$D_s^{\pm}$

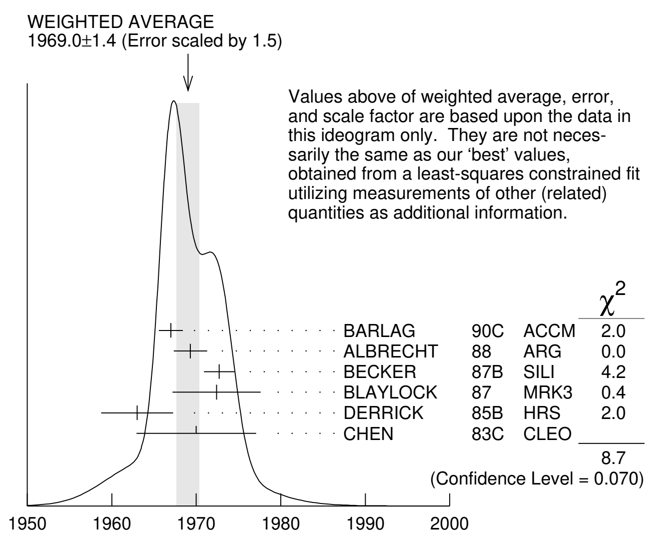
$I(J^P) = 0(0^-)$

The angular distributions of the decays of the ϕ and $\overline{K}^*(892)^0$ in the $\phi\pi^+$ and $K^+\overline{K}^*(892)^0$ modes strongly indicate that the spin is zero. The parity given is that expected of a $c\overline{s}$ ground state.

$D_s^{\pm}$ 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. Measurements of the $D_s^{\pm}$ mass with an error greater than 10 MeV are omitted from the fit and average. A number of early measurements have been omitted altogether.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1968.35± 0.07 OUR FIT					
1969.0 ± 1.4 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.					
1967.0 ± 1.0 ± 1.0	54	BARLAG	90C	ACCM	π^- Cu 230 GeV
1969.3 ± 1.4 ± 1.4		ALBRECHT	88	ARG	e^+e^- 9.4–10.6 GeV
1972.7 ± 1.5 ± 1.0	21	BECKER	87B	SILI	200 GeV π,K,p
1972.4 ± 3.7 ± 3.7	27	BLAYLOCK	87	MRK3	e^+e^- 4.14 GeV
1963 ± 3 ± 3	30	DERRICK	85B	HRS	e^+e^- 29 GeV
1970 ± 5 ± 5	104	CHEN	83C	CLEO	e^+e^- 10.5 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1968.3 ± 0.7 ± 0.7	290	[1] ANJOS	88	E691	Photoproduction
1980 ±15	6	USHIDA	86	EMUL	ν wideband
1973.6 ± 2.6 ± 3.0	163	ALBRECHT	85D	ARG	e^+e^- 10 GeV
1948 ±28 ±10	65	AIHARA	84D	TPC	e^+e^- 29 GeV
1975 ± 9 ±10	49	ALTHOFF	84	TASS	e^+e^- 14–25 GeV
1975 ± 4	3	BAILEY	84	ACCM	hadron$^+$ Be $\rightarrow$ $\phi\pi^+$X



$D_s^{\pm}$ mass (MeV)

[1] ANJOS 88 enters the fit via $m_{D_s^{\pm}} - m_{D^{\pm}}$ (see below).

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

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
98.69±0.05 OUR FIT					
98.69±0.05 OUR AVERAGE					
98.68±0.03±0.04		AAIJ	13V	LHCB	$D_s^+ \to K^+ K^- \pi^+$
99.41±0.38±0.21		ACOSTA	03D	CDF2	$\overline{p}p$, $\sqrt{s}$= 1.96 TeV
98.4 ±0.1 ±0.3	48k	AUBERT	02G	BABR	$e^+e^- \approx \Upsilon(4S)$
99.5 ±0.6 ±0.3		BROWN	94	CLE2	$e^+e^- \approx \Upsilon(4S)$
98.5 ±1.5	555	CHEN	89	CLEO	e^+e^- 10.5 GeV
99.0 ±0.8	290	ANJOS	88	E691	Photoproduction

$D_s^\pm$ MEAN LIFE

Measurements with an error greater than 100×10^{-15} s or with fewer than 100 events have been omitted from the Listings.

VALUE (10^{-15} s)	EVTS	DOCUMENT ID		TECN	COMMENT
504 ± 4 OUR AVERAGE	Error includes scale factor of 1.2.				
506.4± 3.0± 1.7±1.7		[1] AAIJ	17AN	LHCB	pp at 7, 8 TeV
507.4± 5.5± 5.1	13.6k	LINK	05J	FOCS	$\Phi\pi^+$ and $\overline{K}^{*0}K^+$
472.5±17.2± 6.6	760	IORI	01	SELX	600 GeV Σ^-, π^-, p
518 ±14 ± 7	1662	AITALA	99	E791	π^- nucleus, 500 GeV
486.3±15.0$^{+4.9}_{-5.1}$	2167	[2] BONVICINI	99	CLE2	$e^+e^- \approx \Upsilon(4S)$
475 ±20 ± 7	900	FRABETTI	93F	E687	γBe, $\phi\pi^+$
500 ±60 ±30	104	FRABETTI	90	E687	γBe, $\phi\pi^+$
470 ±40 ±20	228	RAAB	88	E691	Photoproduction

[1] This AAIJ 17AN value is derived from the difference between the D_s^- and D^- widths. The 3rd uncertainty, $\pm 1.7 \times 10^{-15}$ s, arises from the uncertainty of the D^- width.

[2] BONVICINI 99 obtains 1.19 ± 0.04 for the ratio of D_s^+ to D^0 lifetimes.

D_s^+ DECAY MODES

Unless otherwise noted, the branching fractions for modes with a resonance in the final state include all the decay modes of the resonance. D_s^- modes are charge conjugates of the modes below.

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level

Inclusive modes

Γ_1	e^+ semileptonic	[a]	(6.33 ±0.15) %		
Γ_2	π^+ anything		(119.3 ±1.4) %		
Γ_3	π^- anything		(43.2 ±0.9) %		
Γ_4	π^0 anything		(123 ±7) %		
Γ_5	K^- anything		(18.7 ±0.5) %		
Γ_6	K^+ anything		(28.9 ±0.7) %		
Γ_7	K^0_S anything		(19.0 ±1.1) %		
Γ_8	η anything	[b]	(29.9 ±2.8) %		
Γ_9	ω anything		(6.1 ±1.4) %		
Γ_{10}	η' anything	[c]	(10.3 ±1.4) %		S=1.1
Γ_{11}	$f_0(980)$ anything, $f_0 \to \pi^+\pi^-$		< 1.3 %		CL=90%
Γ_{12}	ϕ anything		(15.7 ±1.0) %		
Γ_{13}	K^+K^- anything		(15.8 ±0.7) %		
Γ_{14}	$K^0_S K^+$ anything		(5.8 ±0.5) %		
Γ_{15}	$K^0_S K^-$ anything		(1.9 ±0.4) %		
Γ_{16}	$2K^0_S$ anything		(1.70 ±0.32) %		
Γ_{17}	$2K^+$ anything		< 2.6	$\times 10^{-3}$	CL=90%
Γ_{18}	$2K^-$ anything		< 6	$\times 10^{-4}$	CL=90%

Leptonic and semileptonic modes

Γ_{19}	$e^+\nu_e$		< 8.3	$\times 10^{-5}$	CL=90%
Γ_{20}	$\mu^+\nu_\mu$		(5.43 ±0.15)	$\times 10^{-3}$	
Γ_{21}	$\tau^+\nu_\tau$		(5.32 ±0.11) %		
Γ_{22}	$\gamma e^+\nu_e$		< 1.3	$\times 10^{-4}$	CL=90%
Γ_{23}	$K^+K^-e^+\nu_e$		—		
Γ_{24}	$K^0_S K^0_S e^+\nu_e$		< 3.8	$\times 10^{-4}$	CL=90%
Γ_{25}	$\phi e^+\nu_e$	[d]	(2.39 ±0.16) %		S=1.3
Γ_{26}	$\phi\mu^+\nu_\mu$		(1.9 ±0.5) %		
Γ_{27}	$\eta e^+\nu_e + \eta'(958)e^+\nu_e$	[d]	(3.03 ±0.24) %		
Γ_{28}	$\eta e^+\nu_e$	[d]	(2.32 ±0.08) %		
Γ_{29}	$\eta'(958)e^+\nu_e$	[d]	(8.0 ±0.7)	$\times 10^{-3}$	
Γ_{30}	$\eta\mu^+\nu_\mu$		(2.4 ±0.5) %		
Γ_{31}	$\eta'(958)\mu^+\nu_\mu$		(1.1 ±0.5) %		
Γ_{32}	$\omega e^+\nu_e$	[e]	< 2.0	$\times 10^{-3}$	CL=90%
Γ_{33}	$K^0 e^+\nu_e$		(3.4 ±0.4)	$\times 10^{-3}$	
Γ_{34}	$K^*(892)^0 e^+\nu_e$	[d]	(2.15 ±0.28)	$\times 10^{-3}$	S=1.1
Γ_{35}	$f_0(500)e^+\nu_e$, $f_0 \to \pi^0\pi^0$		< 7.3	$\times 10^{-4}$	CL=90%
Γ_{36}	$f_0(980)e^+\nu_e$, $f_0 \to \pi^0\pi^0$		(7.9 ±1.5)	$\times 10^{-4}$	
Γ_{37}	$f_0(980)e^+\nu_e$, $f_0 \to \pi^+\pi^-$				
Γ_{38}	$a_0(980)^0 e^+\nu_e$, $a_0(980)^0 \to \pi^0\eta$		< 1.2	$\times 10^{-4}$	CL=90%
Γ_{39}	$\pi^0 e^+\nu_e$		< 6.4	$\times 10^{-5}$	CL=90%

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

Γ_{40}	$K^+ K^0_S$		(1.450 ± 0.035) %	
Γ_{41}	$K^+ K^0_L$		(1.49 ± 0.06) %	
Γ_{42}	$K^+ \overline{K}^0$		(2.95 ± 0.14) %	
Γ_{43}	$K^+ K^- \pi^+$	[f]	(5.37 ± 0.10) %	S=1.1
Γ_{44}	$\phi\pi^+$	[d,g]	(4.5 ± 0.4) %	
Γ_{45}	$\phi\pi^+,\ \phi\to K^+K^-$	[g]	(2.21 ± 0.06) %	
Γ_{46}	$K^+\overline{K}^*(892)^0$		$(12.7\ ^{+4.0}_{-3.1})$ %	
Γ_{47}	$K^+\overline{K}^*(892)^0,\ \overline{K}^{*0}\to K^-\pi^+$		(2.58 ± 0.06) %	
Γ_{48}	$K^+\overline{K}^*(892)^0,\ \overline{K}^{*0}\to K^0_S\pi^0$		$(4.8\pm0.5)\times10^{-3}$	
Γ_{49}	$f_0(980)\pi^+,\ f_0\to K^+K^-$		(1.11 ± 0.19) %	
Γ_{50}	$f_0(1370)\pi^+,\ f_0\to K^+K^-$		$(7.1\pm2.9)\times10^{-4}$	
Γ_{51}	$f_0(1710)\pi^+,\ f_0\to K^+K^-$		$(6.7\pm2.8)\times10^{-4}$	
Γ_{52}	$a_0(980)^+\pi^0,\ a_0^+\to K^+K^0_S$		$(1.1\pm0.4)\times10^{-3}$	
Γ_{53}	$a_0(1710)^+\pi^0,\ a_0^+\to K^+K^0_S$		$(3.5\pm0.6)\times10^{-3}$	
Γ_{54}	$K^+\overline{K}^*_0(1430)^0,\ \overline{K}^*_0\to K^-\pi^+$		$(1.76\pm0.25)\times10^{-3}$	
Γ_{55}	$K^+\overline{K}^*(1410)^0,\ \overline{K}^*_0\to K^0_S\pi^0$		$(8.8\pm2.8)\times10^{-4}$	
Γ_{56}	$K^+K^0_S\pi^0$		(1.47 ± 0.07) %	
Γ_{57}	$2K^0_S\pi^+$		$(7.1\pm0.4)\times10^{-3}$	S=1.3
Γ_{58}	$f_0(980)\pi^+,\ f_0\to K^0_SK^0_S$		$<1.8\times10^{-4}$	CL=90%
Γ_{59}	$f_0(1710)\pi^+,\ f_0\to K^0_SK^0_S$		$(3.3\pm0.4)\times10^{-3}$	
Γ_{60}	$K^0\overline{K}^0\pi^+$		—	
Γ_{61}	$K^*(892)^+\overline{K}^0$	[d]	(5.4 ± 1.2) %	
Γ_{62}	$K^*(892)^+K^0_S$		$(3.09\pm0.33)\times10^{-3}$	
Γ_{63}	$K^*(892)^+K^0_S,\ K^{*+}\to K^+\pi^0$		$(2.04\pm0.33)\times10^{-3}$	
Γ_{64}	$K^+K^-\pi^+\pi^0$		(5.50 ± 0.24) %	S=1.3
Γ_{65}	$\phi\rho^+$	[d]	(5.59 ± 0.34) %	
Γ_{66}	$\overline{K}_1(1270)^0K^+,\ \overline{K}_1(1270)^0\to K^-\rho^+$		$(5.7\pm0.6)\times10^{-3}$	
Γ_{67}	$\overline{K}_1(1270)^0K^+,\ \overline{K}_1(1270)^0\to K^*(892)\pi$		(1.31 ± 0.25) %	
Γ_{68}	$\overline{K}_1(1400)^0K^+,\ \overline{K}_1(1400)^0\to K^*(892)\pi$		(2.0 ± 0.4) %	
Γ_{69}	$a_0(980)^0\rho^+,\ a_0(980)^0\to K^+K^-$		$(1.9\pm0.4)\times10^{-3}$	
Γ_{70}	$f_1(1420)^0\pi^+,\ f_1(1420)^0\to K^*(892)^{\mp}K^{\pm}$		$(3.9\pm0.7)\times10^{-3}$	

Γ_{71}	$f_1(1420)^0\pi^+$, $f_1(1420)^0 \to a_0(980)^0\pi^0$, $a_0(980)^0 \to K^+K^-$		$(4.0 \pm 1.4) \times 10^{-4}$	
Γ_{72}	$\eta(1475)\pi^+$, $\eta(1475) \to a_0(980)^0\pi^0$, $a_0(980)^0 \to K^+K^-$		$(7.0 \pm 2.8) \times 10^{-4}$	
Γ_{73}	$K^0_S K^- 2\pi^+$		(1.53 ± 0.08) %	S=1.5
Γ_{74}	$K^*(892)^+ \overline{K}^*(892)^0$	[d]	(5.64 ± 0.35) %	
Γ_{75}	$\eta(1475) K^0_S$, $\eta \to K^*(892)^0\pi^+$, $K^{*0} \to K^-\pi^+$		$(3.4 \pm 1.0) \times 10^{-4}$	
Γ_{76}	$\eta(1475)\pi^+$, $\eta \to \overline{K}^*(892)^+ K^-$, $\overline{K}^{*+} \to K^0_S\pi^+$		$(3.4 \pm 1.0) \times 10^{-4}$	
Γ_{77}	$\eta(1475)\pi^+$, $\eta \to a_0(980)^-\pi^+$, $a_0^- \to K^0_S K^-$		$(1.7 \pm 0.9) \times 10^{-3}$	
Γ_{78}	$f_1(1285)\pi^+$, $f_1 \to a_0(980)^-\pi^+$, $a_0^- \to K^0_S K^-$		$(3.4 \pm 0.8) \times 10^{-4}$	
Γ_{79}	$K^+ K^0_S \pi^+\pi^-$		$(9.5 \pm 0.8) \times 10^{-3}$	S=1.1
Γ_{80}	$K^+K^- 2\pi^+\pi^-$		$(6.6 \pm 0.6) \times 10^{-3}$	
Γ_{81}	$\phi 2\pi^+\pi^-$	[d]	(1.21 ± 0.16) %	
Γ_{82}	$\phi\rho^0\pi^+$, $\phi \to K^+K^-$		$(4.9 \pm 0.7) \times 10^{-3}$	
Γ_{83}	$\phi a_1(1260)^+$, $\phi \to K^+K^-$, $a_1^+ \to \rho^0\pi^+$		$(7.4 \pm 1.2) \times 10^{-3}$	
Γ_{84}	$\phi 2\pi^+\pi^-$ non-ρ, $\phi \to K^+K^-$		$(1.4 \pm 0.5) \times 10^{-3}$	
Γ_{85}	$K^+K^-\rho^0\pi^+$ non-ϕ		$< 2.0 \times 10^{-4}$	CL=90%
Γ_{86}	$K^+K^- 2\pi^+\pi^-$ nonresonant		$(1.0 \pm 0.4) \times 10^{-3}$	
Γ_{87}	$2K^0_S 2\pi^+\pi^-$		$(7.8 \pm 3.3) \times 10^{-4}$	

Hadronic modes without K's

Γ_{88}	$\pi^+\pi^0$		$< 1.2 \times 10^{-4}$	CL=90%
Γ_{89}	$2\pi^+\pi^-$		(1.08 ± 0.04) %	
Γ_{90}	$\rho^0\pi^+$		$(1.2 \pm 0.6) \times 10^{-4}$	
Γ_{91}	$\pi^+(\pi^+\pi^-)_{S-\text{wave}}$	[h]	$(9.0 \pm 0.4) \times 10^{-3}$	
Γ_{92}	$f_0(980)\pi^+$, $f_0 \to \pi^+\pi^-$			
Γ_{93}	$f_0(1370)\pi^+$, $f_0 \to \pi^+\pi^-$			
Γ_{94}	$f_0(1500)\pi^+$, $f_0 \to \pi^+\pi^-$			
Γ_{95}	$f_2(1270)\pi^+$, $f_2 \to \pi^+\pi^-$		$(1.11 \pm 0.12) \times 10^{-3}$	
Γ_{96}	$\rho(1450)^0\pi^+$, $\rho^0 \to \pi^+\pi^-$		$(1.6 \pm 0.7) \times 10^{-4}$	
Γ_{97}	$\pi^+ 2\pi^0$		$(5.2 \pm 0.5) \times 10^{-3}$	S=1.1

