$D_s^{\pm}$

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

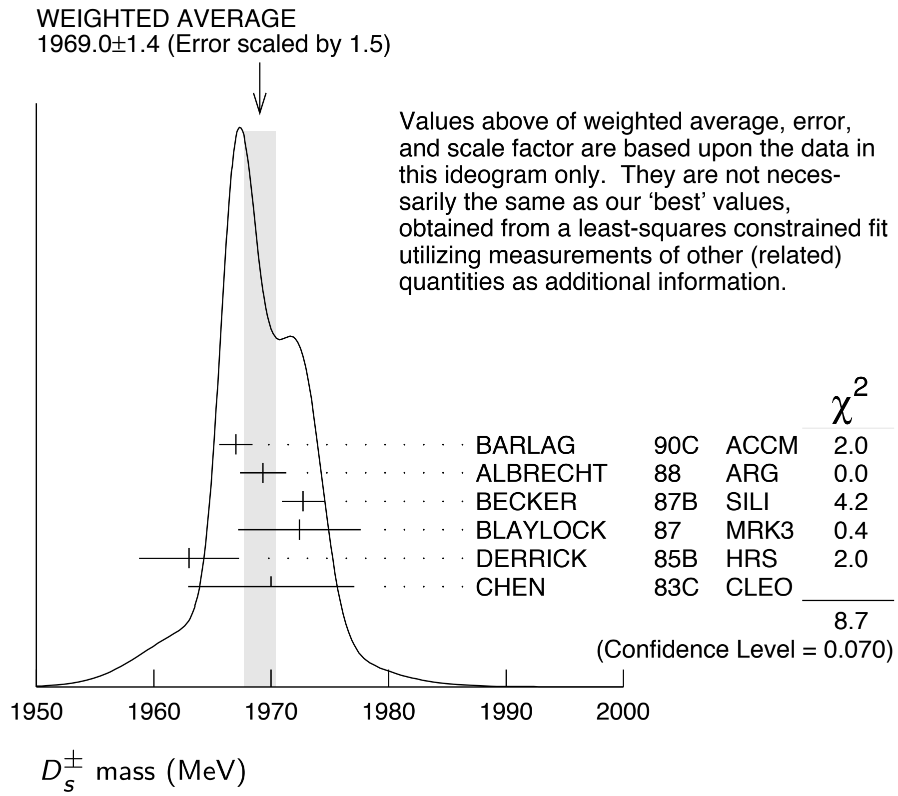
The angular distributions of the decays of the ϕ and $\overline{K}^*(892)^0$ in the $\phi\pi^+$ and $K^+\overline{K}^*(892)^0$ modes strongly indicate that the spin is zero. The parity given is that expected of a $c\overline{s}$ ground state.

$D_s^{\pm}$ 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*
1968.47± 0.33 OUR FIT Error includes scale factor of 1.3.					
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 $\to$ $\phi\pi^+$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*
98.88±0.30 OUR FIT	Error includes scale factor of 1.4.				
98.85±0.25 OUR AVERAGE	Error includes scale factor of 1.1.				
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

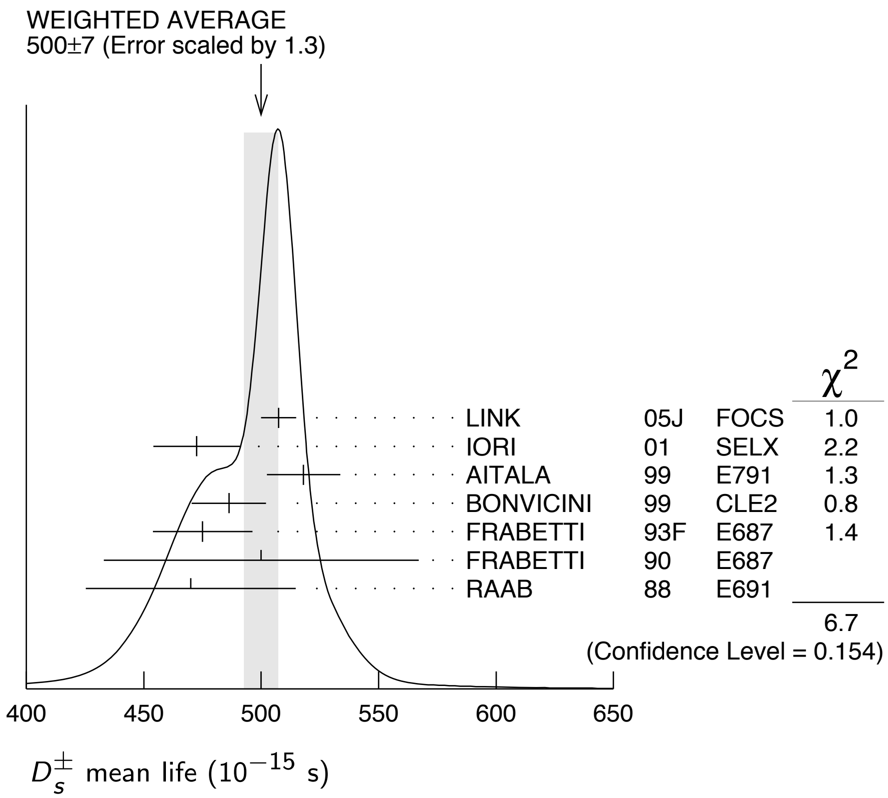
$D_s^{\pm}$ MEAN LIFE

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*
500 ± 7 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.				
507.4± 5.5± 5.1	13.6k	LINK	05J	FOCS	$\phi\pi^+$ and $\overline{K}^{*0}K^+$
472.5±17.2± 6.6	760	IORI	01	SELX	600 GeV Σ^-, π^-, p
518 ±14 ± 7	1662	AITALA	99	E791	π^- nucleus, 500 GeV

