CHARMED, STRANGE MESONS ($C = \pm 1$, $S = \pm 1$) (including possibly non-$q\overline{q}$ states)

$D_s^+ = c\overline{s}$, $D_s^- = \overline{c}s$, similarly for D_s^*'s

$D_s^\pm$

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

Mass $m = 1968.35 \pm 0.07$ MeV
$m_{D_s^\pm} - m_{D^\pm} = 98.69 \pm 0.05$ MeV
Mean life $\tau = (501.2 \pm 2.2) \times 10^{-15}$ s (S = 1.3)
$c\tau = 150.3$ μm

CP-violating decay-rate asymmetries

$A_{CP}(\mu^\pm\nu) = (-0.2 \pm 2.5)\%$
$A_{CP}(\tau^\pm\nu)$ in $D_s^+ \to \tau^+\nu_\tau$, $D_s^- \to \tau^-\overline{\nu}_\tau = (3 \pm 5)\%$
$A_{CP}(K^\pm K_S^0) = (0.07 \pm 0.24)\%$
$A_{CP}(K^\pm K_L^0)$ in $D_s^\pm \to K^\pm K_L^0 = (-1.1 \pm 2.7) \times 10^{-2}$
$A_{CP}(K^+K^-\pi^\pm) = (0.35 \pm 0.34)\%$
$A_{CP}(\phi\pi^\pm) = (-0.38 \pm 0.27)\%$
$A_{CP}(K^\pm K_S^0\pi^0) = (-0.9 \pm 1.9)\%$
$A_{CP}(2K_S^0\pi^\pm) = (1.3 \pm 1.6)\%$
$A_{CP}(K^+K^-\pi^\pm\pi^0) = (-0.6 \pm 0.9)\%$
$A_{CP}(K^\pm K_S^0\pi^+\pi^-) = (0.7 \pm 2.9)\%$ (S = 1.3)
$A_{CP}(K_S^0 K^\mp 2\pi^\pm) = (0.7 \pm 1.8)\%$ (S = 1.3)
$A_{CP}(\pi^+\pi^-\pi^\pm) = (-0.9 \pm 1.1)\%$
$A_{CP}(\pi^\pm\eta) = (0.24 \pm 0.29)\%$
$A_{CP}(\pi^\pm\pi^+\pi^-\eta) = (2.4 \pm 3.0)\%$
$A_{CP}(\pi^\pm\eta') = (-0.08 \pm 0.17)\%$ (S = 1.2)
$A_{CP}(\eta\pi^\pm\pi^0) = (0.9 \pm 1.5)\%$
$A_{CP}(\eta'\pi^\pm\pi^0) = (-1.5 \pm 2.5)\%$
$A_{CP}(K^\pm\pi^0) = (2 \pm 4)\%$ (S = 1.2)
$A_{CP}(\overline{K}^0/K^0\pi^\pm) = (0.4 \pm 0.5)\%$
$A_{CP}(K_S^0\pi^\pm) = (0.20 \pm 0.18)\%$
$A_{CP}(K^\pm\pi^+\pi^-) = (2.2 \pm 1.9)\%$
$A_{CP}(K_S^0\pi^+\pi^0)$ in $D_s^\pm \to K_S^0\pi^\pm\pi^0 = (-2 \pm 5)\%$
$A_{CP}(K^\pm\pi^+\pi^-\pi^0)$ in $D_s^\pm \to K^\pm\pi^+\pi^-\pi^0 = (7 \pm 5) \times 10^{-2}$
$A_{CP}(K^\pm\eta) = (1.8 \pm 1.9)\%$
$A_{CP}(K^\pm\eta'(958)) = (6 \pm 19)\%$

CP violating asymmetries of *P*-odd (*T*-odd) moments

$A_T(K^0_S K^\pm \pi^+ \pi^-) = (-8 \pm 6) \times 10^{-3}$ [a]
$A_{Tviol}(K^0_S K^\mp \pi^\pm \pi^\pm)$ in $D_s^\pm \to K^0_S K^\mp \pi^\pm \pi^\pm = (0.2 \pm 2.5) \times 10^{-3}$