Γ_{98}	$f_0(980)\pi^+$, $f_0 \to \pi^0\pi^0$		(2.9 ±0.6) × 10^{-3}	
Γ_{99}	$f_0(1370)\pi^+$, $f_0 \to \pi^0\pi^0$		(1.3 ±0.6) × 10^{-3}	
Γ_{100}	$f_2(1270)\pi^+$, $f_2 \to \pi^0\pi^0$		(5.0 ±3.5) × 10^{-4}	
Γ_{101}	$2\pi^+\pi^-\pi^0$		—	
Γ_{102}	$\eta\pi^+$	[d]	(1.67 ±0.09) %	S=1.1
Γ_{103}	$\omega\pi^+$	[d]	(1.92 ±0.30) × 10^{-3}	
Γ_{104}	$3\pi^+2\pi^-$		(7.8 ±0.8) × 10^{-3}	
Γ_{105}	$2\pi^+\pi^-2\pi^0$		—	
Γ_{106}	$\eta\rho^+$	[d]	(8.9 ±0.8) %	
Γ_{107}	$\eta\pi^+\pi^0$		(9.5 ±0.5) %	
Γ_{108}	$\eta(\pi^+\pi^0)_{P-wave}$		(5.1 ±3.1) × 10^{-3}	
Γ_{109}	$a_0(980)^{+0}\pi^{0+}$, $a_0(980)^{+0} \to \eta\pi^{+0}$		(2.2 ±0.4) %	
Γ_{110}	$\omega\pi^+\pi^0$	[d]	(2.8 ±0.7) %	
Γ_{111}	$2\pi^+\pi^-\eta$		(3.12 ±0.16) %	
Γ_{112}	$a_1(1260)^+\eta$, $a_1^+ \to \rho(770)^0\pi^+$, $\rho^0 \to \pi^+\pi^-$		(1.73 ±0.16) %	
Γ_{113}	$a_1(1260)^+\eta$, $a_1^+ \to f_0(500)\pi^+$, $f_0 \to \pi^+\pi^-$		(2.5 ±0.9) × 10^{-3}	
Γ_{114}	$a_0(980)^+\rho(770)^0$, $a_0^+ \to \eta\pi^+$		(2.1 ±0.9) × 10^{-3}	
Γ_{115}	$\eta(1405)\pi^+$, $\eta(1405) \to a_0(980)^-\pi^+$, $a_0^- \to \eta\pi^-$		(2.2 ±0.7) × 10^{-4}	
Γ_{116}	$\eta(1405)\pi^+$, $\eta(1405) \to a_0(980)^+\pi^-$, $a_0^+ \to \eta\pi^+$		(2.2 ±0.7) × 10^{-4}	
Γ_{117}	$f_1(1420)\pi^+$, $f_1 \to a_0(980)^-\pi^+$, $a_0^- \to \eta\pi^-$		(5.9 ±1.8) × 10^{-4}	
Γ_{118}	$f_1(1420)\pi^+$, $f_1 \to a_0(980)^+\pi^-$, $a_0^+ \to \eta\pi^+$		(5.3 ±1.8) × 10^{-4}	
Γ_{119}	$3\pi^+2\pi^-\pi^0$		(4.9 ±3.2) %	
Γ_{120}	$\omega 2\pi^+\pi^-$	[d]	(1.6 ±0.5) %	
Γ_{121}	$\eta'(958)\pi^+$	[c,d]	(3.94 ±0.25) %	
Γ_{122}	$3\pi^+2\pi^-2\pi^0$		—	
Γ_{123}	$\omega\eta\pi^+$	[d]	< 2.13 %	CL=90%
Γ_{124}	$\eta'(958)\rho^+$	[c,d]	(5.8 ±1.5) %	
Γ_{125}	$\eta'(958)\pi^+\pi^0$		(6.08 ±0.29) %	
Γ_{126}	$\eta'(958)\pi^+\pi^0$ nonresonant		< 5.1 %	CL=90%

Modes with one or three *K*'s

Γ_{127}	$K^+\pi^0$		(7.4 ±0.5) × 10^{-4}	
Γ_{128}	$K^0_S\pi^+$		(1.09 ±0.05) × 10^{-3}	
Γ_{129}	$K^+\eta$	[d]	(1.73 ±0.08) × 10^{-3}	
Γ_{130}	$K^+\omega$	[d]	(9.9 ±1.5) × 10^{-4}	

Γ_{131}	$K^+\eta'(958)$	[d]	$(2.64 \pm 0.24) \times 10^{-3}$	
Γ_{132}	$K^+\pi^+\pi^-$		$(6.20 \pm 0.19) \times 10^{-3}$	
Γ_{133}	$K^+\rho^0$		$(2.17 \pm 0.25) \times 10^{-3}$	
Γ_{134}	$K^+\rho(1450)^0$, $\rho^0 \to \pi^+\pi^-$		$(7.2 \pm 1.7) \times 10^{-4}$	
Γ_{135}	$K^+ f_0(500)$, $f_0 \to \pi^+\pi^-$		$(4.5 \pm 3.0) \times 10^{-4}$	
Γ_{136}	$K^+ f_0(980)$, $f_0 \to \pi^+\pi^-$		$(2.8 \pm 1.1) \times 10^{-4}$	
Γ_{137}	$K^+ f_0(1370)$, $f_0 \to \pi^+\pi^-$		$(1.2 \pm 0.6) \times 10^{-3}$	
Γ_{138}	$K^*(892)^0\pi^+$, $K^{*0} \to K^+\pi^-$		$(1.67 \pm 0.26) \times 10^{-3}$	
Γ_{139}	$K^*(1410)^0\pi^+$, $K^{*0} \to K^+\pi^-$		$(6 \pm 4) \times 10^{-4}$	
Γ_{140}	$K^*(1430)^0\pi^+$, $K^{*0} \to K^+\pi^-$		$(9.3 \pm 3.1) \times 10^{-4}$	
Γ_{141}	$K^+\pi^+\pi^-$ nonresonant		$(9.9 \pm 3.2) \times 10^{-4}$	
Γ_{142}	$K^0\pi^+\pi^0$		(1.08 ± 0.06) %	
Γ_{143}	$K^0_S 2\pi^+\pi^-$		$(2.8 \pm 1.0) \times 10^{-3}$	
Γ_{144}	$K^+\pi^+\pi^-\pi^0$		$(9.7 \pm 0.6) \times 10^{-3}$	
Γ_{145}	$K^*(892)^0\rho^+$, $K^{*0} \to K^+\pi^-$		$(3.9 \pm 0.4) \times 10^{-3}$	
Γ_{146}	$K^*(892)^+\rho^0$, $K^{*+} \to K^+\pi^0$		$(4.2 \pm 1.2) \times 10^{-4}$	
Γ_{147}	$K_1(1270)^0\pi^+$, $K_1^0 \to K^+\rho^-$		$(3.9 \pm 1.3) \times 10^{-4}$	
Γ_{148}	$K_1(1400)^0\pi^+$, $K_1^0 \to K^*(890)^+\pi^-$, $K^{*+} \to K^+\pi^0$		$(5.4 \pm 0.9) \times 10^{-4}$	
Γ_{149}	$K_1(1400)^0\pi^+$, $K_1^0 \to K^*(890)^0\pi^0$, $K^{*0} \to K^+\pi^-$		$(5.9 \pm 1.0) \times 10^{-4}$	
Γ_{150}	$K^+ a_1(1260)^0$, $a_1 \to \rho^+\pi^-$		$(1.8 \pm 1.1) \times 10^{-4}$	
Γ_{151}	$K^+ a_1(1260)^0$, $a_1 \to \rho^-\pi^+$		$(1.8 \pm 1.1) \times 10^{-4}$	
Γ_{152}	$K^+\pi^+\pi^-\pi^0$ nonresonant		$(9.2 \pm 2.4) \times 10^{-4}$	
Γ_{153}	$(K^+\pi^0)_{P-wave}\rho^0$		$(1.01 \pm 0.21) \times 10^{-3}$	
Γ_{154}	$K^+\omega\pi^0$	[d]	$< 8.2 \times 10^{-3}$	CL=90%
Γ_{155}	$K^+\omega\pi^+\pi^-$	[d]	$< 5.4 \times 10^{-3}$	CL=90%
Γ_{156}	$K^+\omega\eta$	[d]	$< 7.9 \times 10^{-3}$	CL=90%
Γ_{157}	$2K^+K^-$		$(2.15 \pm 0.20) \times 10^{-4}$	
Γ_{158}	ϕK^+, $\phi \to K^+K^-$		$(8.8 \pm 2.0) \times 10^{-5}$	

Doubly Cabibbo-suppressed modes

Γ_{159}	$2K^+\pi^-$		$(1.274 \pm 0.031) \times 10^{-4}$	
Γ_{160}	$K^+K^*(892)^0$, $K^{*0} \to K^+\pi^-$		$(6.0 \pm 3.4) \times 10^{-5}$	

Baryon-antibaryon mode

Γ_{161}	$p\overline{n}$		$(1.22 \pm 0.11) \times 10^{-3}$	
Γ_{162}	$p\overline{p}e^+\nu_e$		$< 2.0 \times 10^{-4}$	CL=90%

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

Γ_{163}	$\pi^+ e^+ e^-$		[i] $<$	5.5	$\times 10^{-6}$	CL=90%
Γ_{164}	$\pi^+ \phi$, $\phi \to e^+ e^-$		[j]	(6 $^{+8}_{-4}$)	$\times 10^{-6}$	
Γ_{165}	$\pi^+ \mu^+ \mu^-$		[i] $<$	1.8	$\times 10^{-7}$	CL=90%
Γ_{166}	$K^+ e^+ e^-$	C1	$<$	3.7	$\times 10^{-6}$	CL=90%
Γ_{167}	$K^+ \mu^+ \mu^-$	C1	$<$	1.4	$\times 10^{-7}$	CL=90%
Γ_{168}	$K^*(892)^+ \mu^+ \mu^-$	C1	$<$	1.4	$\times 10^{-3}$	CL=90%
Γ_{169}	$\pi^+ e^+ \mu^-$	LF	$<$	1.1	$\times 10^{-6}$	CL=90%
Γ_{170}	$\pi^+ e^- \mu^+$	LF	$<$	9.4	$\times 10^{-7}$	CL=90%
Γ_{171}	$K^+ e^+ \mu^-$	LF	$<$	7.9	$\times 10^{-7}$	CL=90%
Γ_{172}	$K^+ e^- \mu^+$	LF	$<$	5.6	$\times 10^{-7}$	CL=90%
Γ_{173}	$\pi^- 2e^+$	L	$<$	1.4	$\times 10^{-6}$	CL=90%
Γ_{174}	$\pi^- 2\mu^+$	L	$<$	8.6	$\times 10^{-8}$	CL=90%
Γ_{175}	$\pi^- e^+ \mu^+$	L	$<$	6.3	$\times 10^{-7}$	CL=90%
Γ_{176}	$K^- 2e^+$	L	$<$	7.7	$\times 10^{-7}$	CL=90%
Γ_{177}	$K^- 2\mu^+$	L	$<$	2.6	$\times 10^{-8}$	CL=90%
Γ_{178}	$K^- e^+ \mu^+$	L	$<$	2.6	$\times 10^{-7}$	CL=90%
Γ_{179}	$K^*(892)^- 2\mu^+$	L	$<$	1.4	$\times 10^{-3}$	CL=90%

[a] This is the purely e^+ semileptonic branching fraction: the e^+ fraction from τ^+ decays has been subtracted off. The sum of our (non-τ) e^+ exclusive fractions — an $e^+ \nu_e$ with an η, η', ϕ, K^0, or K^{*0} — is 5.99 ± 0.31 %.

[b] This fraction includes η from η' decays.

[c] The sum of our exclusive η' fractions — $\eta' e^+ \nu_e$, $\eta' \mu^+ \nu_\mu$, $\eta' \pi^+$, $\eta' \rho^+$, and $\eta' K^+$ — is 11.8 ± 1.6%.

[d] This branching fraction includes all the decay modes of the final-state resonance.

[e] A test for $u\overline{u}$ or $d\overline{d}$ content in the D_s^+. Neither Cabibbo-favored nor Cabibbo-suppressed decays can contribute, and $\omega-\phi$ mixing is an unlikely explanation for any fraction above about 2×10^{-4}.

[f] 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.

[g] We decouple the $D_s^+ \to \phi \pi^+$ branching fraction obtained from mass projections (and used to get some of the other branching fractions) from the $D_s^+ \to \phi \pi^+$, $\phi \to K^+ K^-$ branching fraction obtained from the Dalitz-plot analysis of $D_s^+ \to K^+ K^- \pi^+$. That is, the ratio of these two branching fractions is not exactly the $\phi \to K^+ K^-$ branching fraction 0.491.

[h] This is the average of a model-independent and a K-matrix parametrization of the $\pi^+\pi^-$ S-wave and is a sum over several f_0 mesons.

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

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

CONSTRAINED FIT INFORMATION

An overall fit to 16 branching ratios uses 25 measurements and one constraint to determine 12 parameters. The overall fit has a χ^2 = 12.7 for 14 degrees of freedom.

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

x_{43}	27									
x_{64}	8	0								
x_{73}	24	4	14							
x_{79}	18	3	12	45						
x_{89}	17	33	1	6	4					
x_{102}	1	15	−8	−15	−12	6				
x_{103}	0	1	0	−1	0	0	4			
x_{130}	0	0	0	0	0	0	0	0		
x_{132}	7	3	4	8	6	2	−4	0	0	
x_{144}	0	0	0	0	0	0	0	0	26	0
	x_{40}	x_{43}	x_{64}	x_{73}	x_{79}	x_{89}	x_{102}	x_{103}	x_{130}	x_{132}

See the related review(s):

D_s^+ Branching Fractions

D_s^+ BRANCHING RATIOS

A number of older, now obsolete results have been omitted. They may be found in earlier editions.

Inclusive modes

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

This is the purely e^+ semileptonic branching fraction: the e^+ fraction from τ^+ decays has been subtracted off.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
6.33±0.15 OUR AVERAGE					
6.30±0.13±0.10	17k	[1,2] ABLIKIM	21AC	BES3	e^+e^- at 4.178–4.230 GeV
6.52±0.39±0.15	0.5k	[3] ASNER	10	CLEO	e^+e^- at 3774 MeV

[1] ABLIKIM 21AC finds that the ratio of the D_s^+ and D^0 semielectronic widths is 0.790 ± 0.016 ± 0.020.

[2] ABLIKIM 21AC reports a value of $(6.30 \pm 0.13 \pm 0.09 \pm 0.04) \times 10^{-2}$, where the last uncertainty is an external systematic from $B(D_s^+ \to \tau\nu)$. We have added the systematic uncertainties in quadrature.

[3] Using the D_s^+ and D^0 lifetimes, ASNER 10 finds that the ratio of the D_s^+ and D^0 semileptonic widths is $0.828 \pm 0.051 \pm 0.025$.

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

Events with two π^+'s count twice, etc. But π^+'s from $K_S^0 \to \pi^+\pi^-$ are not included.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
119.3±1.2±0.7	DOBBS	09	CLEO	e^+e^- at 4170 MeV

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

Events with two π^-'s count twice, etc. But π^-'s from $K_S^0 \to \pi^+\pi^-$ are not included.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
43.2±0.9±0.3	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(\pi^0 \text{anything})/\Gamma_{total}$ — Γ_4/Γ

Events with two π^0's count twice, etc. But π^0's from $K_S^0 \to 2\pi^0$ are not included.

VALUE (%)	DOCUMENT ID		TECN	COMMENT
123.4±3.8±5.3	DOBBS	09	CLEO	e^+e^- at 4170 MeV

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
18.7±0.5±0.2	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^+ \text{anything})/\Gamma_{total}$ — Γ_6/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
28.9±0.6±0.3	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(K_S^0 \text{anything})/\Gamma_{total}$ — Γ_7/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
19.0±1.0±0.4	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(\eta \text{anything})/\Gamma_{total}$ — Γ_8/Γ

This ratio includes η particles from η' decays.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
29.9±2.2±1.7		DOBBS	09	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
23.5±3.1±2.0	674 ± 91	HUANG	06B	CLEO	See DOBBS 09

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
6.1±1.4±0.3	DOBBS	09	CLEO	e^+e^- at 4170 MeV

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
10.3±1.4 OUR AVERAGE	Error includes scale factor of 1.1.				
8.8±1.8±0.5	68	ABLIKIM	15Z	BES3	482 pb^{-1}, 4009 MeV
11.7±1.7±0.7		DOBBS	09	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
8.7±1.9±0.8	68	HUANG	06B	CLEO	See DOBBS 09

$\Gamma(f_0(980) \text{ anything}, f_0 \to \pi^+\pi^-)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<1.3	90	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(\phi \text{ anything})/\Gamma_{total}$ — Γ_{12}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
15.7±0.8±0.6		DOBBS	09	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
16.1±1.2±1.1	398 ± 27	HUANG	06B	CLEO	See DOBBS 09

$\Gamma(K^+K^- \text{ anything})/\Gamma_{total}$ — Γ_{13}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
15.8±0.6±0.3	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^0_S K^+ \text{ anything})/\Gamma_{total}$ — Γ_{14}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
5.8±0.5±0.1	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^0_S K^- \text{ anything})/\Gamma_{total}$ — Γ_{15}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
1.9±0.4±0.1	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(2K^0_S \text{ anything})/\Gamma_{total}$ — Γ_{16}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
1.7±0.3±0.1	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(2K^+ \text{ anything})/\Gamma_{total}$ — Γ_{17}/Γ

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<0.26	90	DOBBS	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(2K^- \text{ anything})/\Gamma_{total}$ — Γ_{18}/Γ

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<0.06	90	DOBBS	09	CLEO	e^+e^- at 4170 MeV

Leptonic and semileptonic modes

See the related review(s):

Leptonic Decays of Charged Pseudoscalar Mesons

$\Gamma(e^+\nu_e)/\Gamma_{total}$ — Γ_{19}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.83 × 10^{-4}	90	[1] ZUPANC	13	BELL	e^+e^- at $\Upsilon(4S), \Upsilon(5S)$

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

$<2.3 \times 10^{-4}$	90	DEL-AMO-SA...	10J	BABR	e^+e^-, 10.58 GeV
$<1.2 \times 10^{-4}$	90	ALEXANDER	09	CLEO	e^+e^- at 4170 MeV
$<1.3 \times 10^{-4}$	90	PEDLAR	07A	CLEO	See ALEXANDER 09

[1] ZUPANC 13 also gives the limit as $< 1.0 \times 10^{-4}$ at 95% CL.

$\Gamma(\mu^+\nu_\mu)/\Gamma_{\text{total}}$ Γ_{20}/Γ

See the note on "Decay Constants of Charged Pseudoscalar Mesons."

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
5.43±0.15 OUR AVERAGE					
5.35±0.13±0.16	2.2k	ABLIKIM	21BE	BES3	e^+e^-,4.178,4.226 GeV
5.17±0.75±0.21	69	[1] ABLIKIM	16O	BES3	e^+e^- at 4.009 GeV
5.31±0.28±0.20	492 ± 26	[2] ZUPANC	13	BELL	e^+e^- at $\Upsilon(4S), \Upsilon(5S)$
6.02±0.38±0.34	275 ± 17	[3] DEL-AMO-SA...	10J	BABR	e^+e^-, 10.58 GeV
5.65±0.45±0.17	235 ± 14	ALEXANDER	09	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.49±0.16±0.15	1.1k	ABLIKIM	19E	BES3	e^+e^- at 4178 MeV
6.44±0.76±0.57	169 ± 18	[4] WIDHALM	08	BELL	See ZUPANC 13
5.94±0.66±0.31	88	[5] PEDLAR	07A	CLEO	See ALEXANDER 09
6.8 ±1.1 ±1.8	553	[6] HEISTER	02I	ALEP	Z decays

[1] ABLIKIM 16O also reports that when constrained by the Standard Model ratio of $\Gamma(D_s^+ \to \tau^+\nu_\tau)/\Gamma(D_s^+ \to \mu^+\nu_\mu) = 9.76$, the branching fraction is found to be $(0.495 \pm 0.067 \pm 0.026)$%. The constrained value is used to obtain the decay constant, $f_{D_s^+} = (241.0 \pm 16.3 \pm 6.6)$ MeV.