$486.3 \pm 15.0 ^{+\ 4.9}_{-\ 5.1}$	2167	[2] BONVICINI	99	CLE2	$e^+ e^- \approx \Upsilon(4S)$
$475 \quad \pm 20 \quad \pm\ 7$	900	FRABETTI	93F	E687	γBe, $\phi\pi^+$
$500 \quad \pm 60 \quad \pm 30$	104	FRABETTI	90	E687	γBe, $\phi\pi^+$
$470 \quad \pm 40 \quad \pm 20$	228	RAAB	88	E691	Photoproduction

[2] BONVICINI 99 obtains 1.19 $\pm$ 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]	(6.5 $\pm$0.4) %	
Γ_2	π^+ anything		(119.3 $\pm$1.4) %	
Γ_3	π^- anything		(43.2 $\pm$0.9) %	
Γ_4	π^0 anything		(123 $\pm$7) %	
Γ_5	K^- anything		(18.7 $\pm$0.5) %	
Γ_6	K^+ anything		(28.9 $\pm$0.7) %	
Γ_7	K_S^0 anything		(19.0 $\pm$1.1) %	
Γ_8	η anything	[b]	(29.9 $\pm$2.8) %	

Γ_{9}	ω anything		(6.1 ±1.4) %	
Γ_{10}	η' anything	[c]	(11.7 ±1.8) %	
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}	$e^+\nu_e$		< 1.2 $\times 10^{-4}$	CL=90%
Γ_{20}	$\mu^+\nu_\mu$		(5.8 ±0.4) $\times 10^{-3}$	
Γ_{21}	$\tau^+\nu_\tau$		(5.6 ±0.4) %	
Γ_{22}	$K^+K^-e^+\nu_e$		—	
Γ_{23}	$\phi e^+\nu_e$	[d]	(2.49±0.14) %	
Γ_{24}	$\eta e^+\nu_e + \eta'(958) e^+\nu_e$	[d]	(3.66±0.37) %	
Γ_{25}	$\eta e^+\nu_e$	[d]	(2.67±0.29) %	S=1.1
Γ_{26}	$\eta'(958) e^+\nu_e$	[d]	(9.9 ±2.3) $\times 10^{-3}$	
Γ_{27}	$K^0 e^+\nu_e$		(3.7 ±1.0) $\times 10^{-3}$	
Γ_{28}	$K^*(892)^0 e^+\nu_e$	[d]	(1.8 ±0.7) $\times 10^{-3}$	
Γ_{29}	$f_0(980) e^+\nu_e$, $f_0 \to \pi^+\pi^-$		(2.00±0.32) $\times 10^{-3}$	

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

Γ_{30}	$K^+K^0_S$		(1.49±0.08) %	
Γ_{31}	$K^+K^-\pi^+$	[e]	(5.50±0.27) %	
Γ_{32}	$\phi\pi^+$	[d,f]	(4.5 ±0.4) %	
Γ_{33}	$\phi\pi^+$, $\phi \to K^+K^-$	[f]	(2.32±0.14) %	
Γ_{34}	$K^+\overline{K}^*(892)^0$, $\overline{K}^{*0} \to K^-\pi^+$		(2.60±0.15) %	
Γ_{35}	$f_0(980)\pi^+$, $f_0 \to K^+K^-$		(1.55±0.16) %	
Γ_{36}	$f_0(1370)\pi^+$, $f_0 \to K^+K^-$		(2.4 ±0.4) $\times 10^{-3}$	
Γ_{37}	$f_0(1710)\pi^+$, $f_0 \to K^+K^-$		(1.87±0.33) $\times 10^{-3}$	
Γ_{38}	$K^+\overline{K}^*_0(1430)^0$, $\overline{K}^*_0 \to K^-\pi^+$		(2.1 ±0.4) $\times 10^{-3}$	
Γ_{39}	$K^0\overline{K}^0\pi^+$		—	
Γ_{40}	$K^*(892)^+\overline{K}^0$	[d]	(5.4 ±1.2) %	
Γ_{41}	$K^+K^-\pi^+\pi^0$		(5.6 ±0.5) %	
Γ_{42}	$\phi\rho^+$	[d]	(8.4 $^{+1.9}_{-2.3}$) %	
Γ_{43}	$K^0_S K^- 2\pi^+$		(1.64±0.12) %	
Γ_{44}	$K^*(892)^+\overline{K}^*(892)^0$	[d]	(7.2 ±2.6) %	
Γ_{45}	$K^+K^0_S\pi^+\pi^-$		(9.6 ±1.3) $\times 10^{-3}$	

Γ_{46}	$K^+K^-2\pi^+\pi^-$		$(8.8 \pm 1.6) \times 10^{-3}$	
Γ_{47}	$\phi 2\pi^+\pi^-$	[d]	(1.21 ± 0.16) %	
Γ_{48}	$K^+K^-\rho^0\pi^+$ non-ϕ		$< 2.6 \times 10^{-4}$	CL=90%
Γ_{49}	$\phi\rho^0\pi^+,\ \phi \to K^+K^-$		$(6.6 \pm 1.3) \times 10^{-3}$	
Γ_{50}	$\phi a_1(1260)^+,\ \phi \to K^+K^-,\ a_1^+ \to \rho^0\pi^+$		$(7.5 \pm 1.3) \times 10^{-3}$	
Γ_{51}	$K^+K^-2\pi^+\pi^-$ nonresonant		$(9 \pm 7) \times 10^{-4}$	
Γ_{52}	$2K^0_S 2\pi^+\pi^-$		$(8.4 \pm 3.5) \times 10^{-4}$	

