

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

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
1869.62 ± 0.15 OUR FIT	Error includes scale factor of 1.1.			
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	$K^\mp \pi^\pm \pi^\pm$

¹PERUZZI 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, ≈ 180 GeV
1033.6 ± 22.1 ^{+9.9} _{-12.7}	3777	BONVICINI	99 CLEO	$e^+e^- \approx \Upsilon(4S)$
1048 ± 15 ± 11	9k	FRABETTI	94D E687	$D^+ \rightarrow K^- \pi^+ \pi^+$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1075 ± 40 ± 18	2455	FRABETTI	91 E687	γ Be, $D^+ \rightarrow K^- \pi^+ \pi^+$
1030 ± 80 ± 60	200	ALVAREZ	90 NA14	γ , $D^+ \rightarrow K^- \pi^+ \pi^+$
1050 ⁺⁷⁷ ₋₇₂	317	² 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

²BARLAG 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_S^0 modes, not as \bar{K}^0 modes. Nearly always it is a K_S^0 that is measured, and interference between Cabibbo-allowed and doubly Cabibbo-suppressed modes can invalidate the assumption that $2\Gamma(K_S^0) = \Gamma(\bar{K}^0)$.

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Inclusive modes		
Γ_1 $D^+ \rightarrow e^+$ semileptonic	$(16.07 \pm 0.30) \%$	
Γ_2 $D^+ \rightarrow \mu^+$ anything	$(17.6 \pm 3.2) \%$	
Γ_3 $D^+ \rightarrow K^-$ anything	$(25.7 \pm 1.4) \%$	
Γ_4 $D^+ \rightarrow \bar{K}^0$ anything + K^0 anything	$(61 \pm 5) \%$	
Γ_5 $D^+ \rightarrow K^+$ anything	$(5.9 \pm 0.8) \%$	
Γ_6 $D^+ \rightarrow K^*(892)^-$ anything	$(6 \pm 5) \%$	
Γ_7 $D^+ \rightarrow \bar{K}^*(892)^0$ anything	$(23 \pm 5) \%$	
Γ_8 $D^+ \rightarrow K^*(892)^0$ anything	$< 6.6 \%$	CL=90%
Γ_9 $D^+ \rightarrow \eta$ anything	$(6.3 \pm 0.7) \%$	
Γ_{10} $D^+ \rightarrow \eta'$ anything	$(1.04 \pm 0.18) \%$	
Γ_{11} $D^+ \rightarrow \phi$ anything	$(1.03 \pm 0.12) \%$	
Leptonic and semileptonic modes		
Γ_{12} $D^+ \rightarrow e^+ \nu_e$	$< 8.8 \times 10^{-6}$	CL=90%
Γ_{13} $D^+ \rightarrow \mu^+ \nu_\mu$	$(3.82 \pm 0.33) \times 10^{-4}$	
Γ_{14} $D^+ \rightarrow \tau^+ \nu_\tau$	$< 1.2 \times 10^{-3}$	CL=90%
Γ_{15} $D^+ \rightarrow \bar{K}^0 e^+ \nu_e$	$(8.83 \pm 0.22) \%$	
Γ_{16} $D^+ \rightarrow \bar{K}^0 \mu^+ \nu_\mu$	$(9.2 \pm 0.6) \%$	
Γ_{17} $D^+ \rightarrow K^- \pi^+ e^+ \nu_e$	$(4.00 \pm 0.10) \%$	
Γ_{18} $D^+ \rightarrow \bar{K}^*(892)^0 e^+ \nu_e,$ $\bar{K}^*(892)^0 \rightarrow K^- \pi^+$	$(3.68 \pm 0.10) \%$	
Γ_{19} $D^+ \rightarrow (K^- \pi^+)_{S\text{-wave}} e^+ \nu_e$	$(2.32 \pm 0.10) \times 10^{-3}$	
Γ_{20} $D^+ \rightarrow \bar{K}^*(1410)^0 e^+ \nu_e,$ $\bar{K}^*(1410)^0 \rightarrow K^- \pi^+$	$< 6 \times 10^{-3}$	CL=90%
Γ_{21} $D^+ \rightarrow \bar{K}_2^*(1430)^0 e^+ \nu_e,$ $\bar{K}_2^*(1430)^0 \rightarrow K^- \pi^+$	$< 5 \times 10^{-4}$	CL=90%
Γ_{22} $D^+ \rightarrow K^- \pi^+ e^+ \nu_e$ nonresonant	$< 7 \times 10^{-3}$	CL=90%
Γ_{23} $D^+ \rightarrow K^- \pi^+ \mu^+ \nu_\mu$	$(3.8 \pm 0.4) \%$	
Γ_{24} $D^+ \rightarrow \bar{K}^*(892)^0 \mu^+ \nu_\mu,$ $\bar{K}^*(892)^0 \rightarrow K^- \pi^+$	$(3.52 \pm 0.10) \%$	
Γ_{25} $D^+ \rightarrow K^- \pi^+ \mu^+ \nu_\mu$ nonresonant	$(2.0 \pm 0.5) \times 10^{-3}$	

Γ_{26}	$D^+ \rightarrow K^- \pi^+ \pi^0 \mu^+ \nu_\mu$	$< 1.6 \times 10^{-3}$	CL=90%
Γ_{27}	$D^+ \rightarrow \pi^0 e^+ \nu_e$	$(4.05 \pm 0.18) \times 10^{-3}$	
Γ_{28}	$D^+ \rightarrow \eta e^+ \nu_e$	$(1.14 \pm 0.10) \times 10^{-3}$	
Γ_{29}	$D^+ \rightarrow \rho^0 e^+ \nu_e$	$(2.2 \pm 0.4) \times 10^{-3}$	
Γ_{30}	$D^+ \rightarrow \rho^0 \mu^+ \nu_\mu$	$(2.4 \pm 0.4) \times 10^{-3}$	
Γ_{31}	$D^+ \rightarrow \omega e^+ \nu_e$	$(1.6^{+0.7}_{-0.6}) \times 10^{-3}$	
Γ_{32}	$D^+ \rightarrow \eta'(958) e^+ \nu_e$	$(2.2 \pm 0.5) \times 10^{-4}$	
Γ_{33}	$D^+ \rightarrow \phi e^+ \nu_e$	$< 9 \times 10^{-5}$	CL=90%

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

Γ_{34}	$D^+ \rightarrow \bar{K}^*(892)^0 e^+ \nu_e$	$(5.52 \pm 0.15) \%$
Γ_{35}	$D^+ \rightarrow \bar{K}^*(892)^0 \mu^+ \nu_\mu$	$(5.28 \pm 0.15) \%$
Γ_{36}	$D^+ \rightarrow \bar{K}_0^*(1430)^0 \mu^+ \nu_\mu$	$< 2.4 \times 10^{-4}$
Γ_{37}	$D^+ \rightarrow \bar{K}^*(1680)^0 \mu^+ \nu_\mu$	$< 1.5 \times 10^{-3}$

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

Γ_{38}	$D^+ \rightarrow K_S^0 \pi^+$	$(1.47 \pm 0.07) \%$	S=2.0
Γ_{39}	$D^+ \rightarrow K_L^0 \pi^+$	$(1.46 \pm 0.05) \%$	
Γ_{40}	$D^+ \rightarrow K^- 2\pi^+$	[a] $(9.13 \pm 0.19) \%$	
Γ_{41}	$D^+ \rightarrow (K^- \pi^+)_{S\text{-wave}} \pi^+$	$(7.32 \pm 0.19) \%$	
Γ_{42}	$D^+ \rightarrow \bar{K}_0^*(800)^0 \pi^+$, $\bar{K}_0^*(800) \rightarrow K^- \pi^+$		
Γ_{43}	$D^+ \rightarrow \bar{K}_0^*(1430)^0 \pi^+$, $\bar{K}_0^*(1430)^0 \rightarrow K^- \pi^+$	[b] $(1.21 \pm 0.06) \%$	
Γ_{44}	$D^+ \rightarrow \bar{K}^*(892)^0 \pi^+$, $\bar{K}^*(892)^0 \rightarrow K^- \pi^+$	$(1.01 \pm 0.11) \%$	
Γ_{45}	$D^+ \rightarrow \bar{K}^*(1410)^0 \pi^+$, $\bar{K}^{*0} \rightarrow K^- \pi^+$	not seen	
Γ_{46}	$D^+ \rightarrow \bar{K}_2^*(1430)^0 \pi^+$, $\bar{K}_2^*(1430)^0 \rightarrow K^- \pi^+$	[b] $(2.2 \pm 0.7) \times 10^{-4}$	
Γ_{47}	$D^+ \rightarrow \bar{K}^*(1680)^0 \pi^+$, $\bar{K}^*(1680)^0 \rightarrow K^- \pi^+$	[b] $(2.1 \pm 1.1) \times 10^{-4}$	
Γ_{48}	$D^+ \rightarrow K^- (2\pi^+)_{I=2}$	$(1.41 \pm 0.26) \%$	
Γ_{49}	$D^+ \rightarrow K^- 2\pi^+$ nonresonant		
Γ_{50}	$D^+ \rightarrow K_S^0 \pi^+ \pi^0$	[a] $(6.99 \pm 0.27) \%$	
Γ_{51}	$D^+ \rightarrow K_S^0 \rho^+$	$(4.8 \pm 1.0) \%$	
Γ_{52}	$D^+ \rightarrow \bar{K}^*(892)^0 \pi^+$, $\bar{K}^*(892)^0 \rightarrow K_S^0 \pi^0$	$(1.3 \pm 0.6) \%$	
Γ_{53}	$D^+ \rightarrow K_S^0 \pi^+ \pi^0$ nonresonant	$(9 \pm 7) \times 10^{-3}$	
Γ_{54}	$D^+ \rightarrow K^- 2\pi^+ \pi^0$	[c] $(5.99 \pm 0.18) \%$	

Γ_{55}	$D^+ \rightarrow K_S^0 2\pi^+ \pi^-$	[c]	$(3.12 \pm 0.11) \%$	
Γ_{56}	$D^+ \rightarrow K^- 3\pi^+ \pi^-$	[a]	$(5.6 \pm 0.5) \times 10^{-3}$	S=1.1
Γ_{57}	$D^+ \rightarrow \bar{K}^*(892)^0 2\pi^+ \pi^-$, $\bar{K}^*(892)^0 \rightarrow K^- \pi^+$		$(1.2 \pm 0.4) \times 10^{-3}$	
Γ_{58}	$D^+ \rightarrow \bar{K}^*(892)^0 \rho^0 \pi^+$, $\bar{K}^*(892)^0 \rightarrow K^- \pi^+$		$(2.2 \pm 0.4) \times 10^{-3}$	
Γ_{59}	$D^+ \rightarrow \bar{K}^*(892)^0 a_1(1260)^+$	[d]	$(9.0 \pm 1.8) \times 10^{-3}$	
Γ_{60}	$D^+ \rightarrow \bar{K}^*(892)^0 2\pi^+ \pi^-$ no- ρ , $\bar{K}^*(892)^0 \rightarrow K^- \pi^+$			
Γ_{61}	$D^+ \rightarrow K^- \rho^0 2\pi^+$		$(1.68 \pm 0.27) \times 10^{-3}$	
Γ_{62}	$D^+ \rightarrow K^- 3\pi^+ \pi^-$ nonresonant		$(3.9 \pm 2.9) \times 10^{-4}$	
Γ_{63}	$D^+ \rightarrow K^+ 2K_S^0$		$(4.5 \pm 2.0) \times 10^{-3}$	
Γ_{64}	$D^+ \rightarrow K^+ K^- K_S^0 \pi^+$		$(2.4 \pm 0.6) \times 10^{-4}$	

Pionic modes

Γ_{65}	$D^+ \rightarrow \pi^+ \pi^0$		$(1.19 \pm 0.06) \times 10^{-3}$	
Γ_{66}	$D^+ \rightarrow 2\pi^+ \pi^-$		$(3.18 \pm 0.18) \times 10^{-3}$	
Γ_{67}	$D^+ \rightarrow \rho^0 \pi^+$		$(8.1 \pm 1.5) \times 10^{-4}$	
Γ_{68}	$D^+ \rightarrow \pi^+ (\pi^+ \pi^-)_{S\text{-wave}}$		$(1.78 \pm 0.16) \times 10^{-3}$	
Γ_{69}	$D^+ \rightarrow \sigma \pi^+$, $\sigma \rightarrow \pi^+ \pi^-$		$(1.34 \pm 0.12) \times 10^{-3}$	
Γ_{70}	$D^+ \rightarrow f_0(980) \pi^+$, $f_0(980) \rightarrow \pi^+ \pi^-$		$(1.52 \pm 0.33) \times 10^{-4}$	
Γ_{71}	$D^+ \rightarrow f_0(1370) \pi^+$, $f_0(1370) \rightarrow \pi^+ \pi^-$		$(8 \pm 4) \times 10^{-5}$	
Γ_{72}	$D^+ \rightarrow f_2(1270) \pi^+$, $f_2(1270) \rightarrow \pi^+ \pi^-$		$(4.9 \pm 0.9) \times 10^{-4}$	
Γ_{73}	$D^+ \rightarrow \rho(1450)^0 \pi^+$, $\rho(1450)^0 \rightarrow \pi^+ \pi^-$	< 8	$\times 10^{-5}$	CL=95%
Γ_{74}	$D^+ \rightarrow f_0(1500) \pi^+$, $f_0(1500) \rightarrow \pi^+ \pi^-$		$(1.1 \pm 0.4) \times 10^{-4}$	
Γ_{75}	$D^+ \rightarrow f_0(1710) \pi^+$, $f_0(1710) \rightarrow \pi^+ \pi^-$	< 5	$\times 10^{-5}$	CL=95%
Γ_{76}	$D^+ \rightarrow f_0(1790) \pi^+$, $f_0(1790) \rightarrow \pi^+ \pi^-$	< 6	$\times 10^{-5}$	CL=95%
Γ_{77}	$D^+ \rightarrow (\pi^+ \pi^+)_{S\text{-wave}} \pi^-$	< 1.2	$\times 10^{-4}$	CL=95%
Γ_{78}	$D^+ \rightarrow 2\pi^+ \pi^-$ nonresonant	< 1.1	$\times 10^{-4}$	CL=95%
Γ_{79}	$D^+ \rightarrow \pi^+ 2\pi^0$		$(4.6 \pm 0.4) \times 10^{-3}$	
Γ_{80}	$D^+ \rightarrow 2\pi^+ \pi^- \pi^0$		$(1.13 \pm 0.08) \%$	
Γ_{81}	$D^+ \rightarrow \eta \pi^+$, $\eta \rightarrow \pi^+ \pi^- \pi^0$		$(8.0 \pm 0.5) \times 10^{-4}$	
Γ_{82}	$D^+ \rightarrow \omega \pi^+$, $\omega \rightarrow \pi^+ \pi^- \pi^0$	< 3	$\times 10^{-4}$	CL=90%
Γ_{83}	$D^+ \rightarrow 3\pi^+ 2\pi^-$		$(1.61 \pm 0.16) \times 10^{-3}$	