[2] ZUPANC 13 uses both $\mu^+\nu$ and $\tau^+\nu$ events to get $f_{D_s} = (255.5 \pm 4.2 \pm 5.1)$ MeV.

[3] DEL-AMO-SANCHEZ 10J uses $\mu^+\nu_\mu$ and $\tau^+\nu_\tau$ events together to get $f_{D_s} = (258.6 \pm 6.4 \pm 7.5)$ MeV.

[4] WIDHALM 08 gets $f_{D_s} = (275 \pm 16 \pm 12)$ MeV from the branching fraction.

[5] PEDLAR 07A also fits μ^+ and τ^+ events together and gets an effective $\mu^+\nu_\mu$ branching fraction of $(6.38 \pm 0.59 \pm 0.33) \times 10^{-3}$

[6] This HEISTER 02I result is not actually an independent measurement of the absolute $\mu^+\nu_\mu$ branching fraction, but is in fact based on our $\phi\pi^+$ branching fraction of 3.6 ± 0.9%, so it cannot be included in our overall fit. HEISTER 02I combines its $D_s^+ \to \tau^+\nu_\tau$ and $\mu^+\nu_\mu$ branching fractions to get $f_{D_s} = (285 \pm 19 \pm 40)$ MeV.

$\Gamma(\mu^+\nu_\mu)/\Gamma(\phi\pi^+)$ Γ_{20}/Γ_{44}

See the note on "Decay Constants of Charged Pseudoscalar Mesons" above.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.143±0.018±0.006	489 ± 55	[1] AUBERT	07V	BABR	$e^+e^- \approx \Upsilon(4S)$
0.23 ±0.06 ±0.04	18	[2] ALEXANDROV	00	BEAT	π^- nucleus, 350 GeV
0.173±0.023±0.035	182	[3] CHADHA	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.245±0.052±0.074	39	[4] ACOSTA	94	CLE2	See CHADHA 98

[1] AUBERT 07V gets $f_{D_s^+} = (283 \pm 17 \pm 16)$ MeV, using $\Gamma(D_s^+ \to \phi\pi^+)/\Gamma(\text{total}) = (4.71 \pm 0.46)$%.

[2] ALEXANDROV 00 uses $f^2_D/f^2_{D_s} = 0.82 \pm 0.09$ from a lattice-gauge-theory calculation to get the relative numbers of $D^+ \rightarrow \mu^+\nu_\mu$ and $D^+_s \rightarrow \mu^+\nu_\mu$ events. The present result leads to $f_{D_s} = (323 \pm 44 \pm 36)$ MeV.

[3] CHADHA 98 obtains $f_{D_s} = (280 \pm 19 \pm 28 \pm 34)$ MeV from this measurement, using $\Gamma(D^+_s \rightarrow \phi\pi^+)/\Gamma(\text{total}) = 0.036 \pm 0.009$.

[4] ACOSTA 94 obtains $f_{D_s} = (344 \pm 37 \pm 52 \pm 42)$ MeV from this measurement, using $\Gamma(D^+_s \rightarrow \phi\pi^+)/\Gamma(\text{total}) = 0.037 \pm 0.009$.

$\Gamma(\tau^+\nu_\tau)/\Gamma_{\text{total}}$ Γ_{21}/Γ

See the note on "Decay Constants of Charged Pseudoscalar Mesons" above.

VALUE (%)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
5.32±0.11 OUR AVERAGE					
5.29±0.25±0.20	1.7k	[1] ABLIKIM	21AF	BES3	e^+e^- at 4.178, 4.226 GeV
5.27±0.10±0.12	4.9k	[2] ABLIKIM	21AZ	BES3	e^+e^- at 4.178, 4.226 GeV
5.21±0.25±0.17	950	[3] ABLIKIM	21BE	BES3	e^+e^- at 4.178, 4.226 GeV
3.28±1.83±0.37	33	[4] ABLIKIM	16O	BES3	e^+e^- at 4.009 GeV
$5.70 \pm 0.21 {}^{+0.31}_{-0.30}$	2.2k	[5] ZUPANC	13	BELL	e^+e^- at $\Upsilon(4S)$, $\Upsilon(5S)$
4.96±0.37±0.57	748	[6] DEL-AMO-SA...	10J	BABR	$e^-\overline{\nu}_e\nu_\tau$, $\mu^-\overline{\nu}_\mu\nu_\tau$
6.42±0.81±0.18	126	[7] ALEXANDER	09	CLEO	$\tau^+ \rightarrow \pi^+\overline{\nu}_\tau$
5.52±0.57±0.21	155	[7] NAIK	09A	CLEO	$\tau^+ \rightarrow \rho^+\overline{\nu}_\tau$
5.30±0.47±0.22	181	[7] ONYISI	09	CLEO	$\tau^+ \rightarrow e^+\nu_e\overline{\nu}_\tau$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
6.17±0.71±0.34	102	[8] ECKLUND	08	CLEO	See ONYISI 09
8.0 ±1.3 ±0.4	47	[8] PEDLAR	07A	CLEO	See ALEXANDER 09
5.79±0.77±1.84	881	[9] HEISTER	02I	ALEP	Z decays
7.0 ±2.1 ±2.0	22	[10] ABBIENDI	01L	OPAL	$D^{*+}_s \rightarrow \gamma D^+_s$ from Z's
7.4 ±2.8 ±2.4	16	[11] ACCIARRI	97F	L3	$D^{*+}_s \rightarrow \gamma D^+_s$ from Z's

[1] ABLIKIM 21F uses $\tau^+ \rightarrow \pi^+\pi^0\overline{\nu}$ decays.

[2] ABLIKIM 21AZ uses $\tau^+ \rightarrow e^+\nu_e\overline{\nu}_\tau$ decays.

[3] ABLIKIM 21BE uses $\tau^+ \rightarrow e^+\nu_e\overline{\nu}_\tau$ decays. When constrained by the Standard Model ratio of $\Gamma(D^+_s \rightarrow \tau^+\nu_\tau)/\Gamma(D^+_s \rightarrow \mu^+\nu_\mu) = 9.75$, the branching fraction is found to be $(5.22 \pm 0.10 \pm 0.14)\%$.

[4] ABLIKIM 16O also reports that when constrained by the Standard Model ratio of $\Gamma(D^+_s \rightarrow \tau^+\nu_\tau)/\Gamma(D^+_s \rightarrow \mu^+\nu_\mu) = 9.76$; the branching fraction is found to be $(4.83 \pm 0.65 \pm 0.26)\%$.

[5] ZUPANC 13 uses both $\mu^+\nu$ and $\tau^+\nu$ events to get $f_{D_s} = (255.5 \pm 4.2 \pm 5.1)$ MeV.

[6] DEL-AMO-SANCHEZ 10J (with a small correction; see LEES 15D) uses $\mu^+\nu_\mu$ and $\tau^+\nu_\tau$ events together to get $f_{D_s} = (259.9 \pm 6.6 \pm 7.6)$ MeV.

[7] ALEXANDER 09, NAIK 09A, and ONYISI 09 use different τ decay modes and are independent. The three papers combined give $f_{D_s} = (259.7 \pm 7.8 \pm 3.4)$ MeV.

[8] ECKLUND 08 and PEDLAR 07A are independent: ECKLUND 08 uses $\tau^+ \rightarrow e^+\nu_e\overline{\nu}_\tau$ events, PEDLAR 07A uses $\tau^+ \rightarrow \pi^+\overline{\nu}_\tau$ events.

[9] HEISTER 02I combines its $D^+_s \rightarrow \tau^+\nu_\tau$ and $\mu^+\nu_\mu$ branching fractions to get $f_{D_s} = (285 \pm 19 \pm 40)$ MeV.

[10] This ABBIENDI 01L value gives a decay constant f_{D_s} of (286 ± 44 ± 41) MeV.

[11] The second ACCIARRI 97F error here combines in quadrature systematic (0.016) and normalization (0.018) errors. The branching fraction gives f_{D_s} = (309 ± 58 ± 33 ± 38) MeV.

$\Gamma(\tau^+\nu_\tau)/\Gamma(\mu^+\nu_\mu)$ — Γ_{21}/Γ_{20}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$10.73 \pm 0.69 ^{+0.56}_{-0.53}$	2.2k/492	[1] ZUPANC	13	BELL	e^+e^- at $\Upsilon(4S), \Upsilon(5S)$
$11.0 \pm 1.4 \pm 0.6$	102	[2] ECKLUND	08	CLEO	See ONYISI 09

[1] This ZUPANC 13 ratio is not independent of the separate $\tau\nu$ and $\mu\nu$ fractions listed above.

[2] This ECKLUND 08 value also uses results from PEDLAR 07A, and it is not independent of other results in these Listings. Combined with earlier CLEO results, the decay constant f_{D_s} is 274 ± 10 ± 5 MeV.

$\Gamma(\gamma e^+\nu_e)/\Gamma_{total}$ — Γ_{22}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.3 \times 10^{-4}$	90	ABLIKIM	19AD	BES3	for $E_\gamma > 10$ MeV

$\Gamma(K^+K^-e^+\nu_e)/\Gamma(K^+K^-\pi^+)$ — Γ_{23}/Γ_{43}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.558 \pm 0.007 \pm 0.016$	[1] AUBERT	08AN	BABR	e^+e^- at $\Upsilon(4S)$

[1] This AUBERT 08AN ratio is only for the K^+K^- mass in the range 1.01–to–1.03 GeV in the numerator and 1.0095–to–1.0295 GeV in the denominator.

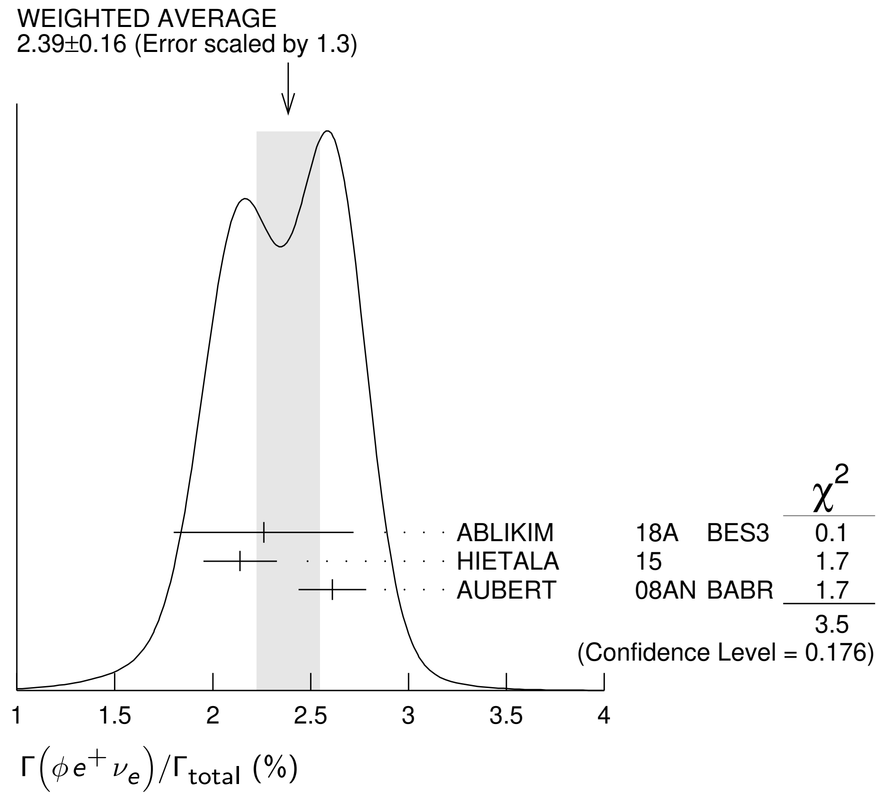
$\Gamma(K^0_S K^0_S e^+\nu_e)/\Gamma_{total}$ — Γ_{24}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.8 \times 10^{-4}$	90	ABLIKIM	22J	BES3	e^+e^- at 4.178-4.226 GeV

$\Gamma(\phi e^+\nu_e)/\Gamma_{total}$ — Γ_{25}/Γ

See the end of the D_s^+ Listings for measurements of $D_s^+ \to \phi e^+\nu_e$ form factors. Unseen decay modes of the ϕ are included.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
2.39±0.16 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.				
$2.26 \pm 0.45 \pm 0.09$	26	ABLIKIM	18A	BES3	e^+e^- at 4.009 GeV
$2.14 \pm 0.17 \pm 0.08$	207	HIETALA	15		Uses CLEO data
$2.61 \pm 0.03 \pm 0.17$	25k	AUBERT	08AN	BABR	e^+e^- at $\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2.36 \pm 0.23 \pm 0.13$	106	ECKLUND	09	CLEO	See HIETALA 15
$2.29 \pm 0.37 \pm 0.11$	45	YELTON	09	CLEO	See ECKLUND 09



$\Gamma(\phi e^+\nu_e)/\Gamma(\phi\pi^+)$ — Γ_{25}/Γ_{44}

As noted in the comment column, most of these measurements use $\phi\mu^+\nu_\mu$ events in addition to or instead of $\phi e^+\nu_e$ events.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.540±0.033±0.048	793	LINK	02J	FOCS	Uses $\phi\mu^+\nu_\mu$
0.54 ±0.05 ±0.04	367	BUTLER	94	CLE2	Uses $\phi e^+\nu_e$ and $\phi\mu^+\nu_\mu$
0.58 ±0.17 ±0.07	97	FRABETTI	93G	E687	Uses $\phi\mu^+\nu_\mu$
0.57 ±0.15 ±0.15	104	ALBRECHT	91	ARG	Uses $\phi e^+\nu_e$
0.49 ±0.10 $^{+0.10}_{-0.14}$	54	ALEXANDER	90B	CLEO	Uses $\phi e^+\nu_e$ and $\phi\mu^+\nu_\mu$

$\Gamma(\phi\mu^+\nu_\mu)/\Gamma_{total}$ — Γ_{26}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.94±0.53±0.09	22	ABLIKIM	18A	BES3	e^+e^- at 4.009 GeV

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

Unseen decay modes of the η are included.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
2.32 ±0.08 OUR AVERAGE					
2.323±0.063±0.063	1.8k	ABLIKIM	19S	BES3	e^+e^- at 4178 MeV
2.30 ±0.31 ±0.08	63	ABLIKIM	16T	BES3	e^+e^- at 4.009 GeV
2.28 ±0.14 ±0.19	358	[1] HIETALA	15		Uses CLEO data
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.48 ±0.29 ±0.13	82	YELTON	09	CLEO	See HIETALA 15

[1] Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration.

$\Gamma(\eta e^+ \nu_e)/\Gamma(\phi e^+ \nu_e)$ — Γ_{28}/Γ_{25}

Unseen decay modes of the η and the ϕ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.24\pm0.12\pm0.15$	440	[1] BRANDENB...	95	CLE2	See HIETALA 15

[1] BRANDENBURG 95 uses both e^+ and μ^+ events and makes a phase-space adjustment to use the μ^+ events as e^+ events.

$\Gamma(\eta'(958) e^+ \nu_e)/\Gamma_{total}$ — Γ_{29}/Γ

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.80 ±0.07 OUR AVERAGE					
$0.824\pm0.073\pm0.027$	261	ABLIKIM	19S	BES3	$e^+ e^-$ at 4178 MeV
$0.93\pm0.30\pm0.05$	14	ABLIKIM	16T	BES3	$e^+ e^-$ at 4009 MeV
$0.68\pm0.15\pm0.06$	20	[1] HIETALA	15		Uses CLEO data
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.91\pm0.33\pm0.05$	7.5	YELTON	09	CLEO	See HIETALA 15

[1] Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration.

$\Gamma(\eta'(958) e^+ \nu_e)/\Gamma(\phi e^+ \nu_e)$ — Γ_{29}/Γ_{25}

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.43\pm0.11\pm0.07$	29	[1] BRANDENB...	95	CLE2	See HIETALA 15

[1] BRANDENBURG 95 uses both e^+ and μ^+ events and makes a phase-space adjustment to use the μ^+ events as e^+ events.

$\left[\Gamma(\eta e^+ \nu_e) + \Gamma(\eta'(958) e^+ \nu_e)\right]/\Gamma(\phi e^+ \nu_e)$ — $\Gamma_{27}/\Gamma_{25} = (\Gamma_{28}+\Gamma_{29})/\Gamma_{25}$

Unseen decay modes of the resonances are included.

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.67\pm0.17\pm0.17$	[1] BRANDENB...	95	CLE2	See HIETALA 15

[1] This BRANDENBURG 95 data is redundant with data in previous blocks.

$\Gamma(\eta \mu^+ \nu_\mu)/\Gamma_{total}$ — Γ_{30}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
$2.42\pm0.46\pm0.11$	44	ABLIKIM	18A	BES3	$e^+ e^-$ at 4.009 GeV

$\Gamma(\eta'(958) \mu^+ \nu_\mu)/\Gamma_{total}$ — Γ_{31}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
$1.06\pm0.54\pm0.07$	10	ABLIKIM	18A	BES3	$e^+ e^-$ at 4.009 GeV

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

A test for $u\overline{u}$ or $d\overline{d}$ content in the D_s^+. Neither Cabibbo-favored nor Cabibbo-suppressed decays can contribute, and $\omega - \phi$ mixing is an unlikely explanation for any fraction above about 2×10^{-4}.

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<0.20	90	MARTIN	11	CLEO	$e^+ e^-$ at 4170 MeV

$\Gamma(K^0 e^+ \nu_e)/\Gamma_{total}$ — Γ_{33}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.34 ±0.04 OUR AVERAGE					
0.325±0.038±0.016	117	[1] ABLIKIM	19D	BES3	e^+e^- at 4178 MeV
0.39 ±0.08 ±0.03	42	HIETALA	15		Uses CLEO data
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.37 ±0.10 ±0.02	14	YELTON	09	CLEO	See HIETALA 15

[1] K^0 reconstructed via $K^0 \to K^0_S \to \pi^+\pi^-$ decays.

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

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.215±0.028 OUR AVERAGE	Error includes scale factor of 1.1.				
0.237±0.026±0.020	155	ABLIKIM	19D	BES3	e^+e^- at 4178 MeV
0.18 ±0.04 ±0.01	32	[1] HIETALA	15		e^+e^- at 4.170 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.18 ±0.07 ±0.01	7.5	YELTON	09	CLEO	See HIETALA 15

[1] Uses CLEO data, but not authored by the CLEO collaboration

$\Gamma(f_0(500) e^+ \nu_e,\ f_0 \to \pi^0\pi^0)/\Gamma_{total}$ — Γ_{35}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<7.3 \times 10^{-4}$	90	ABLIKIM	22J	BES3	e^+e^- at 4.178-4.226 GeV

$\Gamma(f_0(980) e^+ \nu_e,\ f_0 \to \pi^0\pi^0)/\Gamma_{total}$ — Γ_{36}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.9±1.4±0.4	55	[1] ABLIKIM	22J	BES3	e^+e^- at 4.178-4.226 GeV

[1] Assuming $B(f_0 \to \pi^0\pi^0) = 1/3$ via the isospin limit, this result implies $B(D_s^+ \to f_0(980) e^+ \nu_e) = (2.4 \pm 0.4) \times 10^{-3}$.

