$D_s^{\pm}$

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

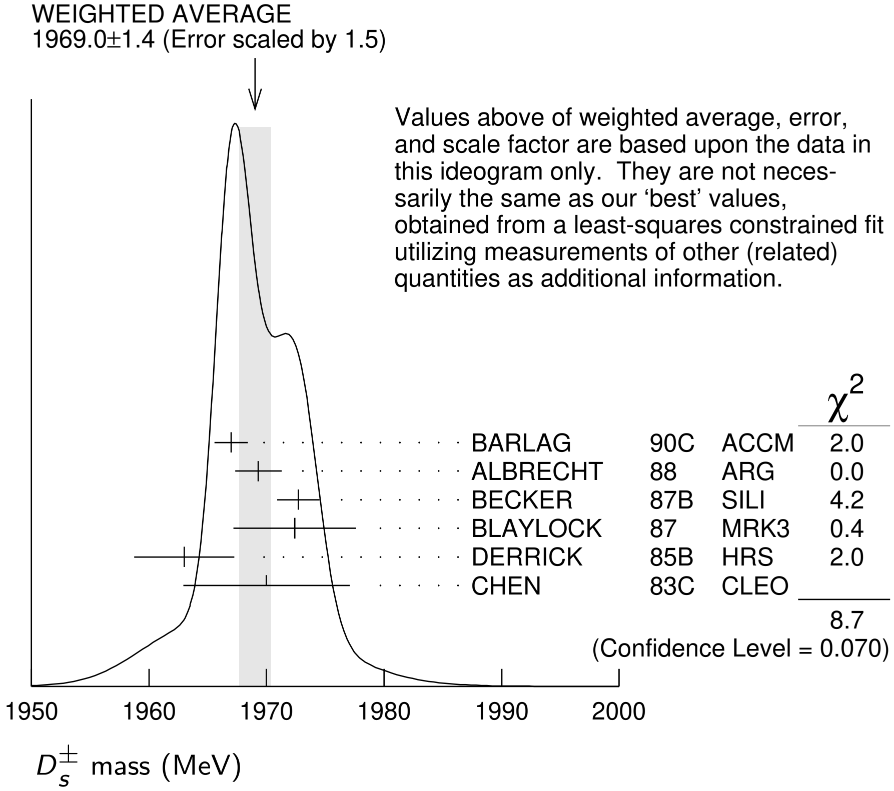
The angular distributions of the decays of the ϕ and $\overline{K}^*(892)^0$ in the $\phi\pi^+$ and $K^+\overline{K}^*(892)^0$ modes strongly indicate that the spin is zero. The parity given is that expected of a $c\overline{s}$ ground state.

$D_s^{\pm}$ 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

[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

$518 \pm 14 \pm 7$	1662	AITALA	99	E791	π^- nucleus, 500 GeV
$486.3 \pm 15.0 {}^{+4.9}_{-5.1}$	2167	[2] BONVICINI	99	CLE2	$e^+ e^- \approx \Upsilon(4S)$
$475 \pm 20 \pm 7$	900	FRABETTI	93F	E687	γ Be, $\phi \pi^+$
$500 \pm 60 \pm 30$	104	FRABETTI	90	E687	γ Be, $\phi \pi^+$
$470 \pm 40 \pm 20$	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}	$\mu^+ \nu_\mu$		$(5.43 \pm 0.15) \times 10^{-3}$	
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}	$\phi e^+ \nu_e$	[d]	(2.39 ± 0.16) %	S=1.3
Γ_{25}	$\phi \mu^+ \nu_\mu$		(1.9 ± 0.5) %	

Γ_{26}	$\eta e^+ \nu_e$ + $\eta'(958) e^+ \nu_e$	[d]	(3.03 ±0.24) %		
Γ_{27}	$\eta e^+ \nu_e$	[d]	(2.32 ±0.08) %		
Γ_{28}	$\eta'(958) e^+ \nu_e$	[d]	(8.0 ±0.7) $\times 10^{-3}$		
Γ_{29}	$\eta \mu^+ \nu_\mu$		(2.4 ±0.5) %		
Γ_{30}	$\eta'(958) \mu^+ \nu_\mu$		(1.1 ±0.5) %		
Γ_{31}	$\omega e^+ \nu_e$	[e]	< 2.0 $\times 10^{-3}$	CL=90%	
Γ_{32}	$K^0 e^+ \nu_e$		(3.4 ±0.4) $\times 10^{-3}$		
Γ_{33}	$K^*(892)^0 e^+ \nu_e$	[d]	(2.15 ±0.28) $\times 10^{-3}$		S=1.1
Γ_{34}	$f_0(980) e^+ \nu_e$, $f_0 \to \pi^+ \pi^-$				
Γ_{35}	$a_0(980)^0 e^+ \nu_e$, $a_0(980)^0 \to \pi^0 \eta$		< 1.2 $\times 10^{-4}$	CL=90%	

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

Γ_{36}	$K^+ K^0_S$		(1.453±0.035) %		
Γ_{37}	$K^+ K^0_L$		(1.49 ±0.06) %		
Γ_{38}	$K^+ \overline{K}^0$		(2.95 ±0.14) %		
Γ_{39}	$K^+ K^- \pi^+$	[f]	(5.38 ±0.10) %		S=1.1
Γ_{40}	$\phi \pi^+$	[d,g]	(4.5 ±0.4) %		
Γ_{41}	$\phi \pi^+$, $\phi \to K^+ K^-$	[g]	(2.22 ±0.06) %		
Γ_{42}	$K^+ \overline{K}^*(892)^0$, $\overline{K}^{*0} \to K^- \pi^+$		(2.58 ±0.06) %		
Γ_{43}	$f_0(980) \pi^+$, $f_0 \to K^+ K^-$		(1.11 ±0.19) %		
Γ_{44}	$f_0(1370) \pi^+$, $f_0 \to K^+ K^-$		(7.1 ±2.9) $\times 10^{-4}$		
Γ_{45}	$f_0(1710) \pi^+$, $f_0 \to K^+ K^-$		(6.7 ±2.8) $\times 10^{-4}$		
Γ_{46}	$K^+ \overline{K}^*_0(1430)^0$, $\overline{K}^*_0 \to K^- \pi^+$		(1.76 ±0.25) $\times 10^{-3}$		
Γ_{47}	$K^+ K^0_S \pi^0$		(1.52 ±0.22) %		
Γ_{48}	$2K^0_S \pi^+$		(7.7 ±0.6) $\times 10^{-3}$		
Γ_{49}	$K^0 \overline{K}^0 \pi^+$		—		
Γ_{50}	$K^*(892)^+ \overline{K}^0$	[d]	(5.4 ±1.2) %		
Γ_{51}	$K^+ K^- \pi^+ \pi^0$		(5.50 ±0.24) %		S=1.3
Γ_{52}	$\phi \rho^+$	[d]	(5.59 ±0.34) %		
Γ_{53}	$\overline{K}_1(1270)^0 K^+$, $\overline{K}_1(1270)^0 \to K^- \rho^+$		(5.7 ±0.6) $\times 10^{-3}$		
Γ_{54}	$\overline{K}_1(1270)^0 K^+$, $\overline{K}_1(1270)^0 \to K^*(892) \pi$		(1.31 ±0.25) %		
Γ_{55}	$\overline{K}_1(1400)^0 K^+$, $\overline{K}_1(1400)^0 \to K^*(892) \pi$		(2.0 ±0.4) %		
Γ_{56}	$a_0(980)^0 \rho^+$, $a_0(980)^0 \to K^+ K^-$		(1.9 ±0.4) $\times 10^{-3}$		
Γ_{57}	$f_1(1420)^0 \pi^+$, $f_1(1420)^0 \to K^*(892)^\mp K^\pm$		(3.9 ±0.7) $\times 10^{-3}$		
Γ_{58}	$f_1(1420)^0 \pi^+$, $f_1(1420)^0 \to a_0(980)^0 \pi^0$, $a_0(980)^0 \to K^+ K^-$		(4.0 ±1.4) $\times 10^{-4}$		