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

Γ_{84}	$D^+ \rightarrow \eta \pi^+$	$(3.53 \pm 0.21) \times 10^{-3}$	
Γ_{85}	$D^+ \rightarrow \eta \pi^+ \pi^0$	$(1.38 \pm 0.35) \times 10^{-3}$	
Γ_{86}	$D^+ \rightarrow \omega \pi^+$	$< 3.4 \times 10^{-4}$	CL=90%
Γ_{87}	$D^+ \rightarrow \eta'(958) \pi^+$	$(4.67 \pm 0.29) \times 10^{-3}$	
Γ_{88}	$D^+ \rightarrow \eta'(958) \pi^+ \pi^0$	$(1.6 \pm 0.5) \times 10^{-3}$	

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

Γ_{89}	$D^+ \rightarrow K^+ K_S^0$	$(2.83 \pm 0.16) \times 10^{-3}$	S=2.2
Γ_{90}	$D^+ \rightarrow K^+ K^- \pi^+$	[a] $(9.54 \pm 0.26) \times 10^{-3}$	S=1.1
Γ_{91}	$D^+ \rightarrow \phi \pi^+, \phi \rightarrow K^+ K^-$	$(2.65^{+0.08}_{-0.09}) \times 10^{-3}$	
Γ_{92}	$D^+ \rightarrow K^+ \bar{K}^*(892)^0, \bar{K}^*(892)^0 \rightarrow K^- \pi^+$	$(2.45^{+0.09}_{-0.14}) \times 10^{-3}$	
Γ_{93}	$D^+ \rightarrow K^+ \bar{K}_0^*(1430)^0, \bar{K}_0^*(1430)^0 \rightarrow K^- \pi^+$	$(1.79 \pm 0.34) \times 10^{-3}$	
Γ_{94}	$D^+ \rightarrow K^+ \bar{K}_2^*(1430)^0, \bar{K}_2^* \rightarrow K^- \pi^+$	$(1.6^{+1.2}_{-0.8}) \times 10^{-4}$	
Γ_{95}	$D^+ \rightarrow K^+ \bar{K}_0^*(800), \bar{K}_0^* \rightarrow K^- \pi^+$	$(6.7^{+3.4}_{-2.1}) \times 10^{-4}$	
Γ_{96}	$D^+ \rightarrow a_0(1450)^0 \pi^+, a_0^0 \rightarrow K^+ K^-$	$(4.4^{+7.0}_{-1.8}) \times 10^{-4}$	
Γ_{97}	$D^+ \rightarrow \phi(1680) \pi^+, \phi \rightarrow K^+ K^-$	$(4.9^{+4.0}_{-1.9}) \times 10^{-5}$	
Γ_{98}	$D^+ \rightarrow K^+ K^- \pi^+$ nonresonant	not seen	
Γ_{99}	$D^+ \rightarrow K^+ K_S^0 \pi^+ \pi^-$	$(1.75 \pm 0.18) \times 10^{-3}$	
Γ_{100}	$D^+ \rightarrow K_S^0 K^- 2\pi^+$	$(2.40 \pm 0.18) \times 10^{-3}$	
Γ_{101}	$D^+ \rightarrow K^+ K^- 2\pi^+ \pi^-$	$(2.2 \pm 1.2) \times 10^{-4}$	

A few poorly measured branching fractions:

Γ_{102}	$D^+ \rightarrow \phi \pi^+ \pi^0$	$(2.3 \pm 1.0) \%$	
Γ_{103}	$D^+ \rightarrow \phi \rho^+$	$< 1.5 \%$	CL=90%
Γ_{104}	$D^+ \rightarrow K^+ K^- \pi^+ \pi^0$ non- ϕ	$(1.5^{+0.7}_{-0.6}) \%$	
Γ_{105}	$D^+ \rightarrow K^*(892)^+ K_S^0$	$(1.6 \pm 0.7) \%$	

Doubly Cabibbo-suppressed modes

Γ_{106}	$D^+ \rightarrow K^+ \pi^0$	$(1.83 \pm 0.26) \times 10^{-4}$	S=1.4
Γ_{107}	$D^+ \rightarrow K^+ \eta$	$(1.08 \pm 0.17) \times 10^{-4}$	
Γ_{108}	$D^+ \rightarrow K^+ \eta'(958)$	$(1.76 \pm 0.22) \times 10^{-4}$	
Γ_{109}	$D^+ \rightarrow K^+ \pi^+ \pi^-$	$(5.27 \pm 0.23) \times 10^{-4}$	
Γ_{110}	$D^+ \rightarrow K^+ \rho^0$	$(2.0 \pm 0.5) \times 10^{-4}$	

Γ_{111}	$D^+ \rightarrow K^*(892)^0 \pi^+,$ $K^*(892)^0 \rightarrow K^+ \pi^-$	$(2.5 \pm 0.4) \times 10^{-4}$
Γ_{112}	$D^+ \rightarrow K^+ f_0(980),$ $f_0(980) \rightarrow \pi^+ \pi^-$	$(4.7 \pm 2.8) \times 10^{-5}$
Γ_{113}	$D^+ \rightarrow K_2^*(1430)^0 \pi^+,$ $K_2^*(1430)^0 \rightarrow K^+ \pi^-$	$(4.2 \pm 2.9) \times 10^{-5}$
Γ_{114}	$D^+ \rightarrow K^+ \pi^+ \pi^-$ nonreso-	not seen
Γ_{115}	$D^+ \rightarrow 2K^+ K^-$	$(8.7 \pm 2.0) \times 10^{-5}$

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

Γ_{116}	$D^+ \rightarrow \pi^+ e^+ e^-$	C1	< 1.1	$\times 10^{-6}$	CL=90%
Γ_{117}	$D^+ \rightarrow \pi^+ \phi, \phi \rightarrow e^+ e^-$	[e]	$(1.7^{+1.4}_{-0.9})$	$\times 10^{-6}$	
Γ_{118}	$D^+ \rightarrow \pi^+ \mu^+ \mu^-$	C1	< 3.9	$\times 10^{-6}$	CL=90%
Γ_{119}	$D^+ \rightarrow \pi^+ \phi, \phi \rightarrow$ $\mu^+ \mu^-$	[e]	(1.8 ± 0.8)	$\times 10^{-6}$	
Γ_{120}	$D^+ \rightarrow \rho^+ \mu^+ \mu^-$	C1	< 5.6	$\times 10^{-4}$	CL=90%
Γ_{121}	$D^+ \rightarrow K^+ e^+ e^-$	[f]	< 1.0	$\times 10^{-6}$	CL=90%
Γ_{122}	$D^+ \rightarrow K^+ \mu^+ \mu^-$	[f]	< 4.3	$\times 10^{-6}$	CL=90%
Γ_{123}	$D^+ \rightarrow \pi^+ e^+ \mu^-$	LF	< 2.9	$\times 10^{-6}$	CL=90%
Γ_{124}	$D^+ \rightarrow \pi^+ e^- \mu^+$	LF	< 3.6	$\times 10^{-6}$	CL=90%
Γ_{125}	$D^+ \rightarrow K^+ e^+ \mu^-$	LF	< 1.2	$\times 10^{-6}$	CL=90%
Γ_{126}	$D^+ \rightarrow K^+ e^- \mu^+$	LF	< 2.8	$\times 10^{-6}$	CL=90%
Γ_{127}	$D^+ \rightarrow \pi^- 2e^+$	L	< 1.1	$\times 10^{-6}$	CL=90%
Γ_{128}	$D^+ \rightarrow \pi^- 2\mu^+$	L	< 2.0	$\times 10^{-6}$	CL=90%
Γ_{129}	$D^+ \rightarrow \pi^- e^+ \mu^+$	L	< 2.0	$\times 10^{-6}$	CL=90%
Γ_{130}	$D^+ \rightarrow \rho^- 2\mu^+$	L	< 5.6	$\times 10^{-4}$	CL=90%
Γ_{131}	$D^+ \rightarrow K^- 2e^+$	L	< 9	$\times 10^{-7}$	CL=90%
Γ_{132}	$D^+ \rightarrow K^- 2\mu^+$	L	< 1.0	$\times 10^{-5}$	CL=90%
Γ_{133}	$D^+ \rightarrow K^- e^+ \mu^+$	L	< 1.9	$\times 10^{-6}$	CL=90%
Γ_{134}	$D^+ \rightarrow K^*(892)^- 2\mu^+$	L	< 8.5	$\times 10^{-4}$	CL=90%
Γ_{135}	Unaccounted decay modes		(51.2 ± 1.0)	%	

[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 $D^+ \rightarrow K^- 2\pi^+ \pi^0$ and $K_S^0 2\pi^+ \pi^-$ 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 $\Delta C=1$ weak neutral current, but leads to the $\pi^+ \ell^+ \ell^-$ final state.
- [f] This mode is not a useful test for a $\Delta C=1$ weak neutral current because both quarks must change flavor in this decay.

CONSTRAINED FIT INFORMATION

An overall fit to 22 branching ratios uses 31 measurements and one constraint to determine 15 parameters. The overall fit has a $\chi^2 = 32.1$ for 17 degrees of freedom.

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

x_{29}	0										
x_{34}	0	3									
x_{35}	22	0	0								
x_{38}	6	0	0	1							
x_{40}	15	0	0	3	44						
x_{50}	5	0	0	1	14	31					
x_{54}	6	0	0	1	18	40	56				
x_{55}	7	0	0	2	22	50	50	0			
x_{56}	3	0	0	1	10	24	7	10	12		
x_{83}	3	0	0	1	10	22	7	9	11	76	
x_{89}	6	0	0	1	75	38	12	15	19	9	
x_{90}	10	0	0	2	29	66	24	38	36	16	
x_{106}	2	0	0	0	6	13	4	5	6	3	
x_{135}	-75	-4	-15	-32	-32	-58	-54	-48	-42	-20	
	x_{16}	x_{29}	x_{34}	x_{35}	x_{38}	x_{40}	x_{50}	x_{54}	x_{55}	x_{56}	
x_{89}	8										
x_{90}	14	25									
x_{106}	3	5	9								
x_{135}	-18	-27	-43	-8							
	x_{83}	x_{89}	x_{90}	x_{106}							

D^+ BRANCHING RATIOS

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

———— c -quark decays ————

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

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

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.103 ± 0.009 $_{-0.008}^{+0.009}$	378	³ ABBIENDI	99K OPAL	$Z^0 \rightarrow c\bar{c}$

³ ABBIENDI 99K uses the excess of right-sign over wrong-sign leptons opposite reconstructed $D^*(2010)^+ \rightarrow D^0 \pi^+$ decays in $Z^0 \rightarrow c\bar{c}$.

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

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

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.082 ± 0.005 OUR AVERAGE				
$0.073 \pm 0.008 \pm 0.002$	73	KAYIS-TOPAK.05	CHRS	ν_μ emulsion
0.095 ± 0.007 $_{-0.013}^{+0.014}$	2829	ASTIER	00D NOMD	$\nu_\mu \text{ Fe} \rightarrow \mu^- \mu^+ X$
0.090 ± 0.007 $_{-0.006}^{+0.007}$	476	⁴ ABBIENDI	99K OPAL	$Z^0 \rightarrow c\bar{c}$
0.086 ± 0.017 $_{-0.007}^{+0.008}$	69	⁵ 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 ± 0.012 $_{-0.01}^{+0.02}$		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

⁴ ABBIENDI 99K uses the excess of right-sign over wrong-sign leptons opposite reconstructed $D^*(2010)^+ \rightarrow D^0 \pi^+$ decays in $Z^0 \rightarrow c\bar{c}$.

⁵ ALBRECHT 92F uses the excess of right-sign over wrong-sign leptons in a sample of events tagged by fully reconstructed $D^*(2010)^+ \rightarrow D^0 \pi^+$ decays.

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

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

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.096 ± 0.004 OUR AVERAGE				
$0.0958 \pm 0.0042 \pm 0.0028$	1828	⁶ ABREU	000 DLPH	$Z^0 \rightarrow c\bar{c}$
0.095 ± 0.006 $_{-0.006}^{+0.007}$	854	⁷ ABBIENDI	99K OPAL	$Z^0 \rightarrow c\bar{c}$

⁶ ABREU 000 uses leptons opposite fully reconstructed $D^*(2010)^+$, D^+ , or D^0 mesons.

⁷ ABBIENDI 99K uses the excess of right-sign over wrong-sign leptons opposite reconstructed $D^*(2010)^+ \rightarrow D^0 \pi^+$ decays in $Z^0 \rightarrow c\bar{c}$.