$\Gamma(f_0(980) e^+ \nu_e,\ f_0 \to \pi^+\pi^-)/\Gamma_{total}$ — Γ_{37}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.13±0.03±0.01	42	[1] HIETALA	15		Uses CLEO data
0.20±0.03±0.01	44	ECKLUND	09	CLEO	See HIETALA 15
0.13±0.04±0.01	13	YELTON	09	CLEO	See ECKLUND 09

[1] HIETALA 15 uses a tighter cut on the reconstructed $\pi^+\pi^-$ mass ($\pm$60 MeV around the f^0) than ECKLUND 09. It finds that applying the same tight cut to both analyses gives consistent results.

$\Gamma(a_0(980)^0 e^+ \nu_e,\ a_0(980)^0 \to \pi^0\eta)/\Gamma_{total}$ — Γ_{38}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.2 \times 10^{-4}$	90	ABLIKIM	21Y	BES3	e^+e^- at 4.178–4.226 GeV

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.4 \times 10^{-5}$	90	ABLIKIM	22BH	BES3	6.32 fb^{-1} of e^+e^- at 4.178–4.226 GeV

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

$\Gamma(K^+ K^0_S)/\Gamma_{total}$ — Γ_{40}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.450±0.035 OUR FIT					
1.46 ±0.05 OUR AVERAGE Error includes scale factor of 1.2.					
1.425±0.038±0.031	1.8k	ABLIKIM	19AM	BES3	$e^+ e^-$ at 4178 MeV
1.52 ±0.05 ±0.03		ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.49 ±0.07 ±0.05		[1] ALEXANDER	08	CLEO	See ONYISI 13

[1] ALEXANDER 08 uses single- and double-tagged events in an overall fit.

$\Gamma(K^+ K^0_S)/\Gamma(K^+ K^- \pi^+)$ — Γ_{40}/Γ_{43}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
27.55±0.18±0.50	40k	ABLIKIM	20R	BES3	$e^+ e^-$, 4178 $\sim$ 4226 MeV

$\Gamma(K^+ K^0_L)/\Gamma_{total}$ — Γ_{41}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.485±0.039±0.046	2.3k	ABLIKIM	19AM	BES3	$e^+ e^-$ at 4178 MeV

$\Gamma(K^+ \overline{K}^0)/\Gamma_{total}$ — Γ_{42}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
2.95±0.11±0.09	2.0k	[1] ZUPANC	13	BELL	$e^+ e^-$ at $\Upsilon(4S), \Upsilon(5S)$

[1] ZUPANC 13 finds the $\overline{K}^0$ from its missing-mass squared, not from $K^0_S \to \pi^+ \pi^-$. The DCS ($D_s^+ \to K^+ K^0$) contribution to this fraction is estimated to be an order of magnitude below the statistical uncertainty.

$\Gamma(K^+ K^- \pi^+)/\Gamma_{total}$ — Γ_{43}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
5.37±0.10 OUR FIT Error includes scale factor of 1.1.					
5.45±0.11 OUR AVERAGE Error includes scale factor of 1.1.					
5.47±0.08±0.13	5.1k	ABLIKIM	21AE	BES3	$e^+ e^-$ at 4.178 GeV
5.55±0.14±0.13		ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV
5.06±0.15±0.21	4.1k	ZUPANC	13	BELL	$e^+ e^-$ at $\Upsilon(4S), \Upsilon(5S)$
5.78±0.20±0.30		DEL-AMO-SA..	10J	BABR	$e^+ e^-$, 10.58 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.50±0.23±0.16		[1] ALEXANDER	08	CLEO	See ONYISI 13

[1] ALEXANDER 08 uses single- and double-tagged events in an overall fit.

$\Gamma(\phi \pi^+)/\Gamma_{total}$ — Γ_{44}/Γ

The results here are model-independent. For earlier, model-dependent results, see our PDG 06 edition. We decouple the $D_s^+ \to \phi \pi^+$ branching fraction obtained from mass projections (and used to get some of the other branching fractions) from the $D_s^+ \to \phi \pi^+$, $\phi \to K^+ K^-$ branching fraction obtained from the Dalitz-plot analysis of $D_s^+ \to K^+ K^- \pi^+$. That is, the ratio of these two branching fractions is not exactly the $\phi \to K^+ K^-$ branching fraction 0.491.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
4.5 ±0.4 OUR AVERAGE					
4.62±0.36±0.51		[1] AUBERT	06N	BABR	e^+e^- at $\Upsilon(4S)$
4.81±0.52±0.38	212 ± 19	[2] AUBERT	05V	BABR	$e^+e^- \approx \Upsilon(4S)$
3.59±0.77±0.48		[3] ARTUSO	96	CLE2	e^+e^- at $\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$3.9\ ^{+5.1}_{-1.9}\ ^{+1.8}_{-1.1}$		[4] BAI	95C	BES	e^+e^- 4.03 GeV

[1] This AUBERT 06N measurement uses $\overline{B}^0 \to D_s^{(*)-} D^{(*)+}$ and $B^- \to D_s^{(*)-} D^{(*)0}$ decays, including some from other papers. However, the result is independent of AUBERT 05V.

[2] AUBERT 05V uses the ratio of $B^0 \to D^{*-} D_s^{*+}$ events seen in two different ways, in both of which the $D^{*-} \to \overline{D}^0 \pi^-$ decay is fully reconstructed: (1) The $D_s^{*+} \to D_s^+ \gamma$, $D_s^+ \to \phi\pi^+$ decay is fully reconstructed. (2) The number of events in the D_s^+ peak in the missing mass spectrum against the $D^{*-}\gamma$ is measured.

[3] ARTUSO 96 uses partially reconstructed $\overline{B}^0 \to D^{*+} D_s^{*-}$ decays to get a model-independent value for $\Gamma(D_s^- \to \phi\pi^-)/\Gamma(D^0 \to K^-\pi^+)$ of 0.92 ± 0.20 ± 0.11.

[4] BAI 95C uses $e^+e^- \to D_s^+ D_s^-$ events in which one or both of the $D_s^\pm$ are observed to obtain the first model-independent measurement of the $D_s^+ \to \phi\pi^+$ branching fraction, without assumptions about $\sigma(D_s^\pm)$. However, with only two "doubly-tagged" events, the statistical error is very large.

$\Gamma(\phi\pi^+,\ \phi \to K^+K^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{45}/Γ_{43}

This is the "fit fraction" from the Dalitz-plot analysis. We decouple the $D_s^+ \to \phi\pi^+$ branching fraction obtained from mass projections (and used to get some of the other branching fractions) from the $D_s^+ \to \phi\pi^+$, $\phi \to K^+K^-$ branching fraction obtained from the Dalitz-plot analysis of $D_s^+ \to K^+K^-\pi^+$. That is, the ratio of these two branching fractions is not exactly the $\phi \to K^+K^-$ branching fraction 0.491.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
41.2±0.7 OUR AVERAGE					
40.5±0.7±0.9	18.6k	ABLIKIM	21AE	BES3	e^+e^- at 4.178 GeV
41.4±0.8±0.5		DEL-AMO-SA..	11G	BABR	Dalitz fit, 96k evts
42.2±1.6±0.3		MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •					
39.6±3.3±4.7		FRABETTI	95B	E687	Dalitz fit, 701 evts

$\Gamma(K^+\overline{K}^*(892)^0)/\Gamma(K^*(892)^+\overline{K}^0)$ — Γ_{46}/Γ_{61}

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{2.35^{+0.42}_{-0.23}\pm0.10}$	ABLIKIM	22AH	BES3	Dalitz plot fit to 990 $D_s^\pm \to K^\pm K_S \pi^0$ evts

$\Gamma\big(K^+ \overline{K}^*(892)^0, \overline{K}^{*0} \to K^- \pi^+\big)/\Gamma\big(K^+ K^- \pi^+\big)$ — Γ_{47}/Γ_{43}

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
47.9±0.6 OUR AVERAGE					
48.3±0.9±0.6	18.6k	ABLIKIM	21AE	BES3	$e^+ e^-$ at 4.178 GeV
47.9±0.5±0.5		DEL-AMO-SA...	11G	BABR	Dalitz fit, 96k evts
47.4±1.5±0.4		MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •					
47.8±4.6±4.0		FRABETTI	95B	E687	Dalitz fit, 701 evts

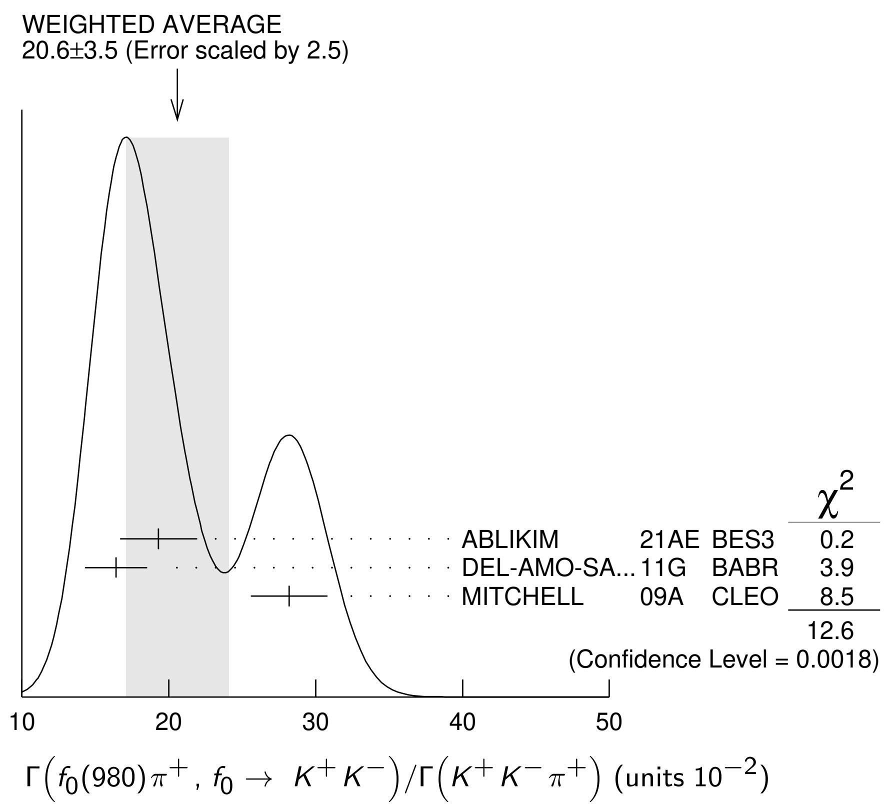
$\Gamma\big(K^+ \overline{K}^*(892)^0, \overline{K}^{*0} \to K^0_S \pi^0\big)/\Gamma\big(K^+ K^0_S \pi^0\big)$ — Γ_{48}/Γ_{56}

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
32.7±2.2±1.9	ABLIKIM	22AH	BES3	Dalitz plot fit, 990 evts

$\Gamma\big(f_0(980)\pi^+, f_0 \to K^+ K^-\big)/\Gamma\big(K^+ K^- \pi^+\big)$ — Γ_{49}/Γ_{43}

This is the "fit fraction" from the Dalitz-plot analysis. This is likely a superposition of $D_s^+ \to f_0(980)\pi$ and $D_s^+ \to a_0(980)\pi$ which are indistinguishable in such an analysis.

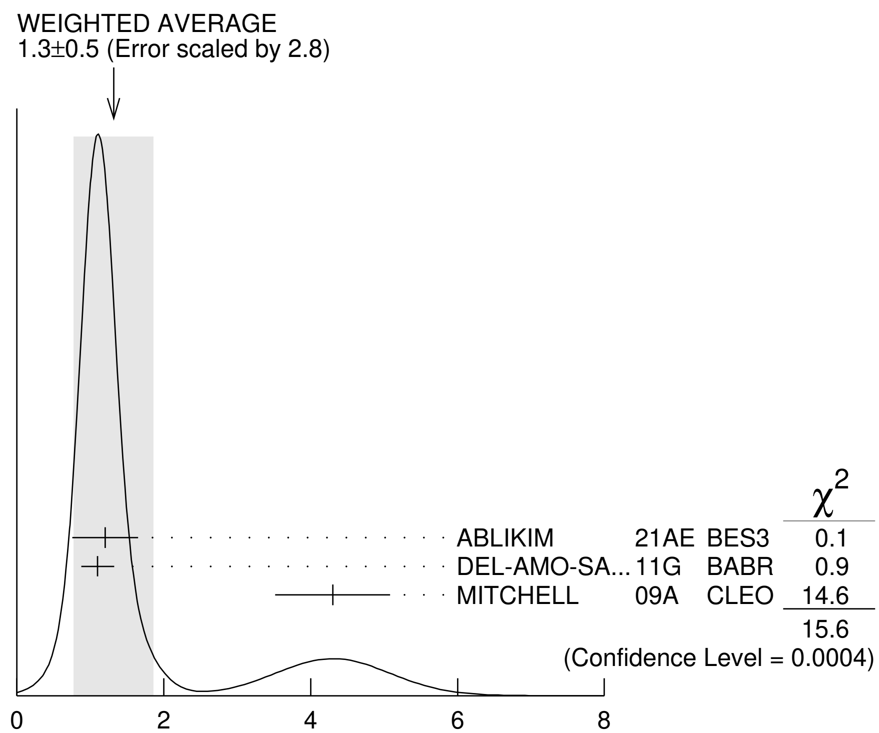
VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
20.6±3.5 OUR AVERAGE	Error includes scale factor of 2.5. See the ideogram below.				
19.3±1.7±2.0	18.6k	ABLIKIM	21AE	BES3	$e^+ e^-$ at 4.178 GeV
16.4±0.7±2.0		DEL-AMO-SA...	11G	BABR	Dalitz fit, 96k evts
28.2±1.9±1.8		MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •					
11.0±3.5±2.6		FRABETTI	95B	E687	Dalitz fit, 701 evts



$\Gamma(f_0(1370)\pi^+, f_0 \to K^+K^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{50}/Γ_{43}

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.3±0.5 OUR AVERAGE		Error includes scale factor of 2.8. See the ideogram below.			
1.2±0.4±0.2	18.6k	ABLIKIM	21AE	BES3	e^+e^- at 4.178 GeV
1.1±0.1±0.2		DEL-AMO-SA...	11G	BABR	Dalitz fit, 96k evts
4.3±0.6±0.5		MITCHELL	09A	CLEO	Dalitz fit, 12k evts



$\Gamma(f_0(1710)\pi^+, f_0 \to K^+K^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{51}/Γ_{43}

This is the "fit fraction" from the Dalitz-plot analysis. This is likely a superposition of $D_s^+ \to f_0(1710)\pi$ and $D_s^+ \to a_0(1710)\pi$ which are indistinguishable in such an analysis.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.3±0.5 OUR AVERAGE		Error includes scale factor of 3.8.			
1.9±0.4±0.6	18.6k	ABLIKIM	21AE	BES3	e^+e^- at 4.178 GeV
1.1±0.1±0.1		DEL-AMO-SA...	11G	BABR	Dalitz fit, 96k evts
3.4±0.5±0.3		MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3.4±2.3±3.5		FRABETTI	95B	E687	Dalitz fit, 701 evts

$\Gamma(a_0(980)^+\pi^0,\ a_0^+ \to K^+K_S^0)/\Gamma(K^+K_S^0\pi^0)$ — Γ_{52}/Γ_{56}

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
7.7±1.7±1.8	ABLIKIM	22AH	BES3	Dalitz plot fit, 990 evts

$\Gamma(a_0(1710)^+\pi^0,\ a_0^+ \to K^+K^0_S)/\Gamma(K^+K^0_S\pi^0)$ — Γ_{53}/Γ_{56}

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
23.6±3.4±2.0	[1] ABLIKIM	22AH	BES3	Dalitz plot fit, 990 evts

[1] ABLIKIM 22AH observe an a_0-like state with mass $m_{a_0} = 1.817 \pm 0.008 \pm 0.020$ GeV, and name the intermediate resonance $a_0(1817)$. We interpret this as the $a_0(1710)$ observed by LEES 21A.

$\Gamma(K^+\overline{K}^*_0(1430)^0, \overline{K}^*_0 \to K^-\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{54}/Γ_{43}

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
3.3±0.5 OUR AVERAGE					
3.0±0.6±0.5	18.6k	ABLIKIM	21AE	BES3	e^+e^- at 4.178 GeV
2.4±0.3±1.0		DEL-AMO-SA..	11G	BABR	Dalitz fit, 96k evts
3.9±0.5±0.5		MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •					
9.3±3.2±3.2		FRABETTI	95B	E687	Dalitz fit, 701 evts

$\Gamma(K^+\overline{K}^*(1410)^0,\ \overline{K}^*_0 \to K^0_S\pi^0)/\Gamma(K^+K^0_S\pi^0)$ — Γ_{55}/Γ_{56}

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
6.0±1.4±1.3	ABLIKIM	22AH	BES3	Dalitz plot fit, 990 evts

$\Gamma(K^+K^0_S\pi^0)/\Gamma_{total}$ — Γ_{56}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.47±0.07 OUR AVERAGE					
1.46±0.06±0.05	990	ABLIKIM	22AH	BES3	e^+e^- at 4.178-4.226 GeV
1.52±0.09±0.20		ONYISI	13	CLEO	e^+e^- at 4.17 GeV

$\Gamma(2K^0_S\pi^+)/\Gamma_{total}$ — Γ_{57}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.71±0.04 OUR AVERAGE	Error includes scale factor of 1.3.				
0.68±0.04±0.01	370	ABLIKIM	22F	BES3	e^+e^- at 4.178–4.226 GeV
0.77±0.05±0.03		ONYISI	13	CLEO	e^+e^- at 4.17 GeV

$\Gamma(f_0(980)\pi^+,\ f_0 \to K^0_S K^0_S)/\Gamma_{total}$ — Γ_{58}/Γ

This is the "fit fraction" from the Dalitz-plot analysis. This is likely a superposition of $D_s^+ \to f_0(980)\pi$ and $D_s^+ \to a_0(980)\pi$ which are indistinguishable in such an analysis.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.8 × 10^{-4}	90	[1] ABLIKIM	22F	BES3	Dalitz plot fit

[1] Based on isospin considerations, the authors interpret the suppression in the observed rate of this mode compared to $D_S^+ \to f_0(980)\pi^+,\ f_0 \to K^+K^-$ as likely due to the destructive interference between $a_0(980)$ and $f_0(980)$ in decays to $K^0_S K^0_S$.

$\Gamma(f_0(1710)\pi^+,\ f_0 \to K^0_S K^0_S)/\Gamma(2K^0_S\pi^+)$ — Γ_{59}/Γ_{57}

This is the "fit fraction" from the Dalitz-plot analysis. This is likely a superposition of $D_s^+ \to f_0(1710)\pi$ and $D_s^+ \to a_0(1700)\pi$ which are indistinguishable in such an analysis.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
46.3±4.0±1.2	ABLIKIM	22F	BES3	Dalitz plot fit, 400 evts

$\Gamma(K^*(892)^+ \overline{K}^0)/\Gamma(\phi\pi^+)$ — Γ_{61}/Γ_{44}

Unseen decay modes of the resonances are included.