$D_s^+ \to \phi \ell^+ \nu_\ell$ form factors

$r_2 = 0.83 \pm 0.08$ (S = 1.8)
$r_v = 1.76 \pm 0.07$ (S = 1.1)
$\Gamma_L/\Gamma_T = 0.72 \pm 0.18$
$f_+(0)\,|V_{cs}|$ in $D_s^+ \to \eta e^+ \nu_e = 0.449 \pm 0.009$
$f_+(0)\,|V_{cs}|$ in $D_s^+ \to \eta \mu^+ \nu_\mu = 0.452 \pm 0.012$
$r_1 \equiv a_1/a_0$ in $D_s^+ \to \eta \mu^+ \nu_\mu = -2.9 \pm 0.6$
$\langle A^\eta_{FB} \rangle$ in $D_s^+ \to \eta \mu^+ \nu_\mu = (-5.9 \pm 3.1) \times 10^{-2}$
$f_+(0)\,|V_{cs}|$ in $D_s^+ \to \eta' e^+ \nu_e = 0.527 \pm 0.024$
$r_1 \equiv a_1/a_0$ in $D_s^+ \to \eta' \mu^+ \nu_\mu = -11 \pm 5$
$\langle A^{\eta'}_{FB} \rangle$ in $D_s^+ \to \eta' \mu^+ \nu_\mu = (-6 \pm 8) \times 10^{-2}$
$f_+(0)\,|V_{cs}|$ in $D_s^+ \to \eta' \mu^+ \nu_\mu = 0.50 \pm 0.04$
$f_+(0)\,|V_{cs}|$ in $D_s^+ \to f_0(980) e^+ \nu_e = 0.50 \pm 0.04$
$f_+(0)|V_{cd}|$ in $D_s^+ \to K^0 e^+ \nu_e = 0.145 \pm 0.010$
$r_v \equiv V(0)/A_1(0)$ in $D_s^+ \to K^*(892)^0 e^+ \nu_e = 1.7 \pm 0.4$
$r_2 \equiv A_2(0)/A_1(0)$ in $D_s^+ \to K^*(892)^0 e^+ \nu_e = 0.77 \pm 0.29$
$f_{D_s^+}\,|V_{cs}|$ in $D_s^+ \to \mu^+ \nu_\mu = 242.7 \pm 3.0$ MeV
$f_{D_s^+}\,|V_{cs}|$ in $D_s^+ \to \tau^+ \nu_\tau = 247.5 \pm 2.3$ MeV

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.

D_s^+ DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Inclusive modes				
e^+ semileptonic	[b]	(6.33 ±0.15) %		–
π^+ anything		(119.3 ±1.4) %		–
π^- anything		(43.2 ±0.9) %		–
π^0 anything		(123 ±7) %		–
K^- anything		(18.7 ±0.5) %		–
K^+ anything		(28.9 ±0.7) %		–
K^0_S anything		(19.0 ±1.1) %		–
η anything	[c]	(29.9 ±2.8) %		–
ω anything		(6.1 ±1.4) %		–
η' anything	[d]	(10.3 ±1.4) %	S=1.1	–

$f_0(980)$ anything, $f_0 \to \pi^+\pi^-$		$<$ 1.3		%	CL=90%	–
ϕ anything		(15.7	±1.0) %			–
K^+K^- anything		(15.8	±0.7) %			–
$K^0_S K^+$ anything		(5.8	±0.5) %			–
$K^0_S K^-$ anything		(1.9	±0.4) %			–
$2K^0_S$ anything		(1.70	±0.32) %			–
$2K^+$ anything		$<$ 2.6		$\times 10^{-3}$	CL=90%	–
$2K^-$ anything		$<$ 6		$\times 10^{-4}$	CL=90%	–
$2\pi^+\pi^-$ + anything		(32.8	±0.7) %			–

Leptonic and semileptonic modes

$e^+\nu_e$		$<$ 8.3		$\times 10^{-5}$	CL=90%	984
$\mu^+\nu_\mu$		(5.37	±0.11) $\times 10^{-3}$			981
$\tau^+\nu_\tau$		(5.39	±0.09) %			182
$\gamma e^+\nu_e$		$<$ 1.3		$\times 10^{-4}$	CL=90%	984
$K^+K^-e^+\nu_e$			—			851
$K^0_S K^0_S e^+\nu_e$		$<$ 3.8		$\times 10^{-4}$	CL=90%	849
$\phi e^+\nu_e$	[e]	(2.34	±0.12) %		S=1.2	720
$K_1(1270)^0 e^+\nu_e$		$<$ 4.1		$\times 10^{-4}$	CL=90%	584
$b_1(1235)^0 e^+\nu_e$, $b^0_1 \to \omega\pi^0$		$<$ 6.4		$\times 10^{-4}$	CL=90%	–
$\phi\mu^+\nu_\mu$		(2.24	±0.11) %			715
$\eta e^+\nu_e$	[e]	(2.27	±0.06) %			908
$\eta'(958) e^+\nu_e$	[e]	(8.1	±0.4) $\times 10^{-3}$			751
$\eta\mu^+\nu_\mu$		(2.24	±0.07) %			905
$\eta'(958)\mu^+\nu_\mu$		(8.0	±0.6) $\times 10^{-3}$			747
$\omega e^+\nu_e$	[f]	$<$ 2.0		$\times 10^{-3}$	CL=90%	829
$K^0 e^+\nu_e$		(2.88	±0.26) $\times 10^{-3}$		S=1.2	921
$K^*(892)^0 e^+\nu_e$	[e]	(2.05	±0.20) $\times 10^{-3}$			782
$f_0(500) e^+\nu_e$, $f_0 \to \pi^0\pi^0$		$<$ 7.3		$\times 10^{-4}$	CL=90%	–
$f_0(500) e^+\nu_e$, $f_0 \to \pi^+\pi^-$		$<$ 3.3		$\times 10^{-4}$	CL=90%	–
$f_0(980) e^+\nu_e$, $f_0 \to \pi^0\pi^0$		(7.9	±1.5) $\times 10^{-4}$			–
$f_0(980) e^+\nu_e$, $f_0 \to \pi^+\pi^-$		(1.64	±0.13) $\times 10^{-3}$			–
$f_0(980)\mu^+\nu_\mu$, $f_0 \to K^+K^-$		$<$ 5.45		$\times 10^{-4}$	CL=90%	–
$a_0(980)^0 e^+\nu_e$, $a^0_0 \to \pi^0\eta$		$<$ 1.2		$\times 10^{-4}$	CL=90%	–
$\pi^0 e^+\nu_e$		$<$ 6.4		$\times 10^{-5}$	CL=90%	980