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.255 ± 0.015 ± 0.008	2371	⁸ ABREU	000	DLPH $Z^0 \rightarrow c\bar{c}$

⁸ ABREU 000 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 $\bar{K}^0 e^+ \nu_e$, $\bar{K}^*(892)^0 e^+ \nu_e$, $\pi^0 e^+ \nu_e$, $\eta e^+ \nu_e$, $\rho^0 e^+ \nu_e$, and $\omega e^+ \nu_e$ branching fractions is $15.3 \pm 0.4\%$.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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16.07 ± 0.30 OUR AVERAGE

16.13 ± 0.10 ± 0.29	26.2 ± 0.2k	⁹ 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	¹⁰ ADAM	06A	CLEO See ASNER 10
17.0 ± 1.9 ± 0.7	158	BALTRUSAIT ..85B	MRK3	$e^+ e^-$ 3.77 GeV

⁹ Using the D^+ and D^0 lifetimes, ASNER 10 finds that the ratio of the D^+ and D^0 semileptonic widths is $0.985 \pm 0.015 \pm 0.024$.

¹⁰ Using the D^+ and D^0 lifetimes, ADAM 06A finds that the ratio of the D^+ and D^0 inclusive e^+ widths is $0.985 \pm 0.028 \pm 0.015$, consistent with the isospin-invariance prediction of 1.

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

Γ_2 / Γ

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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17.6 ± 2.7 ± 1.8	100 ± 12	¹¹ ABLIKIM	08L	BES2 $e^+ e^- \approx \psi(3772)$
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¹¹ ABLIKIM 08L finds the ratio of $D^+ \rightarrow \mu^+ X$ and $D^0 \rightarrow \mu^+ X$ branching fractions to be $2.59 \pm 0.70 \pm 0.25$, 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
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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

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

Γ_4 / Γ

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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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
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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

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

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

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

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

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

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

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

This ratio includes η particles from η' decays.

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

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

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

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

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

————— **Leptonic and semileptonic modes** —————

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

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<8.8 × 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 × 10 ⁻⁵	90	ARTUSO	05A CLEO	See EISENSTEIN 08
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$\Gamma(\mu^+ \nu_\mu)/\Gamma_{\text{total}}$ Γ_{13}/Γ

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

<u>VALUE (units 10⁻⁴)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.82± 0.32±0.09	150 ± 12	¹² EISENSTEIN	08 CLEO	e^+e^- at $\psi(3770)$

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

12.2 $\begin{smallmatrix} +11.1 \\ -5.3 \end{smallmatrix}$ ±1.0	3	¹³ ABLIKIM	05D BES	$e^+e^- \approx 3.773$ GeV
4.40± 0.66 $\begin{smallmatrix} +0.09 \\ -0.12 \end{smallmatrix}$	47 ± 7	¹⁴ ARTUSO	05A CLEO	See EISENSTEIN 08
3.5 ± 1.4 ±0.6	7	¹⁵ BONVICINI	04A CLEO	Incl. in ARTUSO 05A
8 $\begin{smallmatrix} +16 \\ -5 \end{smallmatrix}$ $\begin{smallmatrix} +5 \\ -2 \end{smallmatrix}$	1	¹⁶ BAI	98B BES	$e^+e^- \rightarrow D^{*+} D^-$

- ¹² EISENSTEIN 08, using the D^+ lifetime and assuming $|V_{cd}| = |V_{us}|$, gets $f_{D^+} = (205.8 \pm 8.5 \pm 2.5)$ MeV from this measurement.
- ¹³ 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.
- ¹⁴ ARTUSO 05A obtains $f_{D^+} = 222.6 \pm 16.7^{+2.8}_{-3.4}$ MeV from this measurement.
- ¹⁵ BONVICINI 04A finds eight events with an estimated background of one, and from the branching fraction obtains $f_{D^+} = 202 \pm 41 \pm 17$ MeV.
- ¹⁶ BAI 98B obtains $f_{D^+} = (300^{+180+80}_{-150-40})$ MeV from this measurement.

$\Gamma(\tau^+ \nu_\tau)/\Gamma_{\text{total}}$					Γ_{14}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<1.2 \times 10^{-3}$	90	EISENSTEIN 08	CLEO	$e^+ e^-$ at $\psi(3770)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.1 \times 10^{-3}$	90	RUBIN 06A	CLEO	See EISENSTEIN 08	

$\Gamma(\bar{K}^0 e^+ \nu_e)/\Gamma_{\text{total}}$					Γ_{15}/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
8.83±0.22 OUR AVERAGE					
8.83±0.10±0.20	8467	¹⁷ BESSON	09	CLEO $e^+ e^-$ at $\psi(3770)$	
8.95±1.59±0.67	34 ± 6	¹⁸ ABLIKIM	05A	BES $e^+ e^-$ at $\psi(3770)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
8.53±0.13±0.23		¹⁹ DOBBS	08	CLEO See BESSON 09	
8.71±0.38±0.37	545 ± 24	HUANG	05B	CLEO See DOBBS 08	

- ¹⁷ See the form-factor parameters near the end of this D^+ Listing.
- ¹⁸ 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 $\Gamma(D^0 \rightarrow K^- e^+ \nu_e) / \Gamma(D^+ \rightarrow \bar{K}^0 e^+ \nu_e) = 1.08 \pm 0.22 \pm 0.07$; isospin invariance predicts the ratio is 1.0.
- ¹⁹ DOBBS 08 establishes $|\frac{V_{cd}}{V_{cs}} \cdot \frac{f_+^\pi(0)}{f_+^K(0)}| = 0.188 \pm 0.008 \pm 0.002$ from the D^+ and D^0 decays to $\bar{K} e^+ \nu_e$ and $\pi e^+ \nu_e$. It also finds $\Gamma(D^0 \rightarrow K^- e^+ \nu_e) / \Gamma(D^+ \rightarrow \bar{K}^0 e^+ \nu_e) = 1.06 \pm 0.02 \pm 0.03$; isospin invariance predicts the ratio is 1.0.

$\Gamma(\bar{K}^0 \mu^+ \nu_\mu)/\Gamma_{\text{total}}$					Γ_{16}/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.092±0.006 OUR FIT					
0.103±0.023±0.008	29 ± 6	ABLIKIM	07	BES2 $e^+ e^-$ at 3773 MeV	

$\Gamma(\bar{K}^0 \mu^+ \nu_\mu)/\Gamma(K^- 2\pi^+)$					Γ_{16}/Γ_{40}
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
1.00 ±0.07 OUR FIT					
1.019±0.076±0.065	555 ± 39	LINK	04E	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV	

$\Gamma(K^- \pi^+ e^+ \nu_e)/\Gamma_{\text{total}}$					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±0.75±0.27	29 ± 6	ABLIKIM	060	BES2 $e^+ e^-$ at 3773 MeV	
3.5 $^{+1.2}_{-0.7}$ ±0.4	14	BAI	91	MRK3 $e^+ e^- \approx 3.77$ GeV	

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.4380 ± 0.0036 ± 0.0042	70k ± 363	DEL-AMO-SA..11I	BABR	$e^+ e^- \approx 10.6$ GeV

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

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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5.52 ± 0.15 OUR FIT

5.52 ± 0.07 ± 0.13 $\approx 5k$ BRIERE 10 CLEO $e^+ e^-$ at $\psi(3770)$

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

5.06 ± 1.21 ± 0.40 28 ± 7 ABLIKIM 06O BES2 $e^+ e^-$ at 3773 MeV

5.56 ± 0.27 ± 0.23 422 ± 21 ²⁰HUANG 05B CLEO $e^+ e^-$ at $\psi(3770)$

²⁰HUANG 05B finds $\Gamma(D^0 \rightarrow K^{*-} e^+ \nu_e) / \Gamma(D^+ \rightarrow \bar{K}^{*0} e^+ \nu_e) = 0.98 \pm 0.08 \pm 0.04$; isospin invariance predicts the ratio is 1.0.

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

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.74 ± 0.04 ± 0.05 BRANDENB... 02 CLEO $e^+ e^- \approx \Upsilon(4S)$

0.62 ± 0.15 ± 0.09 35 ADAMOVICH 91 OMEG π^- 340 GeV

0.55 ± 0.08 ± 0.10 880 ALBRECHT 91 ARG $e^+ e^- \approx 10.4$ GeV

0.49 ± 0.04 ± 0.05 ANJOS 89B E691 Photoproduction

$\Gamma(\bar{K}^*(892)^0 e^+ \nu_e, \bar{K}^*(892)^0 \rightarrow K^- \pi^+) / \Gamma(K^- \pi^+ e^+ \nu_e)$ $\Gamma_{18} / \Gamma_{17}$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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94.11 ± 0.74 ± 0.75 DEL-AMO-SA..11I BABR $e^+ e^- \approx 10.6$ GeV

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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5.79 ± 0.16 ± 0.15 DEL-AMO-SA..11I BABR $e^+ e^- \approx 10.6$ GeV

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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< 6 × 10⁻³ 90 DEL-AMO-SA..11I BABR $e^+ e^- \approx 10.6$ GeV

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

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

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

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

$\Gamma(K^- \pi^+ \mu^+ \nu_\mu) / \Gamma(\bar{K}^0 \mu^+ \nu_\mu)$ $\Gamma_{23} / \Gamma_{16}$

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

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
5.28 ± 0.15 OUR FIT				
5.27 ± 0.07 ± 0.14	$\approx 5k$	BRIERE	10	CLEO $e^+ e^-$ at $\psi(3770)$

$\Gamma(\bar{K}^*(892)^0 \mu^+ \nu_\mu) / \Gamma(\bar{K}^0 \mu^+ \nu_\mu)$ $\Gamma_{35} / \Gamma_{16}$

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.58 ± 0.04 OUR FIT				
0.594 ± 0.043 ± 0.033	555 ± 39	LINK	04E	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

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

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.578 ± 0.021 OUR FIT	Error includes scale factor of 1.1.			
0.57 ± 0.06 OUR AVERAGE	Error includes scale factor of 1.2.			
0.72 ± 0.10 ± 0.05		BRANDENB... 02	CLEO	$e^+ e^- \approx \gamma(4S)$
0.56 ± 0.04 ± 0.06	875	FRABETTI 93E	E687	γ Be $\bar{E}_\gamma \approx 200$ 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	²¹ LINK	02J	FOCS γ nucleus, ≈ 180 GeV

²¹ This LINK 02J result includes the effects of an interference of a small S -wave $K^- \pi^+$ amplitude with the dominant \bar{K}^{*0} amplitude. (The interference effect is reported in LINK 02E.) This result is redundant with results of LINK 04E elsewhere in these Listings.

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0530 ± 0.0074^{+0.0099}_{-0.0096}	14k	LINK	05I	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

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

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

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

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<0.0064	90	LINK	05I	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

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

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<0.04	90	LINK	05I	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ 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	22 BESSON	09 CLEO	$e^+ e^-$ at $\psi(3770)$
0.373 ± 0.022 ± 0.013		23 DOBBS	08 CLEO	See BESSON 09
0.44 ± 0.06 ± 0.03	63 ± 9	HUANG	05B CLEO	See DOBBS 08

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

²² See the form-factor parameters near the end of this D^+ Listing.

²³ DOBBS 08 establishes $|\frac{V_{cd}}{V_{cs}} \cdot \frac{f_+^{\pi(0)}}{f_+^{K(0)}}| = 0.188 \pm 0.008 \pm 0.002$ from the D^+ and D^0 decays to $\bar{K} e^+ \nu_e$ and $\pi e^+ \nu_e$. It finds $\Gamma(D^0 \rightarrow \pi^- e^+ \nu_e) / \Gamma(D^+ \rightarrow \pi^0 e^+ \nu_e) = 2.03 \pm 0.14 \pm 0.08$; 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 $\psi(3770)$
13.3 ± 2.0 ± 0.6	46 ± 8	MITCHELL	09B CLEO	See YELTON 11

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

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0022 ± 0.0004 OUR FIT				
0.0021 ± 0.0004 ± 0.0001	27 ± 6	24 HUANG	05B CLEO	$e^+ e^-$ at $\psi(3770)$

²⁴ HUANG 05B finds $\Gamma(D^0 \rightarrow \rho^- e^+ \nu_e) / 2 \Gamma(D^+ \rightarrow \rho^0 e^+ \nu_e) = 1.2_{-0.3}^{+0.4} \pm 0.1$; isospin invariance predicts the ratio is 1.0.

$\Gamma(\rho^0 e^+ \nu_e) / \Gamma(\bar{K}^*(892)^0 e^+ \nu_e)$ $\Gamma_{29} / \Gamma_{34}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.039 ± 0.007 OUR FIT				
0.045 ± 0.014 ± 0.009	49	25 AITALA	97 E791	π^- nucleus, 500 GeV

²⁵ AITALA 97 explicitly subtracts $D^+ \rightarrow \eta' e^+ \nu_e$ and other backgrounds to get this result.

$\Gamma(\rho^0 \mu^+ \nu_\mu) / \Gamma(\bar{K}^*(892)^0 \mu^+ \nu_\mu)$ $\Gamma_{30} / \Gamma_{35}$

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, $\bar{E}_\gamma \approx 180$ GeV
0.051 ± 0.015 ± 0.009	54	26 AITALA	97 E791	π^- nucleus, 500 GeV
0.079 ± 0.019 ± 0.013	39	27 FRABETTI	97 E687	γ Be, $\bar{E}_\gamma \approx 220$ GeV

²⁶ AITALA 97 explicitly subtracts $D^+ \rightarrow \eta' \mu^+ \nu_\mu$ and other backgrounds to get this result.

²⁷ 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.

