GAUGE AND HIGGS BOSONS

γ (photon)

$I(J^{PC}) = 0,1(1^{--})$

Mass $m < 1 \times 10^{-18}$ eV
Charge $q < 1 \times 10^{-35}$ e
Mean life τ = Stable

g or gluon

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

Mass $m = 0$ [a]
SU(3) color octet

graviton

$J = 2$

Mass $m < 6 \times 10^{-32}$ eV

W

$J = 1$

Charge $= \pm 1$ e
Mass $m = 80.385 \pm 0.015$ GeV
W/Z mass ratio $= 0.88153 \pm 0.00017$
$m_Z - m_W = 10.803 \pm 0.015$ GeV
$m_{W^+} - m_{W^-} = -0.2 \pm 0.6$ GeV
Full width $\Gamma = 2.085 \pm 0.042$ GeV
$\langle N_{\pi^\pm} \rangle = 15.70 \pm 0.35$
$\langle N_{K^\pm} \rangle = 2.20 \pm 0.19$
$\langle N_p \rangle = 0.92 \pm 0.14$
$\langle N_{\text{charged}} \rangle = 19.39 \pm 0.08$

W^- modes are charge conjugates of the modes below.

W^+ DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\ell^+ \nu$	[b]	(10.86 ± 0.09) %		–
$e^+ \nu$		(10.71 ± 0.16) %		40192
$\mu^+ \nu$		(10.63 ± 0.15) %		40192
$\tau^+ \nu$		(11.38 ± 0.21) %		40173
hadrons		(67.41 ± 0.27) %		–
$\pi^+ \gamma$		$< 7 \times 10^{-6}$	95%	40192

$D_s^+\gamma$	< 1.3	$\times 10^{-3}$	95%	40168
$c\mathrm{X}$	(33.3 ± 2.6)	%		–
$c\overline{s}$	$(31\ ^{+13}_{-11})$	%		–
invisible	[c] (1.4 ± 2.9)	%		–

Z

$J = 1$

Charge = 0
Mass $m = 91.1876 \pm 0.0021$ GeV [d]
Full width $\Gamma = 2.4952 \pm 0.0023$ GeV
$\Gamma(\ell^+\ell^-) = 83.984 \pm 0.086$ MeV [b]
$\Gamma(\text{invisible}) = 499.0 \pm 1.5$ MeV [e]
$\Gamma(\text{hadrons}) = 1744.4 \pm 2.0$ MeV
$\Gamma(\mu^+\mu^-)/\Gamma(e^+e^-) = 1.0009 \pm 0.0028$
$\Gamma(\tau^+\tau^-)/\Gamma(e^+e^-) = 1.0019 \pm 0.0032$ [f]

Average charged multiplicity

$\langle N_{charged} \rangle = 20.76 \pm 0.16$ (S = 2.1)

Couplings to quarks and leptons

$g_V^\ell = -0.03783 \pm 0.00041$
$g_V^u = 0.25^{+0.07}_{-0.06}$
$g_V^d = -0.33^{+0.05}_{-0.06}$
$g_A^\ell = -0.50123 \pm 0.00026$
$g_A^u = 0.50^{+0.04}_{-0.06}$
$g_A^d = -0.523^{+0.050}_{-0.029}$
$g^{\nu_\ell} = 0.5008 \pm 0.0008$
$g^{\nu_e} = 0.53 \pm 0.09$
$g^{\nu_\mu} = 0.502 \pm 0.017$

Asymmetry parameters [g]

$A_e = 0.1515 \pm 0.0019$
$A_\mu = 0.142 \pm 0.015$
$A_\tau = 0.143 \pm 0.004$
$A_s = 0.90 \pm 0.09$
$A_c = 0.670 \pm 0.027$
$A_b = 0.923 \pm 0.020$

Charge asymmetry (%) at Z pole

$A_{FB}^{(0\ell)} = 1.71 \pm 0.10$
$A_{FB}^{(0u)} = 4 \pm 7$
$A_{FB}^{(0s)} = 9.8 \pm 1.1$
$A_{FB}^{(0c)} = 7.07 \pm 0.35$
$A_{FB}^{(0b)} = 9.92 \pm 0.16$

Z DECAY MODES		Fraction (Γ_i/Γ)		Scale factor/ Confidence level		p (MeV/c)
$e^+ e^-$		(3.363	±0.004) %			45594
$\mu^+ \mu^-$		(3.366	±0.007) %			45594
$\tau^+ \tau^-$		(3.370	±0.008) %			45559
$\ell^+ \ell^-$	[b]	(3.3658	±0.0023) %			–
$\ell^+ \ell^- \ell^+ \ell^-$	[h]	(3.30	±0.31) $\times 10^{-6}$	S=1.1		45594
invisible		(20.00	±0.06) %			–
hadrons		(69.91	±0.06) %			–
$(u\overline{u}+c\overline{c})/2$		(11.6	±0.6) %			–
$(d\overline{d}+s\overline{s}+b\overline{b})/3$		(15.6	±0.4) %			–
$c\overline{c}$		(12.03	±0.21) %			–
$b\overline{b}$		(15.12	±0.05) %			–
$b\overline{b}\,b\overline{b}$		(3.6	±1.3) $\times 10^{-4}$			–
$g\,g\,g$		< 1.1		%	CL=95%	–
$\pi^0\gamma$		< 2.01		$\times 10^{-5}$	CL=95%	45594
$\eta\gamma$		< 5.1		$\times 10^{-5}$	CL=95%	45592
$\omega\gamma$		< 6.5		$\times 10^{-4}$	CL=95%	45590
$\eta'(958)\gamma$		< 4.2		$\times 10^{-5}$	CL=95%	45589
$\gamma\gamma$		< 1.46		$\times 10^{-5}$	CL=95%	45594
$\pi^0\pi^0$		< 1.52		$\times 10^{-5}$	CL=95%	45594
$\gamma\gamma\gamma$		< 1.0		$\times 10^{-5}$	CL=95%	45594
$\pi^\pm W^\mp$	[i]	< 7		$\times 10^{-5}$	CL=95%	10162
$\rho^\pm W^\mp$	[i]	< 8.3		$\times 10^{-5}$	CL=95%	10136
$J/\psi(1S)$X		(3.51	$^{+0.23}_{-0.25}$) $\times 10^{-3}$	S=1.1		–
$J/\psi(1S)\gamma$		< 2.6		$\times 10^{-6}$	CL=95%	45541
$\psi(2S)$X		(1.60	±0.29) $\times 10^{-3}$			–
$\chi_{c1}(1P)$X		(2.9	±0.7) $\times 10^{-3}$			–
$\chi_{c2}(1P)$X		< 3.2		$\times 10^{-3}$	CL=90%	–
$\Upsilon(1S)$ X + $\Upsilon(2S)$ X + $\Upsilon(3S)$ X		(1.0	±0.5) $\times 10^{-4}$			–
$\Upsilon(1S)$X		< 3.4		$\times 10^{-6}$	CL=95%	–
$\Upsilon(2S)$X		< 6.5		$\times 10^{-6}$	CL=95%	–
$\Upsilon(3S)$X		< 5.4		$\times 10^{-6}$	CL=95%	–
$(D^0/\overline{D}^0)$ X		(20.7	±2.0) %			–
$D^\pm$X		(12.2	±1.7) %			–
$D^*(2010)^\pm$X	[i]	(11.4	±1.3) %			–
$D_{s1}(2536)^\pm$X		(3.6	±0.8) $\times 10^{-3}$			–
$D_{sJ}(2573)^\pm$X		(5.8	±2.2) $\times 10^{-3}$			–
$D^{*\prime}(2629)^\pm$X		searched for				–
B^+X	[j]	(6.08	±0.13) %			–
B^0_sX	[j]	(1.59	±0.13) %			–
B^+_cX		searched for				–

$\Lambda_c^+ X$			(1.54	±0.33) %			–
$\Xi_c^0 X$			seen				–
$\Xi_b X$			seen				–
b-baryon X		[j]	(1.38	±0.22) %			–
anomalous γ+ hadrons		[k]	< 3.2		$\times 10^{-3}$	CL=95%	–
$e^+ e^- \gamma$		[k]	< 5.2		$\times 10^{-4}$	CL=95%	45594
$\mu^+ \mu^- \gamma$		[k]	< 5.6		$\times 10^{-4}$	CL=95%	45594
$\tau^+ \tau^- \gamma$		[k]	< 7.3		$\times 10^{-4}$	CL=95%	45559
$\ell^+ \ell^- \gamma\gamma$		[l]	< 6.8		$\times 10^{-6}$	CL=95%	–
$q\overline{q}\gamma\gamma$		[l]	< 5.5		$\times 10^{-6}$	CL=95%	–
$\nu\overline{\nu}\gamma\gamma$		[l]	< 3.1		$\times 10^{-6}$	CL=95%	45594
$e^\pm \mu^\mp$	LF	[i]	< 7.5		$\times 10^{-7}$	CL=95%	45594
$e^\pm \tau^\mp$	LF	[i]	< 9.8		$\times 10^{-6}$	CL=95%	45576
$\mu^\pm \tau^\mp$	LF	[i]	< 1.2		$\times 10^{-5}$	CL=95%	45576
pe	L,B		< 1.8		$\times 10^{-6}$	CL=95%	45589
$p\mu$	L,B		< 1.8		$\times 10^{-6}$	CL=95%	45589

H^0

$J = 0$

Mass $m = 125.09 \pm 0.24$ GeV
Full width $\Gamma < 1.7$ GeV, CL = 95%

H^0 Signal Strengths in Different Channels

See Listings for the latest unpublished results.

Combined Final States = 1.10 ± 0.11
$WW^* = 1.08^{+0.18}_{-0.16}$
$ZZ^* = 1.29^{+0.26}_{-0.23}$
$\gamma\gamma = 1.16 \pm 0.18$
$b\overline{b} = 0.82 \pm 0.30$ (S = 1.1)
$\mu^+ \mu^- < 7.0$, CL = 95%
$\tau^+ \tau^- = 1.12 \pm 0.23$
$Z\gamma < 9.5$, CL = 95%
$t\overline{t}H^0$ Production $= 2.3^{+0.7}_{-0.6}$

H^0 DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$e^+ e^-$	< 1.9 $\times 10^{-3}$	95%	62545
$J/\psi\gamma$	< 1.5 $\times 10^{-3}$	95%	62507
$\Upsilon(1S)\gamma$	< 1.3 $\times 10^{-3}$	95%	62187
$\Upsilon(2S)\gamma$	< 1.9 $\times 10^{-3}$	95%	62143
$\Upsilon(3S)\gamma$	< 1.3 $\times 10^{-3}$	95%	62116
$\mu\tau$	< 1.51 %	95%	62532
invisible	<58 %	95%	–

Neutral Higgs Bosons, Searches for

Searches for a Higgs Boson with Standard Model Couplings

Mass $m > 122$ and none 128–1000 GeV, CL = 95%

The limits for H_1^0 and A^0 in supersymmetric models refer to the $m_h^{\max}$ benchmark scenario for the supersymmetric parameters.

H_1^0 in Supersymmetric Models ($m_{H_1^0} < m_{H_2^0}$)

Mass $m >$ 92.8 GeV, CL = 95%

A^0 Pseudoscalar Higgs Boson in Supersymmetric Models [n]

Mass $m >$ 93.4 GeV, CL = 95% $\quad \tan\beta > 0.4$

Charged Higgs Bosons ($H^\pm$ and $H^{\pm\pm}$), Searches for

$H^\pm$ Mass $m >$ 80 GeV, CL = 95%

New Heavy Bosons (W', Z', leptoquarks, etc.), Searches for

Additional W Bosons

W' with standard couplings
Mass $m > 3.710 \times 10^3$ GeV, CL = 95% (pp direct search)
W_R (Right-handed W Boson)
Mass $m >$ 715 GeV, CL = 90% (electroweak fit)

Additional Z Bosons

$Z'_{\rm SM}$ with standard couplings
Mass $m > 2.900 \times 10^3$ GeV, CL = 95% (pp direct search)
Mass $m > 1.500 \times 10^3$ GeV, CL = 95% (electroweak fit)
Z_{LR} of $\mathrm{SU(2)}_L \times \mathrm{SU(2)}_R \times \mathrm{U(1)}$ (with $g_L = g_R$)
Mass $m >$ 630 GeV, CL = 95% ($p\overline{p}$ direct search)
Mass $m >$ 1162 GeV, CL = 95% (electroweak fit)
Z_χ of $\mathrm{SO(10)} \rightarrow \mathrm{SU(5)} \times \mathrm{U(1)}_\chi$ (with $g_\chi = e/\cos\theta_W$)
Mass $m > 2.620 \times 10^3$ GeV, CL = 95% (pp direct search)
Mass $m > 1.141 \times 10^3$ GeV, CL = 95% (electroweak fit)
Z_ψ of $E_6 \rightarrow \mathrm{SO(10)} \times \mathrm{U(1)}_\psi$ (with $g_\psi = e/\cos\theta_W$)
Mass $m > 2.570 \times 10^3$ GeV, CL = 95% (pp direct search)
Mass $m >$ 476 GeV, CL = 95% (electroweak fit)
Z_η of $E_6 \rightarrow \mathrm{SU(3)} \times \mathrm{SU(2)} \times \mathrm{U(1)} \times \mathrm{U(1)}_\eta$ (with $g_\eta = e/\cos\theta_W$)
Mass $m > 1.870 \times 10^3$ GeV, CL = 95% (pp direct search)
Mass $m >$ 619 GeV, CL = 95% (electroweak fit)

Scalar Leptoquarks

Mass $m >$ 1050 GeV, CL = 95% (1st generation, pair prod.)
Mass $m >$ 304 GeV, CL = 95% (1st generation, single prod.)
Mass $m >$ 1000 GeV, CL = 95% (2nd generation, pair prod.)
Mass $m >$ 73 GeV, CL = 95% (2nd generation, single prod.)
Mass $m >$ 740 GeV, CL = 95% (3rd generation, pair prod.)
(See the Particle Listings for assumptions on leptoquark quantum numbers and branching fractions.)