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

$K^+K^0_S$		(1.500	±0.014) %			850
$K^+K^0_L$		(1.49	±0.06) %			850
$K^0_S K^0_L \pi^+$		(1.86	±0.07) %			802
$\phi(1020)\pi^+$, $\phi \to K^0_L K^0_S$		(1.31	±0.06) %			–
$K^0_L K^*(892)^+$, $K^{*+} \to K^0_S\pi^+$		(3.59	±0.32) $\times 10^{-3}$			–

$K^0_S K^*(892)^+,\ K^{*+} \to K^0_L \pi^+$		(2.68 ±0.33) × 10^{-3}			–
$\phi(1680)\pi^+,\ \phi \to K^0_L K^0_S$		(6.1 ±2.1) × 10^{-4}			–
$K^+ \overline{K}^0$		(2.95 ±0.14) %			850
$K^+ K^- \pi^+$	[g]	(5.45 ±0.08) %		S=1.3	805
$\phi\pi^+$	[e,h]	(4.5 ±0.4) %			712
$\phi\pi^+,\ \phi \to K^+ K^-$	[h]	(2.25 ±0.05) %			712
$K^+ \overline{K}^*(892)^0$		(12.7 $^{+4.0}_{-3.1}$) %			685
$K^+ \overline{K}^*(892)^0,\ \overline{K}^{*0} \to K^- \pi^+$		(2.61 ±0.05) %			416
$K^+ \overline{K}^*(892)^0,\ \overline{K}^{*0} \to K^0_S \pi^0$		(4.8 ±0.4) × 10^{-3}			–
$f_0(980)\pi^+,\ f_0 \to K^+ K^-$		(1.12 ±0.19) %			732
$f_0(1370)\pi^+,\ f_0 \to K^+ K^-$		(7.2 ±3.0) × 10^{-4}			–
$f_0(1710)\pi^+,\ f_0 \to K^+ K^-$		(6.8 ±2.8) × 10^{-4}			198
$a_0(980)^+\pi^0,\ a_0^+ \to K^+ K^0_S$		(1.1 ±0.4) × 10^{-3}			–
$a_0(1710)^+\pi^0,\ a_0^+ \to K^+ K^0_S$		(3.5 ±0.6) × 10^{-3}			–
$K^+ \overline{K}^*_0(1430)^0,\ \overline{K}^*_0 \to K^- \pi^+$		(1.79 ±0.26) × 10^{-3}			218
$K^+ \overline{K}^*(1410)^0,\ \overline{K}^*_0 \to K^0_S \pi^0$		(8.8 ±2.8) × 10^{-4}			–
$K^+ K^0_S \pi^0$		(1.471±0.028) %			805
$K^*(892)^+ K^0_S,\ K^{*+} \to K^+ \pi^0$		(2.04 ±0.32) × 10^{-3}			–
$2K^0_S \pi^+$		(7.32 ±0.14) × 10^{-3}			802
$f_0(980)\pi^+,\ f_0 \to K^0_S K^0_S$		< 1.8 × 10^{-4}	CL=90%		–
$f_0(1710)\pi^+,\ f_0 \to K^0_S K^0_S$		(3.39 ±0.31) × 10^{-3}			–
$K^*(892)^+ K^0_S,\ K^{*+} \to K^0_S \pi^+$		(3.19 ±0.29) × 10^{-3}			683
$K^0 \overline{K}^0 \pi^+$		—			802
$K^*(892)^+ \overline{K}^0$	[e]	(5.4 ±1.2) %			683
$\phi\rho^+$		(4.9 ±0.8) %		S=3.0	401
$K^+ K^- \pi^+ \pi^0$		(5.53 ±0.15) %		S=1.3	748
$\overline{K}_1(1270)^0 K^+,\ \overline{K}_1(1270)^0 \to K^- \rho^+$		(5.7 ±0.6) × 10^{-3}			–
$\overline{K}_1(1270)^0 K^+,\ \overline{K}_1(1270)^0 \to K^*(892)\pi$		(1.31 ±0.25) %			–
$\overline{K}_1(1400)^0 K^+,\ \overline{K}_1(1400)^0 \to K^*(892)\pi$		(2.0 ±0.4) %			–
$a_0(980)^0\rho^+,\ a_0^0 \to K^+ K^-$		(1.9 ±0.4) × 10^{-3}			–