VALUE	DOCUMENT ID		TECN	COMMENT
1.20±0.21±0.13	CHEN	89	CLEO	e^+e^- 10 GeV

$\Gamma(K^*(892)^+ K^0_S)/\Gamma(2K^0_S\pi^+)$ — Γ_{62}/Γ_{57}

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
43.5±3.9±0.5	ABLIKIM	22F	BES3	Dalitz plot fit, 400 evts

$\Gamma(K^*(892)^+ K^0_S,\ K^{*+} \to K^+\pi^0)/\Gamma(K^+K^0_S\pi^0)$ — Γ_{63}/Γ_{56}

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
13.9±1.7±1.3	ABLIKIM	22AH	BES3	Dalitz plot fit, 990 evts

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
5.50±0.24 OUR FIT Error includes scale factor of 1.3.					
5.51±0.28 OUR AVERAGE Error includes scale factor of 1.5.					
5.42±0.10±0.17	3k	[1] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV
6.37±0.21±0.56		ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.65±0.29±0.40		[2] ALEXANDER	08	CLEO	See ONYISI 13

[1] ABLIKIM 21U uses an amplitude analysis of $D_s^+ \to K^+K^-\pi^+\pi^0$ with 9 components.

[2] ALEXANDER 08 uses single- and double-tagged events in an overall fit.

$\Gamma(\phi\rho^+)/\Gamma_{total}$ — Γ_{65}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.59±0.15±0.30	3k	[1] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV

[1] ABLIKIM 21U uses an amplitude analysis of $D_s^+ \to K^+K^-\pi^+\pi^0$ with 9 components.

$\Gamma(\phi\rho^+)/\Gamma(\phi\pi^+)$ — Γ_{65}/Γ_{44}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$1.86\pm0.26^{+0.29}_{-0.40}$	253	AVERY	92	CLE2	$e^+e^- \simeq$ 10.5 GeV

$\Gamma(\overline{K}_1(1270)^0 K^+,\ \overline{K}_1(1270)^0 \to K^-\rho^+)/\Gamma_{total}$ — Γ_{66}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.57±0.05±0.04	3k	[1] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV

[1] ABLIKIM 21U uses an amplitude analysis of $D_s^+ \to K^+K^-\pi^+\pi^0$ with 9 components.

$\Gamma(\overline{K}_1(1270)^0 K^+,\ \overline{K}_1(1270)^0 \to K^*(892)\pi)/\Gamma_{total}$ — Γ_{67}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.31±0.18±0.18	3k	[1,2] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV

[1] ABLIKIM 21U uses an amplitude analysis of $D_s^+ \to K^+K^-\pi^+\pi^0$ with 9 components.

[2] $\overline{K}_1(1270)^0 \to K^*(892)\pi$ denotes a sum over $\overline{K}(892)^0\pi^0$ and $K(892)^-\pi^+$ final states, which are assumed to have relative branching ratio 1/2, as per isospin.

$\Gamma(\overline{K}_1(1400)^0 K^+,\ \overline{K}_1(1400)^0 \to K^*(892)\pi)/\Gamma_{total}$ — Γ_{68}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.98±0.27±0.32	3k	[1] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV

[1] $\overline{K}_1(1400)^0 \to K^*(892)\pi$ denotes a sum over $\overline{K}(892)^0\pi^0$ and $K(892)^-\pi^+$ final states, which are assumed to have relative branching ratio 1/2, as per isospin.

$\Gamma(a_0(980)^0 \rho^+,\ a_0(980)^0 \to K^+K^-)/\Gamma_{total}$ — Γ_{69}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.19±0.03±0.03	3k	[1] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV

[1] ABLIKIM 21U uses an amplitude analysis of $D_s^+ \to K^+K^-\pi^+\pi^0$ with 9 components.

$\Gamma(f_1(1420)^0 \pi^+,\ f_1(1420)^0 \to K^*(892)^{\mp} K^{\pm})/\Gamma_{total}$ — Γ_{70}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.39±0.06±0.03	3k	[1] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV

[1] ABLIKIM 21U uses an amplitude analysis of $D_s^+ \to K^+K^-\pi^+\pi^0$ with 9 components.

$\Gamma(f_1(1420)^0 \pi^+,\ f_1(1420)^0 \to a_0(980)^0\pi^0,\ a_0(980)^0 \to K^+K^-)/\Gamma_{total}$ — Γ_{71}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.04±0.01±0.01	3k	[1] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV

[1] ABLIKIM 21U uses an amplitude analysis of $D_s^+ \to K^+K^-\pi^+\pi^0$ with 9 components.

$\Gamma(\eta(1475)\pi^+,\ \eta(1475) \to a_0(980)^0\pi^0,\ a_0(980)^0 \to K^+K^-)/\Gamma_{total}$ — Γ_{72}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.07±0.02±0.02	3k	[1] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV

[1] ABLIKIM 21U uses an amplitude analysis of $D_s^+ \to K^+K^-\pi^+\pi^0$ with 9 components.

$\Gamma(K_S^0 K^- 2\pi^+)/\Gamma_{total}$ — Γ_{73}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.53±0.08 OUR FIT Error includes scale factor of 1.5.					
1.53±0.11 OUR AVERAGE Error includes scale factor of 1.8.					
1.46±0.05±0.05	1.3k	ABLIKIM	21K	BES3	e^+e^- at 4.178–4.226 GeV
1.69±0.07±0.08		ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.64±0.10±0.07		[1] ALEXANDER	08	CLEO	See ONYISI 13

[1] ALEXANDER 08 uses single- and double-tagged events in an overall fit.

$\Gamma(K^*(892)^+ \overline{K}^*(892)^0)/\Gamma_{total}$ — Γ_{74}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.64±0.23±0.27	3k	[1] ABLIKIM	21U	BES3	e^+e^- at 4.178–4.226 GeV

[1] ABLIKIM 21U uses an amplitude analysis of $D_s^+ \to K^+K^-\pi^+\pi^0$ with 9 components.

$\Gamma(K^*(892)^+ \overline{K}^*(892)^0)/\Gamma(\phi\pi^+)$ — Γ_{74}/Γ_{44}

Unseen decay modes of the resonances are included.

VALUE	DOCUMENT ID		TECN	COMMENT
1.6±0.4±0.4	ALBRECHT	92B	ARG	$e^+e^- \simeq$ 10.4 GeV

$\Gamma\big(K^*(892)^+\overline{K}^*(892)^0\big)/\Gamma\big(K^0_S K^- 2\pi^+\big)$ Γ_{74}/Γ_{73}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
40.6±2.9±4.9	1.3k	[1,2] ABLIKIM	21K	BES3	e^+e^- at 4.178–4.226 GeV

[1] Predominantly S-wave, with a significant D-wave component.
[2] $D^+_s \to K^0_S K^- 2\pi^+$ amplitude analysis with 13 components.

$\Gamma\big(\eta(1475)K^0_S,\ \eta\to K^*(892)^0\pi^+,\ K^{*0}\to K^-\pi^+\big)/\Gamma\big(K^0_S K^- 2\pi^+\big)$ Γ_{75}/Γ_{73}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.2±0.6±0.2	1.3k	[1] ABLIKIM	21K	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D^+_s \to K^0_S K^- 2\pi^+$ amplitude analysis with 13 components.

$\Gamma\big(\eta(1475)\pi^+,\ \eta\to \overline{K}^*(892)^+K^-,\ \overline{K}^{*+}\to K^0_S\pi^+\big)/\Gamma\big(K^0_S K^- 2\pi^+\big)$ Γ_{76}/Γ_{73}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.2±0.6±0.2	1.3k	[1] ABLIKIM	21K	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D^+_s \to K^0_S K^- 2\pi^+$ amplitude analysis with 13 components.

$\Gamma\big(\eta(1475)\pi^+,\ \eta\to a_0(980)^-\pi^+,\ a_0^-\to K^0_S K^-\big)/\Gamma\big(K^0_S K^- 2\pi^+\big)$ Γ_{77}/Γ_{73}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
10.8±2.6±5.2	1.3k	[1] ABLIKIM	21K	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D^+_s \to K^0_S K^- 2\pi^+$ amplitude analysis with 13 components.

$\Gamma\big(f_1(1285)\pi^+,\ f_1\to a_0(980)^-\pi^+,\ a_0^-\to K^0_S K^-\big)/\Gamma\big(K^0_S K^- 2\pi^+\big)$ Γ_{78}/Γ_{73}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.2±0.5±0.2	1.3k	[1] ABLIKIM	21K	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D^+_s \to K^0_S K^- 2\pi^+$ amplitude analysis with 13 components.

$\Gamma\big(K^+K^0_S\pi^+\pi^-\big)/\Gamma_{\text{total}}$ Γ_{79}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
0.95±0.08 OUR FIT Error includes scale factor of 1.1.				
1.03±0.06±0.08	ONYISI	13	CLEO	e^+e^- at 4.17 GeV

$\Gamma\big(K^+K^0_S\pi^+\pi^-\big)/\Gamma\big(K^0_S K^- 2\pi^+\big)$ Γ_{79}/Γ_{73}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.62 ±0.05 OUR FIT					
0.586±0.052±0.043	476	LINK	01C	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma\big(K^+K^-2\pi^+\pi^-\big)/\Gamma_{\text{total}}$ Γ_{80}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
6.60±0.47±0.38	309	ABLIKIM	22AB	BES3	e^+e^- at 4.178–4.226 GeV

$\Gamma\big(K^+K^-2\pi^+\pi^-\big)/\Gamma\big(K^+K^-\pi^+\big)$ Γ_{80}/Γ_{43}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.160±0.027 OUR AVERAGE					
0.150±0.019±0.025	240	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
0.188±0.036±0.040	75	FRABETTI	97C	E687	γ Be, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(\phi 2\pi^+\pi^-)/\Gamma(\phi\pi^+)$ — Γ_{81}/Γ_{44}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.269±0.027 OUR AVERAGE					
0.249±0.024±0.021	136	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
0.28 ±0.06 ±0.01	40	FRABETTI	97C	E687	γBe, $\overline{E}_\gamma \approx$ 200 GeV
0.58 ±0.21 ±0.10	21	FRABETTI	92	E687	γBe
0.42 ±0.13 ±0.07	19	ANJOS	88	E691	Photoproduction
1.11 ±0.37 ±0.28	62	ALBRECHT	85D	ARG	e^+e^- 10 GeV

$\Gamma(\phi\rho^0\pi^+,\ \phi\to K^+K^-)/\Gamma(K^+K^-2\pi^+\pi^-)$ — Γ_{82}/Γ_{80}

VALUE	DOCUMENT ID		TECN	COMMENT
0.75±0.06±0.04	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\phi a_1(1260)^+,\ \phi\to K^+K^-,\ a_1^+\to\rho^0\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{83}/Γ_{43}

VALUE	DOCUMENT ID		TECN	COMMENT
0.137±0.019±0.011	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\phi a_1(1260)^+,\ \phi\to K^+K^-,\ a_1^+\to\rho^0\pi^+)/\Gamma(K^+K^-2\pi^+\pi^-)$ — Γ_{83}/Γ_{80}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.781±0.029±0.016	235	ABLIKIM	22AB	BES3	e^+e^- at 4.178–4.226 GeV

$\Gamma(\phi 2\pi^+\pi^-\ \text{non-}\rho,\ \phi\to K^+K^-)/\Gamma(K^+K^-2\pi^+\pi^-)$ — Γ_{84}/Γ_{80}

VALUE	DOCUMENT ID		TECN	COMMENT
0.21±0.05±0.06	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^+K^-\rho^0\pi^+\ \text{non-}\phi)/\Gamma(K^+K^-2\pi^+\pi^-)$ — Γ_{85}/Γ_{80}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.03	90	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^+K^-2\pi^+\pi^-\ \text{nonresonant})/\Gamma(K^+K^-2\pi^+\pi^-)$ — Γ_{86}/Γ_{80}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.15 ±0.06 OUR AVERAGE					
0.218±0.029±0.08	235	ABLIKIM	22AB	BES3	e^+e^- at 4.178–4.226 GeV
0.10 ±0.06 ±0.05		LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(2K_S^0 2\pi^+\pi^-)/\Gamma(K_S^0 K^- 2\pi^+)$ — Γ_{87}/Γ_{73}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.051±0.015±0.015	37 ± 10	LINK	04D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

Pionic modes

$\Gamma(\pi^+\pi^0)/\Gamma_{total}$ — Γ_{88}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.2\times10^{-4}$	90	[1] GUAN	21	BELL	$e^+e^- \approx \Upsilon(4,5S)$

[1] Uses B($D_s^+ \to \pi^+\phi,\ \phi\to K^+K^-$) = (2.24 ± 0.08)%.

$\Gamma(\pi^+\pi^0)/\Gamma(K^+K^0_S)$ — Γ_{88}/Γ_{40}

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
<2.3	90	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<4.1	90	ADAMS	07A	CLEO	See MENDEZ 10

$\Gamma(2\pi^+\pi^-)/\Gamma_{total}$ — Γ_{89}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
1.08±0.04 OUR FIT				
1.11±0.04±0.04	ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.11±0.07±0.04	[1] ALEXANDER	08	CLEO	See ONYISI 13

[1] ALEXANDER 08 uses single- and double-tagged events in an overall fit.

$\Gamma(2\pi^+\pi^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{89}/Γ_{43}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.201±0.007 OUR FIT					
0.199±0.004±0.009	≈ 10.5k	AUBERT	09O	BABR	$e^+e^-\approx$ 10.6 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.265±0.041±0.031	98	FRABETTI	97D	E687	γ Be ≈ 200 GeV

$\Gamma(\rho^0\pi^+)/\Gamma(2\pi^+\pi^-)$ — Γ_{90}/Γ_{89}

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
1.1±0.6 OUR AVERAGE					
0.9±0.4±0.5		ABLIKIM	22BI	BES3	Dalitz fit, 11.1k events
1.8±0.5±1.0		AUBERT	09O	BABR	Dalitz fit, ≈ 10.5k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •					
not seen		LINK	04	FOCS	Dalitz fit, 1475 ± 50 evts
5.8±2.3±3.7		AITALA	01A	E791	Dalitz fit, 848 evts
<7.3	90	FRABETTI	97D	E687	γ Be ≈ 200 GeV

$\Gamma(\pi^+(\pi^+\pi^-)_{S-wave})/\Gamma(2\pi^+\pi^-)$ — Γ_{91}/Γ_{89}

This is the "fit fraction" from the Dalitz-plot analysis. See also KLEMPT 08, which uses 568 $D_s^+ \to 3\pi$ decays (over 280 background events) from FNAL E791 to study various parametrizations of the decay amplitudes. The emphasis there is more on S-wave $\pi\pi$ decay products — 20 different solutions are given — than on D_s^+ fit fractions.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
83.9 ±1.2 OUR AVERAGE				
84.2 ±0.8 ±1.2	[1] ABLIKIM	22BI	BES3	Dalitz fit, 11.1k events
83.0 ±0.9 ±1.9	[1] AUBERT	09O	BABR	Dalitz fit, ≈ 10.5k evts
87.04±5.60±4.38	[2] LINK	04	FOCS	Dalitz fit, 1475 ± 50 evts

[1] AUBERT 09O and ABLIKIM 22BI give the amplitude and phase of the $\pi^+\pi^-$ S-wave in 29 $\pi^+\pi^-$ invariant-mass bins.

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

$\Gamma(f_0(980)\pi^+, f_0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{92}/Γ_{89}

This is the "fit fraction" from the Dalitz-plot analysis. See above for the full $\pi^+(\pi^+\pi^-)_{S-wave}$ fit fraction.

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.565±0.043±0.047	AITALA	01A	E791	Dalitz fit, 848 evts
1.074±0.140±0.043	FRABETTI	97D	E687	γ Be ≈ 200 GeV

$\Gamma(f_0(1370)\pi^+, f_0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{93}/Γ_{89}

This is the "fit fraction" from the Dalitz-plot analysis. See above for the full $\pi^+(\pi^+\pi^-)_{S-wave}$ fit fraction.

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.324±0.077±0.017	AITALA	01A	E791	Dalitz fit, 848 evts

$\Gamma(f_0(1500)\pi^+, f_0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{94}/Γ_{89}

This is the "fit fraction" from the Dalitz-plot analysis. See above for the full $\pi^+(\pi^+\pi^-)_{S-wave}$ fit fraction.

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.274±0.114±0.019	[1] FRABETTI	97D	E687	γ Be ≈ 200 GeV

[1] FRABETTI 97D calls this mode $S(1475)\pi^+$, but finds the mass and width of this $S(1475)$ to be in excellent agreement with those of the $f_0(1500)$.

$\Gamma(f_2(1270)\pi^+, f_2 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{95}/Γ_{89}

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

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
10.3 ±1.1 OUR AVERAGE				
10.5 ±0.8 ±1.1	ABLIKIM	22BI	BES3	Dalitz fit, 11.1k events
10.1 ±1.5 ±1.1	AUBERT	09O	BABR	Dalitz fit, ≈ 10.5k evts
9.74±4.49±2.94	LINK	04	FOCS	Dalitz fit, 1475 ± 50 evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
19.7 ±3.3 ±0.6	AITALA	01A	E791	Dalitz fit, 848 evts
12.3 ±5.6 ±1.8	FRABETTI	97D	E687	γ Be ≈ 200 GeV

$\Gamma(\rho(1450)^0\pi^+, \rho^0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{96}/Γ_{89}

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

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
1.5 ±0.6 OUR AVERAGE				
1.3 ±0.4 ±0.5	ABLIKIM	22BI	BES3	Dalitz fit, 11.1k events
2.3 ±0.8 ±1.7	AUBERT	09O	BABR	Dalitz fit, ≈ 10.5k evts
6.56±3.43±4.40	LINK	04	FOCS	Dalitz fit, 1475 ± 50 evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.4 ±2.1 ±0.2	AITALA	01A	E791	Dalitz fit, 848 evts

$\Gamma(\pi^+ 2\pi^0)/\Gamma_{total}$ — Γ_{97}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.52±0.05 OUR AVERAGE Error includes scale factor of 1.1.					
0.50±0.04±0.02	590	ABLIKIM	22Z	BES3	e^+e^- at 4.178–4.226 GeV
0.65±0.13±0.03	72 ± 16	NAIK	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(f_0(980)\pi^+,\ f_0 \to \pi^0\pi^0)/\Gamma(\pi^+ 2\pi^0)$ — Γ_{98}/Γ_{97}

This is a "fit fraction" from an amplitude analysis.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
55.4±6.8±7.3	ABLIKIM	22Z	BES3	Dalitz plot fit, 440 evts

$\Gamma(f_0(1370)\pi^+,\ f_0 \to \pi^0\pi^0)/\Gamma(\pi^+ 2\pi^0)$ — Γ_{99}/Γ_{97}

This is a "fit fraction" from an amplitude analysis.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
25.5±5.1±9.3	ABLIKIM	22Z	BES3	Dalitz plot fit, 440 evts

$\Gamma(f_2(1270)\pi^+,\ f_2 \to \pi^0\pi^0)/\Gamma(\pi^+ 2\pi^0)$ — Γ_{100}/Γ_{97}

This is a "fit fraction" from an amplitude analysis.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
9.7±2.9±6.0	ABLIKIM	22Z	BES3	Dalitz plot fit, 440 evts

$\Gamma(2\pi^+\pi^-\pi^0)/\Gamma(\phi\pi^+)$ — Γ_{101}/Γ_{44}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.3	90	ANJOS	89E	E691	Photoproduction

$\Gamma(\eta\pi^+)/\Gamma_{total}$ — Γ_{102}/Γ

Unseen decay modes of the η are included.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.67±0.09 OUR FIT Error includes scale factor of 1.1.					
1.71±0.08 OUR AVERAGE					
1.67±0.08±0.06		ONYISI	13	CLEO	e^+e^- at 4.17 GeV
1.82±0.14±0.07	0.8k	ZUPANC	13	BELL	e^+e^- at $\Upsilon(4S), \Upsilon(5S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.58±0.11±0.18		[1] ALEXANDER	08	CLEO	See ONYISI 13

[1] ALEXANDER 08 uses single- and double-tagged events in an overall fit.