Diquarks

Mass $m >$ 4700 GeV, CL = 95% (E_6 diquark)

Axigluon

Mass $m >$ 3600 GeV, CL = 95%

Axions (A^0) and Other Very Light Bosons, Searches for

The standard Peccei-Quinn axion is ruled out. Variants with reduced couplings or much smaller masses are constrained by various data. The Particle Listings in the full *Review* contain a Note discussing axion searches.

The best limit for the half-life of neutrinoless double beta decay with Majoron emission is $> 7.2 \times 10^{24}$ years (CL = 90%).

NOTES

[*a*] Theoretical value. A mass as large as a few MeV may not be precluded.

[*b*] ℓ indicates each type of lepton (e, μ, and τ), not sum over them.

[*c*] This represents the width for the decay of the W boson into a charged particle with momentum below detectability, p$<$ 200 MeV.

[*d*] The Z-boson mass listed here corresponds to a Breit-Wigner resonance parameter. It lies approximately 34 MeV above the real part of the position of the pole (in the energy-squared plane) in the Z-boson propagator.

[*e*] This partial width takes into account Z decays into $\nu\overline{\nu}$ and any other possible undetected modes.

[*f*] This ratio has not been corrected for the τ mass.

[*g*] Here $A \equiv 2g_V g_A/(g_V^2+g_A^2)$.

[*h*] Here ℓ indicates e or μ.

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

[*j*] This value is updated using the product of (i) the $Z \to b\overline{b}$ fraction from this listing and (ii) the b-hadron fraction in an unbiased sample of weakly decaying b-hadrons produced in Z-decays provided by the Heavy Flavor Averaging Group (HFAG, http://www.slac.stanford.edu/xorg/hfag/osc/PDG_2009/#FRACZ).

[*k*] See the Z Particle Listings for the γ energy range used in this measurement.

[*l*] For $m_{\gamma\gamma} = (60 \pm 5)$ GeV.

[*n*] The limits assume no invisible decays.

LEPTONS

e

$J = \frac{1}{2}$

Mass $m = (548.579909070 \pm 0.000000016) \times 10^{-6}$ u
Mass $m = 0.5109989461 \pm 0.0000000031$ MeV
$\left|m_{e^+} - m_{e^-}\right|/m < 8 \times 10^{-9}$, CL = 90%
$\left|q_{e^+} + q_{e^-}\right|/e < 4 \times 10^{-8}$
Magnetic moment anomaly
$(g-2)/2 = (1159.65218091 \pm 0.00000026) \times 10^{-6}$
$(g_{e^+} - g_{e^-}) / g_{\text{average}} = (-0.5 \pm 2.1) \times 10^{-12}$
Electric dipole moment $d < 0.87 \times 10^{-28}$ $e$cm, CL = 90%
Mean life $\tau > 6.6 \times 10^{28}$ yr, CL = 90% [a]

μ

$J = \frac{1}{2}$

Mass $m = 0.1134289257 \pm 0.0000000025$ u
Mass $m = 105.6583745 \pm 0.0000024$ MeV
Mean life $\tau = (2.1969811 \pm 0.0000022) \times 10^{-6}$ s
$\tau_{\mu^+}/\tau_{\mu^-} = 1.00002 \pm 0.00008$
$c\tau = 658.6384$ m
Magnetic moment anomaly $(g-2)/2 = (11659209 \pm 6) \times 10^{-10}$
$(g_{\mu^+} - g_{\mu^-}) / g_{\text{average}} = (-0.11 \pm 0.12) \times 10^{-8}$
Electric dipole moment $d = (-0.1 \pm 0.9) \times 10^{-19}$ $e$cm

Decay parameters [b]

$\rho = 0.74979 \pm 0.00026$
$\eta = 0.057 \pm 0.034$
$\delta = 0.75047 \pm 0.00034$
$\xi P_\mu = 1.0009^{+0.0016}_{-0.0007}$ [c]
$\xi P_\mu \delta/\rho = 1.0018^{+0.0016}_{-0.0007}$ [c]
$\xi' = 1.00 \pm 0.04$
$\xi'' = 0.98 \pm 0.04$
$\alpha/\text{A} = (0 \pm 4) \times 10^{-3}$
$\alpha'/\text{A} = (-10 \pm 20) \times 10^{-3}$
$\beta/\text{A} = (4 \pm 6) \times 10^{-3}$
$\beta'/\text{A} = (2 \pm 7) \times 10^{-3}$
$\overline{\eta} = 0.02 \pm 0.08$

μ^+ modes are charge conjugates of the modes below.

μ^- DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$e^-\,\overline{\nu}_e\,\nu_\mu$		$\approx 100\%$		53
$e^-\,\overline{\nu}_e\,\nu_\mu\,\gamma$		[d] (1.4 ± 0.4) %		53
$e^-\,\overline{\nu}_e\,\nu_\mu\,e^+\,e^-$		[e] $(3.4\pm0.4)\times10^{-5}$		53
Lepton Family number (LF) violating modes				
$e^-\,\nu_e\,\overline{\nu}_\mu$	LF	[f] < 1.2 %	90%	53
$e^-\,\gamma$	LF	$< 5.7\times10^{-13}$	90%	53
$e^-\,e^+\,e^-$	LF	$< 1.0\times10^{-12}$	90%	53
$e^-\,2\gamma$	LF	$< 7.2\times10^{-11}$	90%	53

τ $J = \frac{1}{2}$

Mass $m = 1776.86 \pm 0.12$ MeV
$(m_{\tau^+} - m_{\tau^-})/m_{\text{average}} < 2.8\times10^{-4}$, CL = 90%
Mean life $\tau = (290.3 \pm 0.5)\times10^{-15}$ s
$c\tau = 87.03\ \mu$m
Magnetic moment anomaly > -0.052 and < 0.013, CL = 95%
$\text{Re}(d_\tau) = -0.220$ to $0.45\times10^{-16}\ e$ cm, CL = 95%
$\text{Im}(d_\tau) = -0.250$ to $0.0080\times10^{-16}\ e$ cm, CL = 95%

Weak dipole moment

$\text{Re}(d_\tau^w) < 0.50\times10^{-17}\ e$ cm, CL = 95%
$\text{Im}(d_\tau^w) < 1.1\times10^{-17}\ e$ cm, CL = 95%

Weak anomalous magnetic dipole moment

$\text{Re}(\alpha_\tau^w) < 1.1\times10^{-3}$, CL = 95%
$\text{Im}(\alpha_\tau^w) < 2.7\times10^{-3}$, CL = 95%
$\tau^\pm \to \pi^\pm K_S^0\,\nu_\tau$ (RATE DIFFERENCE) / (RATE SUM) = (-0.36 ± 0.25)%

Decay parameters

See the τ Particle Listings for a note concerning τ-decay parameters.

$\rho(e \text{ or } \mu) = 0.745 \pm 0.008$
$\rho(e) = 0.747 \pm 0.010$
$\rho(\mu) = 0.763 \pm 0.020$
$\xi(e \text{ or } \mu) = 0.985 \pm 0.030$
$\xi(e) = 0.994 \pm 0.040$
$\xi(\mu) = 1.030 \pm 0.059$
$\eta(e \text{ or } \mu) = 0.013 \pm 0.020$
$\eta(\mu) = 0.094 \pm 0.073$

$(\delta\xi)(e \text{ or } \mu) = 0.746 \pm 0.021$
$(\delta\xi)(e) = 0.734 \pm 0.028$
$(\delta\xi)(\mu) = 0.778 \pm 0.037$
$\xi(\pi) = 0.993 \pm 0.022$
$\xi(\rho) = 0.994 \pm 0.008$
$\xi(a_1) = 1.001 \pm 0.027$
$\xi(\text{all hadronic modes}) = 0.995 \pm 0.007$

τ^+ modes are charge conjugates of the modes below. "$h^\pm$" stands for $\pi^\pm$ or $K^\pm$. "ℓ" stands for e or μ. "Neutrals" stands for γ's and/or π^0's.

τ^- DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Modes with one charged particle				
particle$^- \geq 0$ neutrals $\geq 0 K^0 \nu_\tau$ ("1-prong")		(85.24 ± 0.06) %		–
particle$^- \geq 0$ neutrals $\geq 0 K^0_L \nu_\tau$		(84.58 ± 0.06) %		–
$\mu^- \overline{\nu}_\mu \nu_\tau$	[g]	(17.39 ± 0.04) %		885
$\mu^- \overline{\nu}_\mu \nu_\tau \gamma$	[e]	(3.68 ± 0.10) $\times 10^{-3}$		885
$e^- \overline{\nu}_e \nu_\tau$	[g]	(17.82 ± 0.04) %		888
$e^- \overline{\nu}_e \nu_\tau \gamma$	[e]	(1.84 ± 0.05) %		888
$h^- \geq 0 K^0_L \nu_\tau$		(12.03 ± 0.05) %		883
$h^- \nu_\tau$		(11.51 ± 0.05) %		883
$\pi^- \nu_\tau$	[g]	(10.82 ± 0.05) %		883
$K^- \nu_\tau$	[g]	(6.96 ± 0.10) $\times 10^{-3}$		820
$h^- \geq 1$ neutrals ν_τ		(37.00 ± 0.09) %		–
$h^- \geq 1 \pi^0 \nu_\tau$ (ex. K^0)		(36.51 ± 0.09) %		–
$h^- \pi^0 \nu_\tau$		(25.93 ± 0.09) %		878
$\pi^- \pi^0 \nu_\tau$	[g]	(25.49 ± 0.09) %		878
$\pi^- \pi^0$ non-$\rho(770) \nu_\tau$		(3.0 ± 3.2) $\times 10^{-3}$		878
$K^- \pi^0 \nu_\tau$	[g]	(4.33 ± 0.15) $\times 10^{-3}$		814
$h^- \geq 2 \pi^0 \nu_\tau$		(10.81 ± 0.09) %		–
$h^- 2\pi^0 \nu_\tau$		(9.48 ± 0.10) %		862
$h^- 2\pi^0 \nu_\tau$ (ex. K^0)		(9.32 ± 0.10) %		862
$\pi^- 2\pi^0 \nu_\tau$ (ex. K^0)	[g]	(9.26 ± 0.10) %		862
$\pi^- 2\pi^0 \nu_\tau$ (ex. K^0),		< 9	$\times 10^{-3}$ CL=95%	862
scalar $\pi^- 2\pi^0 \nu_\tau$ (ex. K^0),		< 7	$\times 10^{-3}$ CL=95%	862
vector $K^- 2\pi^0 \nu_\tau$ (ex. K^0)	[g]	(6.5 ± 2.2) $\times 10^{-4}$		796
$h^- \geq 3 \pi^0 \nu_\tau$		(1.34 ± 0.07) %		–
$h^- \geq 3 \pi^0 \nu_\tau$ (ex. K^0)		(1.25 ± 0.07) %		–
$h^- 3\pi^0 \nu_\tau$		(1.18 ± 0.07) %		836
$\pi^- 3\pi^0 \nu_\tau$ (ex. K^0)	[g]	(1.04 ± 0.07) %		836

$K^-3\pi^0\nu_\tau$(ex.K^0, η)	[g]	(4.8 ± 2.1) $\times 10^{-4}$		765
$h^-4\pi^0\nu_\tau$(ex.K^0)		(1.6 ± 0.4) $\times 10^{-3}$		800
$h^-4\pi^0\nu_\tau$(ex.K^0,η)	[g]	(1.1 ± 0.4) $\times 10^{-3}$		800
$a_1(1260)\nu_\tau \rightarrow \pi^-\gamma\nu_\tau$		(3.8 ± 1.5) $\times 10^{-4}$		–
$K^- \geq 0\pi^0 \geq 0K^0 \geq 0\gamma\ \nu_\tau$		(1.552± 0.029) %		820
$K^- \geq 1$ (π^0 or K^0 or γ) ν_τ		(8.59 ± 0.28) $\times 10^{-3}$		–