Γ_{59}	$\eta(1475)\pi^+$, $\eta(1475) \to a_0(980)^0\pi^0$, $a_0(980)^0 \to K^+K^-$		$(7.0 \pm 2.8) \times 10^{-4}$	
Γ_{60}	$K^0_S K^- 2\pi^+$		(1.53 ± 0.08) %	S=1.5
Γ_{61}	$K^*(892)^+ \overline{K}^*(892)^0$	[d]	(5.64 ± 0.35) %	
Γ_{62}	$\eta(1475) K^0_S$, $\eta \to K^*(892)^0\pi^+$, $K^{*0} \to K^-\pi^+$		$(3.4 \pm 1.0) \times 10^{-4}$	
Γ_{63}	$\eta(1475)\pi^+$, $\eta \to \overline{K}^*(892)^+ K^-$, $\overline{K}^{*+} \to K^0_S\pi^+$		$(3.4 \pm 1.0) \times 10^{-4}$	
Γ_{64}	$\eta(1475)\pi^+$, $\eta \to a_0(980)^-\pi^+$, $a_0^- \to K^0_S K^-$		$(1.7 \pm 0.9) \times 10^{-3}$	
Γ_{65}	$f_1(1285)\pi^+$, $f_1 \to a_0(980)^-\pi^+$, $a_0^- \to K^0_S K^-$		$(3.4 \pm 0.8) \times 10^{-4}$	
Γ_{66}	$K^+ K^0_S \pi^+\pi^-$		$(9.5 \pm 0.8) \times 10^{-3}$	S=1.1
Γ_{67}	$K^+K^- 2\pi^+\pi^-$		$(8.6 \pm 1.5) \times 10^{-3}$	
Γ_{68}	$\phi 2\pi^+\pi^-$	[d]	(1.21 ± 0.16) %	
Γ_{69}	$\phi\rho^0\pi^+$, $\phi \to K^+K^-$		$(6.4 \pm 1.3) \times 10^{-3}$	
Γ_{70}	$\phi a_1(1260)^+$, $\phi \to K^+K^-$, $a_1^+ \to \rho^0\pi^+$		$(7.4 \pm 1.2) \times 10^{-3}$	
Γ_{71}	$\phi 2\pi^+\pi^-$ non-ρ, $\phi \to K^+K^-$		$(1.8 \pm 0.7) \times 10^{-3}$	
Γ_{72}	$K^+K^-\rho^0\pi^+$ non-ϕ		$< 2.6 \times 10^{-4}$	CL=90%
Γ_{73}	$K^+K^- 2\pi^+\pi^-$ nonresonant		$(9 \pm 7) \times 10^{-4}$	
Γ_{74}	$2K^0_S 2\pi^+\pi^-$		$(7.8 \pm 3.3) \times 10^{-4}$	

Hadronic modes without K's

Γ_{75}	$\pi^+\pi^0$		$< 1.2 \times 10^{-4}$	CL=90%
Γ_{76}	$2\pi^+\pi^-$		(1.08 ± 0.04) %	
Γ_{77}	$\rho^0\pi^+$		$(1.9 \pm 1.2) \times 10^{-4}$	
Γ_{78}	$\pi^+(\pi^+\pi^-)_{S-\text{wave}}$	[h]	$(9.0 \pm 0.4) \times 10^{-3}$	
Γ_{79}	$f_0(980)\pi^+$, $f_0 \to \pi^+\pi^-$			
Γ_{80}	$f_0(1370)\pi^+$, $f_0 \to \pi^+\pi^-$			
Γ_{81}	$f_0(1500)\pi^+$, $f_0 \to \pi^+\pi^-$			
Γ_{82}	$f_2(1270)\pi^+$, $f_2 \to \pi^+\pi^-$		$(1.09 \pm 0.19) \times 10^{-3}$	
Γ_{83}	$\rho(1450)^0\pi^+$, $\rho^0 \to \pi^+\pi^-$		$(2.9 \pm 1.9) \times 10^{-4}$	
Γ_{84}	$\pi^+ 2\pi^0$		$(6.5 \pm 1.3) \times 10^{-3}$	
Γ_{85}	$2\pi^+\pi^-\pi^0$		—	
Γ_{86}	$\eta\pi^+$	[d]	(1.68 ± 0.09) %	S=1.1
Γ_{87}	$\omega\pi^+$	[d]	$(1.92 \pm 0.30) \times 10^{-3}$	

Γ_{88}	$3\pi^+ 2\pi^-$		$(\ 7.9\ \pm 0.8\ ) \times 10^{-3}$	
Γ_{89}	$2\pi^+ \pi^- 2\pi^0$		—	
Γ_{90}	$\eta\rho^+$	[d]	$(\ 8.9\ \pm 0.8\ )$ %	
Γ_{91}	$\eta\pi^+\pi^0$		$(\ 9.5\ \pm 0.5\ )$ %	
Γ_{92}	$\eta(\pi^+\pi^0)_{P-wave}$		$(\ 5.1\ \pm 3.1\ ) \times 10^{-3}$	
Γ_{93}	$2\pi^+\pi^-\eta$		$(\ 3.12\ \pm 0.16\ )$ %	
Γ_{94}	$a_1(1260)^+\eta,\ a_1^+ \to \rho(770)^0\pi^+,\ \rho^0 \to \pi^+\pi^-$		$(\ 1.73\ \pm 0.16\ )$ %	
Γ_{95}	$a_1(1260)^+\eta,\ a_1^+ \to f_0(500)\pi^+,\ f_0 \to \pi^+\pi^-$		$(\ 2.5\ \pm 0.9\ ) \times 10^{-3}$	
Γ_{96}	$a_0(980)^{+0}\pi^{0+},\ a_0(980)^{+0} \to \eta\pi^{+0}$		$(\ 2.2\ \pm 0.4\ )$ %	
Γ_{97}	$a_0(980)^+\rho(770)^0,\ a_0^+ \to \eta\pi^+$		$(\ 2.1\ \pm 0.9\ ) \times 10^{-3}$	
Γ_{98}	$\eta(1405)\pi^+,\ \eta(1405) \to a_0(980)^-\pi^+,\ a_0^- \to \eta\pi^-$		$(\ 2.2\ \pm 0.7\ ) \times 10^{-4}$	
Γ_{99}	$\eta(1405)\pi^+,\ \eta(1405) \to a_0(980)^+\pi^-,\ a_0^+ \to \eta\pi^+$		$(\ 2.2\ \pm 0.7\ ) \times 10^{-4}$	
Γ_{100}	$f_1(1420)\pi^+,\ f_1 \to a_0(980)^-\pi^+,\ a_0^- \to \eta\pi^-$		$(\ 5.9\ \pm 1.8\ ) \times 10^{-4}$	
Γ_{101}	$f_1(1420)\pi^+,\ f_1 \to a_0(980)^+\pi^-,\ a_0^+ \to \eta\pi^+$		$(\ 5.3\ \pm 1.8\ ) \times 10^{-4}$	
Γ_{102}	$\omega\pi^+\pi^0$	[d]	$(\ 2.8\ \pm 0.7\ )$ %	
Γ_{103}	$3\pi^+ 2\pi^- \pi^0$		$(\ 4.9\ \pm 3.2\ )$ %	
Γ_{104}	$\omega 2\pi^+\pi^-$	[d]	$(\ 1.6\ \pm 0.5\ )$ %	
Γ_{105}	$\eta'(958)\pi^+$	[c,d]	$(\ 3.94\ \pm 0.25\ )$ %	
Γ_{106}	$3\pi^+ 2\pi^- 2\pi^0$		—	
Γ_{107}	$\omega\eta\pi^+$	[d]	$<\ 2.13$ %	CL=90%
Γ_{108}	$\eta'(958)\rho^+$	[c,d]	$(\ 5.8\ \pm 1.5\ )$ %	
Γ_{109}	$\eta'(958)\pi^+\pi^0$		$(\ 5.6\ \pm 0.8\ )$ %	
Γ_{110}	$\eta'(958)\pi^+\pi^0$ nonresonant		$<\ 5.1$ %	CL=90%