Hadronic modes without K's

Γ_{53}	$\pi^+\pi^0$		$< 6 \times 10^{-4}$	CL=90%
Γ_{54}	$2\pi^+\pi^-$		(1.10 ± 0.06) %	
Γ_{55}	$\rho^0\pi^+$		$(2.0 \pm 1.2) \times 10^{-4}$	
Γ_{56}	$\pi^+(\pi^+\pi^-)_{S-\text{wave}}$	[g]	$(9.2 \pm 0.6) \times 10^{-3}$	
Γ_{57}	$f_0(980)\pi^+,\ f_0 \to \pi^+\pi^-$			
Γ_{58}	$f_0(1370)\pi^+,\ f_0 \to \pi^+\pi^-$			
Γ_{59}	$f_0(1500)\pi^+,\ f_0 \to \pi^+\pi^-$			
Γ_{60}	$f_2(1270)\pi^+,\ f_2 \to \pi^+\pi^-$		$(1.11 \pm 0.20) \times 10^{-3}$	
Γ_{61}	$\rho(1450)^0\pi^+,\ \rho^0 \to \pi^+\pi^-$		$(3.0 \pm 2.0) \times 10^{-4}$	
Γ_{62}	$\pi^+2\pi^0$		$(6.5 \pm 1.3) \times 10^{-3}$	
Γ_{63}	$2\pi^+\pi^-\pi^0$		—	
Γ_{64}	$\eta\pi^+$	[d]	(1.56 ± 0.20) %	
Γ_{65}	$\omega\pi^+$	[d]	$(2.3 \pm 0.6) \times 10^{-3}$	
Γ_{66}	$3\pi^+2\pi^-$		$(8.0 \pm 0.9) \times 10^{-3}$	
Γ_{67}	$2\pi^+\pi^-2\pi^0$		—	
Γ_{68}	$\eta\rho^+$	[d]	(8.9 ± 0.8) %	
Γ_{69}	$\eta\pi^+\pi^0$ 3-body	[d]	< 5 %	CL=90%
Γ_{70}	$\omega\pi^+\pi^0$	[d]	(2.8 ± 0.7) %	
Γ_{71}	$3\pi^+2\pi^-\pi^0$		(4.9 ± 3.2) %	
Γ_{72}	$\omega 2\pi^+\pi^-$	[d]	(1.6 ± 0.5) %	
Γ_{73}	$\eta'(958)\pi^+$	[c,d]	(3.8 ± 0.4) %	
Γ_{74}	$3\pi^+2\pi^-2\pi^0$		—	
Γ_{75}	$\omega\eta\pi^+$	[d]	< 2.13 %	CL=90%
Γ_{76}	$\eta'(958)\rho^+$	[c,d]	(12.5 ± 2.2) %	
Γ_{77}	$\eta'(958)\pi^+\pi^0$ 3-body	[d]	< 1.8 %	CL=90%

Modes with one or three K's

Γ_{78}	$K^+\pi^0$		$(8.2 \pm 2.2) \times 10^{-4}$	
Γ_{79}	$K^0_S\pi^+$		$(1.20 \pm 0.08) \times 10^{-3}$	
Γ_{80}	$K^+\eta$	[d]	$(1.39 \pm 0.30) \times 10^{-3}$	
Γ_{81}	$K^+\omega$	[d]	$< 2.4 \times 10^{-3}$	CL=90%
Γ_{82}	$K^+\eta'(958)$	[d]	$(1.6 \pm 0.5) \times 10^{-3}$	
Γ_{83}	$K^+\pi^+\pi^-$		$(6.9 \pm 0.5) \times 10^{-3}$	
Γ_{84}	$K^+\rho^0$		$(2.7 \pm 0.5) \times 10^{-3}$	
Γ_{85}	$K^+\rho(1450)^0,\ \rho^0 \to \pi^+\pi^-$		$(7.3 \pm 2.6) \times 10^{-4}$	

Γ_{86}	$K^*(892)^0\pi^+$, $K^{*0} \to K^+\pi^-$			$(1.50\pm0.26)\times10^{-3}$	
Γ_{87}	$K^*(1410)^0\pi^+$, $K^{*0} \to K^+\pi^-$			$(1.30\pm0.31)\times10^{-3}$	
Γ_{88}	$K^*(1430)^0\pi^+$, $K^{*0} \to K^+\pi^-$			$(5\pm4)\times10^{-4}$	
Γ_{89}	$K^+\pi^+\pi^-$ nonresonant			$(1.1\pm0.4)\times10^{-3}$	
Γ_{90}	$K^0\pi^+\pi^0$			(1.00 ± 0.18) %	
Γ_{91}	$K^0_S 2\pi^+\pi^-$			$(2.9\pm1.1)\times10^{-3}$	
Γ_{92}	$K^+\omega\pi^0$		[d]	$< 8.2\times10^{-3}$	CL=90%
Γ_{93}	$K^+\omega\pi^+\pi^-$		[d]	$< 5.4\times10^{-3}$	CL=90%
Γ_{94}	$K^+\omega\eta$		[d]	$< 7.9\times10^{-3}$	CL=90%
Γ_{95}	$2K^+K^-$			$(4.9\pm1.7)\times10^{-4}$	
Γ_{96}	ϕK^+		[d]	$< 6\times10^{-4}$	CL=90%

Doubly Cabibbo-suppressed modes

Γ_{97}	$2K^+\pi^-$			$(1.29\pm0.18)\times10^{-4}$	

Baryon-antibaryon mode

Γ_{98}	$p\overline{n}$			$(1.3\pm0.4)\times10^{-3}$	

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

Γ_{99}	$\pi^+e^+e^-$		[h]	$< 2.7\times10^{-4}$	CL=90%
Γ_{100}	$\pi^+\mu^+\mu^-$		[h]	$< 2.6\times10^{-5}$	CL=90%
Γ_{101}	$K^+e^+e^-$	*C1*		$< 1.6\times10^{-3}$	CL=90%
Γ_{102}	$K^+\mu^+\mu^-$	*C1*		$< 3.6\times10^{-5}$	CL=90%
Γ_{103}	$K^*(892)^+\mu^+\mu^-$	*C1*		$< 1.4\times10^{-3}$	CL=90%
Γ_{104}	$\pi^+e^\pm\mu^\mp$	*LF*	[i]	$< 6.1\times10^{-4}$	CL=90%
Γ_{105}	$K^+e^\pm\mu^\mp$	*LF*	[i]	$< 6.3\times10^{-4}$	CL=90%
Γ_{106}	π^-2e^+	*L*		$< 6.9\times10^{-4}$	CL=90%
Γ_{107}	$\pi^-2\mu^+$	*L*		$< 2.9\times10^{-5}$	CL=90%
Γ_{108}	$\pi^-e^+\mu^+$	*L*		$< 7.3\times10^{-4}$	CL=90%
Γ_{109}	K^-2e^+	*L*		$< 6.3\times10^{-4}$	CL=90%
Γ_{110}	$K^-2\mu^+$	*L*		$< 1.3\times10^{-5}$	CL=90%
Γ_{111}	$K^-e^+\mu^+$	*L*		$< 6.8\times10^{-4}$	CL=90%
Γ_{112}	$K^*(892)^-2\mu^+$	*L*		$< 1.4\times10^{-3}$	CL=90%