Modes with K^0's

K^0_S(particles)$^-\nu_\tau$		(9.44 ± 0.28) $\times 10^{-3}$		–
$h^-\overline{K}^0\nu_\tau$		(9.87 ± 0.14) $\times 10^{-3}$		812
$\pi^-\overline{K}^0\nu_\tau$	[g]	(8.40 ± 0.14) $\times 10^{-3}$		812
$\pi^-\overline{K}^0$ (non-$K^*(892)^-$)ν_τ		(5.4 ± 2.1) $\times 10^{-4}$		812
$K^-K^0\nu_\tau$	[g]	(1.48 ± 0.05) $\times 10^{-3}$		737
$K^-K^0 \geq 0\pi^0\nu_\tau$		(2.98 ± 0.08) $\times 10^{-3}$		737
$h^-\overline{K}^0\pi^0\nu_\tau$		(5.32 ± 0.13) $\times 10^{-3}$		794
$\pi^-\overline{K}^0\pi^0\nu_\tau$	[g]	(3.82 ± 0.13) $\times 10^{-3}$		794
$\overline{K}^0\rho^-\nu_\tau$		(2.2 ± 0.5) $\times 10^{-3}$		612
$K^-K^0\pi^0\nu_\tau$	[g]	(1.50 ± 0.07) $\times 10^{-3}$		685
$\pi^-\overline{K}^0 \geq 1\pi^0\nu_\tau$		(4.08 ± 0.25) $\times 10^{-3}$		–
$\pi^-\overline{K}^0\pi^0\pi^0\nu_\tau$(ex.$K^0$)	[g]	(2.6 ± 2.3) $\times 10^{-4}$		763
$K^-K^0\pi^0\pi^0\nu_\tau$		$< 1.6 \times 10^{-4}$	CL=95%	619
$\pi^-K^0\overline{K}^0\nu_\tau$		(1.55 ± 0.24) $\times 10^{-3}$		682
$\pi^-K^0_SK^0_S\nu_\tau$	[g]	(2.33 ± 0.07) $\times 10^{-4}$		682
$\pi^-K^0_SK^0_L\nu_\tau$	[g]	(1.08 ± 0.24) $\times 10^{-3}$		682
$\pi^-K^0_LK^0_L\nu_\tau$		(2.33 ± 0.07) $\times 10^{-4}$		682
$\pi^-K^0\overline{K}^0\pi^0\nu_\tau$		(3.6 ± 1.2) $\times 10^{-4}$		614
$\pi^-K^0_SK^0_S\pi^0\nu_\tau$	[g]	(1.82 ± 0.21) $\times 10^{-5}$		614
$K^{*-}K^0\pi^0\nu_\tau \rightarrow \pi^-K^0_SK^0_S\pi^0\nu_\tau$		(1.08 ± 0.21) $\times 10^{-5}$		–
$f_1(1285)\pi^-\nu_\tau \rightarrow \pi^-K^0_SK^0_S\pi^0\nu_\tau$		(6.8 ± 1.5) $\times 10^{-6}$		–
$f_1(1420)\pi^-\nu_\tau \rightarrow \pi^-K^0_SK^0_S\pi^0\nu_\tau$		(2.4 ± 0.8) $\times 10^{-6}$		–
$\pi^-K^0_SK^0_L\pi^0\nu_\tau$	[g]	(3.2 ± 1.2) $\times 10^{-4}$		614
$\pi^-K^0_LK^0_L\pi^0\nu_\tau$		(1.82 ± 0.21) $\times 10^{-5}$		614
$K^-K^0_SK^0_S\nu_\tau$		$< 6.3 \times 10^{-7}$	CL=90%	466
$K^-K^0_SK^0_S\pi^0\nu_\tau$		$< 4.0 \times 10^{-7}$	CL=90%	337
$K^0h^+h^-h^- \geq 0$ neutrals ν_τ		$< 1.7 \times 10^{-3}$	CL=95%	760
$K^0h^+h^-h^-\nu_\tau$	[g]	(2.5 ± 2.0) $\times 10^{-4}$		760

Modes with three charged particles

$h^-\,h^-\,h^+ \geq 0$ neutrals $\geq 0 K^0_L\,\nu_\tau$		(15.21 ± 0.06) %		861
$h^-\,h^-\,h^+ \geq 0$ neutrals ν_τ		(14.55 ± 0.06) %		861
(ex. $K^0_S \to \pi^+\pi^-$)				
("3-prong")				
$h^-\,h^-\,h^+\,\nu_\tau$		(9.80 ± 0.05) %		861
$h^-\,h^-\,h^+\,\nu_\tau$(ex.K^0)		(9.46 ± 0.05) %		861
$h^-\,h^-\,h^+\,\nu_\tau$(ex.K^0,ω)		(9.43 ± 0.05) %		861
$\pi^-\,\pi^+\,\pi^-\,\nu_\tau$		(9.31 ± 0.05) %		861
$\pi^-\,\pi^+\,\pi^-\,\nu_\tau$(ex.$K^0$)		(9.02 ± 0.05) %		861
$\pi^-\,\pi^+\,\pi^-\,\nu_\tau$(ex.$K^0$), non-axial vector		< 2.4 %	CL=95%	861
$\pi^-\,\pi^+\,\pi^-\,\nu_\tau$(ex.$K^0$,$\omega$)	[g]	(8.99 ± 0.05) %		861
$h^-\,h^-\,h^+ \geq 1$ neutrals ν_τ		(5.29 ± 0.05) %		–
$h^-\,h^-\,h^+ \geq 1\pi^0\,\nu_\tau$(ex. K^0)		(5.09 ± 0.05) %		–
$h^-\,h^-\,h^+\,\pi^0\,\nu_\tau$		(4.76 ± 0.05) %		834
$h^-\,h^-\,h^+\,\pi^0\,\nu_\tau$(ex.$K^0$)		(4.57 ± 0.05) %		834
$h^-\,h^-\,h^+\,\pi^0\,\nu_\tau$(ex. K^0, ω)		(2.79 ± 0.07) %		834
$\pi^-\,\pi^+\,\pi^-\,\pi^0\,\nu_\tau$		(4.62 ± 0.05) %		834
$\pi^-\,\pi^+\,\pi^-\,\pi^0\,\nu_\tau$(ex.$K^0$)		(4.49 ± 0.05) %		834
$\pi^-\,\pi^+\,\pi^-\,\pi^0\,\nu_\tau$(ex.$K^0$,$\omega$)	[g]	(2.74 ± 0.07) %		834
$h^-\,h^-\,h^+ \geq 2\pi^0\,\nu_\tau$(ex. K^0)		(5.17 ± 0.31) × 10^{-3}		–
$h^-\,h^-\,h^+\,2\pi^0\,\nu_\tau$		(5.05 ± 0.31) × 10^{-3}		797
$h^-\,h^-\,h^+\,2\pi^0\,\nu_\tau$(ex.$K^0$)		(4.95 ± 0.31) × 10^{-3}		797
$h^-\,h^-\,h^+\,2\pi^0\,\nu_\tau$(ex.$K^0$,$\omega$,$\eta$)	[g]	(10 ± 4) × 10^{-4}		797
$h^-\,h^-\,h^+\,3\pi^0\,\nu_\tau$		(2.12 ± 0.30) × 10^{-4}		749
$2\pi^-\,\pi^+\,3\pi^0\,\nu_\tau$(ex.$K^0$)		(1.94 ± 0.30) × 10^{-4}		749
$2\pi^-\,\pi^+\,3\pi^0\,\nu_\tau$(ex.$K^0$, η, $f_1(1285)$)		(1.7 ± 0.4) × 10^{-4}		–
$2\pi^-\,\pi^+\,3\pi^0\,\nu_\tau$(ex.$K^0$, η, ω, $f_1(1285)$)	[g]	(1.4 ± 2.7) × 10^{-5}		–
$K^-\,h^+\,h^- \geq 0$ neutrals ν_τ		(6.29 ± 0.14) × 10^{-3}		794
$K^-\,h^+\,\pi^-\,\nu_\tau$(ex.$K^0$)		(4.37 ± 0.07) × 10^{-3}		794
$K^-\,h^+\,\pi^-\,\pi^0\,\nu_\tau$(ex.$K^0$)		(8.6 ± 1.2) × 10^{-4}		763
$K^-\,\pi^+\,\pi^- \geq 0$ neutrals ν_τ		(4.77 ± 0.14) × 10^{-3}		794
$K^-\,\pi^+\,\pi^- \geq 0\pi^0\,\nu_\tau$(ex.$K^0$)		(3.73 ± 0.13) × 10^{-3}		794
$K^-\,\pi^+\,\pi^-\,\nu_\tau$		(3.45 ± 0.07) × 10^{-3}		794
$K^-\,\pi^+\,\pi^-\,\nu_\tau$(ex.$K^0$)		(2.93 ± 0.07) × 10^{-3}		794
$K^-\,\pi^+\,\pi^-\,\nu_\tau$(ex.$K^0$,$\omega$)	[g]	(2.93 ± 0.07) × 10^{-3}		794
$K^-\,\rho^0\,\nu_\tau \to K^-\,\pi^+\,\pi^-\,\nu_\tau$		(1.4 ± 0.5) × 10^{-3}		–
$K^-\,\pi^+\,\pi^-\,\pi^0\,\nu_\tau$		(1.31 ± 0.12) × 10^{-3}		763

$K^-\pi^+\pi^-\pi^0\nu_\tau$(ex.$K^0$)		(7.9 ± 1.2) $\times 10^{-4}$		763
$K^-\pi^+\pi^-\pi^0\nu_\tau$(ex.$K^0$,$\eta$)		(7.6 ± 1.2) $\times 10^{-4}$		763
$K^-\pi^+\pi^-\pi^0\nu_\tau$(ex.$K^0$,$\omega$)		(3.7 ± 0.9) $\times 10^{-4}$		763
$K^-\pi^+\pi^-\pi^0\nu_\tau$(ex.$K^0$,$\omega$,$\eta$)	[g]	(3.9 ± 1.4) $\times 10^{-4}$		763
$K^-\pi^+K^-\geq 0$ neut. ν_τ		< 9 $\times 10^{-4}$	CL=95%	685
$K^-K^+\pi^-\geq 0$ neut. ν_τ		(1.496 ± 0.033) $\times 10^{-3}$		685
$K^-K^+\pi^-\nu_\tau$	[g]	(1.435 ± 0.027) $\times 10^{-3}$		685
$K^-K^+\pi^-\pi^0\nu_\tau$	[g]	(6.1 ± 1.8) $\times 10^{-5}$		618
$K^-K^+K^-\nu_\tau$		(2.2 ± 0.8) $\times 10^{-5}$	S=5.4	472
$K^-K^+K^-\nu_\tau$(ex. ϕ)		< 2.5 $\times 10^{-6}$	CL=90%	–
$K^-K^+K^-\pi^0\nu_\tau$		< 4.8 $\times 10^{-6}$	CL=90%	345
$\pi^-K^+\pi^-\geq 0$ neut. ν_τ		< 2.5 $\times 10^{-3}$	CL=95%	794
$e^-e^-e^+\overline{\nu}_e\nu_\tau$		(2.8 ± 1.5) $\times 10^{-5}$		888
$\mu^-e^-e^+\overline{\nu}_\mu\nu_\tau$		< 3.6 $\times 10^{-5}$	CL=90%	885

Modes with five charged particles

$3h^-2h^+\geq 0$ neutrals ν_τ (ex. $K^0_S\to\pi^-\pi^+$) ("5-prong")		(9.9 ± 0.4) $\times 10^{-4}$		794
$3h^-2h^+\nu_\tau$(ex.K^0)		(8.22 ± 0.32) $\times 10^{-4}$		794
$3\pi^-2\pi^+\nu_\tau$(ex.K^0, ω)		(8.21 ± 0.31) $\times 10^{-4}$		794
$3\pi^-2\pi^+\nu_\tau$(ex.K^0, ω, $f_1(1285)$)	[g]	(7.69 ± 0.30) $\times 10^{-4}$		–
$K^-2\pi^-2\pi^+\nu_\tau$(ex.K^0)	[g]	(6 ±12) $\times 10^{-7}$		716
$K^+3\pi^-\pi^+\nu_\tau$		< 5.0 $\times 10^{-6}$	CL=90%	716
$K^+K^-2\pi^-\pi^+\nu_\tau$		< 4.5 $\times 10^{-7}$	CL=90%	528
$3h^-2h^+\pi^0\nu_\tau$(ex.K^0)		(1.64 ± 0.11) $\times 10^{-4}$		746
$3\pi^-2\pi^+\pi^0\nu_\tau$(ex.$K^0$)		(1.62 ± 0.11) $\times 10^{-4}$		746
$3\pi^-2\pi^+\pi^0\nu_\tau$(ex.$K^0$, η, $f_1(1285)$)		(1.11 ± 0.10) $\times 10^{-4}$		–
$3\pi^-2\pi^+\pi^0\nu_\tau$(ex.$K^0$, η, ω, $f_1(1285)$)	[g]	(3.8 ± 0.9) $\times 10^{-5}$		–
$K^-2\pi^-2\pi^+\pi^0\nu_\tau$(ex.$K^0$)	[g]	(1.1 ± 0.6) $\times 10^{-6}$		657
$K^+3\pi^-\pi^+\pi^0\nu_\tau$		< 8 $\times 10^{-7}$	CL=90%	657
$3h^-2h^+2\pi^0\nu_\tau$		< 3.4 $\times 10^{-6}$	CL=90%	687

Miscellaneous other allowed modes

$(5\pi)^-\nu_\tau$		(7.8 ± 0.5) $\times 10^{-3}$		800
$4h^-3h^+\geq 0$ neutrals ν_τ ("7-prong")		< 3.0 $\times 10^{-7}$	CL=90%	682
$4h^-3h^+\nu_\tau$		< 4.3 $\times 10^{-7}$	CL=90%	682
$4h^-3h^+\pi^0\nu_\tau$		< 2.5 $\times 10^{-7}$	CL=90%	612
$X^-(S=-1)\nu_\tau$		(2.92 ± 0.04) %		–
$K^*(892)^-\geq 0$ neutrals $\geq 0K^0_L\nu_\tau$		(1.42 ± 0.18) %	S=1.4	665