Modes with one or three K's

Γ_{111}	$K^+\pi^0$		$(\ 7.4\ \pm 0.5\ ) \times 10^{-4}$	
Γ_{112}	$K_S^0\pi^+$		$(\ 1.10\ \pm 0.05\ ) \times 10^{-3}$	
Γ_{113}	$K^+\eta$	[d]	$(\ 1.73\ \pm 0.08\ ) \times 10^{-3}$	
Γ_{114}	$K^+\omega$	[d]	$(\ 8.7\ \pm 2.5\ ) \times 10^{-4}$	
Γ_{115}	$K^+\eta'(958)$	[d]	$(\ 2.64\ \pm 0.24\ ) \times 10^{-3}$	
Γ_{116}	$K^+\pi^+\pi^-$		$(\ 6.5\ \pm 0.4\ ) \times 10^{-3}$	
Γ_{117}	$K^+\rho^0$		$(\ 2.5\ \pm 0.4\ ) \times 10^{-3}$	
Γ_{118}	$K^+\rho(1450)^0,\ \rho^0 \to \pi^+\pi^-$		$(\ 6.9\ \pm 2.4\ ) \times 10^{-4}$	
Γ_{119}	$K^*(892)^0\pi^+,\ K^{*0} \to K^+\pi^-$		$(\ 1.40\ \pm 0.24\ ) \times 10^{-3}$	

Γ_{120}	$K^*(1410)^0\pi^+$, $K^{*0}\to K^+\pi^-$			$(1.22 \pm 0.28) \times 10^{-3}$	
Γ_{121}	$K^*(1430)^0\pi^+$, $K^{*0}\to K^+\pi^-$			$(5.0 \pm 3.4) \times 10^{-4}$	
Γ_{122}	$K^+\pi^+\pi^-$ nonresonant			$(1.03 \pm 0.34) \times 10^{-3}$	
Γ_{123}	$K^0\pi^+\pi^0$			(1.08 ± 0.06) %	
Γ_{124}	$K^0_S 2\pi^+\pi^-$			$(2.8 \pm 1.0) \times 10^{-3}$	
Γ_{125}	$K^+\omega\pi^0$		[d]	$< 8.2 \times 10^{-3}$	CL=90%
Γ_{126}	$K^+\omega\pi^+\pi^-$		[d]	$< 5.4 \times 10^{-3}$	CL=90%
Γ_{127}	$K^+\omega\eta$		[d]	$< 7.9 \times 10^{-3}$	CL=90%
Γ_{128}	$2K^+K^-$			$(2.15 \pm 0.20) \times 10^{-4}$	
Γ_{129}	ϕK^+, $\phi\to K^+K^-$			$(8.8 \pm 2.0) \times 10^{-5}$	

Doubly Cabibbo-suppressed modes

Γ_{130}	$2K^+\pi^-$			$(1.276 \pm 0.031) \times 10^{-4}$	
Γ_{131}	$K^+K^*(892)^0$, $K^{*0}\to K^+\pi^-$			$(6.0 \pm 3.4) \times 10^{-5}$	

Baryon-antibaryon mode

Γ_{132}	$p\overline{n}$			$(1.22 \pm 0.11) \times 10^{-3}$	
Γ_{133}	$p\overline{p}e^+\nu_e$			$< 2.0 \times 10^{-4}$	CL=90%

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

Γ_{134}	$\pi^+e^+e^-$		[i]	$< 5.5 \times 10^{-6}$	CL=90%
Γ_{135}	$\pi^+\phi$, $\phi\to e^+e^-$		[j]	$(6\ ^{+8}_{-4}) \times 10^{-6}$	
Γ_{136}	$\pi^+\mu^+\mu^-$		[i]	$< 1.8 \times 10^{-7}$	CL=90%
Γ_{137}	$K^+e^+e^-$	*C1*		$< 3.7 \times 10^{-6}$	CL=90%
Γ_{138}	$K^+\mu^+\mu^-$	*C1*		$< 1.4 \times 10^{-7}$	CL=90%
Γ_{139}	$K^*(892)^+\mu^+\mu^-$	*C1*		$< 1.4 \times 10^{-3}$	CL=90%
Γ_{140}	$\pi^+e^+\mu^-$	*LF*		$< 1.1 \times 10^{-6}$	CL=90%
Γ_{141}	$\pi^+e^-\mu^+$	*LF*		$< 9.4 \times 10^{-7}$	CL=90%
Γ_{142}	$K^+e^+\mu^-$	*LF*		$< 7.9 \times 10^{-7}$	CL=90%
Γ_{143}	$K^+e^-\mu^+$	*LF*		$< 5.6 \times 10^{-7}$	CL=90%
Γ_{144}	π^-2e^+	*L*		$< 1.4 \times 10^{-6}$	CL=90%
Γ_{145}	$\pi^-2\mu^+$	*L*		$< 8.6 \times 10^{-8}$	CL=90%
Γ_{146}	$\pi^-e^+\mu^+$	*L*		$< 6.3 \times 10^{-7}$	CL=90%
Γ_{147}	K^-2e^+	*L*		$< 7.7 \times 10^{-7}$	CL=90%
Γ_{148}	$K^-2\mu^+$	*L*		$< 2.6 \times 10^{-8}$	CL=90%
Γ_{149}	$K^-e^+\mu^+$	*L*		$< 2.6 \times 10^{-7}$	CL=90%
Γ_{150}	$K^*(892)^-2\mu^+$	*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 13 branching ratios uses 21 measurements and one constraint to determine 10 parameters. The overall fit has a $\chi^2 = 11.6$ for 12 degrees of freedom.

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

x_{39}	27							
x_{51}	8	1						
x_{60}	25	6	15					
x_{66}	20	4	12	46				
x_{76}	17	33	2	7	5			
x_{86}	1	14	−9	−15	−12	6		
x_{87}	0	1	0	−1	0	0	4	
x_{116}	3	20	−6	−9	−7	7	12	0
	x_{36}	x_{39}	x_{51}	x_{60}	x_{66}	x_{76}	x_{86}	x_{87}

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

$\Gamma(e^+ \text{semileptonic})/\Gamma_{\text{total}}$ 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 ± 0.051 ± 0.025.

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

$\Gamma(\pi^- \text{anything})/\Gamma_{\text{total}}$ 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 $K^0_S \to 2\pi^0$ 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

$\Gamma(K^0_S \text{ anything})/\Gamma_{total}$ — 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.

$\Gamma(\mu^+\nu_\mu)/\Gamma_{total}$ — 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 ± 0.067 ± 0.026)%. The constrained value is used to obtain the decay constant, $f_{D_s^+}$ = (241.0 ± 16.3 ± 6.6) MeV.

[2] ZUPANC 13 uses both $\mu^+\nu$ and $\tau^+\nu$ events to get f_{D_s} = (255.5 ± 4.2 ± 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 ± 6.4 ± 7.5) MeV.

[4] WIDHALM 08 gets f_{D_s}= (275 ± 16 ± 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 ± 0.59 ± 0.33) × 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 ± 19 ± 40) MeV.

$\Gamma(\mu^+\nu_\mu)/\Gamma(\phi\pi^+)$ Γ_{20}/Γ_{40}

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 ± 17 ± 16) MeV, using $\Gamma(D_s^+ \to \phi\pi^+)/\Gamma(\text{total})$ = (4.71 ± 0.46)%.