$\Gamma(\eta\pi^+)/\Gamma(K^+K^0_S)$ — Γ_{102}/Γ_{40}

Unseen decay modes of the η are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.15 ±0.07 OUR FIT Error includes scale factor of 1.1.					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.236±0.043±0.063	2587 ± 89	MENDEZ	10	CLEO	See ONYISI 13

$\Gamma(\eta\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{102}/Γ_{43}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
31.94±0.33±0.49	19.5k	ABLIKIM	20R	BES3	e^+e^-, 4178 ∼ 4226 MeV

$\Gamma(\eta\pi^+)/\Gamma(\phi\pi^+)$ — Γ_{102}/Γ_{44}

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.48±0.03±0.04	920	JESSOP	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.54±0.09±0.06	165	ALEXANDER	92	CLE2	See JESSOP 98

$\Gamma(\eta\pi^+)/\Gamma(\phi\pi^+, \phi\to K^+K^-)$ — Γ_{102}/Γ_{45}

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
84.80±0.47±2.64	22k	GUAN	21	BELL	$e^+e^- \approx \Upsilon(4,5S)$

$\Gamma(\omega\pi^+)/\Gamma_{total}$ — Γ_{103}/Γ

Unseen decay modes of the ω are included.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.192±0.030 OUR FIT					
0.181±0.032 OUR AVERAGE					
0.177±0.032±0.013	65 ± 12	ABLIKIM	19AH	BES3	e^+e^- at 4.178 GeV
0.21 ±0.09 ±0.01	6 ± 2.4	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(\omega\pi^+)/\Gamma(\eta\pi^+)$ — $\Gamma_{103}/\Gamma_{102}$

Unseen decay modes of the resonances are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.115±0.018 OUR FIT				
0.16 ±0.04 ±0.03	BALEST	97	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(3\pi^+2\pi^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{104}/Γ_{43}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.146±0.014 OUR AVERAGE					
0.145±0.011±0.010	671	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
0.158±0.042±0.031	37	FRABETTI	97C	E687	γBe, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(\eta\rho^+)/\Gamma_{total}$ — Γ_{106}/Γ

Unseen decay modes of the η are included.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
8.9±0.6±0.5	328 ± 22	NAIK	09A	CLEO	$\eta \to 2\gamma$

$\Gamma(\eta\rho^+)/\Gamma(\phi\pi^+)$ — Γ_{106}/Γ_{44}

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.98±0.20±0.39	447	JESSOP	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
$2.86\pm0.38^{+0.36}_{-0.38}$	217	AVERY	92	CLE2	See JESSOP 98

$\Gamma(\eta\rho^+)/\Gamma(\eta\pi^+\pi^0)$ — $\Gamma_{106}/\Gamma_{107}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
78.3±5.0±2.1	1.2k	ABLIKIM	19BE	BES3	$\eta\pi^+\pi^0$ amplitude analysis

$\Gamma(\eta\pi^+\pi^0)/\Gamma_{total}$ — Γ_{107}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
9.5 ±0.5 OUR AVERAGE					
9.50±0.28±0.41	2.6k	ABLIKIM	19BE	BES3	e^+e^- at 4.178 GeV
9.2 ±0.4 ±1.1		ONYISI	13	CLEO	e^+e^- at 4.17 GeV

$\Gamma(\eta(\pi^+\pi^0)_{P-wave})/\Gamma(\eta\pi^+\pi^0)$ — $\Gamma_{108}/\Gamma_{107}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.4±2.1±2.5	1.2k	ABLIKIM	19BE	BES3	$\eta\pi^+\pi^0$ amplitude analysis

$\Gamma(a_0(980)^{+0}\pi^{0+},\ a_0(980)^{+0}\to\eta\pi^{+0})/\Gamma(\eta\pi^+\pi^0)$ — $\Gamma_{109}/\Gamma_{107}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
23.2±2.3±3.3	1.2k	[1] ABLIKIM	19BE	BES3	$\eta\pi^+\pi^0$ amplitude analysis

[1] Coherent sum of $D_s^+ \to a_0^+\pi^0 \to \eta\pi^+\pi^0$ and $D_s^+ \to a_0^0\pi^+ \to \eta\pi^+\pi^0$. ABLIKIM 19BE find $a_0(980)^0-f(980)$ mixing effects negligibly small in this $D_s^+ \to \eta\pi^+\pi^0$ Dalitz plot analysis.

$\Gamma(\omega\pi^+\pi^0)/\Gamma_{\text{total}}$ — Γ_{110}/Γ

Unseen decay modes of the ω are included.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
2.78±0.65±0.25	34 ± 7.9	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(2\pi^+\pi^-\eta)/\Gamma_{\text{total}}$ — Γ_{111}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
3.12±0.13±0.09	2.1k	ABLIKIM	21AR	BES3	e^+e^- at 4.178–4.226 GeV

$\Gamma(a_1(1260)^+\eta,\ a_1^+\to\rho(770)^0\pi^+,\ \rho^0\to\pi^+\pi^-)/\Gamma(2\pi^+\pi^-\eta)$ — $\Gamma_{112}/\Gamma_{111}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
55.4±3.9±2.0	[1] ABLIKIM	21AR	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D_s^+ \to 2\pi^+\pi^-\eta$ amplitude analysis with 11 components.

$\Gamma(a_1(1260)^+\eta,\ a_1^+\to f_0(500)\pi^+,\ f_0\to\pi^+\pi^-)/\Gamma(2\pi^+\pi^-\eta)$ — $\Gamma_{113}/\Gamma_{111}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
8.1±1.9±2.1	[1] ABLIKIM	21AR	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D_s^+ \to 2\pi^+\pi^-\eta$ amplitude analysis with 11 components.

$\Gamma(a_0(980)^+\rho(770)^0,\ a_0^+\to\eta\pi^+)/\Gamma(2\pi^+\pi^-\eta)$ — $\Gamma_{114}/\Gamma_{111}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
6.7±2.5±1.5	[1] ABLIKIM	21AR	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D_s^+ \to 2\pi^+\pi^-\eta$ amplitude analysis with 11 components.

$\Gamma(\eta(1405)\pi^+,\ \eta(1405)\to a_0(980)^-\pi^+,\ a_0^-\to\eta\pi^-)/\Gamma(2\pi^+\pi^-\eta)$ — $\Gamma_{115}/\Gamma_{111}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
0.7±0.2±0.1	[1] ABLIKIM	21AR	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D_s^+ \to 2\pi^+\pi^-\eta$ amplitude analysis with 11 components.

$\Gamma(\eta(1405)\pi^+,\ \eta(1405)\to a_0(980)^+\pi^-,\ a_0^+\to\eta\pi^+)/\Gamma(2\pi^+\pi^-\eta)$ — $\Gamma_{116}/\Gamma_{111}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
0.7±0.2±0.1	[1] ABLIKIM	21AR	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D_s^+ \to 2\pi^+\pi^-\eta$ amplitude analysis with 11 components.

$\Gamma(f_1(1420)\pi^+,\ f_1 \to a_0(980)^-\pi^+,\ a_0^- \to \eta\pi^-)/\Gamma(2\pi^+\pi^-\eta)$ — $\Gamma_{117}/\Gamma_{111}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
1.9±0.5±0.3	[1] ABLIKIM	21AR	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D_s^+ \to 2\pi^+\pi^-\eta$ amplitude analysis with 11 components.

$\Gamma(f_1(1420)\pi^+,\ f_1 \to a_0(980)^+\pi^-,\ a_0^+ \to \eta\pi^+)/\Gamma(2\pi^+\pi^-\eta)$ — $\Gamma_{118}/\Gamma_{111}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
1.7±0.5±0.3	[1] ABLIKIM	21AR	BES3	e^+e^- at 4.178–4.226 GeV

[1] $D_s^+ \to 2\pi^+\pi^-\eta$ amplitude analysis with 11 components.

$\Gamma(3\pi^+2\pi^-\pi^0)/\Gamma_{total}$ — Γ_{119}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.049^{+0.033}_{-0.030}}$	BARLAG	92C	ACCM	π^- 230 GeV

$\Gamma(\omega 2\pi^+\pi^-)/\Gamma_{total}$ — Γ_{120}/Γ

Unseen decay modes of the ω are included.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.58±0.45±0.09	29 ± 8.2	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(\eta'(958)\pi^+)/\Gamma_{total}$ — Γ_{121}/Γ

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
3.94±0.15±0.20	ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3.77±0.25±0.30	[1] ALEXANDER	08	CLEO	See ONYISI 13

[1] ALEXANDER 08 uses single- and double-tagged events in an overall fit.

$\Gamma(\eta'(958)\pi^+)/\Gamma(K^+K^0_S)$ — Γ_{121}/Γ_{40}

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.654±0.088±0.139	1436 ± 47	MENDEZ	10	CLEO	See ONYISI 13

$\Gamma(\eta'(958)\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{121}/Γ_{43}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
69.4±0.8±3.8	9.9k	ABLIKIM	20R	BES3	e^+e^-, 4178 ∼ 4226 MeV

$\Gamma(\eta'(958)\pi^+)/\Gamma(\phi\pi^+)$ — Γ_{121}/Γ_{44}

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.03±0.06±0.07	537	JESSOP	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
1.20±0.15±0.11	281	ALEXANDER	92	CLE2	See JESSOP 98
$2.5 \pm 1.0\ ^{+1.5}_{-0.4}$	22	ALVAREZ	91	NA14	Photoproduction
2.5 ±0.5 ±0.3	215	ALBRECHT	90D	ARG	$e^+e^- \approx$ 10.4 GeV

$\Gamma(\omega\eta\pi^+)/\Gamma_{total}$ — Γ_{123}/Γ

Unseen decay modes of the ω and η are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<2.13 × 10^{-2}	90	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(\eta'(958)\rho^+)/\Gamma_{total}$ — Γ_{124}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
5.8±1.4±0.4	ABLIKIM	15Z	BES3	482 pb^{-1}, 4009 MeV

$\Gamma(\eta'(958)\rho^+)/\Gamma(\phi\pi^+)$ — Γ_{124}/Γ_{44}

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.78±0.28±0.30	137	[1] JESSOP	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
$3.44\pm0.62^{+0.44}_{-0.46}$	68	AVERY	92	CLE2	See JESSOP 98

[1] This JESSOP 98 fraction, when combined with other η' fractions, greatly overshoots the inclusive η' fraction. See the measurement just above, which fits nicely.

$\Gamma(\eta'(958)\rho^+)/\Gamma(\eta'(958)\pi^+\pi^0)$ — $\Gamma_{124}/\Gamma_{125}$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
≈ 1	395	[1] ABLIKIM	22AA	BES3	e^+e^- at 4.178–4.226 GeV

[1] Result of an amplitude analysis of $D_s^+ \to \pi^+\pi^0\eta'$ which found that $D_s^+ \to \rho^+\eta'$ is the dominant decay mode, with other contributions negligible. No uncertainty is assigned to this 100% fit fraction; however, the fit fractions of non-resonant contributions are shown to be below 1%.

$\Gamma(\eta'(958)\pi^+\pi^0)/\Gamma_{total}$ — Γ_{125}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
6.08±0.29 OUR AVERAGE					
6.15±0.25±0.18	837	[1] ABLIKIM	22AA	BES3	e^+e^- at 4.178–4.226 GeV
5.6 ±0.5 ±0.6		ONYISI	13	CLEO	e^+e^- at 4.17 GeV

[1] An amplitude analysis in the same publication finds that $D_s^+ \to \rho^+\eta'$ is the only statistically significant contribution to this decay.

$\Gamma(\eta'(958)\pi^+\pi^0\,\text{nonresonant})/\Gamma_{total}$ — Γ_{126}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<5.1 × 10^{-2}	90	ABLIKIM	15Z	BES3	482 pb^{-1}, 4009 MeV

Modes with one or three K's

$\Gamma(K^+\pi^0)/\Gamma(K^+K^0_S)$ — Γ_{127}/Γ_{40}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
4.2±1.4±0.2	202 ± 70	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.5±1.3±0.7	141 ± 34	ADAMS	07A	CLEO	See MENDEZ 10

$\Gamma(K^+\pi^0)/\Gamma(K^+K^-\pi^+)$ — Γ_{127}/Γ_{43}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
13.73±0.90±0.33	2.3k	ABLIKIM	20R	BES3	e^+e^-, 4178 ∼ 4226 MeV

$\Gamma(K^+\pi^0)/\Gamma(\phi\pi^+,\ \phi\to K^+K^-)$ — Γ_{127}/Γ_{45}

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
3.28±0.23±0.13	12k	GUAN	21	BELL	$e^+e^- \approx \Upsilon(4,5S)$

$\Gamma(K^0_S\pi^+)/\Gamma(K^+K^0_S)$ — Γ_{128}/Γ_{40}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
8.12±0.28 OUR AVERAGE					
8.5 ±0.7 ±0.2	393 ± 33	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
8.03±0.24±0.19	17.6k±481	WON	09	BELL	e^+e^- at $\Upsilon(4S)$
10.4 ±2.4 ±1.4	113 ± 26	LINK	08	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
8.2 ±0.9 ±0.2	206 ± 22	ADAMS	07A	CLEO	See MENDEZ 10

$\Gamma(K^0_S\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{128}/Γ_{43}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
20.35±0.62±0.42	2.7k	ABLIKIM	20R	BES3	e^+e^-, 4178 ∼ 4226 MeV

$\Gamma(K^+\eta)/\Gamma(K^+K^0_S)$ — Γ_{129}/Γ_{40}

Unseen decay modes of the η are included.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
11.8±2.2±0.6	222 ± 41	MENDEZ	10	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^+\eta)/\Gamma(K^+K^-\pi^+)$ — Γ_{129}/Γ_{43}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.97±0.18±0.06	1.8k	ABLIKIM	20R	BES3	e^+e^-, 4178 ∼ 4226 MeV

$\Gamma(K^+\eta)/\Gamma(\phi\pi^+,\ \phi\to K^+K^-)$ — Γ_{129}/Γ_{45}

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
7.81±0.22±0.24	14k	GUAN	21	BELL	$e^+e^- \approx \Upsilon(4,5S)$

$\Gamma(K^+\eta)/\Gamma(\eta\pi^+)$ — $\Gamma_{129}/\Gamma_{102}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
8.9±1.5±0.4	113 ± 18	ADAMS	07A	CLEO	See MENDEZ 10

$\Gamma(K^+\omega)/\Gamma_{total}$ — Γ_{130}/Γ

Unseen decay modes of the ω are included.

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
9.9±1.5 OUR FIT						
8.7±2.4±0.8		29	[1] ABLIKIM	19AH	BES3	e^+e^- at 4.178 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<24	90		GE	09A	CLEO	e^+e^- at 4170 MeV

[1] Evidence for mode at 4.4σ.

$\Gamma(K^+\omega)/\Gamma(K^+\pi^+\pi^-\pi^0)$ $\Gamma_{130}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
10.3±1.5 OUR FIT				
10.9±1.8±0.1	[1] ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

[1] ABLIKIM 22BL reports $[\Gamma(D_s^+ \to K^+\omega)/\Gamma(D_s^+ \to K^+\pi^+\pi^-\pi^0)] \times [B(\omega(782) \to \pi^+\pi^-\pi^0)] = (9.7 \pm 1.5 \pm 0.6) \times 10^{-2}$ which we divide by our best value $B(\omega(782) \to \pi^+\pi^-\pi^0) = (89.2 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+\eta'(958))/\Gamma(K^+K^0_S)$ Γ_{131}/Γ_{40}

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
11.8±3.6±0.7	56 ± 17	MENDEZ	10	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^+\eta'(958))/\Gamma(K^+K^-\pi^+)$ Γ_{131}/Γ_{43}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
4.91±0.31±0.31	675	ABLIKIM	20R	BES3	e^+e^-, 4178 $\sim$ 4226 MeV

$\Gamma(K^+\eta'(958))/\Gamma(\eta'(958)\pi^+)$ $\Gamma_{131}/\Gamma_{121}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.2±1.3±0.3	28 ± 9	ADAMS	07A	CLEO	See MENDEZ 10

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
6.20±0.19 OUR FIT					
6.20±0.19 OUR AVERAGE					
6.11±0.18±0.11	1.3k	ABLIKIM	22AC	BES3	e^+e^- at 4.178–4.226 GeV
6.54±0.33±0.25		ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
6.9 ±0.5 ±0.3		[1] ALEXANDER	08	CLEO	See ONYISI 13

[1] ALEXANDER 08 uses single- and double-tagged events in an overall fit.

$\Gamma(K^+\pi^+\pi^-)/\Gamma(K^+K^-\pi^+)$ Γ_{132}/Γ_{43}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.115±0.004 OUR FIT Error includes scale factor of 1.1.					
0.127±0.007±0.014	567 ± 31	LINK	04F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^+\rho^0)/\Gamma(K^+\pi^+\pi^-)$ $\Gamma_{133}/\Gamma_{132}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.35 ±0.04 OUR AVERAGE				
0.321±0.037±0.037	ABLIKIM	22AC	BES3	Dalitz plot fit, 1.3k evts
0.388±0.053±0.026	LINK	04F	FOCS	Dalitz plot fit, 567 evts

$\Gamma(K^+ \rho(1450)^0, \rho^0 \to \pi^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{134}/\Gamma_{132}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.117±0.028 OUR AVERAGE				
0.131±0.031±0.029	ABLIKIM	22AC	BES3	Dalitz plot fit, 1.3k evts
0.106±0.035±0.010	LINK	04F	FOCS	Dalitz plot fit, 567 evts

$\Gamma(K^+ f_0(500), f_0 \to \pi^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{135}/\Gamma_{132}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
7.2±2.1±4.4	ABLIKIM	22AC	BES3	Dalitz plot fit, 1.3k evts

$\Gamma(K^+ f_0(980), f_0 \to \pi^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{136}/\Gamma_{132}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
4.5±1.3±1.2	ABLIKIM	22AC	BES3	Dalitz plot fit, 1.3k evts

$\Gamma(K^+ f_0(1370), f_0 \to \pi^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{137}/\Gamma_{132}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
19.9±2.9±9.3	ABLIKIM	22AC	BES3	Dalitz plot fit, 1.3k evts

$\Gamma(K^*(892)^0\pi^+, K^{*0} \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{138}/\Gamma_{132}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.27 ±0.04 OUR AVERAGE	Error includes scale factor of 2.0.			
0.302 ±0.018 ±0.020	ABLIKIM	22AC	BES3	Dalitz plot fit, 1.3k evts
0.2164±0.0321±0.0114	LINK	04F	FOCS	Dalitz plot fit, 567 evts

$\Gamma(K^*(1410)^0\pi^+, K^{*0} \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{139}/\Gamma_{132}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.10 ±0.07 OUR AVERAGE	Error includes scale factor of 2.7.			
0.045 ±0.021 ±0.025	ABLIKIM	22AC	BES3	Dalitz plot fit, 1.3k evts
0.1882±0.0403±0.0122	LINK	04F	FOCS	Dalitz plot fit, 567 evts

$\Gamma(K^*(1430)^0\pi^+, K^{*0} \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{140}/\Gamma_{132}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.15 ±0.05 OUR AVERAGE	Error includes scale factor of 1.7.			
0.185 ±0.025 ±0.026	ABLIKIM	22AC	BES3	Dalitz plot fit, 1.3k evts
0.0765±0.0500±0.0170	LINK	04F	FOCS	Dalitz plot fit, 567 evts

$\Gamma(K^+\pi^+\pi^-$ nonresonant$)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{141}/\Gamma_{132}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.1588±0.0492±0.0153	LINK	04F	FOCS	Dalitz fit, 567 evts

$\Gamma(K^0\pi^+\pi^0)/\Gamma_{total}$ — Γ_{142}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.08 ±0.06 OUR AVERAGE					
1.086±0.060±0.030	666	[1] ABLIKIM	21AB	BES3	e^+e^- at 4.178–4.226 GeV
1.00 ±0.18 ±0.04	44	NAIK	09A	CLEO	e^+e^- at 4170 MeV

[1] ABLIKIM 21AB uses an amplitude analysis with 5 resonant modes plus one background component, and measures B($D_s^+ \to K_S^0\pi^+\pi^0$) = $(5.43 \pm 0.30 \pm 0.15) \times 10^{-3}$.