$K^*(892)^-\nu_\tau$		(1.20	± 0.07) %		S=1.8	665
$K^*(892)^-\nu_\tau \to \pi^-\overline{K}^0\nu_\tau$		(7.83	± 0.26)	$\times 10^{-3}$		–
$K^*(892)^0 K^- \geq 0$ neutrals ν_τ		(3.2	± 1.4)	$\times 10^{-3}$		542
$K^*(892)^0 K^-\nu_\tau$		(2.1	± 0.4)	$\times 10^{-3}$		542
$\overline{K}^*(892)^0\pi^- \geq 0$ neutrals ν_τ		(3.8	± 1.7)	$\times 10^{-3}$		655
$\overline{K}^*(892)^0\pi^-\nu_\tau$		(2.2	± 0.5)	$\times 10^{-3}$		655
$(\overline{K}^*(892)\pi)^-\nu_\tau \to \pi^-\overline{K}^0\pi^0\nu_\tau$		(1.0	± 0.4)	$\times 10^{-3}$		–
$K_1(1270)^-\nu_\tau$		(4.7	± 1.1)	$\times 10^{-3}$		433
$K_1(1400)^-\nu_\tau$		(1.7	± 2.6)	$\times 10^{-3}$	S=1.7	335
$K^*(1410)^-\nu_\tau$		(1.5	$^{+\ 1.4}_{-\ 1.0}$)	$\times 10^{-3}$		326
$K_0^*(1430)^-\nu_\tau$		$<$ 5		$\times 10^{-4}$	CL=95%	317
$K_2^*(1430)^-\nu_\tau$		$<$ 3		$\times 10^{-3}$	CL=95%	317
$\eta\pi^-\nu_\tau$		$<$ 9.9		$\times 10^{-5}$	CL=95%	797
$\eta\pi^-\pi^0\nu_\tau$	[g]	(1.39	± 0.07)	$\times 10^{-3}$		778
$\eta\pi^-\pi^0\pi^0\nu_\tau$	[g]	(1.9	± 0.4)	$\times 10^{-4}$		746
$\eta K^-\nu_\tau$	[g]	(1.55	± 0.08)	$\times 10^{-4}$		719
$\eta K^*(892)^-\nu_\tau$		(1.38	± 0.15)	$\times 10^{-4}$		511
$\eta K^-\pi^0\nu_\tau$	[g]	(4.8	± 1.2)	$\times 10^{-5}$		665
$\eta K^-\pi^0$(non-$K^*(892)$)ν_τ		$<$ 3.5		$\times 10^{-5}$	CL=90%	–
$\eta\overline{K}^0\pi^-\nu_\tau$	[g]	(9.4	± 1.5)	$\times 10^{-5}$		661
$\eta\overline{K}^0\pi^-\pi^0\nu_\tau$		$<$ 5.0		$\times 10^{-5}$	CL=90%	590
$\eta K^-K^0\nu_\tau$		$<$ 9.0		$\times 10^{-6}$	CL=90%	430
$\eta\pi^+\pi^-\pi^- \geq 0$ neutrals ν_τ		$<$ 3		$\times 10^{-3}$	CL=90%	744
$\eta\pi^-\pi^+\pi^-\nu_\tau$(ex.$K^0$)	[g]	(2.19	± 0.13)	$\times 10^{-4}$		744
$\eta\pi^-\pi^+\pi^-\nu_\tau$(ex.$K^0$,$f_1(1285)$)		(9.9	± 1.6)	$\times 10^{-5}$		–
$\eta a_1(1260)^-\nu_\tau \to \eta\pi^-\rho^0\nu_\tau$		$<$ 3.9		$\times 10^{-4}$	CL=90%	–
$\eta\eta\pi^-\nu_\tau$		$<$ 7.4		$\times 10^{-6}$	CL=90%	637
$\eta\eta\pi^-\pi^0\nu_\tau$		$<$ 2.0		$\times 10^{-4}$	CL=95%	559
$\eta\eta K^-\nu_\tau$		$<$ 3.0		$\times 10^{-6}$	CL=90%	382
$\eta'(958)\pi^-\nu_\tau$		$<$ 4.0		$\times 10^{-6}$	CL=90%	620
$\eta'(958)\pi^-\pi^0\nu_\tau$		$<$ 1.2		$\times 10^{-5}$	CL=90%	591
$\eta'(958)K^-\nu_\tau$		$<$ 2.4		$\times 10^{-6}$	CL=90%	495
$\phi\pi^-\nu_\tau$		(3.4	± 0.6)	$\times 10^{-5}$		585
$\phi K^-\nu_\tau$	[g]	(4.4	± 1.6)	$\times 10^{-5}$		445
$f_1(1285)\pi^-\nu_\tau$		(3.9	± 0.5)	$\times 10^{-4}$	S=1.9	408
$f_1(1285)\pi^-\nu_\tau \to \eta\pi^-\pi^+\pi^-\nu_\tau$		(1.18	± 0.07)	$\times 10^{-4}$	S=1.3	–
$f_1(1285)\pi^-\nu_\tau \to 3\pi^-2\pi^+\nu_\tau$	[g]	(5.2	± 0.4)	$\times 10^{-5}$		–
$\pi(1300)^-\nu_\tau \to (\rho\pi)^-\nu_\tau \to (3\pi)^-\nu_\tau$		$<$ 1.0		$\times 10^{-4}$	CL=90%	–

$\pi(1300)^-\nu_\tau \rightarrow$ $((\pi\pi)_{S-\text{wave}}\,\pi)^-\nu_\tau \rightarrow$ $(3\pi)^-\nu_\tau$		$<$ 1.9	$\times 10^{-4}$	CL=90%	–
$h^-\omega \geq 0$ neutrals ν_τ		(2.40 ± 0.08)	%		708
$h^-\omega\nu_\tau$		(1.99 ± 0.06)	%		708
$\pi^-\omega\nu_\tau$	[g]	(1.95 ± 0.06)	%		708
$K^-\omega\nu_\tau$	[g]	(4.1 ± 0.9)	$\times 10^{-4}$		610
$h^-\omega\pi^0\nu_\tau$	[g]	(4.1 ± 0.4)	$\times 10^{-3}$		684
$h^-\omega 2\pi^0\nu_\tau$		(1.4 ± 0.5)	$\times 10^{-4}$		644
$\pi^-\omega 2\pi^0\nu_\tau$	[g]	(7.1 ± 1.6)	$\times 10^{-5}$		644
$h^- 2\omega\nu_\tau$		$<$ 5.4	$\times 10^{-7}$	CL=90%	250
$2h^-h^+\omega\nu_\tau$		(1.20 ± 0.22)	$\times 10^{-4}$		641
$2\pi^-\pi^+\omega\nu_\tau$(ex.$K^0$)	[g]	(8.4 ± 0.6)	$\times 10^{-5}$		641

Lepton Family number (*LF*), Lepton number (*L*), or Baryon number (*B*) violating modes

L means lepton number violation (*e.g.* $\tau^- \rightarrow e^+\pi^-\pi^-$). Following common usage, *LF* means lepton family violation *and not* lepton number violation (*e.g.* $\tau^- \rightarrow e^-\pi^+\pi^-$). *B* means baryon number violation.

$e^-\gamma$	*LF*	$<$ 3.3	$\times 10^{-8}$	CL=90%	888
$\mu^-\gamma$	*LF*	$<$ 4.4	$\times 10^{-8}$	CL=90%	885
$e^-\pi^0$	*LF*	$<$ 8.0	$\times 10^{-8}$	CL=90%	883
$\mu^-\pi^0$	*LF*	$<$ 1.1	$\times 10^{-7}$	CL=90%	880
$e^-K^0_S$	*LF*	$<$ 2.6	$\times 10^{-8}$	CL=90%	819
$\mu^-K^0_S$	*LF*	$<$ 2.3	$\times 10^{-8}$	CL=90%	815
$e^-\eta$	*LF*	$<$ 9.2	$\times 10^{-8}$	CL=90%	804
$\mu^-\eta$	*LF*	$<$ 6.5	$\times 10^{-8}$	CL=90%	800
$e^-\rho^0$	*LF*	$<$ 1.8	$\times 10^{-8}$	CL=90%	719
$\mu^-\rho^0$	*LF*	$<$ 1.2	$\times 10^{-8}$	CL=90%	715
$e^-\omega$	*LF*	$<$ 4.8	$\times 10^{-8}$	CL=90%	716
$\mu^-\omega$	*LF*	$<$ 4.7	$\times 10^{-8}$	CL=90%	711
$e^-K^*(892)^0$	*LF*	$<$ 3.2	$\times 10^{-8}$	CL=90%	665
$\mu^-K^*(892)^0$	*LF*	$<$ 5.9	$\times 10^{-8}$	CL=90%	659
$e^-\overline{K}^*(892)^0$	*LF*	$<$ 3.4	$\times 10^{-8}$	CL=90%	665
$\mu^-\overline{K}^*(892)^0$	*LF*	$<$ 7.0	$\times 10^{-8}$	CL=90%	659
$e^-\eta'(958)$	*LF*	$<$ 1.6	$\times 10^{-7}$	CL=90%	630
$\mu^-\eta'(958)$	*LF*	$<$ 1.3	$\times 10^{-7}$	CL=90%	625
$e^-f_0(980) \rightarrow e^-\pi^+\pi^-$	*LF*	$<$ 3.2	$\times 10^{-8}$	CL=90%	–
$\mu^-f_0(980) \rightarrow \mu^-\pi^+\pi^-$	*LF*	$<$ 3.4	$\times 10^{-8}$	CL=90%	–
$e^-\phi$	*LF*	$<$ 3.1	$\times 10^{-8}$	CL=90%	596
$\mu^-\phi$	*LF*	$<$ 8.4	$\times 10^{-8}$	CL=90%	590
$e^-e^+e^-$	*LF*	$<$ 2.7	$\times 10^{-8}$	CL=90%	888
$e^-\mu^+\mu^-$	*LF*	$<$ 2.7	$\times 10^{-8}$	CL=90%	882
$e^+\mu^-\mu^-$	*LF*	$<$ 1.7	$\times 10^{-8}$	CL=90%	882

$\mu^- e^+ e^-$	*LF*	$<$	1.8	$\times 10^{-8}$ CL=90%	885
$\mu^+ e^- e^-$	*LF*	$<$	1.5	$\times 10^{-8}$ CL=90%	885
$\mu^- \mu^+ \mu^-$	*LF*	$<$	2.1	$\times 10^{-8}$ CL=90%	873
$e^- \pi^+ \pi^-$	*LF*	$<$	2.3	$\times 10^{-8}$ CL=90%	877
$e^+ \pi^- \pi^-$	*L*	$<$	2.0	$\times 10^{-8}$ CL=90%	877
$\mu^- \pi^+ \pi^-$	*LF*	$<$	2.1	$\times 10^{-8}$ CL=90%	866
$\mu^+ \pi^- \pi^-$	*L*	$<$	3.9	$\times 10^{-8}$ CL=90%	866
$e^- \pi^+ K^-$	*LF*	$<$	3.7	$\times 10^{-8}$ CL=90%	813
$e^- \pi^- K^+$	*LF*	$<$	3.1	$\times 10^{-8}$ CL=90%	813
$e^+ \pi^- K^-$	*L*	$<$	3.2	$\times 10^{-8}$ CL=90%	813
$e^- K^0_S K^0_S$	*LF*	$<$	7.1	$\times 10^{-8}$ CL=90%	736
$e^- K^+ K^-$	*LF*	$<$	3.4	$\times 10^{-8}$ CL=90%	738
$e^+ K^- K^-$	*L*	$<$	3.3	$\times 10^{-8}$ CL=90%	738
$\mu^- \pi^+ K^-$	*LF*	$<$	8.6	$\times 10^{-8}$ CL=90%	800
$\mu^- \pi^- K^+$	*LF*	$<$	4.5	$\times 10^{-8}$ CL=90%	800
$\mu^+ \pi^- K^-$	*L*	$<$	4.8	$\times 10^{-8}$ CL=90%	800
$\mu^- K^0_S K^0_S$	*LF*	$<$	8.0	$\times 10^{-8}$ CL=90%	696
$\mu^- K^+ K^-$	*LF*	$<$	4.4	$\times 10^{-8}$ CL=90%	699
$\mu^+ K^- K^-$	*L*	$<$	4.7	$\times 10^{-8}$ CL=90%	699
$e^- \pi^0 \pi^0$	*LF*	$<$	6.5	$\times 10^{-6}$ CL=90%	878
$\mu^- \pi^0 \pi^0$	*LF*	$<$	1.4	$\times 10^{-5}$ CL=90%	867
$e^- \eta \eta$	*LF*	$<$	3.5	$\times 10^{-5}$ CL=90%	699
$\mu^- \eta \eta$	*LF*	$<$	6.0	$\times 10^{-5}$ CL=90%	653
$e^- \pi^0 \eta$	*LF*	$<$	2.4	$\times 10^{-5}$ CL=90%	798
$\mu^- \pi^0 \eta$	*LF*	$<$	2.2	$\times 10^{-5}$ CL=90%	784
$p \mu^- \mu^-$	*L,B*	$<$	4.4	$\times 10^{-7}$ CL=90%	618
$\overline{p} \mu^+ \mu^-$	*L,B*	$<$	3.3	$\times 10^{-7}$ CL=90%	618
$\overline{p} \gamma$	*L,B*	$<$	3.5	$\times 10^{-6}$ CL=90%	641
$\overline{p} \pi^0$	*L,B*	$<$	1.5	$\times 10^{-5}$ CL=90%	632
$\overline{p} 2\pi^0$	*L,B*	$<$	3.3	$\times 10^{-5}$ CL=90%	604
$\overline{p} \eta$	*L,B*	$<$	8.9	$\times 10^{-6}$ CL=90%	475
$\overline{p} \pi^0 \eta$	*L,B*	$<$	2.7	$\times 10^{-5}$ CL=90%	360
$\Lambda \pi^-$	*L,B*	$<$	7.2	$\times 10^{-8}$ CL=90%	525
$\overline{\Lambda} \pi^-$	*L,B*	$<$	1.4	$\times 10^{-7}$ CL=90%	525
e^- light boson	*LF*	$<$	2.7	$\times 10^{-3}$ CL=95%	–
μ^- light boson	*LF*	$<$	5	$\times 10^{-3}$ CL=95%	–

Heavy Charged Lepton Searches

$L^\pm$ – charged lepton

Mass $m >$ 100.8 GeV, CL = 95% [h] Decay to νW.