Γ_{113}	A dummy mode used by the fit.			(72.2 ± 1.3) %	

[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, K^{*0}, or $f_0(980)$ — is 6.90 ± 0.4 %

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

[*c*] Two times (to include μ decays) the $\eta' e^+ \nu_e$ branching fraction, plus the $\eta' \pi^+$, $\eta' \rho^+$, and $\eta' K^+$ fractions, is (18.4 ± 2.3)%, which considerably exceeds the inclusive η' fraction of (11.7 ± 1.8)%. Our best guess is that the $\eta' \rho^+$ fraction, (12.5 ± 2.2)%, is too large.

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

[*e*] 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.

[*f*] 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.

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

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

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

CONSTRAINED FIT INFORMATION

An overall fit to 17 branching ratios uses 18 measurements and one constraint to determine 13 parameters. The overall fit has a $\chi^2 = 2.1$ for 6 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_{23}	x_{25}	x_{26}	x_{30}	x_{31}	x_{41}	x_{43}	x_{54}	x_{64}	x_{65}
x_{25}	16									
x_{26}	12	2								
x_{30}	0	0	0							
x_{31}	0	0	0	76						
x_{41}	0	0	0	42	48					
x_{43}	0	0	0	51	59	32				
x_{54}	0	0	0	59	74	37	45			
x_{64}	0	0	0	38	43	23	29	33		
x_{65}	0	0	0	11	12	6	8	9	28	
x_{73}	0	0	0	46	53	31	37	40	27	8
x_{83}	0	0	0	37	44	22	28	33	20	6
x_{113}	−17	−25	−20	−69	−79	−71	−57	−62	−51	−19

	x_{73}	x_{83}
x_{83}	25	
x_{113}	−68	−40

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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. The sum of our (non-τ) e^+ exclusive fractions — an $e^+ \nu_e$ with an η, η', ϕ, K^0, K^{*0}, or $f_0(980)$ — is 6.90 ± 0.4 %

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
6.52±0.39±0.15	536 ± 29	[3] ASNER	10	CLEO	$e^+ e^-$ at 3774 MeV

[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.

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

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

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
119.3±1.2±0.7	DOBBS	09	CLEO	e^+e^- at 4170 MeV

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

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

VALUE (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
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 ± 15	HUANG	06B	CLEO	See DOBBS 09

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

VALUE (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	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 (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
<0.06	90	DOBBS	09	CLEO	e^+e^- at 4170 MeV

Leptonic and semileptonic modes

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.2 \times 10^{-4}$	90	ALEXANDER	09	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.3 \times 10^{-4}$	90	PEDLAR	07A	CLEO	See ALEXANDER 09

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

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
5.8 ±0.4 OUR AVERAGE					
5.65±0.45±0.17	235 ± 14	ALEXANDER	09	CLEO	e^+e^- at 4170 MeV
6.44±0.76±0.57	169 ± 18	[4] WIDHALM	08	BELL	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
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

[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 $D_s^+ \rightarrow \tau^+\nu_\tau$ 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_{32}

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	[7] AUBERT	07V	BABR	$e^+e^- \approx \Upsilon(4S)$
0.23 ±0.06 ±0.04	18	[8] ALEXANDROV	00	BEAT	π^- nucleus, 350 GeV
0.173±0.023±0.035	182	[9] CHADHA	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
0.245±0.052±0.074	39	[10] ACOSTA	94	CLE2	See CHADHA 98

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

[8] 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 $D^+ \rightarrow \mu^+\nu_\mu$ and $D_s^+ \rightarrow \mu^+\nu_\mu$ events. The present result leads to f_{D_s} = (323 ± 44 ± 36) MeV.

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

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

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

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.6 ±0.4 OUR AVERAGE					
6.42±0.81±0.18	126 ± 16	[11] ALEXANDER	09	CLEO	$\tau^+ \rightarrow \pi^+\overline{\nu}_\tau$
5.52±0.57±0.21	155 ± 17	[11] NAIK	09A	CLEO	$\tau^+ \rightarrow \rho^+\overline{\nu}_\tau$
5.30±0.47±0.22	181 ± 16	[11] ONYISI	09	CLEO	$\tau^+ \rightarrow e^+\nu_e\overline{\nu}_\tau$

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

$6.17\pm0.71\pm0.34$	102	[12] ECKLUND	08	CLEO	See ONYISI 09
$8.0\ \pm1.3\ \pm0.4$	47	[12] PEDLAR	07A	CLEO	See ALEXANDER 09
$5.79\pm0.77\pm1.84$	881	[13] HEISTER	02I	ALEP	Z decays
$7.0\ \pm2.1\ \pm2.0$	22	[14] ABBIENDI	01L	OPAL	$D_s^{*+} \to \gamma D_s^+$ from Z's
$7.4\ \pm2.8\ \pm2.4$	16	[15] ACCIARRI	97F	L3	$D_s^{*+} \to \gamma D_s^+$ from Z's

[11] 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 ± 7.8 ± 3.4) MeV.

[12] 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.

[13] 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.