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

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

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

$3.28\pm1.83\pm0.37$	33	[4] ABLIKIM	16O	BES3	e^+e^- at 4.009 GeV
$5.70\pm0.21{}^{+0.31}_{-0.30}$	2.2k	[5] ZUPANC	13	BELL	e^+e^- at $\Upsilon(4S)$, $\Upsilon(5S)$
$4.96\pm0.37\pm0.57$	748	[6] DEL-AMO-SA...	10J	BABR	$e^-\overline{\nu}_e\nu_\tau$, $\mu^-\overline{\nu}_\mu\nu_\tau$
$6.42\pm0.81\pm0.18$	126	[7] ALEXANDER	09	CLEO	$\tau^+\to\pi^+\overline{\nu}_\tau$
$5.52\pm0.57\pm0.21$	155	[7] NAIK	09A	CLEO	$\tau^+\to\rho^+\overline{\nu}_\tau$
$5.30\pm0.47\pm0.22$	181	[7] ONYISI	09	CLEO	$\tau^+\to e^+\nu_e\overline{\nu}_\tau$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$6.17\pm0.71\pm0.34$	102	[8] ECKLUND	08	CLEO	See ONYISI 09
$8.0\pm1.3\pm0.4$	47	[8] PEDLAR	07A	CLEO	See ALEXANDER 09
$5.79\pm0.77\pm1.84$	881	[9] HEISTER	02I	ALEP	Z decays
$7.0\pm2.1\pm2.0$	22	[10] ABBIENDI	01L	OPAL	$D_s^{*+}\to\gamma D_s^+$ from Z's
$7.4\pm2.8\pm2.4$	16	[11] ACCIARRI	97F	L3	$D_s^{*+}\to\gamma D_s^+$ from Z's

[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 branching fraction is found to be $(5.22\pm0.10\pm0.14)\%$.

[4] 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 $(4.83\pm0.65\pm0.26)\%$.

[5] ZUPANC 13 uses both $\mu^+\nu$ and $\tau^+\nu$ events to get $f_{D_s}=(255.5\pm4.2\pm5.1)$ 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 $f_{D_s}=(259.9\pm6.6\pm7.6)$ MeV.

[7] ALEXANDER 09, NAIK 09A, and ONYISI 09 use different τ decay modes and are independent. The three papers combined give $f_{D_s}=(259.7\pm7.8\pm3.4)$ MeV.

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

[9] HEISTER 02I combines its $D_s^+\to\tau^+\nu_\tau$ and $\mu^+\nu_\mu$ branching fractions to get $f_{D_s}=(285\pm19\pm40)$ MeV.

[10] This ABBIENDI 01L value gives a decay constant f_{D_s} of $(286\pm44\pm41)$ MeV.

[11] The second ACCIARRI 97F error here combines in quadrature systematic (0.016) and normalization (0.018) errors. The branching fraction gives $f_{D_s}=(309\pm58\pm33\pm38)$ 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. • • •					
$10.73\pm0.69{}^{+0.56}_{-0.53}$	2.2k/492	[1] ZUPANC	13	BELL	e^+e^- at $\Upsilon(4S)$, $\Upsilon(5S)$
$11.0\pm1.4\pm0.6$	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 $274\pm10\pm5$ 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_{39}

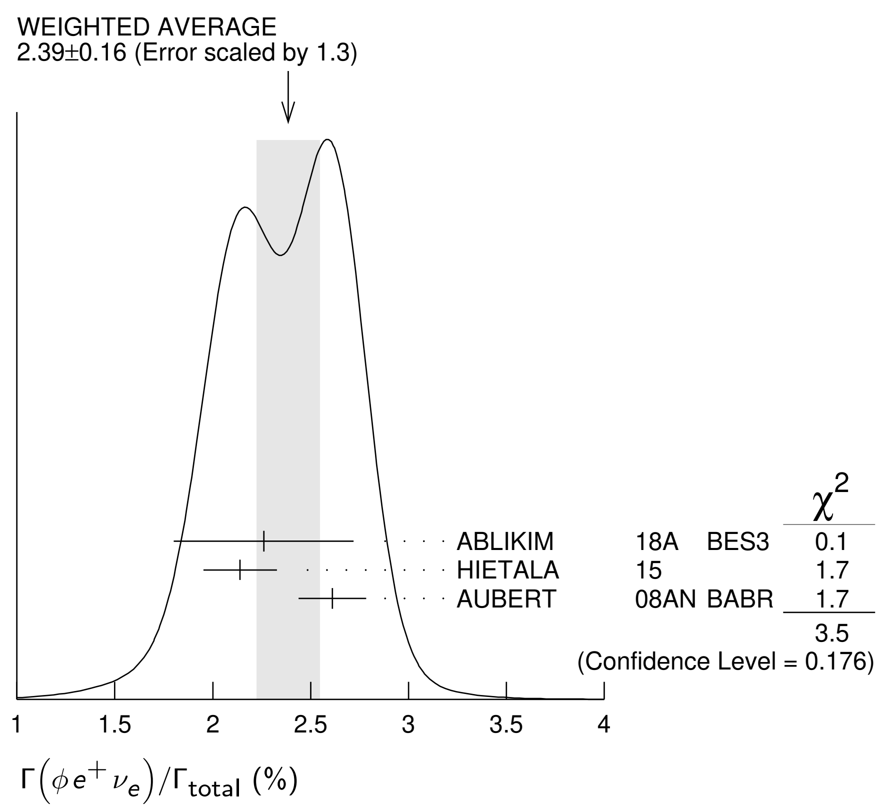
VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.558 \pm 0.007 \pm 0.016$	[1] AUBERT	08AN	BABR	$e^+ e^-$ at $\Upsilon(4S)$

[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.

$\Gamma(\phi e^+ \nu_e)/\Gamma_{total}$ Γ_{24}/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_{24}/Γ_{40}

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_{25}/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_{27}/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_{27}/Γ_{24}

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±0.12±0.15	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_{28}/Γ

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.80 ±0.07 OUR AVERAGE					
0.824±0.073±0.027	261	ABLIKIM	19S	BES3	e^+e^- at 4178 MeV
0.93 ±0.30 ±0.05	14	ABLIKIM	16T	BES3	e^+e^- at 4009 MeV
0.68 ±0.15 ±0.06	20	[1] HIETALA	15		Uses CLEO data
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.91 ±0.33 ±0.05	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_{28}/Γ_{24}

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. • • •					
$0.43 \pm 0.11 \pm 0.07$	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.

$[\Gamma(\eta e^+ \nu_e) + \Gamma(\eta'(958) e^+ \nu_e)]/\Gamma(\phi e^+ \nu_e)$ $\Gamma_{26}/\Gamma_{24} = (\Gamma_{27}+\Gamma_{28})/\Gamma_{24}$

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. • • •				
$1.67 \pm 0.17 \pm 0.17$	[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_{29}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
$2.42 \pm 0.46 \pm 0.11$	44	ABLIKIM	18A	BES3	$e^+ e^-$ at 4.009 GeV

$\Gamma(\eta'(958) \mu^+ \nu_\mu)/\Gamma_{total}$ Γ_{30}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
$1.06 \pm 0.54 \pm 0.07$	10	ABLIKIM	18A	BES3	$e^+ e^-$ at 4.009 GeV

$\Gamma(\omega e^+ \nu_e)/\Gamma_{total}$ Γ_{31}/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_{32}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.34 ± 0.04 OUR AVERAGE					
$0.325 \pm 0.038 \pm 0.016$	117	[1] ABLIKIM	19D	BES3	$e^+ e^-$ at 4178 MeV
$0.39 \pm 0.08 \pm 0.03$	42	HIETALA	15		Uses CLEO data
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.37 \pm 0.10 \pm 0.02$	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_{33}/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.					
$0.237 \pm 0.026 \pm 0.020$	155	ABLIKIM	19D	BES3	$e^+ e^-$ at 4178 MeV
$0.18 \pm 0.04 \pm 0.01$	32	[1] HIETALA	15		$e^+ e^-$ at 4.170 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.18 \pm 0.07 \pm 0.01$	7.5	YELTON	09	CLEO	See HIETALA 15

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

$\Gamma(f_0(980)e^+\nu_e,\ f_0\to\pi^+\pi^-)/\Gamma_{total}$ Γ_{34}/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 (±60 MeV around the f^0) than ECKLUND 09. It finds that applying the same tight cut to both analyses gives consistent results.