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$0.0016^{+0.0007}_{-0.0006} \pm 0.0001$	$7.6^{+3.3}_{-2.7}$	HUANG	05B CLEO	$e^+ e^-$ at $\psi(3770)$

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
$2.16 \pm 0.53 \pm 0.07$		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

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

Unseen decay modes of the ϕ are included.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<0.9 \times 10^{-4}$	90	YELTON	11 CLEO	$e^+ e^-$ at $\psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1.6 $\times 10^{-4}$	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 \bar{K} or $\bar{K}K\bar{K}$ —————

$\Gamma(K_S^0 \pi^+)/\Gamma_{\text{total}}$ Γ_{38}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.526 \pm 0.022 \pm 0.038$		²⁸ DOBBS	07 CLEO	See MENDEZ 10
$1.55 \pm 0.05 \pm 0.06$	2230 ± 60	²⁸ HE	05 CLEO	See DOBBS 07
$1.6 \pm 0.3 \pm 0.1$	161	ADLER	88C MRK3	$e^+ e^-$ 3.77 GeV
²⁸ DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.				

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.161 ± 0.007 OUR FIT				Error includes scale factor of 3.4.
0.158 ± 0.007 OUR AVERAGE				Error includes scale factor of 3.2.
$0.1682 \pm 0.0012 \pm 0.0037$	30k	MENDEZ	10 CLEO	$e^+ e^-$ at 3774 MeV
$0.1530 \pm 0.0023 \pm 0.0016$	10.6k	LINK	02B FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.174 \pm 0.012 \pm 0.011$	473	²⁹ BISHAI	97 CLEO	$e^+ e^- \approx \Upsilon(4S)$
$0.137 \pm 0.015 \pm 0.016$	264	ANJOS	90C E691	Photoproduction
²⁹ See BISHAI 97 for an isospin analysis of $D^+ \rightarrow \bar{K}\pi$ amplitudes.				

$\Gamma(K_L^0 \pi^+)/\Gamma_{\text{total}}$ Γ_{39}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.460 $\pm 0.040 \pm 0.035$	2023 ± 54	³⁰ HE	08 CLEO	$e^+ e^-$ at $\psi(3770)$
³⁰ The difference of CLEO $D^+ \rightarrow K_S^0 \pi^+$ and $K_L^0 \pi^+$ branching fractions over the sum (DOBBS 07 and HE 08) is $+0.022 \pm 0.016 \pm 0.018$.				

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

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

9.13±0.19 OUR FIT

9.14±0.10±0.17 ³¹ DOBBS 07 CLEO $e^+ e^-$ at $\psi(3770)$

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

9.5 ±0.2 ±0.3 15.1k±130 ³¹ HE 05 CLEO See DOBBS 07

9.3 ±0.6 ±0.8 1502 ³² BALEST 94 CLEO $e^+ e^- \approx \Upsilon(4S)$

6.4 ^{+1.5}_{-1.4} ³³ 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 ³⁴ SCHINDLER 81 MRK2 $e^+ e^-$ 3.771 GeV

³¹ DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

³² BALEST 94 measures the ratio of $D^+ \rightarrow K^- \pi^+ \pi^+$ and $D^0 \rightarrow K^- \pi^+$ branching fractions to be $2.35 \pm 0.16 \pm 0.16$ and uses their absolute measurement of the $D^0 \rightarrow K^- \pi^+$ fraction (AKERIB 93).

³³ BARLAG 92C computes the branching fraction by topological normalization.

³⁴ SCHINDLER 81 (MARK-2) measures $\sigma(e^+ e^- \rightarrow \psi(3770)) \times$ 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.

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

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

VALUE DOCUMENT ID TECN COMMENT

0.801 ±0.012 OUR AVERAGE

0.8024±0.0138±0.0043 ³⁵ LINK 09 FOCS MIPWA fit, 53k evts

0.838 ±0.038 ³⁶ 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 ³⁷ LINK 07B FOCS See LINK 09

³⁵ This LINK 09 model-independent partial-wave analysis of the $K^- \pi^+$ S-wave slices the $K^- \pi^+$ mass range into 39 bins.

³⁶ 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 $\bar{K}_0^*(1430)^0$.

³⁷ This LINK 07B fit uses a K matrix. The $K^- \pi^+$ S-wave fit fraction given above breaks down into $(207.3 \pm 25.5 \pm 12.4)\%$ isospin-1/2 and $(40.5 \pm 9.6 \pm 3.2)\%$ isospin-3/2 — with large interference between the two. The isospin-1/2 component includes the κ (or $\bar{K}_0^*(800)^0$) and $\bar{K}_0^*(1430)^0$.

$\Gamma(\bar{K}_0^*(800)^0 \pi^+, \bar{K}_0^*(800) \rightarrow K^- \pi^+)/\Gamma(K^- 2\pi^+)$ 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

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

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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	³⁸ 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 γ Be 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

³⁸The statistical error on this LINK 07B value is corrected in LINK 09.

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

<u>VALUE (units 10⁻³)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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

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

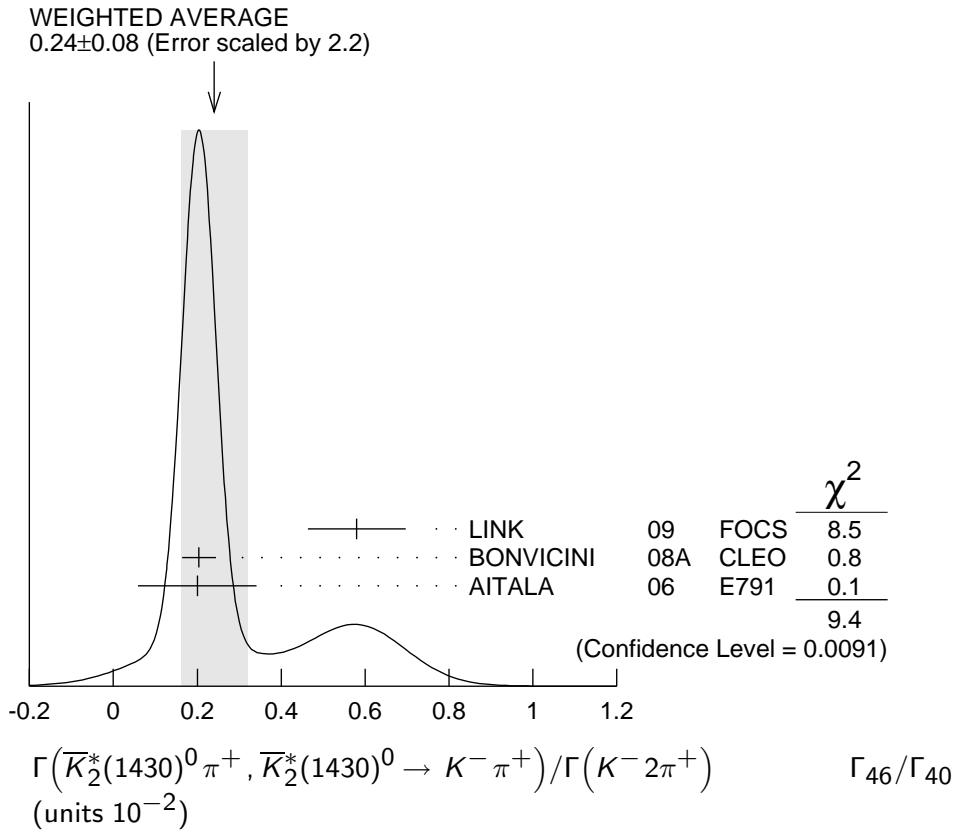
This is the "fit fraction" from the Dalitz-plot analysis.

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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 γ Be 90–260 GeV

$\Gamma(\bar{K}_2^*(1430)^0 \pi^+, \bar{K}_2^*(1430)^0 \rightarrow K^- \pi^+)/\Gamma(K^- 2\pi^+)$ Γ_{46}/Γ_{40}

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

<u>VALUE (units 10⁻²)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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



$\Gamma(\bar{K}^*(1680)^0 \pi^+, \bar{K}^*(1680)^0 \rightarrow K^- \pi^+) / \Gamma(K^- 2\pi^+)$ **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 γ Be 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

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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6.99 ± 0.27 OUR FIT

6.99 ± 0.09 ± 0.25 ³⁹ DOBBS 07 CLEO $e^+ e^-$ at $\psi(3770)$

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

7.2 ± 0.2 ± 0.4 5090 ± 100 ³⁹ HE 05 CLEO See DOBBS 07

5.1 ± 1.3 ± 0.8 159 ADLER 88C MRK3 $e^+ e^-$ 3.77 GeV

³⁹ DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

$\Gamma(K_S^0 \rho^+) / \Gamma(K_S^0 \pi^+ \pi^0)$ $\Gamma_{51} / \Gamma_{50}$

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

VALUE	DOCUMENT ID	TECN	COMMENT
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0.68 ± 0.08 ± 0.12 ADLER 87 MRK3 $e^+ e^-$ 3.77 GeV

$\Gamma(\bar{K}^*(892)^0 \pi^+, \bar{K}^*(892)^0 \rightarrow K_S^0 \pi^0) / \Gamma(K_S^0 \pi^+ \pi^0)$ $\Gamma_{52} / \Gamma_{50}$

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

VALUE	DOCUMENT ID	TECN	COMMENT
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0.19 ± 0.06 ± 0.06 ADLER 87 MRK3 $e^+ e^-$ 3.77 GeV

$\Gamma(K_S^0 \pi^+ \pi^0 \text{ nonresonant}) / \Gamma(K_S^0 \pi^+ \pi^0)$ $\Gamma_{53} / \Gamma_{50}$

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

VALUE	DOCUMENT ID	TECN	COMMENT
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0.13 ± 0.07 ± 0.08 ADLER 87 MRK3 $e^+ e^-$ 3.77 GeV

$\Gamma(K^- 2\pi^+ \pi^0) / \Gamma_{\text{total}}$ Γ_{54} / 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
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5.99 ± 0.18 OUR FIT

5.98 ± 0.08 ± 0.16 ⁴⁰ DOBBS 07 CLEO $e^+ e^-$ at $\psi(3770)$

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

6.0 ± 0.2 ± 0.2 4840 ± 100 ⁴⁰ HE 05 CLEO See DOBBS 07

5.8 ± 1.2 ± 1.2 142 COFFMAN 92B MRK3 $e^+ e^-$ 3.77 GeV

6.3 $\begin{matrix} +1.4 \\ -1.3 \end{matrix}$ ± 1.2 175 BALTRUSAIT..86E MRK3 See COFFMAN 92B

⁴⁰ DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

$\Gamma(K_S^0 2\pi^+ \pi^-) / \Gamma_{\text{total}}$ Γ_{55} / 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
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3.12 ± 0.11 OUR FIT

3.122 ± 0.046 ± 0.096 ⁴¹ DOBBS 07 CLEO $e^+ e^-$ at $\psi(3770)$

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

3.2 $\pm 0.1 \pm 0.2$ 3210 ± 85 ⁴¹ HE 05 CLEO See DOBBS 07

2.1 $\begin{matrix} +1.0 \\ -0.9 \end{matrix}$ ⁴² BARLAG 92C ACCM π^- Cu 230 GeV

3.3 $\pm 0.8 \pm 0.2$ 168 ADLER 88C MRK3 e^+e^- 3.77 GeV

⁴¹ DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

⁴² BARLAG 92C computes the branching fraction by topological normalization.

$\Gamma(K^- 3\pi^+ \pi^-) / \Gamma(K^- 2\pi^+)$ $\Gamma_{56} / \Gamma_{40}$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.061 \pm 0.005 OUR FIT Error includes scale factor of 1.1.

0.062 \pm 0.008 OUR AVERAGE Error includes scale factor of 1.3.

0.058 \pm 0.002 \pm 0.006	2923	LINK	03D FOCS	γ A, $\bar{E}_\gamma \approx 180$ GeV
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0.077 \pm 0.008 \pm 0.010	239	FRABETTI	97C E687	γ Be, $\bar{E}_\gamma \approx 200$ GeV
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.09 \pm 0.01 \pm 0.01	113	ANJOS	90D E691	Photoproduction
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$\Gamma(\bar{K}^*(892)^0 2\pi^+ \pi^-, \bar{K}^*(892)^0 \rightarrow K^- \pi^+) / \Gamma(K^- 3\pi^+ \pi^-)$ $\Gamma_{57} / \Gamma_{56}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.21 \pm 0.04 \pm 0.06	LINK	03D FOCS	γ A, $\bar{E}_\gamma \approx 180$ GeV
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$\Gamma(\bar{K}^*(892)^0 \rho^0 \pi^+, \bar{K}^*(892)^0 \rightarrow K^- \pi^+) / \Gamma(K^- 3\pi^+ \pi^-)$ $\Gamma_{58} / \Gamma_{56}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.40 \pm 0.03 \pm 0.06	LINK	03D FOCS	γ A, $\bar{E}_\gamma \approx 180$ GeV
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$\Gamma(\bar{K}^*(892)^0 \rho^0 \pi^+, \bar{K}^*(892)^0 \rightarrow K^- \pi^+) / \Gamma(K^- 2\pi^+)$ $\Gamma_{58} / \Gamma_{40}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.016 \pm 0.007 \pm 0.004	FRABETTI	97C E687	γ Be, $\bar{E}_\gamma \approx 200$ GeV
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$\Gamma(\bar{K}^*(892)^0 2\pi^+ \pi^- \text{no-}\rho, \bar{K}^*(892)^0 \rightarrow K^- \pi^+) / \Gamma(K^- 2\pi^+)$ $\Gamma_{60} / \Gamma_{40}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.032 \pm 0.010 \pm 0.008	FRABETTI	97C E687	γ Be, $\bar{E}_\gamma \approx 200$ GeV
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$\Gamma(K^- \rho^0 2\pi^+) / \Gamma(K^- 3\pi^+ \pi^-)$ $\Gamma_{61} / \Gamma_{56}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.30 \pm 0.04 \pm 0.01	LINK	03D FOCS	γ A, $\bar{E}_\gamma \approx 180$ GeV
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$\Gamma(K^- \rho^0 2\pi^+) / \Gamma(K^- 2\pi^+)$ $\Gamma_{61} / \Gamma_{40}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.034 \pm 0.009 \pm 0.005	FRABETTI	97C E687	γ Be, $\bar{E}_\gamma \approx 200$ GeV
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$\Gamma(\bar{K}^*(892)^0 a_1(1260)^+)/\Gamma(K^- 2\pi^+)$ Γ_{59}/Γ_{40}

