaij *et al.*	(LHCb Collab.)
DOBBS	13	PRL 110 131802	S. Dobbs *et al.*	(CLEO Collab.)
KO	13	JHEP 1302 098	B.R. Ko *et al.*	(BELLE Collab.)
LEES	13E	PR D87 052012	J.P. Lees *et al.*	(BABAR Collab.)
LEES	13F	PR D87 052010	J.P. Lees *et al.*	(BABAR Collab.)
KO	12A	PRL 109 119903 (errat.)	B.R. Ko *et al.*	(BELLE Collab.)
Also		PRL 109 021601	B.R. Ko *et al.*	(BELLE Collab.)
STARIC	12	PRL 108 071801	M. Staric *et al.*	(BELLE Collab.)
AAIJ	11G	PR D84 112008	R. Aaij *et al.*	(LHCb Collab.)
DEL-AMO-SA...	11H	PR D83 071103	P. del Amo Sanchez *et al.*	(BABAR Collab.)
DEL-AMO-SA...	11I	PR D83 072001	P. del Amo Sanchez *et al.*	(BABAR Collab.)
LEES	11E	PR D84 031103	J.P. Lees *et al.*	(BABAR Collab.)
LEES	11G	PR D84 072006	J.P. Lees *et al.*	(BABAR Collab.)
WILLIAMS	11	PR D84 054015	M. Williams	(LOIC)
WON	11	PRL 107 221801	E. Won *et al.*	(BELLE Collab.)
YELTON	11	PR D84 032001	J. Yelton *et al.*	(CLEO Collab.)
ANASHIN	10A	PL B686 84	V.V. Anashin *et al.*	(VEPP-4M KEDR Collab.)
ASNER	10	PR D81 052007	D.M. Asner *et al.*	(CLEO Collab.)
BRIERE	10	PR D81 112001	R.A. Briere *et al.*	(CLEO Collab.)
KO	10	PRL 104 181602	B.R. Ko *et al.*	(BELLE Collab.)
MENDEZ	10	PR D81 052013	H. Mendez *et al.*	(CLEO Collab.)
PDG	10	JP G37 075021	K. Nakamura *et al.*	(PDG Collab.)
RUBIN	10	PR D82 092007	P. Rubin *et al.*	(CLEO Collab.)
BEDIAGA	09	PR D80 096006	I. Bediaga *et al.*	(CBPF, NDAM)
BESSON	09	PR D80 032005	D. Besson *et al.*	(CLEO Collab.)
Also		PR D79 052010	J.Y. Ge *et al.*	(CLEO Collab.)
KO	09	PRL 102 221802	B.R. Ko *et al.*	(BELLE Collab.)
LINK	09	PL B681 14	J.M. Link *et al.*	(FNAL FOCUS Collab.)
MITCHELL	09B	PRL 102 081801	R.E. Mitchell *et al.*	(CLEO Collab.)
WON	09	PR D80 111101	E. Won *et al.*	(BELLE Collab.)
ABAZOV	08D	PRL 100 101801	V.M. Abazov *et al.*	(D0 Collab.)
ABLIKIM	08L	PL B665 16	M. Ablikim *et al.*	(BES Collab.)
ARTUSO	08	PR D77 092003	M. Artuso *et al.*	(CLEO Collab.)
AUBERT	08AO	PR D78 051102	B. Aubert *et al.*	(BABAR Collab.)
BONVICINI	08	PR D77 091106	G. Bonvicini *et al.*	(CLEO Collab.)
BONVICINI	08A	PR D78 052001	G. Bonvicini *et al.*	(CLEO Collab.)
DOBBS	08	PR D77 112005	S. Dobbs *et al.*	(CLEO Collab.)
Also		PRL 100 251802	D. Cronin-Hennessy *et al.*	(CLEO Collab.)
EISENSTEIN	08	PR D78 052003	B.I. Eisenstein *et al.*	(CLEO Collab.)