$\Gamma(a_0(980)^0e^+\nu_e,\ a_0(980)^0\to\pi^0\eta)/\Gamma_{total}$ Γ_{35}/Γ

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

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

$\Gamma(K^+K^0_S)/\Gamma_{total}$ Γ_{36}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.453±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_{36}/Γ_{39}

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_{37}/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_{38}/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_{39}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
5.38±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. • • •

$5.50 \pm 0.23 \pm 0.16$	[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_{40}/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					
$4.62 \pm 0.36 \pm 0.51$		[1] AUBERT	06N	BABR	e^+e^- at $\Upsilon(4S)$
$4.81 \pm 0.52 \pm 0.38$	212 ± 19	[2] AUBERT	05V	BABR	$e^+e^- \approx \Upsilon(4S)$
$3.59 \pm 0.77 \pm 0.48$		[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 $0.92 \pm 0.20 \pm 0.11$.

[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_{41}/Γ_{39}

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					
$40.5 \pm 0.7 \pm 0.9$	18.6k	ABLIKIM	21AE	BES3	e^+e^- at 4.178 GeV
$41.4 \pm 0.8 \pm 0.5$		DEL-AMO-SA...	11G	BABR	Dalitz fit, 96k evts
$42.2 \pm 1.6 \pm 0.3$		MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$39.6 \pm 3.3 \pm 4.7$		FRABETTI	95B	E687	Dalitz fit, 701 evts

$\Gamma\big(K^+\overline{K}^*(892)^0, \overline{K}^{*0} \to K^-\pi^+\big)/\Gamma\big(K^+K^-\pi^+\big)$ Γ_{42}/Γ_{39}

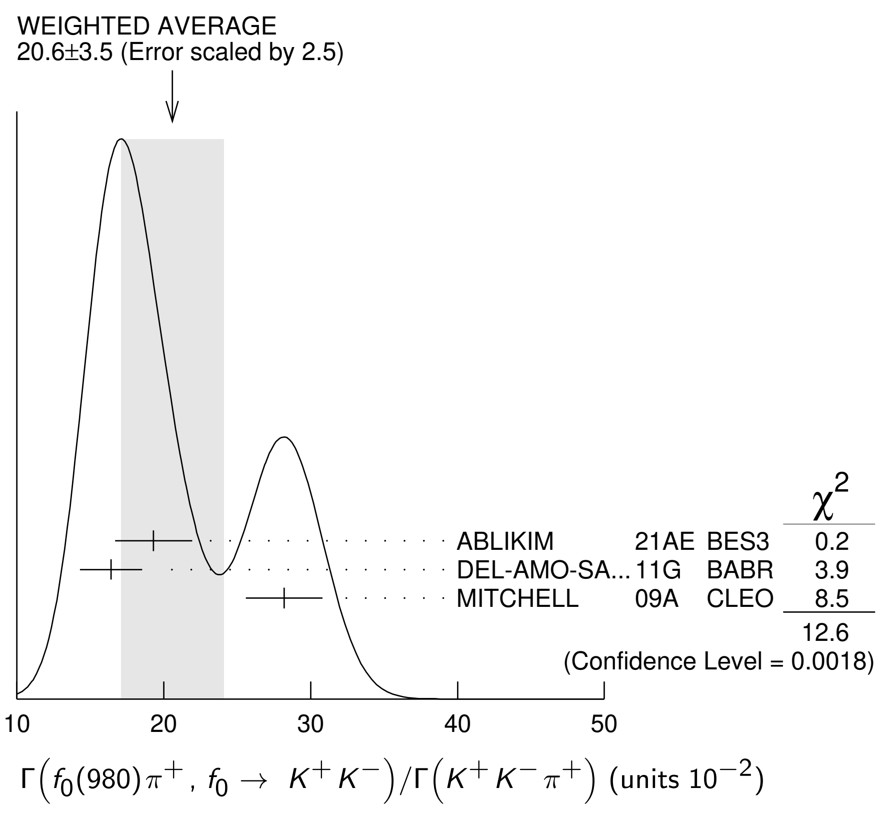
This is the "fit fraction" from the Dalitz-plot analysis.

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

$\Gamma\big(f_0(980)\pi^+, f_0 \to K^+K^-\big)/\Gamma\big(K^+K^-\pi^+\big)$ Γ_{43}/Γ_{39}

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.

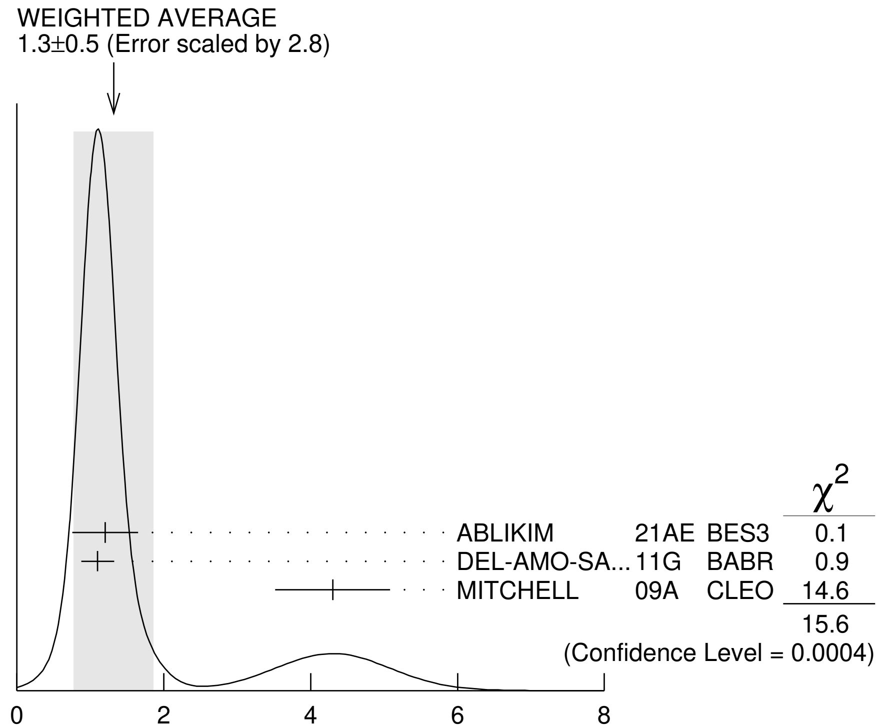
VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
20.6±3.5 OUR AVERAGE Error includes scale factor of 2.5. See the ideogram below.					
19.3±1.7±2.0	18.6k	ABLIKIM	21AE	BES3	e^+e^- at 4.178 GeV
16.4±0.7±2.0		DEL-AMO-SA..	11G	BABR	Dalitz fit, 96k evts
28.2±1.9±1.8		MITCHELL	09A	CLEO	Dalitz fit, 12k 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_{44}/Γ_{39}

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_{45}/Γ_{39}

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 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

$\Gamma(K^+\overline{K}^*_0(1430)^0, \overline{K}^*_0 \to K^-\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{46}/Γ_{39}

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

$\Gamma(K^+ K^0_S \pi^0)/\Gamma_{total}$ Γ_{47}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
1.52±0.09±0.20	ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV

$\Gamma(2K^0_S \pi^+)/\Gamma_{total}$ Γ_{48}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
0.77±0.05±0.03	ONYISI	13	CLEO	$e^+ e^-$ at 4.17 GeV

$\Gamma(K^*(892)^+ \overline{K}^0)/\Gamma(\phi\pi^+)$ Γ_{50}/Γ_{40}

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

$\Gamma(K^+ K^- \pi^+ \pi^0)/\Gamma_{total}$ Γ_{51}/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_{52}/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.

$\Gamma(\overline{K}_1(1270)^0 K^+,\ \overline{K}_1(1270)^0 \to K^- \rho^+)/\Gamma_{total}$ Γ_{53}/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_{54}/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_{55}/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.

$\Gamma\big(a_0(980)^0\rho^+,\ a_0(980)^0 \to K^+K^-\big)/\Gamma_{\text{total}}$ Γ_{56}/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.

$\Gamma\big(f_1(1420)^0\pi^+,\ f_1(1420)^0 \to K^*(892)^\mp K^\pm\big)/\Gamma_{\text{total}}$ Γ_{57}/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.