$f_1(1420)^0\pi^+,\ f_1(1420)^0 \to K^*(892)^\mp K^\pm$		(3.9 ±0.7) × 10^{-3}		–
$f_1(1420)^0\pi^+,\ f_1^0 \to a_0(980)^0\pi^0,\ a_0^0 \to K^+K^-$		(4.0 ±1.4) × 10^{-4}		–
$\eta(1475)\pi^+,\ \eta \to a_0(980)^0\pi^0,\ a_0^0 \to K^+K^-$		(7.0 ±2.8) × 10^{-4}		–
$K_S^0K^-2\pi^+$		(1.569±0.028) %		744
$K^+K^-K_S^0\pi^+$		(1.27 ±0.15) × 10^{-4}		527
$K^*(892)^+\overline{K}^*(892)^0$	[e]	(5.64 ±0.35) %		416
$\eta(1475)K_S^0,\ \eta \to K^*(892)^0\pi^+,\ K^{*0} \to K^-\pi^+$		(3.5 ±1.0) × 10^{-4}		–
$\eta(1475)\pi^+,\ \eta \to \overline{K}^*(892)^+K^-,\ \overline{K}^{*+} \to K_S^0\pi^+$		(3.5 ±1.0) × 10^{-4}		–
$\eta(1475)\pi^+,\ \eta \to a_0(980)^-\pi^+,\ a_0^- \to K_S^0K^-$		(1.7 ±0.9) × 10^{-3}		–
$f_1(1285)\pi^+,\ f_1 \to a_0(980)^-\pi^+,\ a_0^- \to K_S^0K^-$		(3.5 ±0.8) × 10^{-4}		–
$K^+K_S^0\pi^+\pi^-$		(9.34 ±0.22) × 10^{-3}		744
$K^+K^-2\pi^+\pi^-$		(6.6 ±0.6) × 10^{-3}		673
$\phi2\pi^+\pi^-$	[e]	(1.21 ±0.16) %		640
$\phi\rho^0\pi^+,\ \phi \to K^+K^-$		(4.9 ±0.7) × 10^{-3}		181
$\phi a_1(1260)^+,\ \phi \to K^+K^-,\ a_1^+ \to \rho^0\pi^+$		(7.5 ±1.2) × 10^{-3}		†
$\phi2\pi^+\pi^-$ non-$\rho,\ \phi \to K^+K^-$		(1.4 ±0.5) × 10^{-3}		–
$K^+K^-\rho^0\pi^+$ non-ϕ		< 2.0 × 10^{-4}	CL=90%	249
$K^+K^-2\pi^+\pi^-$ nonresonant		(1.0 ±0.4) × 10^{-3}		673
$2K_S^0\,2\pi^+\pi^-$		(8.0 ±3.3) × 10^{-4}		669

Hadronic modes without K's

$\pi^+\pi^0$		< 1.2 × 10^{-4}	CL=90%	975
$2\pi^+\pi^-$		(1.090±0.014) %		959
$\rho^0\pi^+$		(1.14 ±0.16) × 10^{-4}		825
$\omega\pi^+,\ \omega \to \pi^+\pi^-$		(3.9 ±0.4) × 10^{-5}		–
$\pi^+(\pi^+\pi^-)_{S-\text{wave}}$	[i]	(9.23 ±0.13) × 10^{-3}		959
$f_2(1270)\pi^+,\ f_2 \to \pi^+\pi^-$		(1.42 ±0.10) × 10^{-3}		559
$f_2'(1525)^0\pi^+,\ f_2' \to \pi^+\pi^-$		(5.8 ±2.0) × 10^{-6}		–