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

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

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$11.0\pm1.4\pm0.6$	102	[16] ECKLUND	08	CLEO	See ONYISI 09

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

$\Gamma(K^+K^-e^+\nu_e)/\Gamma(K^+K^-\pi^+)$ — Γ_{22}/Γ_{31}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.558\pm0.007\pm0.016$	[17] AUBERT	08AN	BABR	e^+e^- at $\Upsilon(4S)$

[17] 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_{23}/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 (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.49±0.14 OUR FIT					
2.54±0.14 OUR AVERAGE					
$2.36\pm0.23\pm0.13$	106 ± 10	ECKLUND	09	CLEO	e^+e^- at 4170 MeV
$2.61\pm0.03\pm0.17$	(25 ± 0.5)k	AUBERT	08AN	BABR	e^+e^- at $\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2.29\pm0.37\pm0.11$	45	YELTON	09	CLEO	See ECKLUND 09

$\Gamma(\phi e^+ \nu_e)/\Gamma(\phi \pi^+)$ — Γ_{23}/Γ_{32}

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. • • •					
$0.540 \pm 0.033 \pm 0.048$	793	LINK	02J	FOCS	Uses $\phi \mu^+ \nu_\mu$
$0.54 \pm 0.05 \pm 0.04$	367	BUTLER	94	CLE2	Uses $\phi e^+ \nu_e$ and $\phi \mu^+ \nu_\mu$
$0.58 \pm 0.17 \pm 0.07$	97	FRABETTI	93G	E687	Uses $\phi \mu^+ \nu_\mu$
$0.57 \pm 0.15 \pm 0.15$	104	ALBRECHT	91	ARG	Uses $\phi e^+ \nu_e$
$0.49 \pm 0.10 {}^{+0.10}_{-0.14}$	54	ALEXANDER	90B	CLEO	Uses $\phi e^+ \nu_e$ and $\phi \mu^+ \nu_\mu$

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

Unseen decay modes of the η are included.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.67±0.29 OUR FIT	Error includes scale factor of 1.1.				
2.48±0.29±0.13	82	YELTON	09	CLEO	$e^+ e^-$ at 4170 MeV

$\Gamma(\eta e^+ \nu_e)/\Gamma(\phi e^+ \nu_e)$ — Γ_{25}/Γ_{23}

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.07±0.12 OUR FIT	Error includes scale factor of 1.1.				
1.24±0.12±0.15	440	[18] BRANDENB...	95	CLE2	$e^+ e^- \approx \Upsilon(4S)$

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

$\Gamma(\eta'(958) e^+ \nu_e)/\Gamma_{\text{total}}$ — Γ_{26}/Γ

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.99±0.23 OUR FIT					
0.91±0.33±0.05	7.5	YELTON	09	CLEO	$e^+ e^-$ at 4170 MeV

$\Gamma(\eta'(958) e^+ \nu_e)/\Gamma(\phi e^+ \nu_e)$ — Γ_{26}/Γ_{23}

Unseen decay modes of the resonances are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.40±0.09 OUR FIT					
0.43±0.11±0.07	29	[19] BRANDENB...	95	CLE2	$e^+ e^- \approx \Upsilon(4S)$

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

$\left[\Gamma(\eta e^+ \nu_e) + \Gamma(\eta'(958) e^+ \nu_e)\right]/\Gamma(\phi e^+ \nu_e)$ — $\Gamma_{24}/\Gamma_{23} = (\Gamma_{25}+\Gamma_{26})/\Gamma_{23}$

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. • • •				
$1.67 \pm 0.17 \pm 0.17$	[20] BRANDENB...	95	CLE2	$e^+ e^- \approx \Upsilon(4S)$

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

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.37±0.10±0.02	14	YELTON	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^*(892)^0 e^+ \nu_e)/\Gamma_{total}$ — Γ_{28}/Γ

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.18±0.07±0.01	7.5	YELTON	09	CLEO	e^+e^- at 4170 MeV

$\Gamma(f_0(980) e^+ \nu_e, f_0 \to \pi^+\pi^-)/\Gamma_{total}$ — Γ_{29}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.20±0.03 ±0.01	44 ± 7	ECKLUND	09	CLEO	e^+e^- at 4170 MeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.13±0.04 ±0.01	13	YELTON	09	CLEO	See ECKLUND 09

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

$\Gamma(K^+ K^0_S)/\Gamma_{total}$ — Γ_{30}/Γ

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
1.49±0.08 OUR FIT				
1.49±0.07±0.05	[21] ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

[21] ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

$\Gamma(K^+ K^- \pi^+)/\Gamma_{total}$ — Γ_{31}/Γ

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
5.50±0.27 OUR FIT				
5.50±0.23±0.16	[22] ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

[22] ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

$\Gamma(\phi\pi^+)/\Gamma_{total}$ — Γ_{32}/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 (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
4.5 ±0.4 OUR AVERAGE					
4.62±0.36±0.51		[23] AUBERT	06N	BABR	e^+e^- at $\Upsilon(4S)$
4.81±0.52±0.38	212 ± 19	[24] AUBERT	05V	BABR	$e^+e^- \approx \Upsilon(4S)$
3.59±0.77±0.48		[25] ARTUSO	96	CLE2	e^+e^- at $\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$3.9^{+5.1}_{-1.9}{}^{+1.8}_{-1.1}$		[26] BAI	95C	BES	e^+e^- 4.03 GeV

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

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

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

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

$\Gamma(\phi\pi^+,\ \phi \rightarrow K^+K^-)/\Gamma(K^+K^-\pi^+)$ Γ_{33}/Γ_{31}

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.422±0.016±0.003	MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.396±0.033±0.047	FRABETTI	95B	E687	Dalitz fit, 701 evts

$\Gamma(K^+\overline{K}^*(892)^0,\ \overline{K}^{*0} \rightarrow K^-\pi^+)/\Gamma(K^+K^-\pi^+)$ Γ_{34}/Γ_{31}

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.474±0.015±0.004	MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.478±0.046±0.040	FRABETTI	95B	E687	Dalitz fit, 701 evts

$\Gamma(f_0(980)\pi^+,\ f_0 \rightarrow K^+K^-)/\Gamma(K^+K^-\pi^+)$ Γ_{35}/Γ_{31}