$\Gamma(K_S^0 2\pi^+\pi^-)/\Gamma(K_S^0 K^- 2\pi^+)$ — Γ_{143}/Γ_{73}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.18±0.04±0.05	179 ± 36	LINK	08	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
9.7 ±0.6 OUR FIT					
9.75±0.54±0.17	776	ABLIKIM	22BL	BES3	e^+e^- at 4.178–4.226 GeV

$\Gamma(K^*(892)^0\rho^+,\ K^{*0}\to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-\pi^0)$ — $\Gamma_{145}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
40.5±2.8±1.5	ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

$\Gamma(K^*(892)^+\rho^0,\ K^{*+}\to K^+\pi^0)/\Gamma(K^+\pi^+\pi^-\pi^0)$ — $\Gamma_{146}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
4.3±1.1±0.6	ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

$\Gamma(K_1(1270)^0\pi^+,\ K_1^0\to K^+\rho^-)/\Gamma(K^+\pi^+\pi^-\pi^0)$ — $\Gamma_{147}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
4.0±1.2±0.6	ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

$\Gamma(K_1(1400)^0\pi^+,\ K_1^0\to K^*(890)^+\pi^-,\ K^{*+}\to K^+\pi^0)/\Gamma(K^+\pi^+\pi^-\pi^0)$ — $\Gamma_{148}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
5.6±0.9±0.2	ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

$\Gamma(K_1(1400)^0\pi^+,\ K_1^0\to K^*(890)^0\pi^0,\ K^{*0}\to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-\pi^0)$ — $\Gamma_{149}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
6.1±0.9±0.2	ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

$\Gamma(K^+a_1(1260)^0,\ a_1\to\rho^+\pi^-)/\Gamma(K^+\pi^+\pi^-\pi^0)$ — $\Gamma_{150}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
1.9±0.7±0.9	ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

$\Gamma(K^+a_1(1260)^0,\ a_1\to\rho^-\pi^+)/\Gamma(K^+\pi^+\pi^-\pi^0)$ — $\Gamma_{151}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
1.9±0.7±0.9	ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

$\Gamma(K^+\pi^+\pi^-\pi^0\text{ nonresonant})/\Gamma(K^+\pi^+\pi^-\pi^0)$ — $\Gamma_{152}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
9.5±2.2±0.9	ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

$\Gamma((K^+\pi^0)_{P-wave}\rho^0)/\Gamma(K^+\pi^+\pi^-\pi^0)$ — $\Gamma_{153}/\Gamma_{144}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
10.4±2.0±0.6	ABLIKIM	22BL	BES3	PWA, 550 $D_s^\pm \to K^\pm\pi^\pm\pi^\mp\pi^0$

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

Unseen decay modes of the ω are included.

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<0.82	90	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^+\omega\pi^+\pi^-)/\Gamma_{total}$ — Γ_{155}/Γ

Unseen decay modes of the ω are included.

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<0.54	90	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^+\omega\eta)/\Gamma_{total}$ — Γ_{156}/Γ

Unseen decay modes of the ω and η are included.

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<0.79	90	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(2K^+K^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{157}/Γ_{43}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
4.0 ±0.3 ±0.2	748 ± 60	DEL-AMO-SA..	11G	BABR	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$8.95\pm2.12^{+2.24}_{-2.31}$	31	LINK	02I	FOCS	γ A, ≈ 180 GeV

$\Gamma(\phi K^+, \phi\to K^+K^-)/\Gamma(2K^+K^-)$ — $\Gamma_{158}/\Gamma_{157}$

VALUE	DOCUMENT ID		TECN	COMMENT
0.41±0.08±0.03	DEL-AMO-SA..	11G	BABR	$e^+e^- \approx \Upsilon(4S)$

Doubly Cabibbo-suppressed modes

$\Gamma(2K^+\pi^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{159}/Γ_{43}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
2.371±0.034 OUR AVERAGE					
2.372±0.024±0.025	67k	AAIJ	19G	LHCB	pp at 8 TeV
2.3 ±0.3 ±0.2	356 ± 52	DEL-AMO-SA..	11G	BABR	$e^+e^- \approx \Upsilon(4S)$
2.29 ±0.28 ±0.12	281 ± 34	KO	09	BELL	e^+e^- at $\Upsilon(4S)$
5.2 ±1.7 ±1.1	27 ± 9	LINK	05K	FOCS	<0.78%, CL = 90%

$\Gamma(K^+K^*(892)^0, K^{*0}\to K^+\pi^-)/\Gamma(2K^+\pi^-)$ — $\Gamma_{160}/\Gamma_{159}$

VALUE	DOCUMENT ID		TECN	COMMENT
0.47±0.22±0.15	DEL-AMO-SA..	11G	BABR	$e^+e^- \approx \Upsilon(4S)$

Baryon-antibaryon mode

$\Gamma(p\overline{n})/\Gamma_{total}$ — Γ_{161}/Γ

This is the only baryonic mode allowed kinematically.

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.22±0.11 OUR AVERAGE					
1.21±0.10±0.05	193 ± 17	ABLIKIM	19O	BES3	e^+e^-, E_{cm}= 4178 MeV
$1.30\pm0.36^{+0.12}_{-0.16}$	13.0 ± 3.6	ATHAR	08	CLEO	e^+e^-, $E_{cm}\approx$ 4170 MeV

$\Gamma(p\overline{p}e^+\nu_e)/\Gamma_{total}$ — Γ_{162}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.0\times10^{-4}$	90	ABLIKIM	19BD	BES3	e^+e^- at 4178 MeV

Rare or forbidden modes

$\Gamma(\pi^+e^+e^-)/\Gamma_{total}$ — Γ_{163}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.5\times10^{-6}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<13\times10^{-6}$	90	LEES	11G	BABR	$e^+e^-\approx\Upsilon(4S)$
$<2.2\times10^{-5}$	90	[1] RUBIN	10	CLEO	e^+e^- at 4170 MeV
$<27\times10^{-5}$	90	AITALA	99G	E791	π^-N 500 GeV

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

$\Gamma(\pi^+\phi,\ \phi\to e^+e^-)/\Gamma_{total}$ — Γ_{164}/Γ

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$(6^{+8}_{-4}\pm1)\times10^{-6}$	3	RUBIN	10	CLEO	e^+e^- at 4170 MeV

$\Gamma(\pi^+\mu^+\mu^-)/\Gamma_{total}$ — Γ_{165}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.8\times10^{-7}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<4.1\times10^{-7}$	90	AAIJ	13AF	LHCB	pp at 7 TeV
$<4.3\times10^{-5}$	90	LEES	11G	BABR	$e^+e^-\approx\Upsilon(4S)$
$<2.6\times10^{-5}$	90	LINK	03F	FOCS	γ A, $\overline{E}_\gamma\approx$ 180 GeV
$<1.4\times10^{-4}$	90	AITALA	99G	E791	π^-N 500 GeV
$<4.3\times10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(K^+e^+e^-)/\Gamma_{total}$ — Γ_{166}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.7\times10^{-6}$	90	LEES	11G	BABR	$e^+e^-\approx\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<4.9\times10^{-6}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
$<5.2\times10^{-5}$	90	RUBIN	10	CLEO	e^+e^- at 4170 MeV
$<1.6\times10^{-3}$	90	AITALA	99G	E791	π^-N 500 GeV

$\Gamma(K^+\mu^+\mu^-)/\Gamma_{total}$ — Γ_{167}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.4\times10^{-7}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp

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

$<21 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
$< 3.6 \times 10^{-5}$	90	LINK	03F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
$< 1.4 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$< 5.9 \times 10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(K^*(892)^+ \mu^+ \mu^-)/\Gamma_{total}$ Γ_{168}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.4 \times 10^{-3}}$	90	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(\pi^+ e^+ \mu^-)/\Gamma_{total}$ Γ_{169}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{< 1.1 \times 10^{-6}}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<12 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\pi^+ e^- \mu^+)/\Gamma_{total}$ Γ_{170}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{< 9.4 \times 10^{-7}}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<20 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(K^+ e^+ \mu^-)/\Gamma_{total}$ Γ_{171}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{< 7.9 \times 10^{-7}}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<14 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(K^+ e^- \mu^+)/\Gamma_{total}$ Γ_{172}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<5.6 \times 10^{-7}}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<9.7 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\pi^- 2e^+)/\Gamma_{total}$ Γ_{173}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{< 1.4 \times 10^{-6}}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 4.1 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
$< 1.8 \times 10^{-5}$	90	RUBIN	10	CLEO	$e^+ e^-$ at 4170 MeV
$<69 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(\pi^- 2\mu^+)/\Gamma_{total}$ — Γ_{174}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<8.6 \times 10^{-8}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.2 \times 10^{-7}$	90	AAIJ	13AF	LHCB	pp at 7 TeV
$<1.4 \times 10^{-5}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
$<2.9 \times 10^{-5}$	90	LINK	03F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
$<8.2 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$<4.3 \times 10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(\pi^- e^+ \mu^+)/\Gamma_{total}$ — Γ_{175}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.3 \times 10^{-7}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<8.4 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
$<7.3 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(K^- 2e^+)/\Gamma_{total}$ — Γ_{176}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 7.7 \times 10^{-7}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 5.2 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
$< 1.7 \times 10^{-5}$	90	RUBIN	10	CLEO	$e^+ e^-$ at 4170 MeV
$<63 \times 10^{-5}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(K^- 2\mu^+)/\Gamma_{total}$ — Γ_{177}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.6 \times 10^{-8}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.3 \times 10^{-5}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
$<1.3 \times 10^{-5}$	90	LINK	03F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV
$<1.8 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV
$<5.9 \times 10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(K^- e^+ \mu^+)/\Gamma_{total}$ — Γ_{178}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.6 \times 10^{-7}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<6.1 \times 10^{-6}$	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
$<6.8 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(K^*(892)^- 2\mu^+)/\Gamma_{total}$ — Γ_{179}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.4 × 10^{-3}	90	KODAMA	95	E653	π^- emulsion 600 GeV

$D_s^\pm$ Amplitude analyses

$D_s^+ \to K^+ K^- \pi^+$ partial wave analyses

Amplitude analyses of D_s^+ decays to the $K^+ K^- \pi^+$ final state, fitting simultaneously different partial wave components.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	18.6k	[1] ABLIKIM	21AE	BES3	$e^+ e^-$ at 4.178 GeV
seen	96k	[1] DEL-AMO-SA...	11G	BABR	$e^+ e^-$ at $\Upsilon(4S)$
seen	12k	[1] MITCHELL	09A	CLEO	$e^+ e^-$ at 4.17 GeV
seen	701	[2] FRABETTI	95B	E687	

[1] Amplitude analysis with 6 components.
[2] Amplitude analysis with 5 components.

$D_s^+ \to K^+ K_S \pi^0$ partial wave analyses

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
	990	[1] ABLIKIM	22AH	BES3	$e^+ e^-$ at 4.178-4.226 GeV

[1] Amplitude analysis with 5 components.

$D_s^+ \to 2\pi^+ \pi^-$ partial wave analyses

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
	11.1k	[1] ABLIKIM	22BI	BES3	Dalitz fit
	10.5k	[1] AUBERT	09O	BABR	Dalitz fit
	1.5k	[2] LINK	04	FOCS	Dalitz fit
	848	[3] AITALA	01A	E791	Dalitz fit

[1] Amplitude analysis with 4 components, one of which is a model-independent $\pi^+\pi^-$ S-wave parametrisation as complex numbers in 29 $\pi^+\pi^-$ mass bins.
[2] Amplitude analysis with 5 components.
[3] Amplitude analysis with 6 components.

$D_s^+ \to 2\pi^+ \pi^- \eta$ partial wave analyses

Amplitude analyses of D_s^+ decays to the $\pi^+\pi^+\pi^-\eta$ final state, fitting simultaneously different partial wave components.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	2.1k	[1] ABLIKIM	21AR	BES3	$e^+ e^-$ at 4.178–4.226 GeV

[1] Amplitude analysis with 11 components.

$D_s^+ \to \pi^+ \pi^0 \eta'$ partial wave analyses.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
	395	[1] ABLIKIM	22AA	BES3	$e^+ e^-$ at 4.178–4.226 GeV

[1] The only significant contribution found in this analysis is $D_s^+ \to \rho^+ \eta'$.

$D_s^+ \to \pi^+ 2\pi^0$ partial wave analyses.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
	440	ABLIKIM	22Z	BES3	$e^+ e^-$ at 4.178–4.226 GeV

$D_s^+ \to K^+ \pi^+ \pi^-$ partial wave analyses

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
	1.3k	[1] ABLIKIM	22AC	BES3	$e^+ e^-$ at 4.178–4.226 GeV

[1] ABLIKIM 22AC uses an amplitude analysis with 8 components .

$D_s^+ \to K^+ \pi^+ \pi^- \pi^0$ partial wave analyses

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	550	[1] ABLIKIM	22BL	BES3	$e^+ e^-$ at 4.178–4.226 GeV

[1] Amplitude analysis with 11 components.

$D_s^+ \to 2K_S^0 \pi^+$ partial wave analyses

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
	400	ABLIKIM	22F	BES3	$e^+ e^-$ at 4.178–4.226 GeV

$D_s^+ \to (KS)^0 K^- 2\pi^+$ partial wave analyses

Amplitude analyses of D_s^+ decays to the $K_S^0 K^- 2\pi^+$ final state, fitting simultaneously different partial wave components.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	1.3k	[1] ABLIKIM	21K	BES3	$e^+ e^-$ at 4.178–4.226 GeV

[1] Amplitude analysis with 13 components.

$D_s^+ \to K^- K^+ \pi^+ \pi^0$ partial wave analyses

Amplitude analyses of D_s^+ decays to the $K^- K^+ \pi^+ \pi^0$ final state, fitting simultaneously different partial wave components.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	3k	[1] ABLIKIM	21U	BES3	$e^+ e^-$ at 4.178–4.226 GeV

[1] ABLIKIM 21U uses an amplitude analysis with 9 components.

$D_s^+ \to K^- K^+ 2\pi^+ \pi^-$ partial wave analyses

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
	309	ABLIKIM	22AB	BES3	$e^+ e^-$ at 4.178–4.226 GeV

$D_s^+ - D_s^-$ *CP*-VIOLATING DECAY-RATE ASYMMETRIES

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

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
−0.2±2.5 OUR AVERAGE					
−1.2±2.5±1.0	2.2k	ABLIKIM	21BE	BES3	$e^+ e^-$ at 4.178, 4.226 GeV
4.8±6.1		ALEXANDER	09	CLEO	$e^+ e^-$ at 4170 MeV

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
2.9±4.8±1.0	950	[1] ABLIKIM	21BE	BES3	e^+e^- at 4.178, 4.226 GeV

[1] ABLIKIM 21BE also reports that when constrained by the Standard Model ratio of $\Gamma(D_s^+ \to \tau^+\nu_\tau)/\Gamma(D_s^+ \to \mu^+\nu_\mu) = 9.75$, the result is $(-0.1 \pm 1.9 \pm 1.0)$%.

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.09±0.26 OUR AVERAGE					
0.6 ±2.8 ±0.6	1.8k	ABLIKIM	19AM	BES3	e^+e^- at 4178 MeV
−0.05±0.23±0.24	288k	[1] LEES	13E	BABR	e^+e^- at $\Upsilon(4S)$
2.6 ±1.5 ±0.6		ONYISI	13	CLEO	e^+e^- at 4.17 GeV
0.12±0.36±0.22		KO	10	BELL	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.7 ±1.8 ±0.9	4.0k	MENDEZ	10	CLEO	See ONYISI 13
4.9 ±2.1 ±0.9		ALEXANDER	08	CLEO	See MENDEZ 10

[1] LEES 13E finds that after subtracting the contribution due to $K^0 - \overline{K}^0$ mixing, the CP asymmetry is $(+0.28 \pm 0.23 \pm 0.24)$%.