$\rho(1450)^0\pi^+,\ \rho^0 \to\ \pi^+\pi^-$		(1.8 ±0.6) $\times 10^{-4}$			421
$\rho(1700)^0\pi^+,\ \rho^0 \to\ \pi^+\pi^-$		(4 ±4) $\times 10^{-5}$			–
$\pi^+ 2\pi^0$		(5.2 ±0.5) $\times 10^{-3}$	S=1.1		961
$f_0(980)\pi^+,\ f_0 \to\ \pi^0\pi^0$		(2.9 ±0.6) $\times 10^{-3}$			–
$f_0(1370)\pi^+,\ f_0 \to\ \pi^0\pi^0$		(1.3 ±0.6) $\times 10^{-3}$			–
$f_2(1270)\pi^+,\ f_2 \to\ \pi^0\pi^0$		(5.0 ±3.5) $\times 10^{-4}$			–
$2\pi^+\pi^-\pi^0$		—			935
$\omega\pi^+$	[e]	(1.93 ±0.30) $\times 10^{-3}$			822
$\eta\pi^+$	[e]	(1.686±0.027) %			902
$(2\pi^+\pi^-\pi^0)_{\text{non}-\eta}$		(2.04 ±0.09) %			–
$f_0(1370)\rho^+,\ f_0\rho^+ \to$ $2\pi^+\pi^-\pi^0$		(5.1 ±0.9) $\times 10^{-3}$			–
$f_0(980)^0\rho^+,\ f_0^0\rho^+ \to$ $2\pi^+\pi^-\pi^0$		(2.6 ±0.5) $\times 10^{-3}$			–
$f_2(1270)^0\rho^+,$ $f_2(1270)^0\rho^+ \to$ $2\pi^+\pi^-\pi^0$		(1.9 ±0.4) $\times 10^{-3}$			–
$(\rho^+\rho^0)_{S-wave} \to$ $2\pi^+\pi^-\pi^0$		(7.1 ±2.8) $\times 10^{-4}$			–
$(\rho(1450)^+\rho^0)_{S-wave} \to$ $2\pi^+\pi^-\pi^0$		(9.4 ±3.1) $\times 10^{-4}$			–
$(\rho^+\rho(1450)^0)_{P-wave} \to$ $2\pi^+\pi^-\pi^0$		(1.75 ±0.29) $\times 10^{-3}$			–
$\phi\pi^+,\ \phi \to\ \rho\pi$		(5.08 ±0.35) $\times 10^{-3}$			–
$\omega\pi^+,\ \omega \to\ \rho\pi$		(1.41 ±0.19) $\times 10^{-3}$			–
$a_1(1260)^+\pi^0,\ a_1^+ \to$ $(\rho^0\pi^+)_{S-wave}$		(2.6 ±0.4) $\times 10^{-3}$			–
$a_1(1260)^0\pi^+,\ a_1^0 \to$ $(\rho\pi)_{S-wave}$		(1.3 ±0.5) $\times 10^{-3}$			–
$\pi(1300)^0\pi^+,\ \pi^0 \to$ $(\rho\pi)_{P-wave}$		(2.4 ±0.7) $\times 10^{-3}$			–
$3\pi^+ 2\pi^-$		(8.0 ±0.8) $\times 10^{-3}$			899
$2\pi^+\pi^- 2\pi^0$		(4.41 ±0.20) %			902
$\omega\rho^+,\ \omega \to\ \pi^+\pi^-\pi^0$		(8.8 ±0.9) $\times 10^{-3}$			602
$\phi\rho^+,\ \phi \to\ \pi^+\pi^-\pi^0$		(6.1 ±0.6) $\times 10^{-3}$			–
$\rho(1450)^+\pi^0,\ \rho(1450)^+ \to$ $\omega\pi^+,\ \omega \to\ \pi^+\pi^-\pi^0$		(3.5 ±0.5) $\times 10^{-3}$			–
$a_1(1260)^0\rho^+,\ a_1(1260)^0 \to$ $\rho^+\pi^-$		(5.0 ±0.4) $\times 10^{-3}$			–
$a_1(1260)^0\rho^+,\ a_1(1260)^0 \to$ $\rho^-\pi^+$		(3.26 ±0.27) $\times 10^{-3}$			–
$a_1(1260)^+\rho^0,\ a_1(1260)^+ \to$ $\rho^+\pi^0$		(7.3 ±1.0) $\times 10^{-3}$			–
$b_1(1235)^+\pi^0,\ b_1(1235)^+ \to$ $\omega\pi^+,\ \omega \to\ \pi^+\pi^-\pi^0$		(4.8 ±0.6) $\times 10^{-3}$			–

$b_1(1235)^0\pi^+$, $b_1(1235)^0 \to \omega\pi^0$, $\omega \to \pi^+\pi^-\pi^0$		(6.4 ±0.6) × 10^{-3}		–
$\eta\rho^+$	[e]	(8.9 ±0.8) %		724
$\eta\pi^+\pi^0$		(9.10 ±0.17) %		885
$\eta(\pi^+\pi^0)_{P-wave}$		(4.9 ±3.0) × 10^{-3}		885
$a_0(980)^{+0}\pi^{0+}$, $a_0(980)^{+0} \to \eta\pi^{+0}$		(2.1 ±0.4) %		–
$\omega\pi^+\pi^0$	[e]	(2.8 ±0.7) %		802
$2\pi^+\pi^-\eta$		(3.08 ±0.08) %		855
$a_1(1260)^+\eta$, $a_1^+ \to \rho(770)^0\pi^+$, $\rho^0 \to \pi^+\pi^-$		(1.71 ±0.14) %		–
$a_1(1260)^+\eta$, $a_1^+ \to f_0(500)\pi^+$, $f_0 \to \pi^+\pi^-$		(2.5 ±0.9) × 10^{-3}		–
$a_0(980)^+\rho(770)^0$, $a_0^+ \to \eta\pi^+$		(2.1 ±0.9) × 10^{-3}		–
$\eta(1405)\pi^+$, $\eta \to a_0(980)^-\pi^+$, $a_0^- \to \eta\pi^-$		(2.2 ±0.7) × 10^{-4}		–
$\eta(1405)\pi^+$, $\eta \to a_0(980)^+\pi^-$, $a_0^+ \to \eta\pi^+$		(2.2 ±0.7) × 10^{-4}		–
$f_1(1420)\pi^+$, $f_1 \to a_0(980)^-\pi^+$, $a_0^- \to \eta\pi^-$		(5.9 ±1.8) × 10^{-4}		–
$f_1(1420)\pi^+$, $f_1 \to a_0(980)^+\pi^-$, $a_0^+ \to \eta\pi^+$		(5.2 ±1.8) × 10^{-4}		–
$3\pi^+2\pi^-\pi^0$		(4.9 ±3.2) %		856
$\omega 2\pi^+\pi^-$	[e]	(1.6 ±0.5) %		766
$\eta'(958)\pi^+$	[d,e]	(3.95 ±0.08) %		743
$3\pi^+2\pi^-2\pi^0$		—		803
$\omega\eta\pi^+$	[e]	(5.4 ±1.3) × 10^{-3}		654
$\eta'(958)\rho^+$	[d,e]	(5.8 ±1.5) %		465
$\eta'(958)\pi^+\pi^0$		(6.14 ±0.18) %		720
$\eta'(958)\pi^+\pi^0$ nonresonant		< 5.1 %	CL=90%	720