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.282±0.019±0.018	MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.11 ±0.035±0.026	FRABETTI	95B	E687	Dalitz fit, 701 evts

$\Gamma(f_0(1370)\pi^+,\ f_0 \rightarrow K^+K^-)/\Gamma(K^+K^-\pi^+)$ Γ_{36}/Γ_{31}

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.043±0.006±0.005	MITCHELL	09A	CLEO	Dalitz fit, 12k evts

$\Gamma(f_0(1710)\pi^+, f_0 \to K^+K^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{37}/Γ_{31}

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.034±0.005±0.003	MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.034±0.023±0.035	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_{38}/Γ_{31}

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.039±0.005±0.005	MITCHELL	09A	CLEO	Dalitz fit, 12k evts
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.093±0.032±0.032	FRABETTI	95B	E687	Dalitz fit, 701 evts

$\Gamma(K^*(892)^+\overline{K}^0)/\Gamma(\phi\pi^+)$ — Γ_{40}/Γ_{32}

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_{41}/Γ

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
5.6 ±0.5 OUR FIT				
5.65±0.29±0.40	[27] ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

[27] ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

$\Gamma(\phi\rho^+)/\Gamma(\phi\pi^+)$ — Γ_{42}/Γ_{32}

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

$\Gamma(K^0_S K^- 2\pi^+)/\Gamma_{total}$ — Γ_{43}/Γ

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
1.64±0.12 OUR FIT				
1.64±0.10±0.07	[28] ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

[28] ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

$\Gamma(K^*(892)^+\overline{K}^*(892)^0)/\Gamma(\phi\pi^+)$ — Γ_{44}/Γ_{32}

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

$\Gamma(K^+K^0_S\pi^+\pi^-)/\Gamma(K^0_S K^- 2\pi^+)$ — Γ_{45}/Γ_{43}

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

$\Gamma(K^+K^-2\pi^+\pi^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{46}/Γ_{31}

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_{47}/Γ_{32}

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_{48}/Γ_{46}

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_{49}/Γ_{46}

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_{50}/Γ_{31}

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_{51}/Γ_{46}

VALUE	DOCUMENT ID		TECN	COMMENT
0.10±0.06±0.05	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_{52}/Γ_{43}

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_{53}/Γ_{30}

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
<4.1	90	ADAMS	07A	CLEO	e^+e^-, E_{cm}=4.17 GeV

$\Gamma(2\pi^+\pi^-)/\Gamma_{total}$ — Γ_{54}/Γ

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
1.10±0.06 OUR FIT				
1.11±0.07±0.04	[29] ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

[29] ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

$\Gamma(2\pi^+\pi^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{54}/Γ_{31}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.200±0.008 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_{55}/Γ_{54}

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

$\Gamma(\pi^+(\pi^+\pi^-)_{S-\text{wave}})/\Gamma(2\pi^+\pi^-)$ — Γ_{56}/Γ_{54}

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	[30] AUBERT	09O	BABR	Dalitz fit, ≈ 10.5k evts
0.8704±0.0560±0.0438	[31] LINK	04	FOCS	Dalitz fit, 1475 ± 50 evts

[30] AUBERT 09O gives the amplitude and phase of the $\pi^+\pi^-$ S-wave in 29 $\pi^+\pi^-$ invariant-mass bins.

[31] 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 $f_0(980)$, $f_0(1300)$, $f_0(1200\text{–}1600)$, $f_0(1500)$, 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_{57}/Γ_{54}

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

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

$\Gamma(f_0(1370)\pi^+, f_0\to\pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{58}/Γ_{54}

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

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

$\Gamma(f_0(1500)\pi^+, f_0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{59}/Γ_{54}

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

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.274 \pm 0.114 \pm 0.019$	[32] FRABETTI	97D	E687	γ Be $\approx$ 200 GeV

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

$\Gamma(f_2(1270)\pi^+, f_2 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{60}/Γ_{54}

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

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

$\Gamma(\rho(1450)^0\pi^+, \rho^0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-)$ — Γ_{61}/Γ_{54}

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

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

$\Gamma(\pi^+ 2\pi^0)/\Gamma_{total}$ — Γ_{62}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$0.65 \pm 0.13 \pm 0.03$	72 ± 16	NAIK	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(2\pi^+\pi^-\pi^0)/\Gamma(\phi\pi^+)$ — Γ_{63}/Γ_{32}

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_{64}/Γ

Unseen decay modes of the η are included.

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
1.56 ± 0.20 OUR FIT				
$1.58 \pm 0.11 \pm 0.18$	[33] ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

[33] ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

$\Gamma(\eta\pi^+)/\Gamma(\phi\pi^+)$ — Γ_{64}/Γ_{32}

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. • • •					
$0.48 \pm 0.03 \pm 0.04$	920	JESSOP	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
$0.54 \pm 0.09 \pm 0.06$	165	ALEXANDER	92	CLE2	See JESSOP 98

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

Unseen decay modes of the ω are included.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.23±0.06 OUR FIT					
0.21±0.09±0.01	6 ± 2.4	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(\omega\pi^+)/\Gamma(\eta\pi^+)$ — Γ_{65}/Γ_{64}

Unseen decay modes of the resonances are included.

VALUE	DOCUMENT ID		TECN	COMMENT
0.15±0.04 OUR FIT				
0.16±0.04±0.03	BALEST	97	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(3\pi^+2\pi^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{66}/Γ_{31}

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_{68}/Γ

Unseen decay modes of the η are included.

VALUE (units 10^{-2})	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_{68}/Γ_{32}

Unseen decay modes of the resonances are included.

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

$\Gamma(\eta\pi^+\pi^0\,\text{3-body})/\Gamma(\phi\pi^+)$ — Γ_{69}/Γ_{32}

Unseen decay modes of the resonances are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.1	90	JESSOP	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.82	90	[34] DAOUDI	92	CLE2	See JESSOP 98

[34] We use the JESSOP 98 limit, even though the DAOUDI 92 limit, from the same experiment but with a much smaller data sample, is more restrictive.