$\Gamma\big(f_1(1420)^0\pi^+,\ f_1(1420)^0 \to a_0(980)^0\pi^0,\ a_0(980)^0 \to K^+K^-\big)/\Gamma_{\text{total}}$ Γ_{58}/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.

$\Gamma\big(\eta(1475)\pi^+,\ \eta(1475) \to a_0(980)^0\pi^0,\ a_0(980)^0 \to K^+K^-\big)/\Gamma_{\text{total}}$ Γ_{59}/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.

$\Gamma\big(\phi\rho^+\big)/\Gamma\big(\phi\pi^+\big)$ Γ_{52}/Γ_{40}

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

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

$\Gamma\big(K^*(892)^+\overline{K}^*(892)^0\big)/\Gamma\big(K_S^0K^-2\pi^+\big)$ Γ_{61}/Γ_{60}

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] $D_s^+ \to K_S^0K^-2\pi^+$ amplitude analysis with 13 components.

$\Gamma(\eta(1475)\pi^+,\ \eta \to a_0(980)^-\pi^+,\ a_0^- \to K^0_S K^-)/\Gamma(K^0_S K^- 2\pi^+)$ Γ_{64}/Γ_{60}

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.

$\Gamma(\eta(1475)K^0_S,\ \eta \to K^*(892)^0\pi^+,\ K^{*0} \to K^-\pi^+)/\Gamma(K^0_S K^- 2\pi^+)$ Γ_{62}/Γ_{60}

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.

$\Gamma(\eta(1475)\pi^+,\ \eta \to \overline{K}^*(892)^+K^-,\ \overline{K}^{*+} \to K^0_S\pi^+)/\Gamma(K^0_S K^- 2\pi^+)$ Γ_{63}/Γ_{60}

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.

$\Gamma(f_1(1285)\pi^+,\ f_1 \to a_0(980)^-\pi^+,\ a_0^- \to K^0_S K^-)/\Gamma(K^0_S K^- 2\pi^+)$ Γ_{65}/Γ_{60}

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.

$\Gamma(K^*(892)^+\overline{K}^*(892)^0)/\Gamma_{total}$ Γ_{61}/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_{61}/Γ_{40}

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

$\Gamma(K^+K^0_S\pi^+\pi^-)/\Gamma_{total}$ Γ_{66}/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

$\Gamma(K^+K^0_S\pi^+\pi^-)/\Gamma(K^0_S K^- 2\pi^+)$ Γ_{66}/Γ_{60}

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

$\Gamma(K^+K^- 2\pi^+\pi^-)/\Gamma(K^+K^-\pi^+)$ Γ_{67}/Γ_{39}

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	γBe, $\overline{E}_\gamma \approx$ 200 GeV

$\Gamma(\phi 2\pi^+\pi^-)/\Gamma(\phi\pi^+)$ — Γ_{68}/Γ_{40}

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

$\Gamma(K^+K^-\rho^0\pi^+ \text{non-}\phi)/\Gamma(K^+K^-2\pi^+\pi^-)$ — Γ_{72}/Γ_{67}

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

$\Gamma(\phi\rho^0\pi^+,\ \phi\to K^+K^-)/\Gamma(K^+K^-2\pi^+\pi^-)$ — Γ_{69}/Γ_{67}

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_{70}/Γ_{39}

VALUE	DOCUMENT ID		TECN	COMMENT
0.137±0.019±0.011	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_{73}/Γ_{67}

VALUE	DOCUMENT ID		TECN	COMMENT
0.10±0.06±0.05	LINK	03D	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\phi 2\pi^+\pi^- \text{ non-}\rho,\ \phi\to K^+K^-)/\Gamma(K^+K^-2\pi^+\pi^-)$ — Γ_{71}/Γ_{67}

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

$\Gamma(2K^0_S 2\pi^+\pi^-)/\Gamma(K^0_S K^- 2\pi^+)$ — Γ_{74}/Γ_{60}

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 ——

$\Gamma(\pi^+\pi^0)/\Gamma(K^+K^0_S)$ — Γ_{75}/Γ_{36}

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

$\Gamma(\pi^+\pi^0)/\Gamma_{\text{total}}$ — Γ_{75}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.2 × 10^{-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)%.

$\Gamma(2\pi^+\pi^-)/\Gamma_{total}$ — Γ_{76}/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_{76}/Γ_{39}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.200±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_{77}/Γ_{76}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
0.018±0.005±0.010		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
0.058±0.023±0.037		AITALA	01A	E791	Dalitz fit, 848 evts
<0.073	90	FRABETTI	97D	E687	γ Be ≈ 200 GeV

$\Gamma(\pi^+(\pi^+\pi^-)_{S-wave})/\Gamma(2\pi^+\pi^-)$ — Γ_{78}/Γ_{76}

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	DOCUMENT ID		TECN	COMMENT
0.833 ±0.020 OUR AVERAGE				
0.830 ±0.009 ±0.019	[1] AUBERT	09O	BABR	Dalitz fit, ≈ 10.5k evts
0.8704±0.0560±0.0438	[2] LINK	04	FOCS	Dalitz fit, 1475 ± 50 evts

[1] AUBERT 09O gives 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_{79}/Γ_{76}

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

$\Gamma\big(f_0(1370)\pi^+ , f_0 \to \pi^+\pi^-\big)/\Gamma\big(2\pi^+\pi^-\big)$ — Γ_{80}/Γ_{76}

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

$\Gamma\big(f_0(1500)\pi^+ , f_0 \to \pi^+\pi^-\big)/\Gamma\big(2\pi^+\pi^-\big)$ — Γ_{81}/Γ_{76}

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 $f_0(1500)$.

$\Gamma\big(f_2(1270)\pi^+ , f_2 \to \pi^+\pi^-\big)/\Gamma\big(2\pi^+\pi^-\big)$ — Γ_{82}/Γ_{76}

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.101 ±0.018 OUR AVERAGE				
0.101 ±0.015 ±0.011	AUBERT	09O	BABR	Dalitz fit, ≈ 10.5k evts
0.0974±0.0449±0.0294	LINK	04	FOCS	Dalitz fit, 1475 ± 50 evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.197 ±0.033 ±0.006	AITALA	01A	E791	Dalitz fit, 848 evts
0.123 ±0.056 ±0.018	FRABETTI	97D	E687	γ Be ≈ 200 GeV

$\Gamma\big(\rho(1450)^0\pi^+ , \rho^0 \to \pi^+\pi^-\big)/\Gamma\big(2\pi^+\pi^-\big)$ — Γ_{83}/Γ_{76}

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.027 ±0.018 OUR AVERAGE				
0.023 ±0.008 ±0.017	AUBERT	09O	BABR	Dalitz fit, ≈ 10.5k evts
0.0656±0.0343±0.0440	LINK	04	FOCS	Dalitz fit, 1475 ± 50 evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.044 ±0.021 ±0.002	AITALA	01A	E791	Dalitz fit, 848 evts

$\Gamma\big(\pi^+ 2\pi^0\big)/\Gamma_{total}$ — Γ_{84}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.65±0.13±0.03	72 ± 16	NAIK	09A	CLEO	e^+e^- at 4170 MeV

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

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_{86}/Γ

Unseen decay modes of the η are included.

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.68±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_{86}/Γ_{36}

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

$\Gamma(\eta\pi^+)/\Gamma(\phi\pi^+)$ — Γ_{86}/Γ_{40}

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_{86}/Γ_{41}

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

$\Gamma(\eta\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{86}/Γ_{39}

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

$\Gamma(2\pi^+\pi^-\eta)/\Gamma_{total}$ — Γ_{93}/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

$\Gamma(a_1(1260)^+\eta,\ a_1^+ \to \rho(770)^0\pi^+,\ \rho^0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-\eta)$ — Γ_{94}/Γ_{93}

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.

$\Gamma(a_1(1260)^+\eta,\ a_1^+ \to f_0(500)\pi^+,\ f_0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-\eta)$ — Γ_{95}/Γ_{93}

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.