Modes with one or three K's

$K^+\pi^0$		(7.5 ±0.5) × 10^{-4}		917
$K^0_S\pi^+$		(1.22 ±0.04) × 10^{-3}		916
$K^+\eta$	[e]	(1.76 ±0.08) × 10^{-3}		835
$K^+\omega$	[e]	(9.9 ±1.5) × 10^{-4}		741
$K^+\eta'(958)$	[e]	(2.68 ±0.24) × 10^{-3}		646
$K^+\pi^+\pi^-$		(6.23 ±0.10) × 10^{-3}		900

$K^+\rho^0$		(	2.18	± 0.25)	$\times 10^{-3}$	745
$K^+\rho(1450)^0,\ \rho^0 \to\ \pi^+\pi^-$		(	7.3	± 1.7)	$\times 10^{-4}$	–
$K^+ f_0(500),\ f_0 \to\ \pi^+\pi^-$		(	4.5	± 3.0)	$\times 10^{-4}$	–
$K^+ f_0(980),\ f_0 \to\ \pi^+\pi^-$		(	2.8	± 1.1)	$\times 10^{-4}$	–
$K^+ f_0(1370),\ f_0 \to\ \pi^+\pi^-$		(	1.2	± 0.6)	$\times 10^{-3}$	–
$K^*(892)^0\pi^+,\ K^{*0} \to\ K^+\pi^-$		(	1.68	± 0.26)	$\times 10^{-3}$	775
$K^*(1410)^0\pi^+,\ K^{*0} \to\ K^+\pi^-$		(	6	± 4)	$\times 10^{-4}$	–
$K^*(1430)^0\pi^+,\ K^{*0} \to\ K^+\pi^-$		(	9.4	± 3.2)	$\times 10^{-4}$	–
$K^+\pi^+\pi^-$ nonresonant		(	9.9	± 3.2)	$\times 10^{-4}$	900
$K^0_S\pi^+\pi^0$		(	5.09	± 0.22)	$\times 10^{-3}$	899
$K^0_S\rho(770)^+,\ \rho^+ \to\ \pi^+\pi^0$		(	2.6	± 0.4)	$\times 10^{-3}$	–
$K^0_S\rho(1450)^+,\ \rho^+ \to\ \pi^+\pi^0$		(	1.04	± 0.32)	$\times 10^{-3}$	–
$K^*(892)^0\pi^+,\ K^{*0} \to\ K^0_S\pi^0$		(	4.3	± 1.2)	$\times 10^{-4}$	–
$K^*(892)^+\pi^0,\ K^{*+} \to\ K^0_S\pi^+$		(	2.3	± 0.7)	$\times 10^{-4}$	–
$K^*(1410)^0\pi^+,\ K^{*0} \to\ K^0_S\pi^0$		(	1.7	± 0.9)	$\times 10^{-4}$	–
$K^0_S 2\pi^+\pi^-$		(	2.8	± 1.0)	$\times 10^{-3}$	870
$K^+\pi^+\pi^-\pi^0$		(	9.7	± 0.6)	$\times 10^{-3}$	873
$K^*(892)^0\rho^+,\ K^{*0} \to\ K^+\pi^-$		(	3.9	± 0.4)	$\times 10^{-3}$	–
$K^*(892)^+\rho^0,\ K^{*+} \to\ K^+\pi^0$		(	4.2	± 1.2)	$\times 10^{-4}$	–
$K_1(1270)^0\pi^+,\ K_1^0 \to\ K^+\rho^-$		(	3.9	± 1.3)	$\times 10^{-4}$	†
$K_1(1400)^0\pi^+,\ K_1^0 \to\ K^*(890)^+\pi^-,\ K^{*+} \to\ K^+\pi^0$		(	5.4	± 0.9)	$\times 10^{-4}$	–
$K_1(1400)^0\pi^+,\ K_1^0 \to\ K^*(890)^0\pi^0,\ K^{*0} \to\ K^+\pi^-$		(	5.9	± 1.0)	$\times 10^{-4}$	–
$K^+ a_1(1260)^0,\ a_1 \to\ \rho^+\pi^-$		(	1.8	± 1.1)	$\times 10^{-4}$	–
$K^+ a_1(1260)^0,\ a_1 \to\ \rho^-\pi^+$		(	1.8	± 1.1)	$\times 10^{-4}$	–
$K^+\pi^+\pi^-\pi^0$ nonresonant		(	9.2	± 2.4)	$\times 10^{-4}$	873
$(K^+\pi^0)_{P-wave}\rho^0$		(	1.01	± 0.21)	$\times 10^{-3}$	688
$K^+\omega\pi^0$	[e]	<	8.2		$\times 10^{-3}$ CL=90%	684
$K^+\omega\pi^+\pi^-$	[e]	<	5.4		$\times 10^{-3}$ CL=90%	603
$K^+\omega\eta$	[e]	<	7.9		$\times 10^{-3}$ CL=90%	366
$2K^+K^-$		(	2.18	± 0.20)	$\times 10^{-4}$	628
$\phi K^+,\ \phi \to\ K^+K^-$		(	8.9	± 2.0)	$\times 10^{-5}$	–

