CHARMED, STRANGE MESONS
$(C = S = \pm 1)$

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

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$D_s^\pm$
was $F^\pm$

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

Mass $m = 1968.6 \pm 0.6$ MeV $(S = 1.1)$

$m_{D_s^\pm} - m_{D^\pm} = 99.2 \pm 0.5$ MeV $(S = 1.1)$

Mean life $\tau = (0.496^{+0.010}_{-0.009}) \times 10^{-12}$ s

$c\tau = 148.6\ \mu$m

D_s^+ form factors

$r_2 = 1.60 \pm 0.24$

$r_v = 1.92 \pm 0.32$

$\Gamma_L/\Gamma_T = 0.72 \pm 0.18$

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				
K^- anything		$(13\ ^{+14}_{-12})\,\%$		$-$
$\overline{K}^0$ anything $+\ K^0$ anything		$(39\ \pm 28\ )\,\%$		$-$
K^+ anything		$(20\ ^{+18}_{-14})\,\%$		$-$
non-$K\overline{K}$ anything		$(64\ \pm 17\ )\,\%$		$-$
e^+ anything		$(8\ ^{+6}_{-5})\,\%$		$-$
ϕ anything		$(18\ ^{+15}_{-10})\,\%$		$-$
Leptonic and semileptonic modes				
$\mu^+\nu_\mu$		$(4.6 \pm 1.9\ )\times 10^{-3}$	S=1.3	981
$\tau^+\nu_\tau$		$(7\ \pm 4\ )\,\%$		182
$\phi\ell^+\nu_\ell$	[ww]	$(2.0 \pm 0.5\ )\,\%$		$-$
$\eta\ell^+\nu_\ell +\ \eta'(958)\ell^+\nu_\ell$	[ww]	$(3.5 \pm 1.0\ )\,\%$		$-$
$\eta\ell^+\nu_\ell$		$(2.6 \pm 0.7\ )\,\%$		$-$
$\eta'(958)\ell^+\nu_\ell$		$(8.9 \pm 3.4\ )\times 10^{-3}$		$-$

Hadronic modes with a $K\overline{K}$ pair (including from a ϕ)

$K^+\overline{K}^0$		(3.6 ± 1.1) %		850
$K^+K^-\pi^+$	[qq]	(4.4 ± 1.2) %	S=1.1	805
$\quad\phi\pi^+$	[xx]	(3.6 ± 0.9) %		712
$\quad K^+\overline{K}^*(892)^0$	[xx]	(3.3 ± 0.9) %		682
$\quad f_0(980)\pi^+$	[xx]	(1.8 ± 0.8) %	S=1.3	732
$\quad K^+\overline{K}_0^*(1430)^0$	[xx]	(7 ± 4) × 10^{-3}		186
$\quad f_0(1710)\pi^+ \to K^+K^-\pi^+$	[yy]	(1.5 ± 1.9) × 10^{-3}		204
$\quad K^+K^-\pi^+$ nonresonant		(9 ± 4) × 10^{-3}		805
$K^0\overline{K}^0\pi^+$		—		802
$\quad K^*(892)^+\overline{K}^0$	[xx]	(4.3 ± 1.4) %		683
$K^+K^-\pi^+\pi^0$		—		748
$\quad\phi\pi^+\pi^0$	[xx]	(9 ± 5) %		687
$\quad\quad\phi\rho^+$	[xx]	(6.7 ± 2.3) %		407
$\quad\quad\phi\pi^+\pi^0$ 3-body	[xx]	< 2.6 %	CL=90%	687
$\quad K^+K^-\pi^+\pi^0$ non-ϕ		< 9 %	CL=90%	748
$K^+\overline{K}^0\pi^+\pi^-$		< 2.8 %	CL=90%	744
$K^0K^-\pi^+\pi^+$		(4.3 ± 1.5) %		744
$\quad K^*(892)^+\overline{K}^*(892)^0$	[xx]	(5.8 ± 2.5) %		412
$\quad K^0K^-\pi^+\pi^+$ non-$K^{*+}\overline{K}^{*0}$		< 2.9 %	CL=90%	744
$K^+K^-\pi^+\pi^+\pi^-$		(8.3 ± 3.3) × 10^{-3}		673
$\quad\phi\pi^+\pi^+\pi^-$	[xx]	(1.18± 0.35) %		640
$\quad K^+K^-\pi^+\pi^+\pi^-$ non-ϕ		(3.0 $^{+3.0}_{-2.0}$) × 10^{-3}		673