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

VALUE	DOCUMENT ID	TECN	COMMENT
0.099 ± 0.008 ± 0.018	LINK	03D FOCS	γ A, $\bar{E}_\gamma \approx 180$ GeV

$\Gamma(K^- 3\pi^+ \pi^- \text{ nonresonant})/\Gamma(K^- 3\pi^+ \pi^-)$ Γ_{62}/Γ_{56}

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
0.07 ± 0.05 ± 0.01		LINK	03D FOCS	γ A, $\bar{E}_\gamma \approx 180$ GeV

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

<0.026	90	FRABETTI	97C E687	γ Be, $\bar{E}_\gamma \approx 200$ GeV
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$\Gamma(K^+ 2K_S^0)/\Gamma(K^- 2\pi^+)$ Γ_{63}/Γ_{40}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.049 ± 0.022 OUR AVERAGE				Error includes scale factor of 2.4.
0.035 ± 0.010 ± 0.005	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

$\Gamma(K^+ K^- K_S^0 \pi^+)/\Gamma(K_S^0 2\pi^+ \pi^-)$ Γ_{64}/Γ_{55}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
7.7 ± 1.5 ± 0.9	35 ± 7	LINK	01C FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

———— Pionic modes ————

$\Gamma(\pi^+ \pi^0)/\Gamma(K^- 2\pi^+)$ Γ_{65}/Γ_{40}

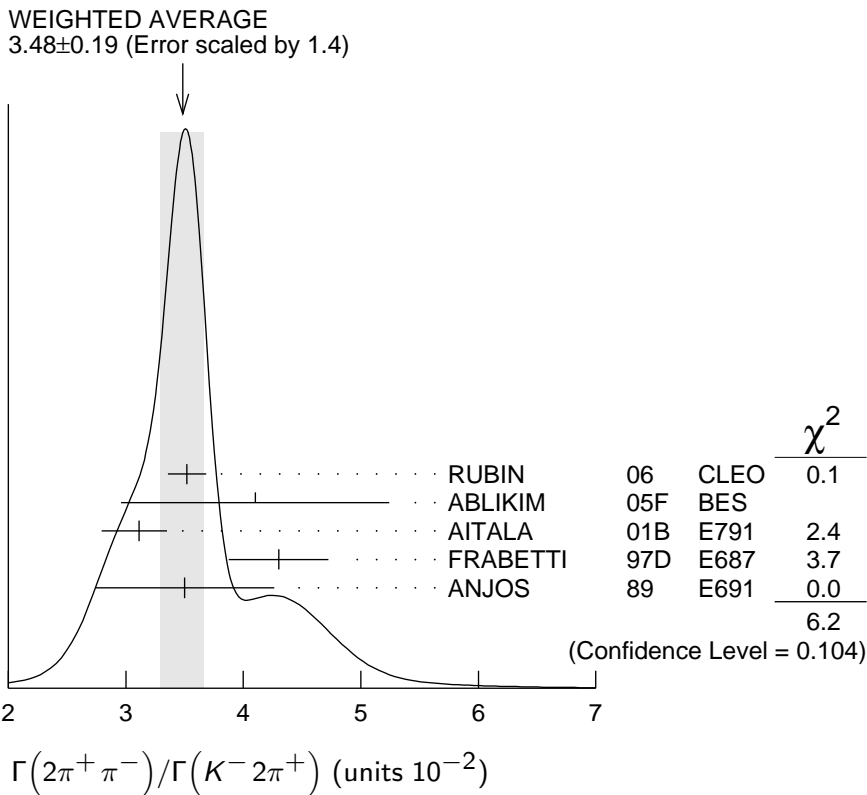
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.31 ± 0.06 OUR AVERAGE				
1.29 ± 0.04 ± 0.05	2649 ± 76	MENDEZ	10 CLEO	$e^+ e^-$ at 3774 MeV
1.33 ± 0.11 ± 0.09	1229 ± 99	AUBERT,B	06F BABR	$e^+ e^- \approx \Upsilon(4S)$
1.44 ± 0.19 ± 0.10	171 ± 22	ARMS	04 CLEO	$e^+ e^- \approx 10$ GeV

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

1.33 ± 0.07 ± 0.06	914 ± 46	RUBIN	06 CLEO	See MENDEZ 10
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$\Gamma(2\pi^+ \pi^-)/\Gamma(K^- 2\pi^+)$ Γ_{66}/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 ± 0.11 ± 0.12	3303 ± 95	RUBIN	06 CLEO	$e^+ e^-$ at $\psi(3770)$
4.1 ± 1.1 ± 0.3	85 ± 22	ABLIKIM	05F BES	$e^+ e^- \approx \psi(3770)$
3.11 ± 0.18 $^{+0.16}_{-0.26}$	1172	AITALA	01B E791	π^- nucleus, 500 GeV
4.3 ± 0.3 ± 0.3	236	FRABETTI	97D E687	γ Be ≈ 200 GeV
3.5 ± 0.7 ± 0.3	83	ANJOS	89 E691	Photoproduction

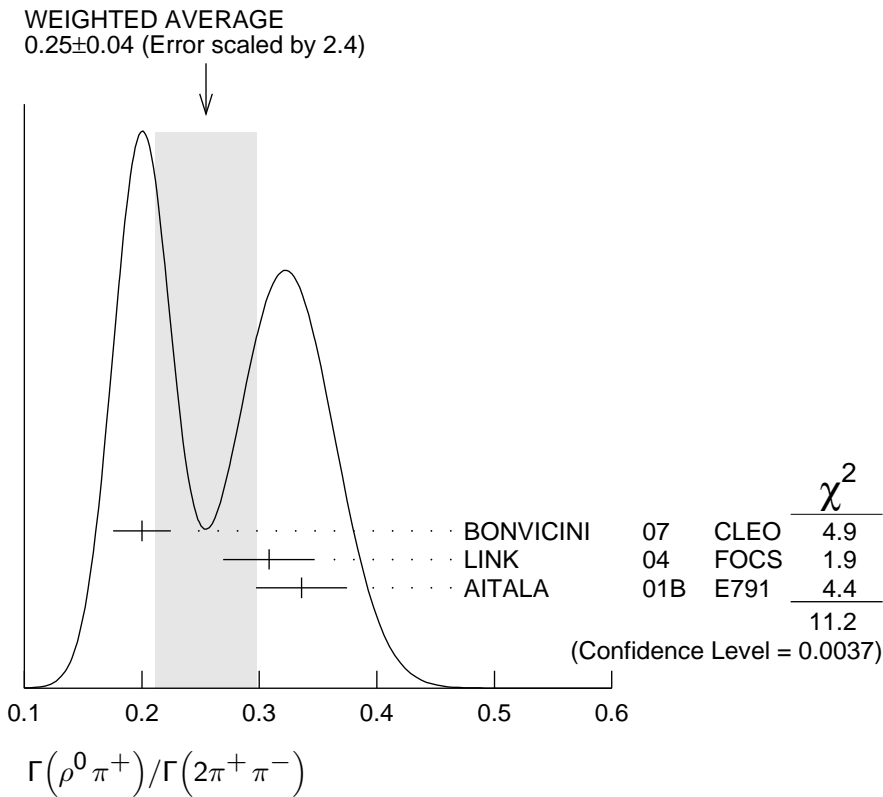


$\Gamma(\rho^0\pi^+)/\Gamma(2\pi^+\pi^-)$

Γ_{67}/Γ_{66}

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



$\Gamma(\pi^+(\pi^+\pi^-)_{S\text{-wave}}) / \Gamma(2\pi^+\pi^-)$ $\Gamma_{68} / \Gamma_{66}$

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$0.5600 \pm 0.0324 \pm 0.0214$	⁴³ LINK	04 FOCS	Dalitz fit, 1527 ± 51 evts

⁴³ LINK 04 borrows a K-matrix parametrization from ANISOVICH 03 of the full $\pi\text{-}\pi$ 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 $f_0(980)$, $f_0(1300)$, $f_0(1200\text{--}1600)$, $f_0(1500)$, and $f_0(1750)$. See LINK 04 for details and discussion.

$\Gamma(\sigma\pi^+, \sigma \rightarrow \pi^+\pi^-) / \Gamma(2\pi^+\pi^-)$ $\Gamma_{69} / \Gamma_{66}$

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

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

$\Gamma(f_0(980)\pi^+, f_0(980) \rightarrow \pi^+\pi^-) / \Gamma(2\pi^+\pi^-)$ $\Gamma_{70} / \Gamma_{66}$

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

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

$\Gamma(f_0(1370)\pi^+, f_0(1370) \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{71}/Γ_{66}

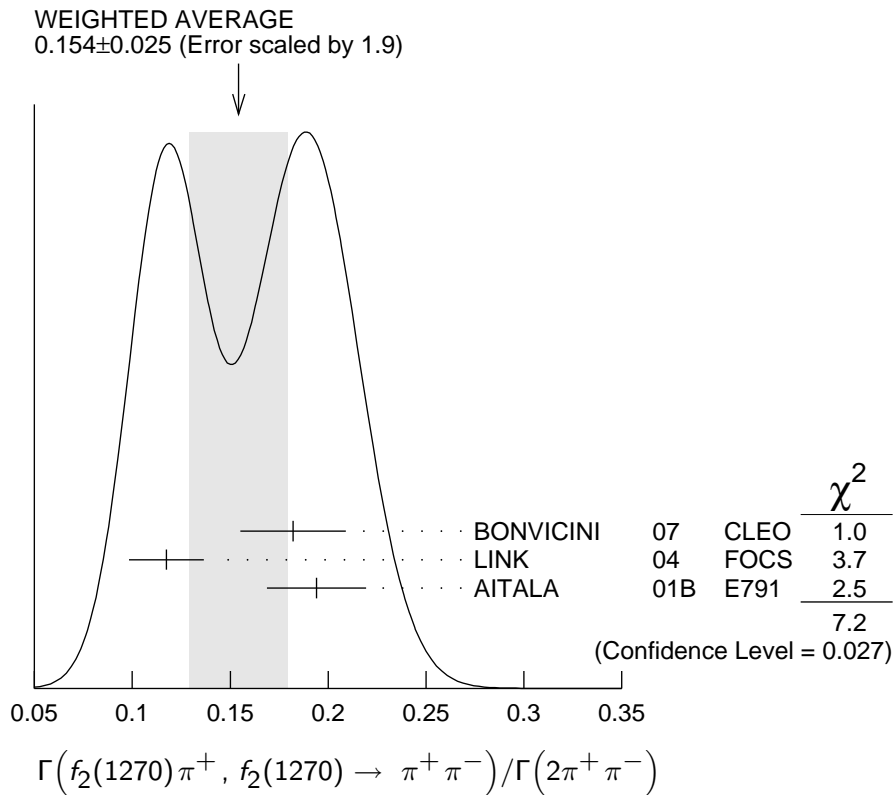
This is the "fit fraction" from the Dalitz-plot analysis.

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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

$\Gamma(f_2(1270)\pi^+, f_2(1270) \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{72}/Γ_{66}

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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



$\Gamma(\rho(1450)^0\pi^+, \rho(1450)^0 \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{73}/Γ_{66}

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

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

$\Gamma(f_0(1500)\pi^+, f_0(1500) \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{74}/Γ_{66}

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.034 ± 0.010 ± 0.008	BONVICINI 07	CLEO	Dalitz fit, ≈ 2240 evts

$\Gamma(f_0(1710)\pi^+, f_0(1710) \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{75}/Γ_{66}

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

$\Gamma(f_0(1790)\pi^+, f_0(1790) \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{76}/Γ_{66}

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

$\Gamma((\pi^+\pi^+)_{S\text{-wave}}\pi^-)/\Gamma(2\pi^+\pi^-)$ Γ_{77}/Γ_{66}

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

$\Gamma(2\pi^+\pi^- \text{ nonresonant})/\Gamma(2\pi^+\pi^-)$ Γ_{78}/Γ_{66}

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 \pm 0.060 \pm 0.027 AITALA 01B E791 Dalitz fit, 1172 evts

$\Gamma(\pi^+2\pi^0)/\Gamma(K^-2\pi^+)$ Γ_{79}/Γ_{40}

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

$\Gamma(2\pi^+\pi^-\pi^0)/\Gamma(K^-2\pi^+)$ Γ_{80}/Γ_{40}

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

$\Gamma(\eta\pi^+)/\Gamma_{\text{total}}$ Γ_{84}/Γ

Unseen decay modes of the η are included.