Radiative decays

$\rho(770)^+\gamma$			$<$	6.1	$\times 10^{-4}$	CL=90%	–

Doubly Cabibbo-suppressed modes

$2K^+\pi^-$			(	1.293±0.027)	$\times 10^{-4}$	S=1.1	805
$K^+K^*(892)^0,\ K^{*0}\to K^+\pi^-$			(	6.1 ±3.4)	$\times 10^{-5}$		–
$2K^+\pi^-\pi^0$			$<$	1.7	$\times 10^{-4}$	CL=90%	748

Baryon-antibaryon mode

$p\overline{n}$			(	1.22 ±0.11)	$\times 10^{-3}$		295
$p\overline{p}e^+\nu_e$			$<$	2.0	$\times 10^{-4}$	CL=90%	296

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

$\pi^+e^+e^-$		[*j*]	$<$	5.5	$\times 10^{-6}$	CL=90%	979
$\pi^+\phi,\ \phi\to e^+e^-$		[*k*]	(	1.17 ±0.22)	$\times 10^{-5}$		–
$\pi^+\pi^0e^+e^-$			$<$	7.0	$\times 10^{-5}$	CL=90%	974
$\rho^+\phi,\ \phi\to e^+e^-$			(	2.4 ±0.7)	$\times 10^{-5}$		–
$\pi^+\mu^+\mu^-$		[*j*]	$<$	1.8	$\times 10^{-7}$	CL=90%	968
$K^+e^+e^-$	*C1*		$<$	3.7	$\times 10^{-6}$	CL=90%	922
$K^+\pi^0e^+e^-$			$<$	7.1	$\times 10^{-5}$	CL=90%	917
$K^0_S\pi^+e^+e^-$			$<$	8.1	$\times 10^{-5}$	CL=90%	916
$K^+\mu^+\mu^-$	*C1*		$<$	1.4	$\times 10^{-7}$	CL=90%	909
$K^*(892)^+\mu^+\mu^-$	*C1*		$<$	1.4	$\times 10^{-3}$	CL=90%	765
$\pi^+e^+\mu^-$	*LF*		$<$	1.1	$\times 10^{-6}$	CL=90%	976
$\pi^+e^-\mu^+$	*LF*		$<$	9.4	$\times 10^{-7}$	CL=90%	976
$K^+e^+\mu^-$	*LF*		$<$	7.9	$\times 10^{-7}$	CL=90%	919
$K^+e^-\mu^+$	*LF*		$<$	5.6	$\times 10^{-7}$	CL=90%	919
π^-2e^+	*L*		$<$	1.4	$\times 10^{-6}$	CL=90%	979
$\pi^-2\mu^+$	*L*		$<$	8.6	$\times 10^{-8}$	CL=90%	968
$\pi^-e^+\mu^+$	*L*		$<$	6.3	$\times 10^{-7}$	CL=90%	976
K^-2e^+	*L*		$<$	7.7	$\times 10^{-7}$	CL=90%	922
$\pi^-\pi^0e^+e^+$			$<$	2.9	$\times 10^{-5}$	CL=90%	974
$K^-\pi^0e^+e^+$			$<$	3.4	$\times 10^{-5}$	CL=90%	917
$K^0_S\pi^-e^+e^+$			$<$	1.3	$\times 10^{-5}$	CL=90%	916
$K^0_SK^-e^+e^+$			$<$	2.9	$\times 10^{-5}$	CL=90%	850
$\phi\pi^-e^+e^+$			$<$	6.9	$\times 10^{-5}$	CL=90%	711
$\phi K^-e^+e^+$			$<$	9.9	$\times 10^{-5}$	CL=90%	606
$K^-2\mu^+$	*L*		$<$	2.6	$\times 10^{-8}$	CL=90%	909
$K^-e^+\mu^+$	*L*		$<$	2.6	$\times 10^{-7}$	CL=90%	919
$K^*(892)^-2\mu^+$	*L*		$<$	1.4	$\times 10^{-3}$	CL=90%	765

$D_s^{*\pm}$

$I(J^P) = 0(1^-)$

Mass $m = 2112.2 \pm 0.4$ MeV
$m_{D_s^{*\pm}} - m_{D_s^{\pm}} = 143.8 \pm 0.4$ MeV
Full width $\Gamma < 1.9$ MeV, CL = 90%

D_s^{*-} modes are charge conjugates of the modes below.

D_s^{*+} DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D_s^+\gamma$	(93.6 $\pm$0.4) %	139
$D_s^+\pi^0$	(5.77$\pm$0.35) %	48
$D_s^+ e^+ e^-$	(6.7 $\pm$1.6) $\times 10^{-3}$	139
$e^+\nu_e$	(2.1 $^{+1.2}_{-0.9}$) $\times 10^{-5}$	1056

$D_{s0}^*(2317)^{\pm}$

$I(J^P) = 0(0^+)$
J, P need confirmation.
J^P is natural, low mass consistent with 0^+.

See the review on "Heavy Non-$q\overline{q}$ Mesons."

Mass $m = 2317.8 \pm 0.5$ MeV
$m_{D_{s0}^*(2317)^{\pm}} - m_{D_s^{\pm}} = 349.4 \pm 0.5$ MeV
Full width $\Gamma < 3.8$ MeV, CL = 95%

$D_{s0}^*(2317)^-$ modes are charge conjugates of modes below.