Hadronic modes without K's

$\pi^+\pi^+\pi^-$		(1.0 ± 0.4) %	S=1.2	959
$\quad\rho^0\pi^+$		< 8 × 10^{-4}	CL=90%	827
$\quad f_0(980)\pi^+$	[xx]	(1.8 ± 0.8) %	S=1.7	732
$\quad f_2(1270)\pi^+$	[xx]	(2.3 ± 1.3) × 10^{-3}		559
$\quad f_0(1500)\pi^+ \to \pi^+\pi^-\pi^+$	[zz]	(2.8 ± 1.6) × 10^{-3}		391
$\quad \pi^+\pi^+\pi^-$ nonresonant		< 2.8 × 10^{-3}	CL=90%	959
$\pi^+\pi^+\pi^-\pi^0$		< 12 %	CL=90%	935
$\quad\eta\pi^+$	[xx]	(1.7 ± 0.5) %		902
$\quad\omega\pi^+$	[xx]	(2.8 ± 1.1) × 10^{-3}		822
$\pi^+\pi^+\pi^+\pi^-\pi^-$		(6.9 ± 3.0) × 10^{-3}		899
$\pi^+\pi^+\pi^-\pi^0\pi^0$		—		902
$\quad\eta\rho^+$	[xx]	(10.8 ± 3.1) %		727
$\quad\eta\pi^+\pi^0$ 3-body	[xx]	< 4 %	CL=90%	886
$\pi^+\pi^+\pi^+\pi^-\pi^-\pi^0$		(4.9 ± 3.2) %		856
$\quad\eta'(958)\pi^+$	[xx]	(3.9 ± 1.0) %		743
$\pi^+\pi^+\pi^+\pi^-\pi^-\pi^0\pi^0$		—		803
$\quad\eta'(958)\rho^+$	[xx]	(10.1 ± 2.8) %		470
$\quad\eta'(958)\pi^+\pi^0$ 3-body	[xx]	< 1.4 %	CL=90%	720

Modes with one or three K's

$K^0 \pi^+$		< 8	$\times 10^{-3}$	CL=90%	916
$K^+ \pi^+ \pi^-$		$(1.0 \pm 0.4)\%$			900
$K^+ \rho^0$		< 2.9	$\times 10^{-3}$	CL=90%	747
$K^*(892)^0 \pi^+$	[xx]	$(6.5 \pm 2.8) \times 10^{-3}$			773
$K^+ K^+ K^-$		< 6	$\times 10^{-4}$	CL=90%	628
ϕK^+	[xx]	< 5	$\times 10^{-4}$	CL=90%	607

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

$\pi^+ e^+ e^-$		[ss]	< 2.7	$\times 10^{-4}$	CL=90%	979
$\pi^+ \mu^+ \mu^-$		[ss]	< 1.4	$\times 10^{-4}$	CL=90%	968
$K^+ e^+ e^-$	C1		< 1.6	$\times 10^{-3}$	CL=90%	922
$K^+ \mu^+ \mu^-$	C1		< 1.4	$\times 10^{-4}$	CL=90%	909
$K^*(892)^+ \mu^+ \mu^-$	C1		< 1.4	$\times 10^{-3}$	CL=90%	765
$\pi^+ e^\pm \mu^\mp$	LF	[ee]	< 6.1	$\times 10^{-4}$	CL=90%	976
$K^+ e^\pm \mu^\mp$	LF	[ee]	< 6.3	$\times 10^{-4}$	CL=90%	919
$\pi^- e^+ e^+$	L		< 6.9	$\times 10^{-4}$	CL=90%	979
$\pi^- \mu^+ \mu^+$	L		< 8.2	$\times 10^{-5}$	CL=90%	968
$\pi^- e^+ \mu^+$	L		< 7.3	$\times 10^{-4}$	CL=90%	976
$K^- e^+ e^+$	L		< 6.3	$\times 10^{-4}$	CL=90%	922
$K^- \mu^+ \mu^+$	L		< 1.8	$\times 10^{-4}$	CL=90%	909
$K^- e^+ \mu^+$	L		< 6.8	$\times 10^{-4}$	CL=90%	919
$K^*(892)^- \mu^+ \mu^+$	L		< 1.4	$\times 10^{-3}$	CL=90%	765

$D_s^{*\pm}$

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

J^P is natural, width and decay modes consistent with 1^-.

Mass $m = 2112.4 \pm 0.7$ MeV   ($S = 1.1$)

$m_{D_s^{*\pm}} - m_{D_s^\pm} = 143.8 \pm 0.4$ 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)
$D_s^+ \gamma$	$(94.2 \pm 2.5)\%$	139
$D_s^+ \pi^0$	$(5.8 \pm 2.5)\%$	48

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

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

J, P need confirmation.

Mass $m = 2535.35 \pm 0.34 \pm 0.5$ MeV

Full width $\Gamma < 2.3$ MeV, CL = 90%

$D_{s1}(2536)^-$ modes are charge conjugates of the modes below.

$D_{s1}(2536)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^*(2010)^+ K^0$	seen	150
$D^*(2007)^0 K^+$	seen	169
$D^+ K^0$	not seen	382
$D^0 K^+$	not seen	392
$D_s^{*+} \gamma$	possibly seen	389

$D_{sJ}(2573)^\pm$ $I(J^P) = 0(?^?)$

J^P is natural, width and decay modes consistent with 2^+.

Mass $m = 2573.5 \pm 1.7$ MeV
Full width $\Gamma = 15^{+5}_{-4}$ MeV

$D_{sJ}(2573)^-$ modes are charge conjugates of the modes below.

$D_{sJ}(2573)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^0 K^+$	seen	436
$D^*(2007)^0 K^+$	not seen	245