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

Unseen decay modes of the ω are included.

VALUE (units 10^{-2})	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_{71}/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_{72}/Γ

Unseen decay modes of the ω are included.

VALUE (units 10^{-2})	*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_{73}/Γ

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

VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
3.8 ±0.4 OUR FIT				
3.77±0.25±0.30	[35] ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

[35] ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

$\Gamma(\eta'(958)\pi^+)/\Gamma(\phi\pi^+)$ Γ_{73}/Γ_{32}

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. • • •					
$1.03\pm0.06\pm0.07$	537	JESSOP	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
$1.20\pm0.15\pm0.11$	281	ALEXANDER	92	CLE2	See JESSOP 98
$2.5 \pm1.0 {}^{+1.5}_{-0.4}$	22	ALVAREZ	91	NA14	Photoproduction
$2.5 \pm0.5 \pm0.3$	215	ALBRECHT	90D	ARG	$e^+e^- \approx 10.4$ GeV

$\Gamma(\omega\eta\pi^+)/\Gamma_{total}$ Γ_{75}/Γ

Unseen decay modes of the ω and η are included.

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

$\Gamma(\eta'(958)\rho^+)/\Gamma(\phi\pi^+)$ Γ_{76}/Γ_{32}

Unseen decay modes of the resonances are included.

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

$\Gamma(\eta'(958)\pi^+\pi^0\,\text{3-body})/\Gamma(\phi\pi^+)$ Γ_{77}/Γ_{32}

Unseen decay modes of the resonances are included.

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.4	90	JESSOP	98	CLE2	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.85	90	DAOUDI	92	CLE2	See JESSOP 98

Modes with one or three K's

$\Gamma(K^+\pi^0)/\Gamma(K^+K^0_S)$ Γ_{78}/Γ_{30}

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
5.5±1.3±0.7	141 ± 34	ADAMS	07A	CLEO	e^+e^-, E_{cm}=4.17 GeV

$\Gamma(K^0_S\pi^+)/\Gamma(K^+K^0_S)$ — Γ_{79}/Γ_{30}

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
8.07±0.29 OUR AVERAGE					
8.03±0.24±0.19	17.6k±481	WON	09	BELL	e^+e^- at $\Upsilon(4S)$
10.4 ±2.4 ±1.4	113 ± 26	LINK	08	FOCS	γ A, $\overline{E}_\gamma\approx$ 180 GeV
8.2 ±0.9 ±0.2	206 ± 22	ADAMS	07A	CLEO	e^+e^-, E_{cm}=4.17 GeV

$\Gamma(K^+\eta)/\Gamma(\eta\pi^+)$ — Γ_{80}/Γ_{64}

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
8.9±1.5±0.4	113 ± 18	ADAMS	07A	CLEO	e^+e^-, E_{cm}=4.17 GeV

$\Gamma(K^+\omega)/\Gamma_{total}$ — Γ_{81}/Γ

Unseen decay modes of the ω are included.

VALUE (units 10^{-2})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.24	90	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^+\eta'(958))/\Gamma(\eta'(958)\pi^+)$ — Γ_{82}/Γ_{73}

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
4.2±1.3±0.3	28 ± 9	ADAMS	07A	CLEO	e^+e^-, E_{cm}=4.17 GeV

$\Gamma(K^+\pi^+\pi^-)/\Gamma_{total}$ — Γ_{83}/Γ

VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
0.69±0.05 OUR FIT				
0.69±0.05±0.03	[36] ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

[36] ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

$\Gamma(K^+\pi^+\pi^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{83}/Γ_{31}

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.126±0.009 OUR FIT					
0.127±0.007±0.014	567 ± 31	LINK	04F	FOCS	γ A, $\overline{E}_\gamma\approx$ 180 GeV

$\Gamma(K^+\rho^0)/\Gamma(K^+\pi^+\pi^-)$ — Γ_{84}/Γ_{83}

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

$\Gamma(K^+\rho(1450)^0, \rho^0\to\pi^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — Γ_{85}/Γ_{83}

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

$\Gamma(K^*(892)^0\pi^+, K^{*0}\to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — Γ_{86}/Γ_{83}

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

$\Gamma(K^*(1410)^0\pi^+, K^{*0} \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — Γ_{87}/Γ_{83}

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

$\Gamma(K^*(1430)^0\pi^+, K^{*0} \to K^+\pi^-)/\Gamma(K^+\pi^+\pi^-)$ — Γ_{88}/Γ_{83}

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

$\Gamma(K^+\pi^+\pi^-\text{ nonresonant})/\Gamma(K^+\pi^+\pi^-)$ — Γ_{89}/Γ_{83}

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_{90}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.00±0.18±0.04	44 ± 8	NAIK	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^0_S 2\pi^+\pi^-)/\Gamma(K^0_S K^- 2\pi^+)$ — Γ_{91}/Γ_{43}

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_{92}/Γ

Unseen decay modes of the ω are included.

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
<0.82	90	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^+\omega\pi^+\pi^-)/\Gamma_{total}$ — Γ_{93}/Γ

Unseen decay modes of the ω are included.

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
<0.54	90	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(K^+\omega\eta)/\Gamma_{total}$ — Γ_{94}/Γ

Unseen decay modes of the ω and η are included.

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
<0.79	90	GE	09A	CLEO	e^+e^- at 4170 MeV

$\Gamma(2K^+K^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{95}/Γ_{31}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$8.95\pm2.12^{+2.24}_{-2.31}$	31	LINK	02I	FOCS	γ nucleus, ≈ 180 GeV

$\Gamma(\phi K^+)/\Gamma(\phi\pi^+)$ — Γ_{96}/Γ_{32}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.013	90	FRABETTI	95F	E687	γBe, $\overline{E}_\gamma \approx$ 220 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.071	90	ANJOS	92D	E691	γBe, $\overline{E}_\gamma$ = 145 GeV

Doubly Cabibbo-suppressed modes

$\Gamma(2K^+\pi^-)/\Gamma(K^+K^-\pi^+)$ — Γ_{97}/Γ_{31}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
2.35±0.30 OUR AVERAGE					
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%

Baryon-antibaryon mode

$\Gamma(p\overline{n})/\Gamma_{total}$ — Γ_{98}/Γ

This is the only baryonic mode allowed kinematically.