HE	08	PRL 100 091801	Q. He *et al.*	(CLEO Collab.)
PDG	08	PL B667 1	C. Amsler *et al.*	(PDG Collab.)
RUBIN	08	PR D78 072003	P. Rubin *et al.*	(CLEO Collab.)
ABLIKIM	07	PL B644 20	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	07G	PL B658 1	M. Ablikim *et al.*	(BES Collab.)
BONVICINI	07	PR D76 012001	G. Bonvicini *et al.*	(CLEO Collab.)
DOBBS	07	PR D76 112001	S. Dobbs *et al.*	(CLEO Collab.)
LINK	07B	PL B653 1	J.M. Link *et al.*	(FNAL FOCUS Collab.)
ABLIKIM	06O	EPJ C47 31	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	06P	EPJ C47 39	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	06U	PL B643 246	M. Ablikim *et al.*	(BES Collab.)
ADAM	06A	PRL 97 251801	N.E. Adam *et al.*	(CLEO Collab.)
AITALA	06	PR D73 032004	E.M. Aitala *et al.*	(FNAL E791 Collab.)
Also		PR D74 059901 (errat.)	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AUBERT,B	06F	PR D74 011107	B. Aubert *et al.*	(BABAR Colla.b)
DYTMAN	06	PR D74 071102	S.A. Dytman *et al.*	(CLEO Collab.)
HUANG	06B	PR D74 112005	G.S. Huang *et al.*	(CLEO Collab.)
LINK	06B	PL B637 32	J.M. Link *et al.*	(FNAL FOCUS Collab.)
RUBIN	06	PRL 96 081802	P. Rubin *et al.*	(CLEO Collab.)
RUBIN	06A	PR D73 112005	P. Rubin *et al.*	(CLEO Collab.)
ABLIKIM	05A	PL B608 24	M. Ablikim *et al.*	(BES Collab.)

ABLIKIM	05D	PL B610 183	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	05F	PL B622 6	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	05P	PL B625 196	M. Ablikim *et al.*	(BES Collab.)
ARTUSO	05A	PRL 95 251801	M. Artuso *et al.*	(CLEO Collab.)
AUBERT	05S	PR D71 091101	B. Aubert *et al.*	(BABAR Collab.)
HE	05	PRL 95 121801	Q. He *et al.*	(CLEO Collab.)
Also		PRL 96 199903 (errat.)	Q. He *et al.*	(CLEO Collab.)
HE	05A	PRL 95 221802	Q. He *et al.*	(CLEO Collab.)
HUANG	05B	PRL 95 181801	G.S. Huang *et al.*	(CLEO Collab.)
KAYIS-TOPAK...	05	PL B626 24	A. Kayis-Topaksu *et al.*	(CERN CHORUS Collab.)
LINK	05E	PL B622 239	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	05I	PL B621 72	J.M. Link *et al.*	(FNAL FOCUS Collab.)
ABLIKIM	04C	PL B597 39	M. Ablikim *et al.*	(BEPC BES Collab.)
ARMS	04	PR D69 071102	K. Arms *et al.*	(CLEO Collab.)
BONVICINI	04A	PR D70 112004	G. Bonvicini *et al.*	(CLEO Collab.)
LINK	04	PL B585 200	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	04E	PL B598 33	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	04F	PL B601 10	J.M. Link *et al.*	(FNAL FOCUS Collab.)
ANISOVICH	03	EPJ A16 229	V.V. Anisovich *et al.*	
LINK	03D	PL B561 225	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	03F	PL B572 21	J.M. Link *et al.*	(FNAL FOCUS Collab.)
AITALA	02	PRL 89 121801	E.M. Aitala *et al.*	(FNAL E791 Collab.)
BRANDENB...	02	PRL 89 222001	G. Brandenburg *et al.*	(CLEO Collab.)
KAYIS-TOPAK...	02	PL B549 48	A. Kayis-Topaksu *et al.*	(CERN CHORUS Collab.)