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
34.3\pm1.4\pm1.7	1033 \pm 42	ARTUSO 08	CLEO	See MENDEZ 10

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

$\Gamma(\eta\pi^+)/\Gamma(K^-2\pi^+)$ Γ_{84}/Γ_{40}

Unseen decay modes of the η are included.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
3.87\pm0.09\pm0.19	2940 \pm 68	MENDEZ 10	CLEO	e^+e^- at 3774 MeV

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

3.81 \pm 0.26 \pm 0.21 377 \pm 26 RUBIN 06 CLEO See ARTUSO 08

$\Gamma(\omega\pi^+)/\Gamma_{\text{total}}$ Γ_{86}/Γ

Unseen decay modes of the ω are included.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<3.4 $\times 10^{-4}$	90	RUBIN 06	CLEO	e^+e^- at $\psi(3770)$

$\Gamma(3\pi^+2\pi^-)/\Gamma(K^-2\pi^+)$ Γ_{83}/Γ_{40}

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

1.77±0.17 OUR FIT

1.73±0.20±0.17 732 ± 77 RUBIN 06 CLEO e^+e^- at $\psi(3770)$

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

2.3 ± 0.4 ± 0.2 58 FRABETTI 97C E687 γ Be, $\bar{E}_\gamma \approx 200$ GeV

$\Gamma(3\pi^+2\pi^-)/\Gamma(K^-3\pi^+\pi^-)$ Γ_{83}/Γ_{56}

VALUE EVTS DOCUMENT ID TECN COMMENT

0.289±0.019 OUR FIT

0.290±0.017±0.011 835 LINK 03D FOCS γ A, $\bar{E}_\gamma \approx 180$ GeV

$\Gamma(\eta\pi^+\pi^0)/\Gamma_{\text{total}}$ Γ_{85}/Γ

VALUE (units 10^{-4}) EVTS DOCUMENT ID TECN COMMENT

13.8±3.1±1.6 149 ± 34 ARTUSO 08 CLEO e^+e^- at $\psi(3770)$

$\Gamma(\eta'(958)\pi^+)/\Gamma_{\text{total}}$ Γ_{87}/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_{87}/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

$\Gamma(\eta'(958)\pi^+\pi^0)/\Gamma_{\text{total}}$ Γ_{88}/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 $K\bar{K}$ pair** —————

$\Gamma(K^+K_S^0)/\Gamma_{\text{total}}$ Γ_{89}/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

$\Gamma(K^+K_S^0)/\Gamma(K_S^0\pi^+)$ Γ_{89}/Γ_{38}

VALUE EVTS DOCUMENT ID TECN COMMENT

0.193 ± 0.007 OUR FIT Error includes scale factor of 3.2.

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, $\bar{E}_\gamma \approx 180$ 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	γ Be $\bar{E}_\gamma \approx 200$ GeV
0.271 ±0.065 ±0.039	69	ANJOS	90C	E691	γ Be
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

$\Gamma(K^+ K_S^0)/\Gamma(K^- 2\pi^+)$

Γ_{89}/Γ_{40}

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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3.11±0.16 OUR FIT Error includes scale factor of 3.3.

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 ⁴⁴ LINK 02B FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

⁴⁴ This LINK 02B result is redundant with a result in the previous datablock.

$\Gamma(K^+ K^- \pi^+)/\Gamma_{\text{total}}$

Γ_{90}/Γ

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.954±0.026 OUR FIT Error includes scale factor of 1.1.

0.935±0.017±0.024 ⁴⁵ DOBBS 07 CLEO e^+e^- at $\psi(3770)$

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

0.97 ±0.04 ±0.04 1250 ± 40 ⁴⁵ HE 05 CLEO See DOBBS 07

⁴⁵ 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_{90}/Γ_{40}

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.1045±0.0022 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 $\begin{smallmatrix} +0.008 \\ -0.006 \end{smallmatrix}$ JUN 00 SELX Σ^- nucleus, 600 GeV

0.0976±0.0042±0.0046 FRABETTI 95B E687 γ Be, $\bar{E}_\gamma \approx 200$ GeV

$\Gamma(\phi\pi^+, \phi \rightarrow K^+ K^-)/\Gamma(K^+ K^- \pi^+)$

Γ_{91}/Γ_{90}

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

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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27.8±0.4 $\begin{smallmatrix} +0.2 \\ -0.5 \end{smallmatrix}$ 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

$\Gamma(K^+ \bar{K}^*(892)^0, \bar{K}^*(892)^0 \rightarrow K^- \pi^+)/\Gamma(K^+ K^- \pi^+)$

Γ_{92}/Γ_{90}

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

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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25.7±0.5 $\begin{smallmatrix} +0.4 \\ -1.2 \end{smallmatrix}$ 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

$\Gamma(K^+ \bar{K}_0^*(1430)^0, \bar{K}_0^*(1430)^0 \rightarrow K^- \pi^+) / \Gamma(K^+ K^- \pi^+)$ $\Gamma_{93} / \Gamma_{90}$

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$18.8 \pm 1.2^{+3.3}_{-3.4}$	RUBIN	08	CLEO Dalitz fit, $19,458 \pm 163$ evts

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

$37.0 \pm 3.5 \pm 1.8$	FRABETTI	95B	E687 Dalitz fit, 915 evts
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$\Gamma(K^+ \bar{K}_2^*(1430)^0, \bar{K}_2^* \rightarrow K^- \pi^+) / \Gamma(K^+ K^- \pi^+)$ $\Gamma_{94} / \Gamma_{90}$

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

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

$\Gamma(K^+ \bar{K}_0^*(800), \bar{K}_0^* \rightarrow K^- \pi^+) / \Gamma(K^+ K^- \pi^+)$ $\Gamma_{95} / \Gamma_{90}$

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, $19,458 \pm 163$ evts

$\Gamma(a_0(1450)^0 \pi^+, a_0^0 \rightarrow K^+ K^-) / \Gamma(K^+ K^- \pi^+)$ $\Gamma_{96} / \Gamma_{90}$

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, $19,458 \pm 163$ evts

$\Gamma(\phi(1680) \pi^+, \phi \rightarrow K^+ K^-) / \Gamma(K^+ K^- \pi^+)$ $\Gamma_{97} / \Gamma_{90}$

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, $19,458 \pm 163$ evts

$\Gamma(K^*(892)^+ K_S^0) / \Gamma(K_S^0 \pi^+)$ $\Gamma_{105} / \Gamma_{38}$

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 $\bar{E}_\gamma \approx 200$ GeV

$\Gamma(\phi \pi^+ \pi^0) / \Gamma_{\text{total}}$ Γ_{102} / Γ

Unseen decay modes of the ϕ are included.

VALUE	DOCUMENT ID	TECN	COMMENT
0.023 ± 0.010	⁴⁶ BARLAG	92C	ACCM π^- Cu 230 GeV

⁴⁶ BARLAG 92C computes the branching fraction using topological normalization.

$\Gamma(\phi \rho^+) / \Gamma(K^- 2\pi^+)$ $\Gamma_{103} / \Gamma_{40}$

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_{104} / Γ

VALUE	DOCUMENT ID	TECN	COMMENT
$0.015^{+0.007}_{-0.006}$	⁴⁷ BARLAG	92C	ACCM π^- Cu 230 GeV

⁴⁷ BARLAG 92C computes the branching fraction using topological normalization.

$\Gamma(K^+ K^- \pi^+ \pi^0 \text{non-}\phi) / \Gamma(K^- 2\pi^+)$ $\Gamma_{104} / \Gamma_{40}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.25	90	ANJOS	89E E691	Photoproduction
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$\Gamma(K^+ K_S^0 \pi^+ \pi^-) / \Gamma(K_S^0 2\pi^+ \pi^-)$ $\Gamma_{99} / \Gamma_{55}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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5.62 ± 0.39 ± 0.40	469 ± 32	LINK	01C FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
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$\Gamma(K_S^0 K^- 2\pi^+) / \Gamma(K_S^0 2\pi^+ \pi^-)$ $\Gamma_{100} / \Gamma_{55}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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7.68 ± 0.41 ± 0.32	670 ± 35	LINK	01C FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
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$\Gamma(K^+ K^- 2\pi^+ \pi^-) / \Gamma(K^- 3\pi^+ \pi^-)$ $\Gamma_{101} / \Gamma_{56}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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0.040 ± 0.009 ± 0.019	38	LINK	03D FOCS	γ A, $\bar{E}_\gamma \approx 180$ GeV
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———— Doubly Cabibbo-suppressed modes ————

$\Gamma(K^+ \pi^0) / \Gamma_{\text{total}}$ Γ_{106} / Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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1.83 ± 0.26 OUR FIT	Error includes scale factor of 1.4.			
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2.52 ± 0.47 ± 0.26	189 ± 37	AUBERT,B	06F BABR	$e^+ e^- \approx \Upsilon(4S)$
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• • • 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
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$\Gamma(K^+ \pi^0) / \Gamma(K^- 2\pi^+)$ $\Gamma_{106} / \Gamma_{40}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
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2.01 ± 0.29 OUR FIT	Error includes scale factor of 1.4.			
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1.9 ± 0.2 ± 0.1	343 ± 37	MENDEZ	10 CLEO	$e^+ e^-$ at 3774 MeV
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$\Gamma(K^+ \eta) / \Gamma(\eta \pi^+)$ $\Gamma_{107} / \Gamma_{84}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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3.06 ± 0.43 ± 0.14	166 ± 23	WON	11 BELL	$e^+ e^- \approx \Upsilon(4S)$
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$\Gamma(K^+ \eta) / \Gamma(K^- 2\pi^+)$ $\Gamma_{107} / \Gamma_{40}$

Unseen decay modes of the η are included.

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.15	90	MENDEZ	10 CLEO	$e^+ e^-$ at 3774 MeV
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$\Gamma(K^+ \eta'(958)) / \Gamma(\eta'(958) \pi^+)$ $\Gamma_{108} / \Gamma_{87}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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3.77 ± 0.39 ± 0.10	180 ± 19	WON	11 BELL	$e^+ e^- \approx \Upsilon(4S)$
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$\Gamma(K^+ \eta'(958))/\Gamma(K^- 2\pi^+)$ Γ_{108}/Γ_{40}

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

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.20	90	MENDEZ	10	CLEO $e^+ e^-$ at 3774 MeV
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$\Gamma(K^+ \pi^+ \pi^-)/\Gamma(K^- 2\pi^+)$ Γ_{109}/Γ_{40}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
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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, $\bar{E}_\gamma \approx 180$ 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 γ Be, $\bar{E}_\gamma = 220$ GeV

$\Gamma(K^+ \rho^0)/\Gamma(K^+ \pi^+ \pi^-)$ $\Gamma_{110}/\Gamma_{109}$

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

VALUE	DOCUMENT ID	TECN	COMMENT
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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

$\Gamma(K^+ f_0(980), f_0(980) \rightarrow \pi^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-)$ $\Gamma_{112}/\Gamma_{109}$

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

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

$\Gamma(K^*(892)^0 \pi^+, K^*(892)^0 \rightarrow K^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-)$ $\Gamma_{111}/\Gamma_{109}$

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

VALUE	DOCUMENT ID	TECN	COMMENT
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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

$\Gamma(K_2^*(1430)^0 \pi^+, K_2^*(1430)^0 \rightarrow K^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-)$ $\Gamma_{113}/\Gamma_{109}$

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

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

$\Gamma(K^+ \pi^+ \pi^- \text{ nonresonant})/\Gamma(K^+ \pi^+ \pi^-)$ $\Gamma_{114}/\Gamma_{109}$

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

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.36 ± 0.14 ± 0.07	⁴⁸ AITALA	97C	E791 Dalitz fit, 59 evts
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⁴⁸ LINK 04F, with three times as many events, finds no need for a nonresonant amplitude.

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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9.49 ± 2.17 ± 0.22 65 ⁴⁹ LINK 02I FOCS γ nucleus, ≈ 180 GeV

⁴⁹ LINK 02I finds little evidence for ϕK^+ or $f_0(980) K^+$ submodes.

————— Rare or forbidden modes —————

$\Gamma(\pi^+ e^+ e^-)/\Gamma_{\text{total}}$ **Γ_{116}/Γ**
 A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

<u>VALUE</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$<1.1 \times 10^{-6}$	90	-3.9 ± 2.3	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		⁵⁰ 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, $\bar{E}_\gamma \approx 220$ 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	39	HAAS	88 CLEO	$e^+ e^-$ 10 GeV

⁵⁰This RUBIN 10 limit is for the $e^+ e^-$ mass in the continuum away from the $\phi(1020)$. See the next data block.

$\Gamma(\pi^+ \phi, \phi \rightarrow e^+ e^-)/\Gamma_{\text{total}}$ **Γ_{117}/Γ**
 This is *not* a test for the $\Delta C = 1$ weak neutral current, but leads to the $\pi^+ e^+ e^-$ final state.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$(1.7^{+1.4}_{-0.9} \pm 0.1) \times 10^{-6}$	4	⁵¹ RUBIN	10 CLEO	$e^+ e^-$ at $\psi(3770)$

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

$(2.7^{+3.6}_{-1.8} \pm 0.2) \times 10^{-6}$	2	HE	05A CLEO	See RUBIN 10
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⁵¹This RUBIN 10 result is consistent with the known $D^+ \rightarrow \phi \pi^+$ and $\phi \rightarrow e^+ e^-$ fractions.

$\Gamma(\pi^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$ **Γ_{118}/Γ**
 A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

<u>VALUE</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$<3.9 \times 10^{-6}$	90		⁵² ABAZOV	08D D0	$p\bar{p}$, $E_{\text{cm}} = 1.96$ TeV

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

$<6.5 \times 10^{-6}$	90	-0.2 ± 2.9	LEES	11G BABR	$e^+ e^- \approx \Upsilon(4S)$
$<8.8 \times 10^{-6}$	90		LINK	03F FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
$<1.5 \times 10^{-5}$	90		AITALA	99G E791	$\pi^- N$ 500 GeV
$<8.9 \times 10^{-5}$	90		FRABETTI	97B E687	γ Be, $\bar{E}_\gamma \approx 220$ GeV
$<1.8 \times 10^{-5}$	90		AITALA	96 E791	$\pi^- N$ 500 GeV
$<2.2 \times 10^{-4}$	90	0	KODAMA	95 E653	π^- emulsion 600 GeV
$<5.9 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^-$ 29 GeV
$<2.9 \times 10^{-3}$	90	36	HAAS	88 CLEO	$e^+ e^-$ 10 GeV

⁵²This ABAZOV 08D limit is for the $\mu^+ \mu^-$ mass in the continuum away from the $\phi(1020)$. See the next data block.