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$1.30\pm0.36^{+0.12}_{-0.16}$	13.0 ± 3.6	ATHAR	08	CLEO	e^+e^-, $E_{cm} \approx 4170$ MeV

Rare or forbidden modes

$\Gamma(\pi^+e^+e^-)/\Gamma_{total}$ — Γ_{99}/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
$<2.7 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(\pi^+\mu^+\mu^-)/\Gamma_{total}$ — Γ_{100}/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%	EVTS	DOCUMENT ID		TECN	COMMENT
$<2.6 \times 10^{-5}$	90		LINK	03F	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<1.4 \times 10^{-4}$	90		AITALA	99G	E791	$\pi^- N$ 500 GeV
$<4.3 \times 10^{-4}$	90	0	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(K^+e^+e^-)/\Gamma_{total}$ — Γ_{101}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.6 \times 10^{-3}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(K^+\mu^+\mu^-)/\Gamma_{total}$ — Γ_{102}/Γ

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

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<3.6 \times 10^{-5}$	90		LINK	03F	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<1.4 \times 10^{-4}$	90		AITALA	99G	E791	$\pi^- N$ 500 GeV
$<5.9 \times 10^{-4}$	90	0	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(K^*(892)^+ \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{103}/Γ

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

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<1.4 \times 10^{-3}$	90	0	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(\pi^+ e^\pm \mu^\mp)/\Gamma_{total}$ — Γ_{104}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.1 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(K^+ e^\pm \mu^\mp)/\Gamma_{total}$ — Γ_{105}/Γ

A test of lepton-family-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.3 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(\pi^- 2e^+)/\Gamma_{total}$ — Γ_{106}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.9 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(\pi^- 2\mu^+)/\Gamma_{total}$ — Γ_{107}/Γ

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<2.9 \times 10^{-5}$	90		LINK	03F	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<8.2 \times 10^{-5}$	90		AITALA	99G	E791	$\pi^- N$ 500 GeV
$<4.3 \times 10^{-4}$	90	0	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(\pi^- e^+ \mu^+)/\Gamma_{total}$ — Γ_{108}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<7.3 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(K^- 2e^+)/\Gamma_{total}$ — Γ_{109}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.3 \times 10^{-4}$	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(K^- 2\mu^+)/\Gamma_{total}$ — Γ_{110}/Γ

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<1.3 \times 10^{-5}$	90		LINK	03F	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<1.8 \times 10^{-4}$	90		AITALA	99G	E791	$\pi^- N$ 500 GeV
$<5.9 \times 10^{-4}$	90	0	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(K^- e^+ \mu^+)/\Gamma_{total}$ Γ_{111}/Γ

A test of lepton-number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<6.8 × 10^{-4}	90	AITALA	99G	E791	$\pi^- N$ 500 GeV

$\Gamma(K^*(892)^- 2\mu^+)/\Gamma_{total}$ Γ_{112}/Γ

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<1.4 × 10^{-3}	90	0	KODAMA	95	E653	π^- emulsion 600 GeV

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

This is the difference of the D_s^+ and D_s^- partial widths divided by the sum of the widths.

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

VALUE	DOCUMENT ID		TECN	COMMENT
+0.048±0.061	ALEXANDER	09	CLEO	$e^+ e^-$ at 4170 MeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
+0.049±0.021±0.009	ALEXANDER	08	CLEO	$e^+ e^-$ at 4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
+0.003±0.011±0.008	ALEXANDER	08	CLEO	$e^+ e^-$ at 4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
−0.059±0.042±0.012	ALEXANDER	08	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
−0.007±0.036±0.011	ALEXANDER	08	CLEO	$e^+ e^-$ at 4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
+0.020±0.046±0.007	ALEXANDER	08	CLEO	$e^+ e^-$ at 4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
−0.082±0.052±0.008	ALEXANDER	08	CLEO	$e^+ e^-$ at 4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
−0.055±0.037±0.012	ALEXANDER	08	CLEO	$e^+ e^-$ at 4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
+0.02±0.29	ADAMS	07A	CLEO	e^+e^-, $E_{\rm cm}$=4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
+0.27±0.11	ADAMS	07A	CLEO	e^+e^-, $E_{\rm cm}$=4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
+0.112±0.070±0.009	ALEXANDER	08	CLEO	e^+e^- at 4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
−0.20±0.18	ADAMS	07A	CLEO	e^+e^-, $E_{\rm cm}$=4.17 GeV

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

VALUE	DOCUMENT ID		TECN	COMMENT
−0.17±0.37	ADAMS	07A	CLEO	e^+e^-, $E_{\rm cm}$=4.17 GeV

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

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

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
−0.036±0.067±0.023	508 ± 34	LINK	05E	FOCS	γ A, $\overline{E}_{\gamma} \approx$ 180 GeV

$D_s^+ \to \phi\ell^+\nu_{\ell}$ FORM FACTORS

$r_2 \equiv A_2(0)/A_1(0)$ 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	[37] 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	$\phi\mu^+\nu_{\mu}$

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

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.80 ±0.08 OUR AVERAGE					
1.807±0.046±0.065	25±0.5k	[38] 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	$\phi \mu^+ \nu_\mu$

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

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.72±0.18 OUR AVERAGE					
1.0 ±0.3 ±0.2	308	AVERY	94B	CLE2	$\phi e^+ \nu_e$
1.0 ±0.5 ±0.1	90	[39] FRABETTI	94F	E687	$\phi \mu^+ \nu_\mu$
0.54±0.21±0.10	19	[39] KODAMA	93	E653	$\phi \mu^+ \nu_\mu$

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

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