LINK	02B	PRL 88 041602	J.M. Link *et al.*	(FNAL FOCUS Collab.)
Also		PRL 88 159903 (errat.)	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	02E	PL B535 43	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	02F	PL B537 192	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	02I	PL B541 227	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	02J	PL B541 243	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	02L	PL B544 89	J.M. Link *et al.*	(FNAL FOCUS Collab.)
AITALA	01B	PRL 86 770	E.M. Aitala *et al.*	(FNAL E791 Collab.)
LINK	01C	PRL 87 162001	J.M. Link *et al.*	(FNAL FOCUS Collab.)
ABREU	00O	EPJ C12 209	P. Abreu *et al.*	(DELPHI Collab.)
ASTIER	00D	PL B486 35	P. Astier *et al.*	(CERN NOMAD Collab.)
JUN	00	PRL 84 1857	S.Y. Jun *et al.*	(FNAL SELEX Collab.)
LINK	00B	PL B491 232	J.M. Link *et al.*	(FNAL FOCUS Collab.)
Also		PL B495 443 (errat.)	J.M. Link *et al.*	(FNAL FOCUS Collab.)
ABBIENDI	99K	EPJ C8 573	G. Abbiendi *et al.*	(OPAL Collab.)
ADAMOVICH	99	EPJ C6 35	M. Adamovich *et al.*	(CERN BEATRICE 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	98B	PRL 80 1393	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	98C	PL B421 405	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	98F	PL B440 435	E.M. Aitala *et al.*	(FNAL E791 Collab.)
BAI	98B	PL B429 188	J.Z. Bai *et al.*	(BEPC BES Collab.)
AITALA	97	PL B397 325	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	97B	PL B403 377	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	97C	PL B404 187	E.M. Aitala *et al.*	(FNAL E791 Collab.)
BISHAI	97	PRL 78 3261	M. Bishai *et al.*	(CLEO Collab.)
FRABETTI	97	PL B391 235	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FRABETTI	97B	PL B398 239	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FRABETTI	97C	PL B401 131	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FRABETTI	97D	PL B407 79	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
AITALA	96	PRL 76 364	E.M. Aitala *et al.*	(FNAL E791 Collab.)
FRABETTI	95	PL B346 199	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FRABETTI	95B	PL B351 591	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FRABETTI	95E	PL B359 403	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
KODAMA	95	PL B345 85	K. Kodama *et al.*	(FNAL E653 Collab.)
ALBRECHT	94I	ZPHY C64 375	H. Albrecht *et al.*	(ARGUS Collab.)
BALEST	94	PRL 72 2328	R. Balest *et al.*	(CLEO Collab.)
FRABETTI	94D	PL B323 459	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
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.)
AKERIB	93	PRL 71 3070	D.S. Akerib *et al.*	(CLEO Collab.)
ANJOS	93	PR D48 56	J.C. Anjos *et al.*	(FNAL E691 Collab.)
FRABETTI	93E	PL B307 262	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
ALBRECHT	92F	PL B278 202	H. Albrecht *et al.*	(ARGUS Collab.)
ANJOS	92C	PR D46 1941	J.C. Anjos *et al.*	(FNAL E691 Collab.)
BARLAG	92C	ZPHY C55 383	S. Barlag *et al.*	(ACCMOR Collab.)
Also		ZPHY C48 29	S. Barlag *et al.*	(ACCMOR Collab.)

COFFMAN	92B	PR D45 2196	D.M. Coffman *et al.*	(Mark III Collab.)
DAOUDI	92	PR D45 3965	M. Daoudi *et al.*	(CLEO Collab.)
KODAMA	92	PL B274 246	K. Kodama *et al.*	(FNAL E653 Collab.)
KODAMA	92C	PL B286 187	K. Kodama *et al.*	(FNAL E653 Collab.)