$\Gamma(\pi^+ \phi, \phi \rightarrow \mu^+ \mu^-)/\Gamma_{\text{total}}$ Γ_{119}/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
$(1.8 \pm 0.5 \pm 0.6) \times 10^{-6}$	⁵³ ABAZOV 08D D0		$p\bar{p}$, $E_{\text{cm}} = 1.96$ TeV

⁵³This ABAZOV 08D value is consistent with the known $D^+ \rightarrow \phi \pi^+$ and $\phi \rightarrow \mu^+ \mu^-$ fractions.

$\Gamma(\rho^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$ Γ_{120}/Γ

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

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 5.6 \times 10^{-4}$	90	0	KODAMA 95 E653		π^- emulsion 600 GeV

$\Gamma(K^+ e^+ e^-)/\Gamma_{\text{total}}$ Γ_{121}/Γ

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

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 1.0 \times 10^{-6}$	90	-3.7 ± 4.4	LEES 11G BABR		$e^+ e^- \approx \mathcal{I}(4S)$

• • • 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, $\bar{E}_\gamma \approx 220$ GeV
$< 4.8 \times 10^{-3}$	90		WEIR 90B MRK2		$e^+ e^-$ 29 GeV

$\Gamma(K^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$ Γ_{122}/Γ

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

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 4.3 \times 10^{-6}$	90	-1.3 ± 3.0	LEES 11G BABR		$e^+ e^- \approx \mathcal{I}(4S)$

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

$< 9.2 \times 10^{-6}$	90		LINK 03F FOCS		γ nucleus, $\bar{E}_\gamma \approx 180$ 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, $\bar{E}_\gamma \approx 220$ 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

$\Gamma(\pi^+ e^+ \mu^-)/\Gamma_{\text{total}}$ Γ_{123}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$< 2.9 \times 10^{-6}$	90	-2.9 ± 4.2	LEES 11G BABR		$e^+ e^- \approx \mathcal{I}(4S)$

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

$< 1.1 \times 10^{-4}$	90		FRABETTI 97B E687		γ Be, $\bar{E}_\gamma \approx 220$ GeV
$< 3.3 \times 10^{-3}$	90		WEIR 90B MRK2		$e^+ e^-$ 29 GeV

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

A test of lepton-family-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<3.6 \times 10^{-6}$	90	3.6 ± 4.5	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, $\bar{E}_\gamma \approx 220$ GeV
$<3.3 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^- 29$ GeV

$\Gamma(K^+ e^+ \mu^-)/\Gamma_{\text{total}}$ **Γ_{125}/Γ**

A test of lepton-family-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<1.2 \times 10^{-6}$	90	-4.3 ± 1.9	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, $\bar{E}_\gamma \approx 220$ GeV
$<3.4 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^- 29$ GeV

$\Gamma(K^+ e^- \mu^+)/\Gamma_{\text{total}}$ **Γ_{126}/Γ**

A test of lepton-family-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<2.8 \times 10^{-6}$	90	3.2 ± 4.0	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, $\bar{E}_\gamma \approx 220$ GeV
$<3.4 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^- 29$ GeV

$\Gamma(\pi^- 2e^+)/\Gamma_{\text{total}}$ **Γ_{127}/Γ**

A test of lepton-number conservation.

VALUE	CL%	EVTS	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	4.7 ± 4.7	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, $\bar{E}_\gamma \approx 220$ GeV
$<4.8 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^- 29$ GeV

$\Gamma(\pi^- 2\mu^+)/\Gamma_{\text{total}}$ **Γ_{128}/Γ**

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<2.0 \times 10^{-6}$	90	-3.1 ± 1.3	LEES	11G BABR	$e^+ e^- \approx \Upsilon(4S)$

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

$<4.8 \times 10^{-6}$	90		LINK	03F FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ 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, $\bar{E}_\gamma \approx 220$ GeV
$<2.2 \times 10^{-4}$	90	0	KODAMA	95 E653	π^- emulsion 600 GeV
$<6.8 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^- 29$ GeV

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

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<2.0 \times 10^{-6}$	90	-5.1 ± 4.7	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, $\bar{E}_\gamma \approx 220$ GeV
$<3.7 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^-$ 29 GeV

$\Gamma(\rho^- 2\mu^+)/\Gamma_{\text{total}}$ **Γ_{130}/Γ**

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<5.6 \times 10^{-4}$	90	0	KODAMA	95 E653	π^- emulsion 600 GeV

$\Gamma(K^- 2e^+)/\Gamma_{\text{total}}$ **Γ_{131}/Γ**

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<0.9 \times 10^{-6}$	90	-2.8 ± 2.4	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, $\bar{E}_\gamma \approx 220$ GeV
$<9.1 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^-$ 29 GeV

$\Gamma(K^- 2\mu^+)/\Gamma_{\text{total}}$ **Γ_{132}/Γ**

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<10 \times 10^{-6}$	90	7.2 ± 5.6	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 nucleus, $\bar{E}_\gamma \approx 180$ GeV
$<1.2 \times 10^{-4}$	90		FRABETTI	97B E687	γ Be, $\bar{E}_\gamma \approx 220$ GeV
$<3.2 \times 10^{-4}$	90	0	KODAMA	95 E653	π^- emulsion 600 GeV
$<4.3 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^-$ 29 GeV

$\Gamma(K^- e^+ \mu^+)/\Gamma_{\text{total}}$ **Γ_{133}/Γ**

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<1.9 \times 10^{-6}$	90	-11.6 ± 5.1	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, $\bar{E}_\gamma \approx 220$ GeV
$<4.0 \times 10^{-3}$	90		WEIR	90B MRK2	$e^+ e^-$ 29 GeV

$\Gamma(K^*(892)^- 2\mu^+)/\Gamma_{\text{total}}$ Γ_{134}/Γ

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$<8.5 \times 10^{-4}$	90	0	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 these modes divided by the sum of the widths.

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

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

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
-0.41 ± 0.09 OUR AVERAGE				
$-0.363 \pm 0.094 \pm 0.067$	1738k	⁵⁴ KO	12A BELL	$e^+ e^- \approx \Upsilon(nS)$
$-0.44 \pm 0.13 \pm 0.10$	807k	DEL-AMO-SA..11H	BABR	$e^+ e^- \approx \Upsilon(4S)$
$-1.3 \pm 0.7 \pm 0.3$	30k	MENDEZ	10 CLEO	$e^+ e^-$ at 3774 MeV
$-1.6 \pm 1.5 \pm 0.9$	10.6k	⁵⁵ LINK	02B FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

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

$-0.71 \pm 0.19 \pm 0.20$	KO	10 BELL	See KO 12A
$-0.6 \pm 1.0 \pm 0.3$	DOBBS	07 CLEO	See MENDEZ 10

⁵⁴ KO 12A finds that after subtracting the contribution due to $K^0 - \bar{K}^0$ mixing, the CP asymmetry due to the change of charm is $(-0.024 \pm 0.094 \pm 0.067)\%$, consistent with zero.

⁵⁵ LINK 02B measures $N(D^+ \rightarrow K_S^0 \pi^+)/N(D^+ \rightarrow K^- \pi^+ \pi^+)$, the ratio of numbers of events observed, and similarly for the D^- .

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
$-0.1 \pm 0.4 \pm 0.9$	231k	MENDEZ	10 CLEO	$e^+ e^-$ at 3774 MeV

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

$-0.5 \pm 0.4 \pm 0.9$	DOBBS	07 CLEO	See MENDEZ 10
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$A_{CP}(K^\mp \pi^\pm \pi^\pm \pi^0)$ in $D^+ \rightarrow K^- \pi^+ \pi^+ \pi^0, D^- \rightarrow K^+ \pi^- \pi^- \pi^0$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$+1.0 \pm 0.9 \pm 0.9$	DOBBS	07 CLEO	$e^+ e^-$ at $\psi(3770)$

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$+0.3 \pm 0.9 \pm 0.3$	DOBBS	07 CLEO	$e^+ e^-$ at $\psi(3770)$

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$+0.1 \pm 1.1 \pm 0.6$	DOBBS	07 CLEO	$e^+ e^-$ at $\psi(3770)$

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

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 $D^\pm \rightarrow \pi^\pm \eta$

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 $D^\pm \rightarrow \pi^\pm \eta'(958)$

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

$A_{CP}(K_S^0 K^\pm)$ in $D^\pm \rightarrow K_S^0 K^\pm$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
-0.23 ± 0.31 OUR AVERAGE				
-0.25 ± 0.28 ± 0.14	277k	⁵⁶ KO	13	BELL $e^+ e^-$ at $\Upsilon(nS)$
-0.2 ± 1.5 ± 0.9	5.2k	MENDEZ	10	CLEO $e^+ e^-$ at 3774 MeV
+7.1 ± 6.1 ± 1.2	949	⁵⁷ LINK	02B	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ 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	⁵⁸ LINK	02B	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

⁵⁶ KO 13 finds that after subtracting the contribution due to $K^0 - \bar{K}^0$ mixing, the CP asymmetry is $(+0.08 \pm 0.28 \pm 0.14)\%$.

⁵⁷ LINK 02B measures $N(D^+ \rightarrow K_S^0 K^+)/N(D^+ \rightarrow K_S^0 \pi^+)$, the ratio of numbers of events observed, and similarly for the D^- .

⁵⁸ LINK 02B measures $N(D^+ \rightarrow K_S^0 K^+)/N(D^+ \rightarrow K^- \pi^+ \pi^+)$, the ratio of numbers of events observed, and similarly for the D^- .

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

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
0.3 ± 0.6 OUR AVERAGE				
-0.03 ± 0.84 ± 0.29		RUBIN	08	CLEO $e^+ e^-$, 3774 MeV
-0.1 ± 1.5 ± 0.8		DOBBS	07	CLEO $e^+ e^-$ at $\psi(3770)$
+1.4 ± 1.0 ± 0.8	43k ± 321	⁵⁹ AUBERT	05S	BABR $e^+ e^- \approx \Upsilon(4S)$
+0.6 ± 1.1 ± 0.5	14k	⁶⁰ LINK	00B	FOCS
-1.4 ± 2.9		⁶⁰ AITALA	97B	E791 $-0.062 < A_{CP} < +0.034$ (90% CL)
-3.1 ± 6.8		⁶⁰ FRABETTI	94I	E687 $-0.14 < A_{CP} < +0.081$ (90% CL)

⁵⁹ 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^- .

⁶⁰ 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^- .

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
0.1 ± 1.3 OUR AVERAGE				
- 0.4 ± 2.0 ± 0.6		RUBIN	08 CLEO	Fit-fraction asymmetry
+ 0.9 ± 1.7 ± 0.7	11k ± 122	⁶¹ AUBERT	05S BABR	$e^+ e^- \approx \Upsilon(4S)$
- 1.0 ± 5.0		⁶² AITALA	97B E791	-0.092 < A_{CP} < +0.072 (90% CL)
-12 ± 13		⁶² FRABETTI	94I E687	-0.33 < A_{CP} < +0.094 (90% CL)

⁶¹ AUBERT 05S measures $N(D^+ \rightarrow K^+ \bar{K}^{*0})/N(D_S^+ \rightarrow K^+ K^- \pi^+)$, the ratio of the numbers of events observed, and similarly for the D^- .

⁶² FRABETTI 94I and AITALA 97B measure $N(D^+ \rightarrow K^+ \bar{K}^*(892)^0)/N(D^+ \rightarrow K^- \pi^+ \pi^+)$, 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
0.42 ± 0.28 OUR AVERAGE				
+0.51 ± 0.28 ± 0.05	237k	STARIC	12 BELL	Mainly at $\Upsilon(4S)$
-1.8 ± 1.6 ^{+0.2} / _{-0.4}		RUBIN	08 CLEO	Fit-fraction asymmetry
+0.2 ± 1.5 ± 0.6	10k ± 136	⁶³ AUBERT	05S BABR	$e^+ e^- \approx \Upsilon(4S)$
-2.8 ± 3.6		⁶⁴ AITALA	97B E791	-0.087 < A_{CP} < +0.031 (90% CL)
+6.6 ± 8.6		⁶⁴ FRABETTI	94I E687	-0.075 < A_{CP} < +0.21 (90% CL)

⁶³ 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^- .

⁶⁴ 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 $D^+ \rightarrow K^+ \bar{K}_0^*(1430)^0$, $D^- \rightarrow K^- K_0^*(1430)^0$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
+8 ± 6 ⁺⁴/₋₂	RUBIN	08 CLEO	Fit-fraction asymmetry

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
+43 ± 19 ⁺⁵/₋₁₈	RUBIN	08 CLEO	Fit-fraction asymmetry

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
-12 ± 11 ⁺¹⁴/₋₆	RUBIN	08 CLEO	Fit-fraction asymmetry

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
-19 ± 12 ⁺⁸/₋₁₁	RUBIN	08 CLEO	Fit-fraction asymmetry

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$-9 \pm 22 \pm 14$	RUBIN	08	CLEO Fit-fraction asymmetry

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
-1.7 ± 4.2	⁶⁵ AITALA	97B E791	$-0.086 < A_{CP} < +0.052$ (90% CL)

⁶⁵ AITALA 97B measure $N(D^+ \rightarrow \pi^+\pi^-\pi^+)/N(D^+ \rightarrow K^-\pi^+\pi^+)$, the ratio of numbers of events observed, and similarly for the D^- .