$L^\pm$ – stable charged heavy lepton

Mass $m >$ 102.6 GeV, CL = 95%

Neutrino Properties

See the note on "Neutrino properties listings" in the Particle Listings.

Mass $m < 2$ eV (tritium decay)
Mean life/mass, $\tau/m > 300$ s/eV, CL = 90% (reactor)
Mean life/mass, $\tau/m > 7 \times 10^9$ s/eV (solar)
Mean life/mass, $\tau/m > 15.4$ s/eV, CL = 90% (accelerator)
Magnetic moment $\mu < 0.29 \times 10^{-10}\ \mu_B$, CL = 90% (reactor)

Number of Neutrino Types

Number $N = 2.984 \pm 0.008$ (Standard Model fits to LEP-SLC data)
Number $N = 2.92 \pm 0.05$ (S = 1.2) (Direct measurement of invisible Z width)

Neutrino Mixing

The following values are obtained through data analyses based on the 3-neutrino mixing scheme described in the review "Neutrino Mass, Mixing, and Oscillations" by K. Nakamura and S.T. Petcov in this *Review*.

$\sin^2(\theta_{12}) = 0.304 \pm 0.014$
$\Delta m^2_{21} = (7.53 \pm 0.18) \times 10^{-5}$ eV^2
$\sin^2(\theta_{23}) = 0.51 \pm 0.05$ (normal mass hierarchy)
$\sin^2(\theta_{23}) = 0.50 \pm 0.05$ (inverted mass hierarchy)
$\Delta m^2_{32} = (2.44 \pm 0.06) \times 10^{-3}$ eV^2 [i] (normal mass hierarchy)
$\Delta m^2_{32} = (2.51 \pm 0.06) \times 10^{-3}$ eV^2 [i] (inverted mass hierarchy)
$\sin^2(\theta_{13}) = (2.19 \pm 0.12) \times 10^{-2}$

Stable Neutral Heavy Lepton Mass Limits

Mass $m > 45.0$ GeV, CL = 95% (Dirac)
Mass $m > 39.5$ GeV, CL = 95% (Majorana)

Neutral Heavy Lepton Mass Limits

Mass $m > 90.3$ GeV, CL = 95%
(Dirac ν_L coupling to e, μ, τ; conservative case(τ))
Mass $m > 80.5$ GeV, CL = 95%
(Majorana ν_L coupling to e, μ, τ; conservative case(τ))

NOTES

[*a*] This is the best limit for the mode $e^- \to \nu\gamma$. The best limit for "electron disappearance" is 6.4×10^{24} yr.

[*b*] See the "Note on Muon Decay Parameters" in the μ Particle Listings for definitions and details.

[*c*] P_μ is the longitudinal polarization of the muon from pion decay. In standard $V-A$ theory, $P_\mu = 1$ and $\rho = \delta = 3/4$.

[*d*] This only includes events with the γ energy > 10 MeV. Since the $e^- \overline{\nu}_e \nu_\mu$ and $e^- \overline{\nu}_e \nu_\mu \gamma$ modes cannot be clearly separated, we regard the latter mode as a subset of the former.

[*e*] See the relevant Particle Listings for the energy limits used in this measurement.

[*f*] A test of additive vs. multiplicative lepton family number conservation.

[*g*] Basis mode for the τ.

[*h*] $L^\pm$ mass limit depends on decay assumptions; see the Full Listings.

[*i*] The sign of Δm^2_{32} is not known at this time. The range quoted is for the absolute value.

QUARKS

The u-, d-, and s-quark masses are estimates of so-called "current-quark masses," in a mass-independent subtraction scheme such as $\overline{\text{MS}}$ at a scale $\mu \approx 2$ GeV. The c- and b-quark masses are the "running" masses in the $\overline{\text{MS}}$ scheme. For the b-quark we also quote the 1S mass. These can be different from the heavy quark masses obtained in potential models.

u

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

$m_u = 2.2^{+0.6}_{-0.4}$ MeV Charge $= \frac{2}{3}\ e$ $I_z = +\frac{1}{2}$
$m_u/m_d = 0.38$–0.58

d

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

$m_d = 4.7^{+0.5}_{-0.4}$ MeV Charge $= -\frac{1}{3}\ e$ $I_z = -\frac{1}{2}$
$m_s/m_d = 17$–22
$\overline{m} = (m_u+m_d)/2 = 3.5^{+0.7}_{-0.3}$ MeV

s

$I(J^P) = 0(\frac{1}{2}^+)$

$m_s = 96^{+8}_{-4}$ MeV Charge $= -\frac{1}{3}\ e$ Strangeness $= -1$
$m_s\ /\ ((m_u + m_d)/2) = 27.3 \pm 0.7$

c

$I(J^P) = 0(\frac{1}{2}^+)$

$m_c = 1.27 \pm 0.03$ GeV Charge $= \frac{2}{3}\ e$ Charm $= +1$
$m_c/m_s = 11.72 \pm 0.25$
$m_b/m_c = 4.53 \pm 0.05$
$m_b - m_c = 3.45 \pm 0.05$ GeV

b

$I(J^P) = 0(\frac{1}{2}^+)$

Charge $= -\frac{1}{3}\ e$ Bottom $= -1$

$m_b(\overline{\text{MS}}) = 4.18^{+0.04}_{-0.03}$ GeV
$m_b(1\text{S}) = 4.66^{+0.04}_{-0.03}$ GeV

t

$I(J^P) = 0(\frac{1}{2}^+)$

Charge $= \frac{2}{3}\ e$ Top $= +1$

Mass (direct measurements) $m = 173.21 \pm 0.51 \pm 0.71$ GeV [a,b]
Mass ($\overline{\text{MS}}$ from cross-section measurements) $m = 160^{+5}_{-4}$ GeV [a]
Mass (Pole from cross-section measurements) $m = 174.2 \pm 1.4$ GeV
$m_t - m_{\overline{t}} = -0.2 \pm 0.5$ GeV (S = 1.1)
Full width $\Gamma = 1.41^{+0.19}_{-0.15}$ GeV (S = 1.4)
$\Gamma(W\,b)/\Gamma(W\,q(q = b,\ s,\ d)) = 0.957 \pm 0.034$ (S = 1.5)

t-quark EW Couplings

$F_0 = 0.690 \pm 0.030$
$F_- = 0.314 \pm 0.025$
$F_+ = 0.008 \pm 0.016$
$F_{V+A} < 0.29$, CL = 95%

***t* DECAY MODES**		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$t \to\ W\,q(q = b,\ s,\ d)$				–
$t \to\ W\,b$				–
$t \to\ \ell\,\nu_\ell$ anything	[c,d]	(9.4±2.4) %		–
$t \to\ e\,\nu_e\,b$		(13.3±0.6) %		–
$t \to\ \mu\,\nu_\mu\,b$		(13.4±0.6) %		–
$t \to\ q\,\overline{q}\,b$		(66.5±1.4) %		–
$t \to\ \gamma\,q(q{=}u,c)$	[e]	$< 5.9 \times 10^{-3}$	95%	–
$\Delta T = 1$ weak neutral current (*T1*) modes				
$t \to\ Z\,q(q{=}u,c)$	*T1*	[f] $< 5 \times 10^{-4}$	95%	–
$t \to\ \ell^+\,\overline{q}\,\overline{q}'\,(q{=}d,s,b;\ q'{=}u,c)$		$< 1.6 \times 10^{-3}$	95%	–

b′ (4*th* Generation) Quark, Searches for

Mass $m >$ 190 GeV, CL = 95% ($p\overline{p}$, quasi-stable b')
Mass $m >$ 755 GeV, CL = 95% (pp, neutral-current decays)
Mass $m >$ 675 GeV, CL = 95% (pp, charged-current decays)
Mass $m >$ 46.0 GeV, CL = 95% (e^+e^-, all decays)

t' (4^{th} Generation) Quark, Searches for

$m(t'(2/3)) > 782$ GeV, CL = 95% (neutral-current decays)
$m(t'(2/3)) > 700$ GeV, CL = 95% (charged-current decays)
$m(t'(5/3)) > 800$ GeV, CL = 95%

Free Quark Searches

All searches since 1977 have had negative results.

NOTES

[*a*] A discussion of the definition of the top quark mass in these measurements can be found in the review "The Top Quark."

[*b*] Based on published top mass measurements using data from Tevatron Run-I and Run-II and LHC at $\sqrt{s} = 7$ TeV. Including the most recent unpublished results from Tevatron Run-II, the Tevatron Electroweak Working Group reports a top mass of 173.2 $\pm$ 0.9 GeV. See the note "The Top Quark' in the Quark Particle Listings of this *Review*.

[*c*] ℓ means e or μ decay mode, not the sum over them.

[*d*] Assumes lepton universality and W-decay acceptance.

[*e*] This limit is for $\Gamma(t \to \gamma q)/\Gamma(t \to W b)$.

[*f*] This limit is for $\Gamma(t \to Z q)/\Gamma(t \to W b)$.

LIGHT UNFLAVORED MESONS
($S = C = B = 0$)

For $I = 1$ (π, b, ρ, a): $u\overline{d}$, $(u\overline{u}-d\overline{d})/\sqrt{2}$, $d\overline{u}$;
for $I = 0$ (η, η', h, h', ω, ϕ, f, f'): $c_1(u\overline{u} + d\overline{d}) + c_2(s\overline{s})$

$\pi^{\pm}$

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

Mass $m = 139.57018 \pm 0.00035$ MeV (S = 1.2)
Mean life $\tau = (2.6033 \pm 0.0005) \times 10^{-8}$ s (S = 1.2)
$c\tau = 7.8045$ m

$\pi^{\pm} \to \ell^{\pm}\nu\gamma$ form factors [a]

$F_V = 0.0254 \pm 0.0017$
$F_A = 0.0119 \pm 0.0001$
F_V slope parameter $a = 0.10 \pm 0.06$
$R = 0.059^{+0.009}_{-0.008}$

π^- modes are charge conjugates of the modes below.

For decay limits to particles which are not established, see the section on Searches for Axions and Other Very Light Bosons.

π^+ DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\mu^+\nu_\mu$	[b]	(99.98770±0.00004) %		30
$\mu^+\nu_\mu\gamma$	[c]	(2.00 ±0.25) $\times 10^{-4}$		30
$e^+\nu_e$	[b]	(1.230 ±0.004) $\times 10^{-4}$		70
$e^+\nu_e\gamma$	[c]	(7.39 ±0.05) $\times 10^{-7}$		70
$e^+\nu_e\pi^0$		(1.036 ±0.006) $\times 10^{-8}$		4
$e^+\nu_e e^+e^-$		(3.2 ±0.5) $\times 10^{-9}$		70
$e^+\nu_e\nu\overline{\nu}$		< 5 $\times 10^{-6}$	90%	70
Lepton Family number (LF) or Lepton number (L) violating modes				
$\mu^+\overline{\nu}_e$	L	[d] < 1.5 $\times 10^{-3}$	90%	30
$\mu^+\nu_e$	LF	[d] < 8.0 $\times 10^{-3}$	90%	30
$\mu^-e^+e^+\nu$	LF	< 1.6 $\times 10^{-6}$	90%	30

π^0

$I^G(J^{PC}) = 1^-(0^{-+})$

Mass $m = 134.9766 \pm 0.0006$ MeV (S = 1.1)
$m_{\pi^\pm} - m_{\pi^0} = 4.5936 \pm 0.0005$ MeV
Mean life $\tau = (8.52 \pm 0.18) \times 10^{-17}$ s (S = 1.2)
$c\tau = 25.5$ nm

For decay limits to particles which are not established, see the appropriate Search sections (A^0 (axion) and Other Light Boson (X^0) Searches, etc.).