$D_{s0}^*(2317)^{\pm}$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$D_s^+\pi^0$	(100^{+0}_{-20}) %		298
$D_s^+\gamma$	< 5 %	90%	323
$D_s^*(2112)^+\gamma$	< 6 %	90%	–
$D_s^+\gamma\gamma$	< 18 %	95%	323
$D_s^*(2112)^+\pi^0$	< 11 %	90%	–
$D_s^+\pi^+\pi^-$	< 4 $\times 10^{-3}$	90%	194
$D_s^+\pi^0\pi^0$	not seen		205

$D_{s1}(2460)^{\pm}$

$I(J^P) = 0(1^+)$

See the review on "Heavy Non-$q\overline{q}$ Mesons."

Mass $m = 2459.5 \pm 0.6$ MeV (S = 1.1)
$m_{D_{s1}(2460)^{\pm}} - m_{D_s^{*\pm}} = 347.3 \pm 0.7$ MeV (S = 1.2)
$m_{D_{s1}(2460)^{\pm}} - m_{D_s^{\pm}} = 491.1 \pm 0.6$ MeV (S = 1.1)
Full width $\Gamma < 3.5$ MeV, CL = 95%

$D_{s1}(2460)^-$ modes are charge conjugates of the modes below.

$D_{s1}(2460)^+$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$D_s^{*+}\pi^0$	(48 ±11) %		297
$D_s^+\gamma$	(18 ± 4) %		442
$D_s^+\pi^+\pi^-$	(4.3± 1.3) %	S=1.1	363
$D_s^{*+}\gamma$	< 8 %	CL=90%	323
$D_{s0}^*(2317)^+\gamma$	($3.7^{+\ 5.0}_{-\ 2.4}$) %		138

$D_{s1}(2536)^{\pm}$

$I(J^P) = 0(1^+)$
J, P need confirmation.

Mass $m = 2535.12 \pm 0.06$ MeV
$m_{D_{s1}(2536)^{\pm}} - m_{D_s^*(2111)} = 422.9 \pm 0.4$ MeV
$m_{D_{s1}(2536)^{\pm}} - m_{D^*(2010)^{\pm}} = 524.85 \pm 0.04$ MeV
$m_{D_{s1}(2536)^{\pm}} - m_{D^*(2007)^0} = 528.26 \pm 0.05$ MeV (S = 1.1)
Full width $\Gamma = 0.92 \pm 0.05$ MeV

Branching fractions are given relative to the one **DEFINED AS 1**.
$D_{s1}(2536)^-$ modes are charge conjugates of the modes below.

$D_{s1}(2536)^+$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$D^*(2010)^+K^0$	(31 ±7) %		149
$(D^*(2010)^+K^0)_{S-wave}$	(22 ±5) %		149
$K_S^0 D^*(2010)^+$	(17 ±4) %		149
$D^+\pi^-K^+$	$(10.0\pm2.5)\times10^{-3}$		176
$D^*(2007)^0K^+$	(36 ±6) %		167
D^+K^0	< 12 %	90%	381
D^0K^+	< 4 %	90%	391
$D_s^{*+}\gamma$	possibly seen		388
$D_s^+\pi^+\pi^-$	seen		437

$D^*_{s2}(2573)$ $I(J^P) = 0(2^+)$

Mass $m = 2569.1 \pm 0.8$ MeV (S = 2.4)
$m_{D^*_{s2}(2573)} - m_{D^0} = 704 \pm 3.2$ MeV
Full width $\Gamma = 16.9 \pm 0.7$ MeV

$D^*_{s2}(2573)^-$ modes are charge conjugates of the modes below.

$D^*_{s2}(2573)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^0 K^+$	(37±6) %	431
$D^*(2007)^0 K^+$	not seen	238
$D^+ K^0_S$	seen	422
$D^{*+} K^0_S$	seen	225

$D^*_{s1}(2700)^\pm$ $I(J^P) = 0(1^-)$

Mass $m = 2714 \pm 5$ MeV (S = 1.5)
Full width $\Gamma = 122 \pm 10$ MeV

$D^*_{s1}(2700)^\pm$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^0 K^+$	seen	579
$D^+ K^0_S$	seen	573
$D^{*0} K^+$	seen	438
$D^{*+} K^0_S$	seen	431

$D^*_{s3}(2860)^\pm$ $I(J^P) = 0(3^-)$

Mass $m = 2860 \pm 7$ MeV
Full width $\Gamma = 53 \pm 10$ MeV

$D^*_{s3}(2860)^\pm$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^0 K^+$	seen	710
$D^+ K^0_S$	seen	704
$D^{*0} K^+$	seen	589
$D^{*+} K^0_S$	seen	584

NOTES

[*a*] See the Particle Listings for the (complicated) definition of this quantity.

[*b*] 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 $\pm$ 0.31 %.

[*c*] This fraction includes η from η' decays.

[*d*] 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 $\pm$ 1.6%.

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

[*f*] 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}.

[*g*] 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 in the Particle Listings.

[*h*] 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.

[*i*] 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.

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

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