$\Gamma\big(a_0(980)^+ \rho(770)^0,\ a_0^+ \to \eta\pi^+\big)/\Gamma\big(2\pi^+\pi^-\eta\big)$ Γ_{97}/Γ_{93}

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.

$\Gamma\big(\eta(1405)\pi^+,\ \eta(1405) \to a_0(980)^-\pi^+,\ a_0^- \to \eta\pi^-\big)/\Gamma\big(2\pi^+\pi^-\eta\big)$ Γ_{98}/Γ_{93}

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.

$\Gamma\big(\eta(1405)\pi^+,\ \eta(1405) \to a_0(980)^+\pi^-,\ a_0^+ \to \eta\pi^+\big)/\Gamma\big(2\pi^+\pi^-\eta\big)$ Γ_{99}/Γ_{93}

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.

$\Gamma\big(f_1(1420)\pi^+,\ f_1 \to a_0(980)^-\pi^+,\ a_0^- \to \eta\pi^-\big)/\Gamma\big(2\pi^+\pi^-\eta\big)$ Γ_{100}/Γ_{93}

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.

$\Gamma\big(f_1(1420)\pi^+,\ f_1 \to a_0(980)^+\pi^-,\ a_0^+ \to \eta\pi^+\big)/\Gamma\big(2\pi^+\pi^-\eta\big)$ Γ_{101}/Γ_{93}

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.

$\Gamma\big(\omega\pi^+\big)/\Gamma_{total}$ Γ_{87}/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

$\Gamma\big(\omega\pi^+\big)/\Gamma\big(\eta\pi^+\big)$ Γ_{87}/Γ_{86}

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	$e^+e^- \approx \Upsilon(4S)$

$\Gamma\big(3\pi^+2\pi^-\big)/\Gamma\big(K^+K^-\pi^+\big)$ Γ_{88}/Γ_{39}

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_{90}/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_{90}/Γ_{40}

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. • • •					
$2.98\pm0.20\pm0.39$	447	JESSOP	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
$2.86\pm0.38^{+0.36}_{-0.38}$	217	AVERY	92	CLE2	See JESSOP 98

$\Gamma(\eta\rho^+)/\Gamma(\eta\pi^+\pi^0)$ — Γ_{90}/Γ_{91}

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_{91}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
9.5 ±0.5 OUR AVERAGE					
$9.50\pm0.28\pm0.41$	2.6k	ABLIKIM	19BE	BES3	e^+e^- at 4.178 GeV
$9.2\ \pm0.4\ \pm1.1$		ONYISI	13	CLEO	e^+e^- at 4.17 GeV

$\Gamma(\eta(\pi^+\pi^0)_{P-wave})/\Gamma(\eta\pi^+\pi^0)$ — Γ_{92}/Γ_{91}

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

$\Gamma(a_0(980)^{+0}\pi^{0+},\ a_0(980)^{+0}\to\eta\pi^{+0})/\Gamma(\eta\pi^+\pi^0)$ — Γ_{96}/Γ_{91}

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.

$\Gamma(\omega\pi^+\pi^0)/\Gamma_{total}$ — Γ_{102}/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

$\Gamma(3\pi^+2\pi^-\pi^0)/\Gamma_{total}$ — Γ_{103}/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_{104}/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_{105}/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_{105}/Γ_{36}

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

$\Gamma(\eta'(958)\pi^+)/\Gamma(\phi\pi^+)$ — Γ_{105}/Γ_{40}

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

$\Gamma(\eta'(958)\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{105}/Γ_{39}

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

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

Unseen decay modes of the ω and η are included.

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

$\Gamma(\eta'(958)\rho^+)/\Gamma_{total}$ — Γ_{108}/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_{108}/Γ_{40}

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	$e^+e^- \approx \Upsilon(4S)$
$3.44 \pm 0.62 {}^{+0.44}_{-0.46}$	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.

$\Gamma(\eta'(958)\pi^+\pi^0)/\Gamma_{total}$ — Γ_{109}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
5.6±0.5±0.6	ONYISI	13	CLEO	e^+e^- at 4.17 GeV

$\Gamma(\eta'(958)\pi^+\pi^0$ nonresonant$)/\Gamma_{total}$ — Γ_{110}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.1 \times 10^{-2}$	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_{111}/Γ_{36}

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. • • •					
$5.5 \pm 1.3 \pm 0.7$	141 ± 34	ADAMS	07A	CLEO	See MENDEZ 10

$\Gamma(K^+\pi^0)/\Gamma(K^+K^-\pi^+)$ — Γ_{111}/Γ_{39}

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

$\Gamma(K^+\pi^0)/\Gamma(\phi\pi^+, \phi \to K^+K^-)$ — Γ_{111}/Γ_{41}

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_{112}/Γ_{36}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
8.12±0.28 OUR AVERAGE					
$8.5 \pm 0.7 \pm 0.2$	393 ± 33	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
$8.03 \pm 0.24 \pm 0.19$	$17.6\text{k} \pm 481$	WON	09	BELL	e^+e^- at $\Upsilon(4S)$
$10.4 \pm 2.4 \pm 1.4$	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. • • •					
$8.2 \pm 0.9 \pm 0.2$	206 ± 22	ADAMS	07A	CLEO	See MENDEZ 10

$\Gamma(K^0_S\pi^+)/\Gamma(K^+K^-\pi^+)$ — Γ_{112}/Γ_{39}

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

$\Gamma(K^+\eta)/\Gamma(K^+K^0_S)$ — Γ_{113}/Γ_{36}

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

$\Gamma(K^+\eta)/\Gamma(\eta\pi^+)$ — Γ_{113}/Γ_{86}

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

$\Gamma(K^+\eta)/\Gamma(K^+K^-\pi^+)$ — Γ_{113}/Γ_{39}

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

$\Gamma(K^+\eta)/\Gamma(\phi\pi^+, \phi\to K^+K^-)$ — Γ_{113}/Γ_{41}

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

$\Gamma(K^+\omega)/\Gamma_{total}$ — Γ_{114}/Γ

Unseen decay modes of the ω are included.

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

$\Gamma(K^+\eta'(958))/\Gamma(K^+K^0_S)$ — Γ_{115}/Γ_{36}

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

$\Gamma(K^+\eta'(958))/\Gamma(\eta'(958)\pi^+)$ — $\Gamma_{115}/\Gamma_{105}$

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

$\Gamma(K^+\eta'(958))/\Gamma(K^+K^-\pi^+)$ — Γ_{115}/Γ_{39}

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

$\Gamma(K^+\pi^+\pi^-)/\Gamma_{total}$ — Γ_{116}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
0.65 ±0.04 OUR FIT				
0.654±0.033±0.025	ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.69 ±0.05 ±0.03	[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_{116}/Γ_{39}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.120±0.007 OUR FIT					
0.127±0.007±0.014	567 ± 31	LINK	04F	FOCS	γ A, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(K^+\rho^0)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{117}/\Gamma_{116}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.3883±0.0531±0.0261	LINK	04F	FOCS	Dalitz fit, 567 evts

$\Gamma(K^+\rho(1450)^0, \rho^0\to\pi^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{118}/\Gamma_{116}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.1062±0.0351±0.0104	LINK	04F	FOCS	Dalitz fit, 567 evts

$\Gamma(K^*(892)^0\pi^+ , K^{*0} \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{119}/\Gamma_{116}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.2164±0.0321±0.0114	LINK	04F	FOCS	Dalitz fit, 567 evts

$\Gamma(K^*(1410)^0\pi^+ , K^{*0} \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{120}/\Gamma_{116}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.1882±0.0403±0.0122	LINK	04F	FOCS	Dalitz fit, 567 evts

$\Gamma(K^*(1430)^0\pi^+ , K^{*0} \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{121}/\Gamma_{116}$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.0765±0.0500±0.0170	LINK	04F	FOCS	Dalitz fit, 567 evts

$\Gamma(K^+\pi^+\pi^-$ nonresonant$)/\Gamma(K^+\pi^+\pi^-)$ — $\Gamma_{122}/\Gamma_{116}$

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_{123}/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_{124}/Γ_{60}