π^0 DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
2γ		(98.823 ± 0.034) %	S=1.5	67
$e^+ e^- \gamma$		(1.174 ± 0.035) %	S=1.5	67
γ positronium		$(1.82 \pm 0.29) \times 10^{-9}$		67
$e^+ e^+ e^- e^-$		$(3.34 \pm 0.16) \times 10^{-5}$		67
$e^+ e^-$		$(6.46 \pm 0.33) \times 10^{-8}$		67
4γ		$< 2 \times 10^{-8}$	CL=90%	67
$\nu\overline{\nu}$	[e]	$< 2.7 \times 10^{-7}$	CL=90%	67
$\nu_e \overline{\nu}_e$		$< 1.7 \times 10^{-6}$	CL=90%	67
$\nu_\mu \overline{\nu}_\mu$		$< 1.6 \times 10^{-6}$	CL=90%	67
$\nu_\tau \overline{\nu}_\tau$		$< 2.1 \times 10^{-6}$	CL=90%	67
$\gamma\nu\overline{\nu}$		$< 6 \times 10^{-4}$	CL=90%	67
Charge conjugation (C) or Lepton Family number (LF) violating modes				
3γ	C	$< 3.1 \times 10^{-8}$	CL=90%	67
$\mu^+ e^-$	LF	$< 3.8 \times 10^{-10}$	CL=90%	26
$\mu^- e^+$	LF	$< 3.4 \times 10^{-9}$	CL=90%	26
$\mu^+ e^- + \mu^- e^+$	LF	$< 3.6 \times 10^{-10}$	CL=90%	26

η

$I^G(J^{PC}) = 0^+(0^{-+})$

Mass $m = 547.862 \pm 0.017$ MeV
Full width $\Gamma = 1.31 \pm 0.05$ keV

C-nonconserving decay parameters

$\pi^+\pi^-\pi^0$	left-right asymmetry	$= (0.09^{+0.11}_{-0.12}) \times 10^{-2}$
$\pi^+\pi^-\pi^0$	sextant asymmetry	$= (0.12^{+0.10}_{-0.11}) \times 10^{-2}$
$\pi^+\pi^-\pi^0$	quadrant asymmetry	$= (-0.09 \pm 0.09) \times 10^{-2}$
$\pi^+\pi^-\gamma$	left-right asymmetry	$= (0.9 \pm 0.4) \times 10^{-2}$
$\pi^+\pi^-\gamma$	β (D-wave)	$= -0.02 \pm 0.07$ (S = 1.3)

CP-nonconserving decay parameters

$\pi^+\pi^- e^+ e^-$ decay-plane asymmetry $A_\phi = (-0.6 \pm 3.1) \times 10^{-2}$

Dalitz plot parameter

$\pi^0\pi^0\pi^0$ $\alpha = -0.0318 \pm 0.0015$

η DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Neutral modes			
neutral modes	(72.12±0.34) %	S=1.2	–
2γ	(39.41±0.20) %	S=1.1	274
$3\pi^0$	(32.68±0.23) %	S=1.1	179
$\pi^0 2\gamma$	(2.56±0.22) $\times 10^{-4}$		257
$2\pi^0 2\gamma$	< 1.2 $\times 10^{-3}$	CL=90%	238
4γ	< 2.8 $\times 10^{-4}$	CL=90%	274
invisible	< 1.0 $\times 10^{-4}$	CL=90%	–
Charged modes			
charged modes	(28.10±0.34) %	S=1.2	–
$\pi^+\pi^-\pi^0$	(22.92±0.28) %	S=1.2	174
$\pi^+\pi^-\gamma$	(4.22±0.08) %	S=1.1	236
$e^+e^-\gamma$	(6.9 ±0.4) $\times 10^{-3}$	S=1.3	274
$\mu^+\mu^-\gamma$	(3.1 ±0.4) $\times 10^{-4}$		253
e^+e^-	< 2.3 $\times 10^{-6}$	CL=90%	274
$\mu^+\mu^-$	(5.8 ±0.8) $\times 10^{-6}$		253
$2e^+2e^-$	(2.40±0.22) $\times 10^{-5}$		274
$\pi^+\pi^- e^+e^-(\gamma)$	(2.68±0.11) $\times 10^{-4}$		235
$e^+e^-\mu^+\mu^-$	< 1.6 $\times 10^{-4}$	CL=90%	253
$2\mu^+2\mu^-$	< 3.6 $\times 10^{-4}$	CL=90%	161
$\mu^+\mu^-\pi^+\pi^-$	< 3.6 $\times 10^{-4}$	CL=90%	113
$\pi^+ e^- \overline{\nu}_e$ + c.c.	< 1.7 $\times 10^{-4}$	CL=90%	256
$\pi^+\pi^- 2\gamma$	< 2.1 $\times 10^{-3}$		236
$\pi^+\pi^-\pi^0\gamma$	< 5 $\times 10^{-4}$	CL=90%	174
$\pi^0\mu^+\mu^-\gamma$	< 3 $\times 10^{-6}$	CL=90%	210
Charge conjugation (C), Parity (P), Charge conjugation × Parity (CP), or Lepton Family number (LF) violating modes			
$\pi^0\gamma$	C < 9 $\times 10^{-5}$	CL=90%	257
$\pi^+\pi^-$	P,CP < 1.3 $\times 10^{-5}$	CL=90%	236
$2\pi^0$	P,CP < 3.5 $\times 10^{-4}$	CL=90%	238
$2\pi^0\gamma$	C < 5 $\times 10^{-4}$	CL=90%	238
$3\pi^0\gamma$	C < 6 $\times 10^{-5}$	CL=90%	179
3γ	C < 1.6 $\times 10^{-5}$	CL=90%	274
$4\pi^0$	P,CP < 6.9 $\times 10^{-7}$	CL=90%	40
$\pi^0 e^+e^-$	C [f] < 4 $\times 10^{-5}$	CL=90%	257
$\pi^0\mu^+\mu^-$	C [f] < 5 $\times 10^{-6}$	CL=90%	210
$\mu^+ e^- + \mu^- e^+$	LF < 6 $\times 10^{-6}$	CL=90%	264

$f_0(500)$ or σ [g] was $f_0(600)$

$I^G(J^{PC}) = 0^+(0^{++})$

Mass m = (400–550) MeV
Full width Γ = (400–700) MeV

$f_0(500)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\pi$	dominant	–
$\gamma\gamma$	seen	–

$\rho(770)$ [h]

$I^G(J^{PC}) = 1^+(1^{--})$

Mass $m = 775.26 \pm 0.25$ MeV
Full width $\Gamma = 149.1 \pm 0.8$ MeV
$\Gamma_{ee} = 7.04 \pm 0.06$ keV

$\rho(770)$ DECAY MODES		Fraction (Γ_i/Γ)		Scale factor/ Confidence level	p (MeV/c)
$\pi\pi$		$\sim$ 100	%		363
		$\rho(770)^\pm$ decays			
$\pi^\pm\gamma$		(4.5 ±0.5)	$\times 10^{-4}$	S=2.2	375
$\pi^\pm\eta$		$<$ 6	$\times 10^{-3}$	CL=84%	152
$\pi^\pm\pi^+\pi^-\pi^0$		$<$ 2.0	$\times 10^{-3}$	CL=84%	254
		$\rho(770)^0$ decays			
$\pi^+\pi^-\gamma$		(9.9 ±1.6)	$\times 10^{-3}$		362
$\pi^0\gamma$		(6.0 ±0.8)	$\times 10^{-4}$		376
$\eta\gamma$		(3.00±0.20)	$\times 10^{-4}$		194
$\pi^0\pi^0\gamma$		(4.5 ±0.8)	$\times 10^{-5}$		363
$\mu^+\mu^-$	[i]	(4.55±0.28)	$\times 10^{-5}$		373
e^+e^-	[i]	(4.72±0.05)	$\times 10^{-5}$		388
$\pi^+\pi^-\pi^0$		($1.01^{+0.54}_{-0.36}$±0.34)	$\times 10^{-4}$		323
$\pi^+\pi^-\pi^+\pi^-$		(1.8 ±0.9)	$\times 10^{-5}$		251
$\pi^+\pi^-\pi^0\pi^0$		(1.6 ±0.8)	$\times 10^{-5}$		257
$\pi^0 e^+ e^-$		$<$ 1.2	$\times 10^{-5}$	CL=90%	376

$\omega(782)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 782.65 \pm 0.12$ MeV (S = 1.9)
Full width $\Gamma = 8.49 \pm 0.08$ MeV
$\Gamma_{ee} = 0.60 \pm 0.02$ keV

$\omega(782)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi^+\pi^-\pi^0$	(89.2 $\pm$0.7) %		327
$\pi^0\gamma$	(8.28$\pm$0.28) %	S=2.1	380
$\pi^+\pi^-$	(1.53$^{+0.11}_{-0.13}$) %	S=1.2	366
neutrals (excluding $\pi^0\gamma$)	(8 $^{+8}_{-5}$) $\times 10^{-3}$	S=1.1	–
$\eta\gamma$	(4.6 $\pm$0.4) $\times 10^{-4}$	S=1.1	200
$\pi^0 e^+ e^-$	(7.7 $\pm$0.6) $\times 10^{-4}$		380
$\pi^0\mu^+\mu^-$	(1.3 $\pm$0.4) $\times 10^{-4}$	S=2.1	349
e^+e^-	(7.28$\pm$0.14) $\times 10^{-5}$	S=1.3	391
$\pi^+\pi^-\pi^0\pi^0$	$<$ 2 $\times 10^{-4}$	CL=90%	262
$\pi^+\pi^-\gamma$	$<$ 3.6 $\times 10^{-3}$	CL=95%	366
$\pi^+\pi^-\pi^+\pi^-$	$<$ 1 $\times 10^{-3}$	CL=90%	256
$\pi^0\pi^0\gamma$	(6.6 $\pm$1.1) $\times 10^{-5}$		367
$\eta\pi^0\gamma$	$<$ 3.3 $\times 10^{-5}$	CL=90%	162
$\mu^+\mu^-$	(9.0 $\pm$3.1) $\times 10^{-5}$		377
3γ	$<$ 1.9 $\times 10^{-4}$	CL=95%	391
Charge conjugation (C) violating modes			
$\eta\pi^0$ C	$<$ 2.1 $\times 10^{-4}$	CL=90%	162
$2\pi^0$ C	$<$ 2.1 $\times 10^{-4}$	CL=90%	367
$3\pi^0$ C	$<$ 2.3 $\times 10^{-4}$	CL=90%	330

$\eta'(958)$

$I^G(J^{PC}) = 0^+(0^{-+})$

Mass m = 957.78 $\pm$ 0.06 MeV
Full width Γ = 0.197 $\pm$ 0.009 MeV

$\eta'(958)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\pi^+\pi^-\eta$	(42.9 $\pm$0.7) %		232
$\rho^0\gamma$(including non-resonant $\pi^+\ \pi^-\ \gamma$)	(29.1 $\pm$0.5) %		165
$\pi^0\pi^0\eta$	(22.3 $\pm$0.8) %		239
$\omega\gamma$	(2.62$\pm$0.13) %		159
$\omega e^+ e^-$	(2.0 $\pm$0.4) $\times 10^{-4}$		159
$\gamma\gamma$	(2.21$\pm$0.08) %		479
$3\pi^0$	(2.20$\pm$0.20) $\times 10^{-3}$		430
$\mu^+\mu^-\gamma$	(1.08$\pm$0.27) $\times 10^{-4}$		467
$\pi^+\pi^-\mu^+\mu^-$	$<$ 2.9 $\times 10^{-5}$	90%	401
$\pi^+\pi^-\pi^0$	(3.82$\pm$0.35) $\times 10^{-3}$		428
$\pi^0\rho^0$	$<$ 4 %	90%	111
$2(\pi^+\pi^-)$	(8.5 $\pm$0.9) $\times 10^{-5}$		372

$\pi^+\pi^-2\pi^0$	(1.8 $\pm$0.4)	$\times 10^{-4}$			376
$2(\pi^+\pi^-)$ neutrals	$<$ 1	%	95%		–
$2(\pi^+\pi^-)\pi^0$	$<$ 1.9	$\times 10^{-3}$	90%		298
$2(\pi^+\pi^-)2\pi^0$	$<$ 1	%	95%		197
$3(\pi^+\pi^-)$	$<$ 3.1	$\times 10^{-5}$	90%		189
$\pi^+\pi^- e^+ e^-$	(2.4 $^{+1.3}_{-1.0}$)	$\times 10^{-3}$			458
$\pi^+ e^- \nu_e +$ c.c.	$<$ 2.1	$\times 10^{-4}$	90%		469
$\gamma e^+ e^-$	(4.70$\pm$0.30)	$\times 10^{-4}$			479
$\pi^0\gamma\gamma$	$<$ 8	$\times 10^{-4}$	90%		469
$4\pi^0$	$<$ 3.2	$\times 10^{-4}$	90%		380
$e^+ e^-$	$<$ 5.6	$\times 10^{-9}$	90%		479
invisible	$<$ 5	$\times 10^{-4}$	90%		–

Charge conjugation (C), Parity (P), Lepton family number (LF) violating modes

$\pi^+\pi^-$	P,CP	$<$ 6	$\times 10^{-5}$	90%		458
$\pi^0\pi^0$	P,CP	$<$ 4	$\times 10^{-4}$	90%		459
$\pi^0 e^+ e^-$	C	[f] $<$ 1.4	$\times 10^{-3}$	90%		469
$\eta e^+ e^-$	C	[f] $<$ 2.4	$\times 10^{-3}$	90%		322
3γ	C	$<$ 1.0	$\times 10^{-4}$	90%		479
$\mu^+\mu^-\pi^0$	C	[f] $<$ 6.0	$\times 10^{-5}$	90%		445
$\mu^+\mu^-\eta$	C	[f] $<$ 1.5	$\times 10^{-5}$	90%		273
$e\mu$	LF	$<$ 4.7	$\times 10^{-4}$	90%		473