$A_{CP}(K^{\pm}K^0_L)$ in $D_s^{\pm} \to K^{\pm}K^0_L$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
−1.1±2.6±0.6	2.3k	ABLIKIM	19AM	BES3	e^+e^- at 4178 MeV

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−0.5±0.8±0.4	ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.3±1.1±0.8	ALEXANDER	08	CLEO	See ONYISI 13

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−0.38±0.26±0.08	ABAZOV	14B	D0	$p\overline{p}$ at 1.96 TeV

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−1.6±6.0±1.1	ONYISI	13	CLEO	e^+e^- at 4.17 GeV

$A_{CP}(2K^0_S\pi^{\pm})$ in $D_s^{\pm} \to 2K^0_S\pi^{\pm}$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
3.1±5.2±0.6	ONYISI	13	CLEO	e^+e^- at 4.17 GeV

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
0.0±2.7±1.2	ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−5.9±4.2±1.2	ALEXANDER	08	CLEO	See ONYISI 13

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−5.7±5.3±0.9	ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV

$A_{CP}(K^0_S K^{\mp} 2\pi^{\pm})$ in $D_s^{+} \rightarrow K^0_S K^{\mp} 2\pi^{\pm}$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
4.1±2.7±0.9	ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.7±3.6±1.1	ALEXANDER	08	CLEO	See ONYISI 13

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−0.7±3.0±0.6	ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.0±4.6±0.7	ALEXANDER	08	CLEO	See ONYISI 13

$A_{CP}(\pi^{\pm} \eta)$ in $D_s^{\pm} \rightarrow \pi^{\pm} \eta$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.3±0.4 OUR AVERAGE					
0.8±0.7±0.5	38k	AAIJ	21U	LHCB	pp at 13 TeV
0.2±0.3±0.3	22k	GUAN	21	BELL	$e^+ e^- \approx \Upsilon(4,5S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.1±3.0±0.8		ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV
−4.6±2.9±0.3	2.5k	MENDEZ	10	CLEO	See ONYISI 13
−8.2±5.2±0.8		ALEXANDER	08	CLEO	See MENDEZ 10

$A_{CP}(\pi^{\pm} \eta')$ in $D_s^{\pm} \rightarrow \pi^{\pm} \eta'$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
−0.9 ±0.5 OUR AVERAGE					
−0.82±0.36±0.35	152k	AAIJ	17AF	LHCB	pp at 7, 8 TeV
−2.2 ±2.2 ±0.6		ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
−6.1 ±3.0 ±0.3	1.4k	MENDEZ	10	CLEO	See ONYISI 13
−5.5 ±3.7 ±1.2		ALEXANDER	08	CLEO	See MENDEZ 10

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−0.5±3.9±2.0	ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV

$A_{CP}(\eta' \pi^{\pm} \pi^0)$ in $D_s^{\pm} \rightarrow \eta' \pi^{\pm} \pi^0$

VALUE (%)	DOCUMENT ID		TECN	COMMENT
−0.4±7.4±1.9	ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
2 ± 4 OUR AVERAGE Error includes scale factor of 1.2.					
− 0.8± 3.9±1.2	2.8k	AAIJ	21U	LHCB	pp at 7, 8, 13 TeV
6.4± 4.4±1.1	12k	GUAN	21	BELL	$e^+ e^- \approx \Upsilon(4,5S)$

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

$-26.6\pm23.8\pm0.9$	202	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
$2\ \pm29$		ADAMS	07A	CLEO	See MENDEZ 10

$A_{CP}(\overline{K}^0/K^0\pi^\pm)$ in $D_s^+ \to \overline{K}^0\pi^+$, $D_s^- \to K^0\pi^-$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.4 ±0.5 OUR AVERAGE					
$0.38\pm0.46\pm0.17$	121k	[1] AAIJ	14BD	LHCB	pp at 7, 8 TeV
$0.3\ \pm2.0\ \pm0.3$	14k	LEES	13E	BABR	e^+e^- at $\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.61\pm0.83\pm0.14$	26k	AAIJ	13W	LHCB	See AAIJ 14BD

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

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.20± 0.18 OUR AVERAGE					
$0.16\pm\ 0.17\pm0.05$	721k	AAIJ	19T	LHCB	pp at 7, 8, 13 TeV
$0.6\ \pm\ 2.0\ \pm0.3$	14k	LEES	13E	BABR	e^+e^- at $\Upsilon(4S)$
$5.45\pm\ 2.50\pm0.33$		KO	10	BELL	$e^+e^- \approx \Upsilon(4S)$
$16.3\ \pm\ 7.3\ \pm0.3$	0.4k	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$27\ \ \pm11$		ADAMS	07A	CLEO	See MENDEZ 10

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
3.7±2.7 OUR AVERAGE					
$3.3\pm3.0\pm1.3$	1.3k	ABLIKIM	22AC	BES3	e^+e^- at 4.178–4.226 GeV
$4.5\pm4.8\pm0.6$		ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$11.2\pm7.0\pm0.9$		ALEXANDER	08	CLEO	See ONYISI 13

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
2.7±5.5±0.9	666	[1] ABLIKIM	21AB	BES3	e^+e^- at 4.178–4.226 GeV

[1] ABLIKIM 21AB uses an amplitude analysis with 5 resonant modes plus one background component.

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
6.6±5.4±0.7	776	ABLIKIM	22BL	BES3	e^+e^- at 4.178–4.226 GeV

$A_{CP}(K^\pm\eta)$ in $D_s^\pm \to K^\pm\eta$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.8± 1.9 OUR AVERAGE					
$0.9\pm\ 3.7\pm1.1$	2.5k	AAIJ	21U	LHCB	pp at 13 TeV
$2.1\pm\ 2.1\pm0.4$	14k	GUAN	21	BELL	$e^+e^- \approx \Upsilon(4,5S)$

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

9.3±15.2±0.9	222	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
−20 ±18		ADAMS	07A	CLEO	See MENDEZ 10

$A_{CP}(K^\pm\eta'(958))$ in $D_s^\pm \to K^\pm\eta'(958)$

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
6.0±18.9±0.9	56 ± 17	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
−17 ±37		ADAMS	07A	CLEO	See MENDEZ 10

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

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

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
−13.6± 7.7± 3.4	29.8±0.3k	LEES	11E	BABR	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
−36 ±67 ±23	508 ± 34	LINK	05E	FOCS	γ A, $\overline{E}_\gamma \approx 180$ GeV

D_s^+ Semileptonic Form Factors and Decay Constants

$r_2 \equiv A_2(0)/A_1(0)$ in $D_s^+ \to \phi\ell^+\nu_\ell$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.84 ±0.11 OUR AVERAGE Error includes scale factor of 2.4.					
0.816±0.036±0.030	25±0.5k	[1] AUBERT	08AN	BABR	$\phi e^+\nu_e$
0.713±0.202±0.284	793	LINK	04C	FOCS	$\phi\mu^+\nu_\mu$
1.57 ±0.25 ±0.19	271	AITALA	99D	E791	$\phi e^+\nu_e$, $\phi\mu^+\nu_\mu$
1.4 ±0.5 ±0.3	308	AVERY	94B	CLE2	$\phi e^+\nu_e$
1.1 ±0.8 ±0.1	90	FRABETTI	94F	E687	$\phi\mu^+\nu_\mu$
2.1 $^{+0.6}_{-0.5}$ ±0.2	19	KODAMA	93	E653	$\phi\mu^+\nu_\mu$

[1] To compare with previous measurements, this AUBERT 08AN value is from a fit that fixes the pole masses at $m_A = 2.5$ GeV/c^2 and $m_V = 2.1$ GeV/c^2. A simultaneous fit to r_2, r_V, r_0 (a significant *s*-wave contribution) and m_A, gives $r_2 = 0.763 \pm 0.071 \pm 0.065$.

$r_v \equiv V(0)/A_1(0)$ in $D_s^+ \rightarrow \phi \ell^+ \nu_\ell$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.80 ±0.08 OUR AVERAGE					
1.807±0.046±0.065	25±0.5k	[1] AUBERT	08AN	BABR	$\phi e^+ \nu_e$
1.549±0.250±0.148	793	LINK	04C	FOCS	$\phi \mu^+ \nu_\mu$
2.27 ±0.35 ±0.22	271	AITALA	99D	E791	$\phi e^+ \nu_e$, $\phi \mu^+ \nu_\mu$
0.9 ±0.6 ±0.3	308	AVERY	94B	CLE2	$\phi e^+ \nu_e$
1.8 ±0.9 ±0.2	90	FRABETTI	94F	E687	$\phi \mu^+ \nu_\mu$
2.3 $^{+1.1}_{-0.9}$ ±0.4	19	KODAMA	93	E653	$\phi \mu^+ \nu_\mu$

[1] To compare with previous measurements, this AUBERT 08AN value is from a fit that fixes the pole masses at $m_A = 2.5$ GeV/c^2 and $m_V = 2.1$ GeV/c^2. A simultaneous fit to r_2, r_V, r_0 (a significant s-wave contribution) and m_A, gives $r_V = 1.849 \pm 0.060 \pm 0.095$.

Γ_L/Γ_T in $D_s^+ \rightarrow \phi \ell^+ \nu_\ell$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.72±0.18 OUR AVERAGE					
1.0 ±0.3 ±0.2	308	AVERY	94B	CLE2	$\phi e^+ \nu_e$
1.0 ±0.5 ±0.1	90	[1] FRABETTI	94F	E687	$\phi \mu^+ \nu_\mu$
0.54±0.21±0.10	19	[1] KODAMA	93	E653	$\phi \mu^+ \nu_\mu$

[1] FRABETTI 94F and KODAMA 93 evaluate Γ_L/Γ_T for a lepton mass of zero.

$f_+(0)\,|V_{cs}|$ in $D_s^+ \rightarrow \eta e^+ \nu_e$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.4455±0.0053±0.0044	1.8k	ABLIKIM	19S	BES3	$e^+ e^-$ at 4178 MeV

$f_+(0)\,|V_{cs}|$ in $D_s^+ \rightarrow \eta' e^+ \nu_e$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.477±0.049±0.011	261	ABLIKIM	19S	BES3	$e^+ e^-$ at 4178 MeV

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.162±0.019±0.003	117	[1] ABLIKIM	19D	BES3	$K^0_S e^+ \nu_e$

[1] Using a two parameter fit in the z expansion.

$r_v \equiv V(0)/A_1(0)$ in $D_s^+ \rightarrow K^*(892)^0 e^+ \nu_e$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.67±0.34±0.16	155	ABLIKIM	19D	BES3	$e^+ e^-$ at 4178 MeV

$r_2 \equiv A_2(0)/A_1(0)$ in $D_s^+ \rightarrow K^*(892)^0 e^+ \nu_e$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.77±0.28±0.07	155	ABLIKIM	19D	BES3	$e^+ e^-$ at 4178 MeV

$f_{D_s^+}\,|V_{cs}|$ in $D_s^+ \rightarrow \mu^+ \nu_\mu$

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
243.1±3.0±3.6±1.0	2.2K	[1] ABLIKIM	21BE	BES3	$e^+ e^-$ at 4.178, 4.226 GeV

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

246.2±3.6±3.5	1.1k	ABLIKIM	19E	BES3	e^+e^- at 4178 MeV

[1] The third uncertainty is dominated by the uncertainty of the D_s^+ lifetime.

$f_{D_s^+}\ |V_{cs}|$ in $D_s^+ \to \tau^+\nu_\tau$

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
245.3±3.0 OUR AVERAGE					
251.6±5.9±4.9	1.7k	[1] ABLIKIM	21AF	BES3	e^+e^- at 4.178, 4.226 GeV
244.4±2.3±2.9	4.9k	[2] ABLIKIM	21AZ	BES3	e^+e^- at 4.178, 4.226 GeV
243.0±5.8±4.0±1.0	950	[3,4] ABLIKIM	21BE	BES3	e^+e^- at 4.178, 4.226 GeV

[1] ABLIKIM 21F uses $\tau^+ \to \pi^+\pi^0\overline{\nu}$ decays.
[2] ABLIKIM 21AZ uses $\tau^+ \to e^+\nu_e\overline{\nu}_\tau$ decays.
[3] ABLIKIM 21BE uses $\tau^+ \to e^+\nu_e\overline{\nu}_\tau$ decays. When constrained by the Standard Model ratio of $\Gamma(D_s^+ \to \tau^+\nu_\tau)/\Gamma(D_s^+ \to \mu^+\nu_\mu) = 9.75$, the result is $243.2 \pm 2.3 \pm 3.3 \pm 1.0$.
[4] The third uncertainty is dominated by the uncertainty of the D_s^+ lifetime.

$D_s^\pm$ REFERENCES

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ABLIKIM	22AB	JHEP 2207 051	M. Ablikim *et al.*	(BESIII Collab.)
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ABLIKIM	22BH	PR D106 112004	M. Ablikim *et al.*	(BESIII Collab.)
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ABLIKIM	22BL	JHEP 2209 242	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	22F	PR D105 L051103	M. Ablikim *et al.*	(BESIII Collab.)
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ABLIKIM	22Z	JHEP 2201 052	M. Ablikim *et al.*	(BESIII Collab.)
AAIJ	21T	JHEP 2106 044	R. Aaij *et al.*	(LHCb Collab.)
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ABLIKIM	21AB	JHEP 2106 181	M. Ablikim *et al.*	(BESIII Collab.)
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GE	09A	PR D80 051102	J.Y. Ge *et al.*	(CLEO Collab.)
KO	09	PRL 102 221802	B.R. Ko *et al.*	(BELLE Collab.)
MITCHELL	09A	PR D79 072008	R.E. Mitchell *et al.*	(CLEO Collab.)
NAIK	09A	PR D80 112004	P. Naik *et al.*	(CLEO Collab.)
ONYISI	09	PR D79 052002	P.U.E. Onyisi *et al.*	(CLEO Collab.)
WON	09	PR D80 111101	E. Won *et al.*	(BELLE Collab.)
YELTON	09	PR D80 052007	J. Yelton *et al.*	(CLEO Collab.)
ALEXANDER	08	PRL 100 161804	J.P. Alexander *et al.*	(CLEO Collab.)
ATHAR	08	PRL 100 181802	S.B. Athar *et al.*	(CLEO Collab.)
AUBERT	08AN	PR D78 051101	B. Aubert *et al.*	(BABAR Collab.)
ECKLUND	08	PRL 100 161801	K.M. Ecklund *et al.*	(CLEO Collab.)
KLEMPT	08	EPJ C55 39	E. Klempt, M. Matveev, A.V. Sarantsev	(BONN+)
LINK	08	PL B660 147	J.M. Link *et al.*	(FNAL FOCUS Collab.)
WIDHALM	08	PRL 100 241801	L. Widhalm *et al.*	(BELLE Collab.)
ADAMS	07A	PRL 99 191805	G.S. Adams *et al.*	(CLEO Collab.)
AUBERT	07V	PRL 98 141801	B. Aubert *et al.*	(BABAR Collab.)
PEDLAR	07A	PR D76 072002	T.K. Pedlar *et al.*	(CLEO Collab.)
Also		PRL 99 071802	M. Artuso *et al.*	(CLEO Collab.)
AUBERT	06N	PR D74 031103	B. Aubert *et al.*	(BABAR Collab.)
HUANG	06B	PR D74 112005	G.S. Huang *et al.*	(CLEO Collab.)
PDG	06	JP G33 1	W.-M. Yao *et al.*	(PDG Collab.)
AUBERT	05V	PR D71 091104	B. Aubert *et al.*	(BABAR Collab.)
LINK	05E	PL B622 239	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	05J	PRL 95 052003	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	05K	PL B624 166	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	04	PL B585 200	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	04C	PL B586 183	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	04D	PL B586 191	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	04F	PL B601 10	J.M. Link *et al.*	(FNAL FOCUS Collab.)
ACOSTA	03D	PR D68 072004	D. Acosta *et al.*	(FNAL CDF-II Collab.)
ANISOVICH	03	EPJ A16 229	V.V. Anisovich *et al.*	
LINK	03D	PL B561 225	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	03F	PL B572 21	J.M. Link *et al.*	(FNAL FOCUS Collab.)
AUBERT	02G	PR D65 091104	B. Aubert *et al.*	(BABAR Collab.)
HEISTER	02I	PL B528 1	A. Heister *et al.*	(ALEPH Collab.)
LINK	02I	PL B541 227	J.M. Link *et al.*	(FNAL FOCUS Collab.)
LINK	02J	PL B541 243	J.M. Link *et al.*	(FNAL FOCUS Collab.)
ABBIENDI	01L	PL B516 236	G. Abbiendi *et al.*	(OPAL Collab.)
AITALA	01A	PRL 86 765	E.M. Aitala *et al.*	(FNAL E791 Collab.)
IORI	01	PL B523 22	M. Iori *et al.*	(FNAL SELEX Collab.)
LINK	01C	PRL 87 162001	J.M. Link *et al.*	(FNAL FOCUS Collab.)
ALEXANDROV	00	PL B478 31	Y. Alexandrov *et al.*	(CERN BEATRICE Collab.)
AITALA	99	PL B445 449	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	99D	PL B450 294	E.M. Aitala *et al.*	(FNAL E791 Collab.)
AITALA	99G	PL B462 401	E.M. Aitala *et al.*	(FNAL E791 Collab.)
BONVICINI	99	PRL 82 4586	G. Bonvicini *et al.*	(CLEO Collab.)

CHADHA	98	PR D58 032002	M. Chada *et al.*	(CLEO Collab.)
JESSOP	98	PR D58 052002	C.P. Jessop *et al.*	(CLEO Collab.)
ACCIARRI	97F	PL B396 327	M. Acciarri *et al.*	(L3 Collab.)
BALEST	97	PRL 79 1436	R. Balest *et al.*	(CLEO Collab.)
FRABETTI	97C	PL B401 131	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FRABETTI	97D	PL B407 79	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
ARTUSO	96	PL B378 364	M. Artuso *et al.*	(CLEO Collab.)
BAI	95C	PR D52 3781	J.Z. Bai *et al.*	(BES Collab.)
BRANDENB...	95	PRL 75 3804	G.W. Brandenburg *et al.*	(CLEO Collab.)
FRABETTI	95B	PL B351 591	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
KODAMA	95	PL B345 85	K. Kodama *et al.*	(FNAL E653 Collab.)
ACOSTA	94	PR D49 5690	D. Acosta *et al.*	(CLEO Collab.)
AVERY	94B	PL B337 405	P. Avery *et al.*	(CLEO Collab.)
BROWN	94	PR D50 1884	D. Brown *et al.*	(CLEO Collab.)
BUTLER	94	PL B324 255	F. Butler *et al.*	(CLEO Collab.)
FRABETTI	94F	PL B328 187	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FRABETTI	93F	PRL 71 827	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
FRABETTI	93G	PL B313 253	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
KODAMA	93	PL B309 483	K. Kodama *et al.*	(FNAL E653 Collab.)
ALBRECHT	92B	ZPHY C53 361	H. Albrecht *et al.*	(ARGUS Collab.)
ALEXANDER	92	PRL 68 1275	J. Alexander *et al.*	(CLEO Collab.)
AVERY	92	PRL 68 1279	P. Avery *et al.*	(CLEO Collab.)
BARLAG	92C	ZPHY C55 383	S. Barlag *et al.*	(ACCMOR Collab.)
Also		ZPHY C48 29	S. Barlag *et al.*	(ACCMOR Collab.)
FRABETTI	92	PL B281 167	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
ALBRECHT	91	PL B255 634	H. Albrecht *et al.*	(ARGUS Collab.)
ALVAREZ	91	PL B255 639	M.P. Alvarez *et al.*	(CERN NA14/2 Collab.)
ALBRECHT	90D	PL B245 315	H. Albrecht *et al.*	(ARGUS Collab.)
ALEXANDER	90B	PRL 65 1531	J. Alexander *et al.*	(CLEO Collab.)
BARLAG	90C	ZPHY C46 563	S. Barlag *et al.*	(ACCMOR Collab.)
FRABETTI	90	PL B251 639	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
ANJOS	89E	PL B223 267	J.C. Anjos *et al.*	(FNAL E691 Collab.)
CHEN	89	PL B226 192	W.Y. Chen *et al.*	(CLEO Collab.)
ALBRECHT	88	PL B207 349	H. Albrecht *et al.*	(ARGUS Collab.)
ANJOS	88	PRL 60 897	J.C. Anjos *et al.*	(FNAL E691 Collab.)
RAAB	88	PR D37 2391	J.R. Raab *et al.*	(FNAL E691 Collab.)
BECKER	87B	PL B184 277	H. Becker *et al.*	(NA11 and NA32 Collabs.)
BLAYLOCK	87	PRL 58 2171	G.T. Blaylock *et al.*	(Mark III Collab.)
USHIDA	86	PRL 56 1767	N. Ushida *et al.*	(FNAL E531 Collab.)
ALBRECHT	85D	PL 153B 343	H. Albrecht *et al.*	(ARGUS Collab.)
DERRICK	85B	PRL 54 2568	M. Derrick *et al.*	(HRS Collab.)
AIHARA	84D	PRL 53 2465	H. Aihara *et al.*	(TPC Collab.)
ALTHOFF	84	PL 136B 130	M. Althoff *et al.*	(TASSO Collab.)
BAILEY	84	PL 139B 320	R. Bailey *et al.*	(ACCMOR Collab.)
CHEN	83C	PRL 51 634	A. Chen *et al.*	(CLEO Collab.)

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