ADAMOVICH	91	PL B268 142	M.I. Adamovich *et al.*	(WA82 Collab.)
ALBRECHT	91	PL B255 634	H. Albrecht *et al.*	(ARGUS Collab.)
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.)
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.)
FRABETTI	91	PL B263 584	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
ALVAREZ	90	ZPHY C47 539	M.P. Alvarez *et al.*	(CERN NA14/2 Collab.)
ANJOS	90C	PR D41 2705	J.C. Anjos *et al.*	(FNAL E691 Collab.)
ANJOS	90D	PR D42 2414	J.C. Anjos *et al.*	(FNAL E691 Collab.)
ANJOS	90E	PRL 65 2630	J.C. Anjos *et al.*	(FNAL E691 Collab.)
BARLAG	90C	ZPHY C46 563	S. Barlag *et al.*	(ACCMOR Collab.)
WEIR	90B	PR D41 1384	A.J. Weir *et al.*	(Mark II Collab.)
ANJOS	89	PRL 62 125	J.C. Anjos *et al.*	(FNAL E691 Collab.)
ANJOS	89B	PRL 62 722	J.C. Anjos *et al.*	(FNAL E691 Collab.)
ANJOS	89E	PL B223 267	J.C. Anjos *et al.*	(FNAL E691 Collab.)
ADLER	88C	PRL 60 89	J. Adler *et al.*	(Mark III Collab.)
ALBRECHT	88I	PL B210 267	H. Albrecht *et al.*	(ARGUS Collab.)
HAAS	88	PRL 60 1614	P. Haas *et al.*	(CLEO Collab.)
ONG	88	PRL 60 2587	R.A. Ong *et al.*	(Mark II Collab.)
RAAB	88	PR D37 2391	J.R. Raab *et al.*	(FNAL E691 Collab.)
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.)
BARTEL	87	ZPHY C33 339	W. Bartel *et al.*	(JADE Collab.)
BALTRUSAIT...	86E	PRL 56 2140	R.M. Baltrusaitis *et al.*	(Mark III Collab.)
BALTRUSAIT...	85B	PRL 54 1976	R.M. Baltrusaitis *et al.*	(Mark III Collab.)
BALTRUSAIT...	85E	PRL 55 150	R.M. Baltrusaitis *et al.*	(Mark III Collab.)
BARTEL	85J	PL 163B 277	W. Bartel *et al.*	(JADE Collab.)
ADAMOVICH	84	PL 140B 119	M.I. Adamovich *et al.*	(CERN WA58 Collab.)
ALTHOFF	84G	ZPHY C22 219	M. Althoff *et al.*	(TASSO Collab.)
DERRICK	84	PRL 53 1971	M. Derrick *et al.*	(HRS Collab.)
SCHINDLER	81	PR D24 78	R.H. Schindler *et al.*	(Mark II Collab.)
TRILLING	81	PRPL 75 57	G.H. Trilling	(LBL, UCB) J
ZHOLENTZ	80	PL 96B 214	A.A. Zholentz *et al.*	(NOVO)
Also		SJNP 34 814	A.A. Zholents *et al.*	(NOVO)
		Translated from YAF 34 1471.		
GOLDHABER	77	PL 69B 503	G. Goldhaber *et al.*	(Mark I Collab.)
PERUZZI	77	PRL 39 1301	I. Peruzzi *et al.*	(LGW Collab.)
PICCOLO	77	PL 70B 260	M. Piccolo *et al.*	(Mark I Collab.)
PERUZZI	76	PRL 37 569	I. Peruzzi *et al.*	(Mark I Collab.)
MOSTELLER	48	Am.Stat. 3 No.5 30	R.A. Fisher, F. Mosteller	

OTHER RELATED PAPERS

RICHMAN	95	RMP 67 893	J.D. Richman, P.R. Burchat	(UCSB, STAN)
ROSNER	95	CNPP 21 369	J. Rosner	(CHIC)