$f_0(980)$ [j]

$I^G(J^{PC}) = 0^+(0^{++})$

Mass $m = 990 \pm 20$ MeV
Full width Γ = 10 to 100 MeV

$f_0(980)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\pi$	dominant	476
$K\overline{K}$	seen	36
$\gamma\gamma$	seen	495

$a_0(980)$ [j]

$I^G(J^{PC}) = 1^-(0^{++})$

Mass $m = 980 \pm 20$ MeV
Full width Γ = 50 to 100 MeV

$a_0(980)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta\pi$	dominant	319
$K\overline{K}$	seen	†
$\gamma\gamma$	seen	490

$\phi(1020)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 1019.461 \pm 0.019$ MeV (S = 1.1)
Full width $\Gamma = 4.266 \pm 0.031$ MeV (S = 1.2)

$\phi(1020)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
K^+K^-	(48.9 ±0.5) %	S=1.1	127
$K^0_L K^0_S$	(34.2 ±0.4) %	S=1.1	110
$\rho\pi + \pi^+\pi^-\pi^0$	(15.32 ±0.32) %	S=1.1	–
$\eta\gamma$	(1.309±0.024) %	S=1.2	363
$\pi^0\gamma$	(1.27 ±0.06) $\times 10^{-3}$		501
$\ell^+\ell^-$	—		510
e^+e^-	(2.954±0.030) $\times 10^{-4}$	S=1.1	510
$\mu^+\mu^-$	(2.87 ±0.19) $\times 10^{-4}$		499
ηe^+e^-	(1.08 ±0.04) $\times 10^{-4}$		363
$\pi^+\pi^-$	(7.4 ±1.3) $\times 10^{-5}$		490
$\omega\pi^0$	(4.7 ±0.5) $\times 10^{-5}$		172
$\omega\gamma$	< 5 %	CL=84%	209
$\rho\gamma$	< 1.2 $\times 10^{-5}$	CL=90%	215
$\pi^+\pi^-\gamma$	(4.1 ±1.3) $\times 10^{-5}$		490
$f_0(980)\gamma$	(3.22 ±0.19) $\times 10^{-4}$	S=1.1	29
$\pi^0\pi^0\gamma$	(1.13 ±0.06) $\times 10^{-4}$		492
$\pi^+\pi^-\pi^+\pi^-$	(4.0 $^{+2.8}_{-2.2}$) $\times 10^{-6}$		410
$\pi^+\pi^+\pi^-\pi^-\pi^0$	< 4.6 $\times 10^{-6}$	CL=90%	342
$\pi^0 e^+e^-$	(1.12 ±0.28) $\times 10^{-5}$		501
$\pi^0\eta\gamma$	(7.27 ±0.30) $\times 10^{-5}$	S=1.5	346
$a_0(980)\gamma$	(7.6 ±0.6) $\times 10^{-5}$		39
$K^0\overline{K}^0\gamma$	< 1.9 $\times 10^{-8}$	CL=90%	110
$\eta'(958)\gamma$	(6.25 ±0.21) $\times 10^{-5}$		60
$\eta\pi^0\pi^0\gamma$	< 2 $\times 10^{-5}$	CL=90%	293
$\mu^+\mu^-\gamma$	(1.4 ±0.5) $\times 10^{-5}$		499
$\rho\gamma\gamma$	< 1.2 $\times 10^{-4}$	CL=90%	215
$\eta\pi^+\pi^-$	< 1.8 $\times 10^{-5}$	CL=90%	288
$\eta\mu^+\mu^-$	< 9.4 $\times 10^{-6}$	CL=90%	321
$\eta U \to \eta e^+e^-$	< 1 $\times 10^{-6}$	CL=90%	–
Lepton Family number (LF) violating modes			
$e^\pm\mu^\mp$ *LF*	< 2 $\times 10^{-6}$	CL=90%	504

$h_1(1170)$ $I^G(J^{PC}) = 0^-(1^{+-})$

Mass $m = 1170 \pm 20$ MeV
Full width $\Gamma = 360 \pm 40$ MeV

$h_1(1170)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	308

$b_1(1235)$ $I^G(J^{PC}) = 1^+(1^{+-})$

Mass $m = 1229.5 \pm 3.2$ MeV (S = 1.6)
Full width $\Gamma = 142 \pm 9$ MeV (S = 1.2)

$b_1(1235)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\omega\pi$	dominant		348
[D/S amplitude ratio $= 0.277 \pm 0.027$]			
$\pi^\pm\gamma$	$(1.6\pm0.4)\times10^{-3}$		607
$\eta\rho$	seen		†
$\pi^+\pi^+\pi^-\pi^0$	< 50 %	84%	535
$K^*(892)^\pm K^\mp$	seen		†
$(K\overline{K})^\pm\pi^0$	< 8 %	90%	248
$K^0_S K^0_L \pi^\pm$	< 6 %	90%	235
$K^0_S K^0_S \pi^\pm$	< 2 %	90%	235
$\phi\pi$	< 1.5 %	84%	147

$a_1(1260)$ [k] $I^G(J^{PC}) = 1^-(1^{++})$

Mass $m = 1230 \pm 40$ MeV [l]
Full width $\Gamma = 250$ to 600 MeV

$a_1(1260)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$(\rho\pi)_{S-\text{wave}}$	seen	353
$(\rho\pi)_{D-\text{wave}}$	seen	353
$(\rho(1450)\pi)_{S-\text{wave}}$	seen	†
$(\rho(1450)\pi)_{D-\text{wave}}$	seen	†
$\sigma\pi$	seen	–
$f_0(980)\pi$	not seen	179
$f_0(1370)\pi$	seen	†
$f_2(1270)\pi$	seen	†
$K\overline{K}^*(892)+$ c.c.	seen	†
$\pi\gamma$	seen	608

$f_2(1270)$ $I^G(J^{PC}) = 0^+(2^{++})$

Mass $m = 1275.5 \pm 0.8$ MeV
Full width $\Gamma = 186.7^{+2.2}_{-2.5}$ MeV (S = 1.4)

$f_2(1270)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi\pi$	$(84.2\ ^{+2.9}_{-0.9})$ %	S=1.1	623
$\pi^+\pi^- 2\pi^0$	$(\ 7.7\ ^{+1.1}_{-3.2})$ %	S=1.2	563
$K\overline{K}$	$(\ 4.6\ ^{+0.5}_{-0.4})$ %	S=2.7	404
$2\pi^+ 2\pi^-$	$(\ 2.8\ \pm 0.4\ )$ %	S=1.2	560
$\eta\eta$	$(\ 4.0\ \pm 0.8\ ) \times 10^{-3}$	S=2.1	326
$4\pi^0$	$(\ 3.0\ \pm 1.0\ ) \times 10^{-3}$		565
$\gamma\gamma$	$(\ 1.42 \pm 0.24) \times 10^{-5}$	S=1.4	638
$\eta\pi\pi$	$<\ 8 \times 10^{-3}$	CL=95%	478
$K^0 K^- \pi^+ +$ c.c.	$<\ 3.4 \times 10^{-3}$	CL=95%	293
$e^+ e^-$	$<\ 6 \times 10^{-10}$	CL=90%	638

$f_1(1285)$ $I^G(J^{PC}) = 0^+(1^{++})$

Mass $m = 1282.0 \pm 0.5$ MeV (S = 1.8)
Full width $\Gamma = 24.1 \pm 1.0$ MeV (S = 1.3)

$f_1(1285)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
4π	$(33.1^{+\ 2.1}_{-\ 1.8})$ %	S=1.3	568
$\pi^0\pi^0\pi^+\pi^-$	$(22.0^{+\ 1.4}_{-\ 1.2})$ %	S=1.3	566
$2\pi^+ 2\pi^-$	$(11.0^{+\ 0.7}_{-\ 0.6})$ %	S=1.3	563
$\rho^0\pi^+\pi^-$	$(11.0^{+\ 0.7}_{-\ 0.6})$ %	S=1.3	336
$\rho^0\rho^0$	seen		†
$4\pi^0$	$<\ 7 \times 10^{-4}$	CL=90%	568
$\eta\pi^+\pi^-$	$(35\ \pm 15\ )$ %		479
$\eta\pi\pi$	$(52.4^{+\ 1.9}_{-\ 2.2})$ %	S=1.2	482
$a_0(980)\pi$ [ignoring $a_0(980) \to K\overline{K}$]	$(36\ \pm\ 7\ )$ %		238
$\eta\pi\pi$ [excluding $a_0(980)\pi$]	$(16\ \pm\ 7\ )$ %		482
$K\overline{K}\pi$	$(\ 9.0 \pm\ 0.4)$ %	S=1.1	308
$K\overline{K}^*(892)$	not seen		†
$\pi^+\pi^-\pi^0$	$(\ 3.0 \pm\ 0.9) \times 10^{-3}$		603

$\rho^{\pm}\pi^{\mp}$	$<$ 3.1	$\times 10^{-3}$	CL=95%	390
$\gamma\rho^{0}$	(5.5± 1.3) %		S=2.8	407
$\phi\gamma$	(7.4± 2.6) $\times 10^{-4}$			236

$\eta(1295)$

$I^G(J^{PC}) = 0^+(0^{-+})$

Mass $m = 1294 \pm 4$ MeV (S = 1.6)
Full width $\Gamma = 55 \pm 5$ MeV

$\eta(1295)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta\pi^+\pi^-$	seen	487
$a_0(980)\pi$	seen	248
$\eta\pi^0\pi^0$	seen	490
$\eta(\pi\pi)_{S\text{-wave}}$	seen	–

$\pi(1300)$

$I^G(J^{PC}) = 1^-(0^{-+})$

Mass $m = 1300 \pm 100$ MeV [I]
Full width $\Gamma = 200$ to 600 MeV

$\pi(1300)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	404
$\pi(\pi\pi)_{S\text{-wave}}$	seen	–

$a_2(1320)$

$I^G(J^{PC}) = 1^-(2^{++})$

Mass $m = 1318.3^{+0.5}_{-0.6}$ MeV (S = 1.2)
Full width $\Gamma = 107 \pm 5$ MeV [I]

$a_2(1320)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
3π	(70.1 ±2.7) %	S=1.2	624
$\eta\pi$	(14.5 ±1.2) %		535
$\omega\pi\pi$	(10.6 ±3.2) %	S=1.3	366
$K\overline{K}$	(4.9 ±0.8) %		437
$\eta'(958)\pi$	(5.5 ±0.9) $\times 10^{-3}$		288
$\pi^{\pm}\gamma$	(2.91±0.27) $\times 10^{-3}$		652
$\gamma\gamma$	(9.4 ±0.7) $\times 10^{-6}$		659
e^+e^-	$<$ 5 $\times 10^{-9}$	CL=90%	659

$f_0(1370)$ [j]

$I^G(J^{PC}) = 0^+(0^{++})$

Mass m = 1200 to 1500 MeV
Full width Γ = 200 to 500 MeV

$f_0(1370)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\pi$	seen	672
4π	seen	617
$4\pi^0$	seen	617
$2\pi^+2\pi^-$	seen	612
$\pi^+\pi^-2\pi^0$	seen	615
$\rho\rho$	dominant	†
$2(\pi\pi)_{S\text{-wave}}$	seen	–
$\pi(1300)\pi$	seen	†
$a_1(1260)\pi$	seen	35
$\eta\eta$	seen	411
$K\overline{K}$	seen	475
$K\overline{K}n\pi$	not seen	†
6π	not seen	508
$\omega\omega$	not seen	†
$\gamma\gamma$	seen	685
e^+e^-	not seen	685

$\pi_1(1400)$ [n]

$I^G(J^{PC}) = 1^-(1^{-+})$

Mass m = 1354 ± 25 MeV (S = 1.8)
Full width Γ = 330 ± 35 MeV

$\pi_1(1400)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta\pi^0$	seen	557
$\eta\pi^-$	seen	556

$\eta(1405)$ [o]

$I^G(J^{PC}) = 0^+(0^{-+})$

Mass m = 1408.8 ± 1.8 MeV [l] (S = 2.1)
Full width Γ = 51.0 ± 2.9 MeV [l] (S = 1.8)

$\eta(1405)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$K\overline{K}\pi$	seen		424
$\eta\pi\pi$	seen		562
$a_0(980)\pi$	seen		345

$\eta(\pi\pi)_{S\text{-wave}}$	seen		–
$f_0(980)\eta$	seen		†
4π	seen		639
$\rho\rho$	<58 %	99.85%	†
$\rho^0\gamma$	seen		491
$K^*(892)K$	seen		123

$f_1(1420)$ [p]

$I^G(J^{PC}) = 0^+(1^{++})$

Mass $m = 1426.4 \pm 0.9$ MeV (S = 1.1)
Full width $\Gamma = 54.9 \pm 2.6$ MeV

$f_1(1420)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}\pi$	dominant	438
$K\overline{K}^*(892)+$ c.c.	dominant	163
$\eta\pi\pi$	possibly seen	573
$\phi\gamma$	seen	349

$\omega(1420)$ [q]

$I^G(J^{PC}) = 0^-(1^{--})$

Mass m (1400–1450) MeV
Full width Γ (180–250) MeV

$\omega(1420)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	dominant	486
$\omega\pi\pi$	seen	444
$b_1(1235)\pi$	seen	125
e^+e^-	seen	710

$a_0(1450)$ [j]