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

VALUE (%)	EVTs	DOCUMENT ID	TECN	COMMENT
$-4.2 \pm 6.4 \pm 2.2$	523 ± 32	LINK	05E FOCS	γ A, $\bar{E}_\gamma \approx 180$ GeV

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

VALUE (%)	EVTs	DOCUMENT ID	TECN	COMMENT
$-3.5 \pm 10.7 \pm 0.9$	343 ± 37	MENDEZ	10 CLEO	e^+e^- at 3774 MeV

D^+-D^- T-VIOLATING DECAY-RATE ASYMMETRIES

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

$C_T \equiv \vec{p}_{K^+} \cdot (\vec{p}_{\pi^+} \times \vec{p}_{\pi^-})$ is a T -odd correlation of the K^+ , π^+ , and π^- momenta for the D^+ . $\bar{C}_T \equiv \vec{p}_{K^-} \cdot (\vec{p}_{\pi^-} \times \vec{p}_{\pi^+})$ is the corresponding quantity for the D^- . $A_T \equiv [\Gamma(C_T > 0) - \Gamma(C_T < 0)] / [\Gamma(C_T > 0) + \Gamma(C_T < 0)]$ would, in the absence of strong phases, test for T violation in D^+ decays (the Γ 's are partial widths). With $\bar{A}_T \equiv [\Gamma(-\bar{C}_T > 0) - \Gamma(-\bar{C}_T < 0)] / [\Gamma(-\bar{C}_T > 0) + \Gamma(-\bar{C}_T < 0)]$, the asymmetry $A_{Tviol} \equiv \frac{1}{2}(A_T - \bar{A}_T)$ tests for T violation even with nonzero strong phases.

VALUE (units 10^{-3})	EVTs	DOCUMENT ID	TECN	COMMENT
$-12.0 \pm 10.0 \pm 4.6$	$21.2 \pm 0.4k$	LEES	11E BABR	$e^+e^- \approx \Upsilon(4S)$

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

$23 \pm 62 \pm 22$	523 ± 32	LINK	05E FOCS	γ A, $\bar{E}_\gamma \approx 180$ GeV
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$D^+ \rightarrow (\bar{K}^0/\pi^0/\eta/\bar{K}^{*0})\ell^+\nu_\ell$ FORM FACTORS

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

VALUE	DOCUMENT ID	TECN	COMMENT
$0.707 \pm 0.010 \pm 0.009$	BESSON	09	CLEO $\bar{K}^0 e^+ \nu_e$ 3-parameter fit

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

VALUE	DOCUMENT ID	TECN	COMMENT
$-1.66 \pm 0.44 \pm 0.10$	BESSON	09	CLEO $\bar{K}^0 e^+ \nu_e$ 3-parameter fit

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

VALUE	DOCUMENT ID	TECN	COMMENT
$-14 \pm 11 \pm 1$	BESSON	09	CLEO $\bar{K}^0 e^+ \nu_e$ 3-parameter fit

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

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

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

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

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

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

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

VALUE	DOCUMENT ID	TECN	COMMENT
$0.086 \pm 0.006 \pm 0.001$	YELTON 11	CLEO	z expansion

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

VALUE	DOCUMENT ID	TECN	COMMENT
$-1.83 \pm 2.23 \pm 0.28$	YELTON 11	CLEO	z expansion

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

See also BRIERE 10 for $\bar{K}^* \ell^+ \nu_\ell$ 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		⁶⁶ DEL-AMO-SA..11i	BABR	
1.504 ± 0.057 ± 0.039	15k	⁶⁷ LINK	02L FOCS	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$
1.45 ± 0.23 ± 0.07	763	ADAMOVICH	99 BEAT	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$
1.90 ± 0.11 ± 0.09	3000	⁶⁸ AITALA	98B E791	$\bar{K}^*(892)^0 e^+ \nu_e$
1.84 ± 0.11 ± 0.09	3034	AITALA	98F E791	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$
1.74 ± 0.27 ± 0.28	874	FRABETTI	93E E687	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$
2.00 ^{+0.34} / _{-0.32} ± 0.16	305	KODAMA	92 E653	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$

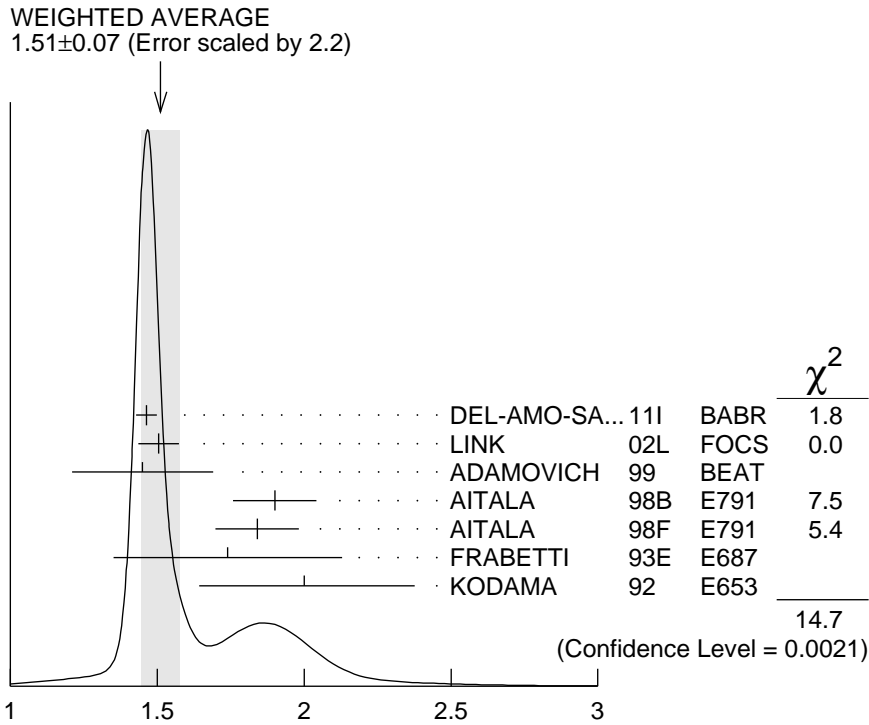
• • • We do not use the following data for averages, fits, limits, etc. • • •

2.0 ± 0.6 ± 0.3	183	ANJOS	90E E691	$\bar{K}^*(892)^0 e^+ \nu_e$
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⁶⁶ 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).

⁶⁷ 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.

⁶⁸ This is slightly different from the AITALA 98B value: see ref. [5] in AITALA 98F.



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

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

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.807±0.025 OUR AVERAGE				
0.801±0.020±0.020		⁶⁹ DEL-AMO-SA...11I	BABR	
0.875±0.049±0.064	15k	⁷⁰ LINK	02L	FOCS $\bar{K}^*(892)^0 \mu^+ \nu_\mu$
1.00 ±0.15 ±0.03	763	ADAMOVICH	99	BEAT $\bar{K}^*(892)^0 \mu^+ \nu_\mu$
0.71 ±0.08 ±0.09	3000	AITALA	98B	E791 $\bar{K}^*(892)^0 e^+ \nu_e$
0.75 ±0.08 ±0.09	3034	AITALA	98F	E791 $\bar{K}^*(892)^0 \mu^+ \nu_\mu$
0.78 ±0.18 ±0.10	874	FRABETTI	93E	E687 $\bar{K}^*(892)^0 \mu^+ \nu_\mu$
0.82 ^{+0.22} _{-0.23} ±0.11	305	KODAMA	92	E653 $\bar{K}^*(892)^0 \mu^+ \nu_\mu$

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

0.0 ±0.5 ±0.2 183 ANJOS 90E E691 $\bar{K}^*(892)^0 e^+ \nu_e$
⁶⁹ 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).

⁷⁰ 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.

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

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

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

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

See also BRIERE 10 for $\bar{K}^* \ell^+ \nu_\ell$ 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	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$
1.20±0.13±0.13	874	FRABETTI 93E	E687	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$
1.18±0.18±0.08	305	KODAMA 92	E653	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.8 ^{+0.6} _{-0.4} ±0.3	183	ANJOS	90E E691	$\bar{K}^*(892)^0 e^+ \nu_e$

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

See also BRIERE 10 for $\bar{K}^* \ell^+ \nu_\ell$ 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	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$
0.16±0.05±0.02	305	KODAMA 92	E653	$\bar{K}^*(892)^0 \mu^+ \nu_\mu$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.15 ^{+0.07} _{-0.05} ±0.03	183	ANJOS	90E E691	$\bar{K}^*(892)^0 e^+ \nu_e$

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LINK	07B	PL B653 1	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
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AITALA	99G	PL B462 401	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
BONVICINI	99	PRL 82 4586	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
AITALA	98B	PRL 80 1393	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
AITALA	98C	PL B421 405	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
AITALA	98F	PL B440 435	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
BAI	98B	PL B429 188	J.Z. Bai <i>et al.</i>	(BEPC BES Collab.)
AITALA	97	PL B397 325	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
AITALA	97B	PL B403 377	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
AITALA	97C	PL B404 187	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
BISHAI	97	PRL 78 3261	M. Bishai <i>et al.</i>	(CLEO Collab.)
FRABETTI	97	PL B391 235	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
FRABETTI	97B	PL B398 239	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
FRABETTI	97C	PL B401 131	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
FRABETTI	97D	PL B407 79	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
AITALA	96	PRL 76 364	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
FRABETTI	95	PL B346 199	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)

FRABETTI	95B	PL B351 591	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
FRABETTI	95E	PL B359 403	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
KODAMA	95	PL B345 85	K. Kodama <i>et al.</i>	(FNAL E653 Collab.)
ALBRECHT	94I	ZPHY C64 375	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BALEST	94	PRL 72 2328	R. Balest <i>et al.</i>	(CLEO Collab.)
FRABETTI	94D	PL B323 459	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
FRABETTI	94G	PL B331 217	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
FRABETTI	94I	PR D50 R2953	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
AKERIB	93	PRL 71 3070	D.S. Akerib <i>et al.</i>	(CLEO Collab.)
ANJOS	93	PR D48 56	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
FRABETTI	93E	PL B307 262	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
ALBRECHT	92F	PL B278 202	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ANJOS	92C	PR D46 1941	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
BARLAG	92C	ZPHY C55 383	S. Barlag <i>et al.</i>	(ACCMOR Collab.)
Also		ZPHY C48 29	S. Barlag <i>et al.</i>	(ACCMOR Collab.)
COFFMAN	92B	PR D45 2196	D.M. Coffman <i>et al.</i>	(Mark III Collab.)
DAOUDI	92	PR D45 3965	M. Daoudi <i>et al.</i>	(CLEO Collab.)
KODAMA	92	PL B274 246	K. Kodama <i>et al.</i>	(FNAL E653 Collab.)
KODAMA	92C	PL B286 187	K. Kodama <i>et al.</i>	(FNAL E653 Collab.)
ADAMOVICH	91	PL B268 142	M.I. Adamovich <i>et al.</i>	(WA82 Collab.)
ALBRECHT	91	PL B255 634	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALVAREZ	91B	ZPHY C50 11	M.P. Alvarez <i>et al.</i>	(CERN NA14/2 Collab.)
AMMAR	91	PR D44 3383	R. Ammar <i>et al.</i>	(CLEO Collab.)
BAI	91	PRL 66 1011	Z. Bai <i>et al.</i>	(Mark III Collab.)
COFFMAN	91	PL B263 135	D.M. Coffman <i>et al.</i>	(Mark III Collab.)
FRABETTI	91	PL B263 584	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
ALVAREZ	90	ZPHY C47 539	M.P. Alvarez <i>et al.</i>	(CERN NA14/2 Collab.)
ANJOS	90C	PR D41 2705	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
ANJOS	90D	PR D42 2414	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
ANJOS	90E	PRL 65 2630	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
BARLAG	90C	ZPHY C46 563	S. Barlag <i>et al.</i>	(ACCMOR Collab.)
WEIR	90B	PR D41 1384	A.J. Weir <i>et al.</i>	(Mark II Collab.)
ANJOS	89	PRL 62 125	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
ANJOS	89B	PRL 62 722	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
ANJOS	89E	PL B223 267	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
ADLER	88C	PRL 60 89	J. Adler <i>et al.</i>	(Mark III Collab.)
ALBRECHT	88I	PL B210 267	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
HAAS	88	PRL 60 1614	P. Haas <i>et al.</i>	(CLEO Collab.)
ONG	88	PRL 60 2587	R.A. Ong <i>et al.</i>	(Mark II Collab.)
RAAB	88	PR D37 2391	J.R. Raab <i>et al.</i>	(FNAL E691 Collab.)
ADAMOVICH	87	EPL 4 887	M.I. Adamovich <i>et al.</i>	(Photon Emulsion Collab.)
ADLER	87	PL B196 107	J. Adler <i>et al.</i>	(Mark III Collab.)
BARTEL	87	ZPHY C33 339	W. Bartel <i>et al.</i>	(JADE Collab.)
BALTRUSAITIS...	86E	PRL 56 2140	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)
BALTRUSAITIS...	85B	PRL 54 1976	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)
BALTRUSAITIS...	85E	PRL 55 150	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)
BARTEL	85J	PL 163B 277	W. Bartel <i>et al.</i>	(JADE Collab.)
ADAMOVICH	84	PL 140B 119	M.I. Adamovich <i>et al.</i>	(CERN WA58 Collab.)
ALTHOFF	84G	ZPHY C22 219	M. Althoff <i>et al.</i>	(TASSO Collab.)
DERRICK	84	PRL 53 1971	M. Derrick <i>et al.</i>	(HRS Collab.)
SCHINDLER	81	PR D24 78	R.H. Schindler <i>et al.</i>	(Mark II Collab.)
TRILLING	81	PRPL 75 57	G.H. Trilling	(LBL, UCB) J
ZHOLENTZ	80	PL 96B 214	A.A. Zholents <i>et al.</i>	(NOVO)
Also		SJNP 34 814	A.A. Zholents <i>et al.</i>	(NOVO)
		Translated from YAF 34	1471.	
GOLDHABER	77	PL 69B 503	G. Goldhaber <i>et al.</i>	(Mark I Collab.)
PERUZZI	77	PRL 39 1301	I. Peruzzi <i>et al.</i>	(LGW Collab.)
PICCOLO	77	PL 70B 260	M. Piccolo <i>et al.</i>	(Mark I Collab.)
PERUZZI	76	PRL 37 569	I. Peruzzi <i>et al.</i>	(Mark I Collab.)

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