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

$\Gamma(K^+\omega\pi^0)/\Gamma_{total}$ — Γ_{125}/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_{126}/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_{127}/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_{128}/Γ_{39}

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. • • •

$8.95 \pm 2.12^{+2.24}_{-2.31}$	31	LINK	02I	FOCS	γ A, ≈ 180 GeV

$\Gamma(\phi K^+, \phi \to K^+ K^-)/\Gamma(2K^+ K^-)$ $\Gamma_{129}/\Gamma_{128}$

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_{130}/Γ_{39}

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%

$\Gamma(K^+ K^*(892)^0, K^{*0} \to K^+ \pi^-)/\Gamma(2K^+ \pi^-)$ $\Gamma_{131}/\Gamma_{130}$

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_{132}/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
$1.30 \pm 0.36^{+0.12}_{-0.16}$	13.0 ± 3.6	ATHAR	08	CLEO	$e^+ e^-$, $E_{cm} \approx$ 4170 MeV

$\Gamma(p\overline{p}e^+ \nu_e)/\Gamma_{total}$ Γ_{133}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<2.0 × 10^{-4}	90	ABLIKIM	19BD	BES3	$e^+ e^-$ at 4178 MeV

Rare or forbidden modes

$\Gamma(\pi^+ e^+ e^-)/\Gamma_{total}$ Γ_{134}/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 × 10^{-6}	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp

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

<13 × 10^{-6}	90	LEES	11G	BABR	$e^+ e^- \approx \Upsilon(4S)$
< 2.2 × 10^{-5}	90	[1] RUBIN	10	CLEO	$e^+ e^-$ at 4170 MeV
<27 × 10^{-5}	90	AITALA	99G	E791	$\pi^- N$ 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_{135}/Γ

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

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

$\Gamma(\pi^+\mu^+\mu^-)/\Gamma_{total}$ Γ_{136}/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
$\mathbf{<1.8\times10^{-7}}$	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_{137}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<3.7\times10^{-6}}$	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_{138}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.4\times10^{-7}}$	90	AAIJ	21T	LHCB	1.6 fb^{-1} pp
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<21\times10^{-6}$	90	LEES	11G	BABR	$e^+e^-\approx\Upsilon(4S)$
$<3.6\times10^{-5}$	90	LINK	03F	FOCS	γ A, $\overline{E}_\gamma\approx$ 180 GeV
$<1.4\times10^{-4}$	90	AITALA	99G	E791	π^- N 500 GeV
$<5.9\times10^{-4}$	90	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(K^*(892)^+\mu^+\mu^-)/\Gamma_{total}$ Γ_{139}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.4\times10^{-3}}$	90	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(\pi^+e^+\mu^-)/\Gamma_{total}$ Γ_{140}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.1\times10^{-6}}$	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_{141}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 9.4 \times 10^{-7}$	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_{142}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 7.9 \times 10^{-7}$	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_{143}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.6 \times 10^{-7}$	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_{144}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 1.4 \times 10^{-6}$	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_{145}/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_{146}/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_{147}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{< 7.7 \times 10^{-7}}$	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_{148}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<2.6 \times 10^{-8}}$	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_{149}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<2.6 \times 10^{-7}}$	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_{150}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.4 \times 10^{-3}}$	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.

$D_s^+ \rightarrow 2\pi^+\pi^-\eta$ 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.

$D_s^+ \rightarrow (KS)^0 K^- 2\pi^+$ 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.

$D_s^+ \rightarrow K^- K^+ \pi^+ \pi^0$ 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.

$D_s^+ - D_s^-$ *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:
$A_{CP}(f) = [\Gamma(D_s^+ \rightarrow f) - \Gamma(D_s^- \rightarrow \overline{f})] \ / \ [\Gamma(D_s^+ \rightarrow f) + \Gamma(D_s^- \rightarrow \overline{f})]$.

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

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 $D_s^+ \rightarrow \tau^+\nu_\tau$, $D_s^- \rightarrow \tau^-\overline{\nu}_\tau$

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 $\Gamma(D_s^+ \rightarrow \tau^+\nu_\tau)/\Gamma(D_s^+ \rightarrow \mu^+\nu_\mu) = 9.75$, the result is $(-0.1 \pm 1.9 \pm 1.0)$%.

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

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 $D^\pm_s \to K^\pm K^0_L$

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 $D^\pm_s \to K^+K^-\pi^\pm$

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 $D^\pm_s \to \phi\pi^\pm$

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 $D^\pm_s \to K^\pm K^0_S\pi^0$

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 $D^\pm_s \to 2K^0_S\pi^\pm$

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 $D^\pm_s \to K^+K^-\pi^\pm\pi^0$

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 $D^\pm_s \to K^\pm K^0_S\pi^+\pi^-$

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 $D^+_s \to K^0_S K^\mp 2\pi^\pm$

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 $D^\pm_s \to \pi^+\pi^-\pi^\pm$

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 $D_s^{\pm} \to \pi^{\pm}\eta$

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 $D_s^{\pm} \to \pi^{\pm}\eta'$

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 $D_s^{\pm} \to \eta\pi^{\pm}\pi^0$

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 $D_s^{\pm} \to \eta'\pi^{\pm}\pi^0$

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 $D_s^{\pm} \to K^{\pm}\pi^0$

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±23.8±0.9	202	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
2 ±29		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±0.46±0.17	121k	[1] AAIJ	14BD	LHCB	pp at 7, 8 TeV
0.3 ±2.0 ±0.3	14k	LEES	13E	BABR	e^+e^- at $\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.61±0.83±0.14	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 $A_{CP}(D^{\pm} \to \overline{K}^0/K^0 K^{\pm}) + A_{CP}(D_s^{\pm} \to \overline{K}^0/K^0\pi^{\pm}) = (0.41 \pm 0.49 \pm 0.26)\%$.

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.20± 0.18 OUR AVERAGE					
0.16± 0.17±0.05	721k	AAIJ	19T	LHCB	pp at 7, 8, 13 TeV
0.6 ± 2.0 ±0.3	14k	LEES	13E	BABR	e^+e^- at $\Upsilon(4S)$
5.45± 2.50±0.33		KO	10	BELL	$e^+e^- \approx \Upsilon(4S)$
16.3 ± 7.3 ±0.3	0.4k	MENDEZ	10	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
27 ±11		ADAMS	07A	CLEO	See MENDEZ 10

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
4.5±4.8±0.6	ONYISI	13	CLEO	e^+e^- at 4.17 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
11.2±7.0±0.9	ALEXANDER	08	CLEO	See ONYISI 13

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

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.

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.8± 1.9 OUR AVERAGE					
0.9± 3.7±1.1	2.5k	AAIJ	21U	LHCB	pp at 13 TeV
2.1± 2.1±0.4	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 $D^\pm_s \to K^\pm\eta'(958)$

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

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

$C_T \equiv \vec{p}_{K^+} \cdot (\vec{p}_{\pi^+} \times \vec{p}_{\pi^-})$ is a parity-odd correlation of the K^+, π^+, and π^- momenta for the D^+_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 $K^0_S K^\pm \pi^+ \pi^- \to D_s^\pm$ 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 ± 0.071 ± 0.065.

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

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 ± 0.060 ± 0.095.

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

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 $D_s^+ \to \eta e^+ \nu_e$

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 $D_s^+ \to \eta' e^+ \nu_e$

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 $D_s^+ \to K^0 e^+ \nu_e$

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 $D_s^+ \to K^*(892)^0 e^+ \nu_e$

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 $D_s^+ \to K^*(892)^0 e^+ \nu_e$

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 $D_s^+ \to \mu^+ \nu_\mu$

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.

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ALEXANDER	09	PR D79 052001	J.P. Alexander *et al.*	(CLEO Collab.)
AUBERT	09O	PR D79 032003	B. Aubert *et al.*	(BABAR Collab.)
DOBBS	09	PR D79 112008	S. Dobbs *et al.*	(CLEO Collab.)
ECKLUND	09	PR D80 052009	K.M. Ecklund *et al.*	(CLEO Collab.)
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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