$I^G(J^{PC}) = 1^-(0^{++})$

Mass $m = 1474 \pm 19$ MeV
Full width $\Gamma = 265 \pm 13$ MeV

$a_0(1450)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\eta$	seen	627
$\pi\eta'(958)$	seen	410
$K\overline{K}$	seen	547
$\omega\pi\pi$	seen	484
$a_0(980)\pi\pi$	seen	342
$\gamma\gamma$	seen	737

$\rho(1450)$ [r]

$I^G(J^{PC}) = 1^+(1^{--})$

Mass $m = 1465 \pm 25$ MeV [l]
Full width $\Gamma = 400 \pm 60$ MeV [l]

$\rho(1450)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\pi$	seen	720
4π	seen	669
e^+e^-	seen	732
$\eta\rho$	seen	311
$a_2(1320)\pi$	not seen	54
$K\overline{K}$	not seen	541
$K\overline{K}^*(892)+$ c.c.	possibly seen	229
$\eta\gamma$	seen	630
$f_0(500)\gamma$	not seen	–
$f_0(980)\gamma$	not seen	398
$f_0(1370)\gamma$	not seen	92
$f_2(1270)\gamma$	not seen	177

$\eta(1475)$ [o]

$I^G(J^{PC}) = 0^+(0^{-+})$

Mass $m = 1476 \pm 4$ MeV (S = 1.3)
Full width $\Gamma = 85 \pm 9$ MeV (S = 1.5)

$\eta(1475)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}\pi$	dominant	477
$K\overline{K}^*(892)+$ c.c.	seen	245
$a_0(980)\pi$	seen	396
$\gamma\gamma$	seen	738
$K^0_S K^0_S \eta$	possibly seen	†

$f_0(1500)$ [n]

$I^G(J^{PC}) = 0^+(0^{++})$

Mass $m = 1504 \pm 6$ MeV (S = 1.3)
Full width $\Gamma = 109 \pm 7$ MeV

$f_0(1500)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor	p (MeV/c)
$\pi\pi$	(34.9±2.3) %	1.2	740
$\pi^+\pi^-$	seen		739
$2\pi^0$	seen		740

4π	(49.5±3.3) %	1.2	691
$4\pi^0$	seen		691
$2\pi^+2\pi^-$	seen		686
$2(\pi\pi)_{S\text{-wave}}$	seen		–
$\rho\rho$	seen		†
$\pi(1300)\pi$	seen		143
$a_1(1260)\pi$	seen		217
$\eta\eta$	(5.1±0.9) %	1.4	515
$\eta\eta'(958)$	(1.9±0.8) %	1.7	†
$K\overline{K}$	(8.6±1.0) %	1.1	568
$\gamma\gamma$	not seen		752

$f_2'(1525)$

$I^G(J^{PC}) = 0^+(2^{++})$

Mass $m = 1525 \pm 5$ MeV [l]
Full width $\Gamma = 73^{+6}_{-5}$ MeV [l]

$f_2'(1525)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}$	(88.7 ±2.2) %	581
$\eta\eta$	(10.4 ±2.2) %	530
$\pi\pi$	(8.2 ±1.5) × 10^{-3}	750
$\gamma\gamma$	(1.10±0.14) × 10^{-6}	763

$\pi_1(1600)$ [n]

$I^G(J^{PC}) = 1^-(1^{-+})$

Mass $m = 1662^{+8}_{-9}$ MeV
Full width $\Gamma = 241 \pm 40$ MeV (S = 1.4)

$\pi_1(1600)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\pi\pi$	not seen	803
$\rho^0\pi^-$	not seen	641
$f_2(1270)\pi^-$	not seen	318
$b_1(1235)\pi$	seen	357
$\eta'(958)\pi^-$	seen	543
$f_1(1285)\pi$	seen	314

$\eta_2(1645)$

$I^G(J^{PC}) = 0^+(2^{-+})$

Mass $m = 1617 \pm 5$ MeV
Full width $\Gamma = 181 \pm 11$ MeV

$\eta_2(1645)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$a_2(1320)\pi$	seen	242
$K\overline{K}\pi$	seen	580
$K^*\overline{K}$	seen	404
$\eta\pi^+\pi^-$	seen	685
$a_0(980)\pi$	seen	499
$f_2(1270)\eta$	not seen	†

$\omega(1650)$ [s]

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 1670 \pm 30$ MeV
Full width $\Gamma = 315 \pm 35$ MeV

$\omega(1650)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	647
$\omega\pi\pi$	seen	617
$\omega\eta$	seen	500
e^+e^-	seen	835

$\omega_3(1670)$

$I^G(J^{PC}) = 0^-(3^{--})$

Mass $m = 1667 \pm 4$ MeV
Full width $\Gamma = 168 \pm 10$ MeV [l]

$\omega_3(1670)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	645
$\omega\pi\pi$	seen	615
$b_1(1235)\pi$	possibly seen	361

$\pi_2(1670)$

$I^G(J^{PC}) = 1^-(2^{-+})$

Mass $m = 1672.2 \pm 3.0$ MeV [l] (S = 1.4)
Full width $\Gamma = 260 \pm 9$ MeV [l] (S = 1.2)

$\pi_2(1670)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
3π	(95.8±1.4) %		809
$f_2(1270)\pi$	(56.3±3.2) %		328
$\rho\pi$	(31 ±4) %		648
$\sigma\pi$	(10.9±3.4) %		–
$\pi(\pi\pi)_{S\text{-wave}}$	(8.7±3.4) %		–

$K\overline{K}^*(892)+$ c.c.	(4.2±1.4) %			455
$\omega\rho$	(2.7±1.1) %			304
$\pi^\pm\gamma$	(7.0±1.1)	$\times 10^{-4}$		830
$\gamma\gamma$	< 2.8	$\times 10^{-7}$	90%	836
$\rho(1450)\pi$	< 3.6	$\times 10^{-3}$	97.7%	147
$b_1(1235)\pi$	< 1.9	$\times 10^{-3}$	97.7%	365
$f_1(1285)\pi$	possibly seen			323
$a_2(1320)\pi$	not seen			292

$\phi(1680)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 1680 \pm 20$ MeV [I]
Full width $\Gamma = 150 \pm 50$ MeV [I]

$\phi(1680)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}^*(892)+$ c.c.	dominant	462
$K^0_S K\pi$	seen	621
$K\overline{K}$	seen	680
e^+e^-	seen	840
$\omega\pi\pi$	not seen	623
$K^+K^-\pi^+\pi^-$	seen	544
$\eta\phi$	seen	290
$\eta\gamma$	seen	751

$\rho_3(1690)$

$I^G(J^{PC}) = 1^+(3^{--})$

Mass $m = 1688.8 \pm 2.1$ MeV [I]
Full width $\Gamma = 161 \pm 10$ MeV [I] (S = 1.5)

$\rho_3(1690)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor	p (MeV/c)
4π	(71.1 ± 1.9) %		790
$\pi^\pm\pi^+\pi^-\pi^0$	(67 ±22) %		787
$\omega\pi$	(16 ± 6) %		655
$\pi\pi$	(23.6 ± 1.3) %		834
$K\overline{K}\pi$	(3.8 ± 1.2) %		629
$K\overline{K}$	(1.58± 0.26) %	1.2	685
$\eta\pi^+\pi^-$	seen		727
$\rho(770)\eta$	seen		520
$\pi\pi\rho$ Excluding 2ρ and $a_2(1320)\pi$.	seen		633
$a_2(1320)\pi$	seen		307
$\rho\rho$	seen		335

$\rho(1700)$ [r]

$I^G(J^{PC}) = 1^+(1^{--})$

Mass $m = 1720 \pm 20$ MeV [l] ($\eta\rho^0$ and $\pi^+\pi^-$ modes)
Full width $\Gamma = 250 \pm 100$ MeV [l] ($\eta\rho^0$ and $\pi^+\pi^-$ modes)

$\rho(1700)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$2(\pi^+\pi^-)$	large	803
$\rho\pi\pi$	dominant	653
$\rho^0\pi^+\pi^-$	large	651
$\rho^\pm\pi^\mp\pi^0$	large	652
$a_1(1260)\pi$	seen	404
$h_1(1170)\pi$	seen	447
$\pi(1300)\pi$	seen	349
$\rho\rho$	seen	372
$\pi^+\pi^-$	seen	849
$\pi\pi$	seen	849
$K\overline{K}^*(892)+$ c.c.	seen	496
$\eta\rho$	seen	545
$a_2(1320)\pi$	not seen	334
$K\overline{K}$	seen	704
e^+e^-	seen	860
$\pi^0\omega$	seen	674

$f_0(1710)$ [t]

$I^G(J^{PC}) = 0^+(0^{++})$

Mass $m = 1723^{+6}_{-5}$ MeV (S = 1.6)
Full width $\Gamma = 139 \pm 8$ MeV (S = 1.1)

$f_0(1710)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}$	seen	706
$\eta\eta$	seen	665
$\pi\pi$	seen	851
$\omega\omega$	seen	360

$\pi(1800)$

$I^G(J^{PC}) = 1^-(0^{-+})$

Mass $m = 1812 \pm 12$ MeV (S = 2.3)
Full width $\Gamma = 208 \pm 12$ MeV

$\pi(1800)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi^+\pi^-\pi^-$	seen	879
$f_0(500)\pi^-$	seen	–
$f_0(980)\pi^-$	seen	625
$f_0(1370)\pi^-$	seen	368
$f_0(1500)\pi^-$	not seen	250
$\rho\pi^-$	not seen	732
$\eta\eta\pi^-$	seen	661
$a_0(980)\eta$	seen	473
$a_2(1320)\eta$	not seen	†
$f_2(1270)\pi$	not seen	442
$f_0(1370)\pi^-$	not seen	368
$f_0(1500)\pi^-$	seen	250
$\eta\eta'(958)\pi^-$	seen	375
$K_0^*(1430)K^-$	seen	†
$K^*(892)K^-$	not seen	570

$\phi_3(1850)$

$I^G(J^{PC}) = 0^-(3^{--})$

Mass $m = 1854 \pm 7$ MeV
Full width $\Gamma = 87^{+28}_{-23}$ MeV (S = 1.2)

$\phi_3(1850)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}$	seen	785
$K\overline{K}^*(892)+$ c.c.	seen	602

$\pi_2(1880)$

$I^G(J^{PC}) = 1^-(2^{-+})$

Mass $m = 1895 \pm 16$ MeV
Full width $\Gamma = 235 \pm 34$ MeV

$f_2(1950)$

$I^G(J^{PC}) = 0^+(2^{++})$

Mass $m = 1944 \pm 12$ MeV (S = 1.5)
Full width $\Gamma = 472 \pm 18$ MeV

$f_2(1950)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K^*(892)\overline{K}^*(892)$	seen	387
$\pi^+\pi^-$	seen	962
$\pi^0\pi^0$	seen	963
4π	seen	925
$\eta\eta$	seen	803
$K\overline{K}$	seen	837
$\gamma\gamma$	seen	972
$p\overline{p}$	seen	254

$f_2(2010)$

$I^G(J^{PC}) = 0^+(2^{++})$

Mass $m = 2011^{+60}_{-80}$ MeV
Full width $\Gamma = 202 \pm 60$ MeV

$f_2(2010)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\phi\phi$	seen	†
$K\overline{K}$	seen	876

$a_4(2040)$

$I^G(J^{PC}) = 1^-(4^{++})$

Mass $m = 1995^{+10}_{-8}$ MeV (S = 1.1)
Full width $\Gamma = 257^{+25}_{-23}$ MeV (S = 1.3)

$a_4(2040)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}$	seen	867
$\pi^+\pi^-\pi^0$	seen	973
$\rho\pi$	seen	841
$f_2(1270)\pi$	seen	579
$\omega\pi^-\pi^0$	seen	818
$\omega\rho$	seen	623
$\eta\pi$	seen	917
$\eta'(958)\pi$	seen	760

$f_4(2050)$

$I^G(J^{PC}) = 0^+(4^{++})$

Mass $m = 2018 \pm 11$ MeV (S = 2.1)
Full width $\Gamma = 237 \pm 18$ MeV (S = 1.9)

$f_4(2050)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\omega\omega$	seen	637
$\pi\pi$	(17.0±1.5) %	1000
$K\overline{K}$	$(\ 6.8^{+3.4}_{-1.8}) \times 10^{-3}$	880
$\eta\eta$	$(\ 2.1\pm0.8) \times 10^{-3}$	848
$4\pi^0$	$<$ 1.2 %	964
$a_2(1320)\pi$	seen	567

$\phi(2170)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 2189 \pm 11$ MeV (S = 1.8)
Full width $\Gamma = 79 \pm 14$ MeV

$\phi(2170)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
e^+e^-	seen	1095
$\phi f_0(980)$	seen	434
$K^+K^-f_0(980) \rightarrow K^+K^-\pi^+\pi^-$	seen	–
$K^+K^-f_0(980) \rightarrow K^+K^-\pi^0\pi^0$	seen	–
$K^{*0}K^{\pm}\pi^{\mp}$	not seen	780
$K^*(892)^0\overline{K}^*(892)^0$	not seen	635

$f_2(2300)$

$I^G(J^{PC}) = 0^+(2^{++})$

Mass $m = 2297 \pm 28$ MeV
Full width $\Gamma = 149 \pm 40$ MeV

$f_2(2300)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\phi\phi$	seen	529
$K\overline{K}$	seen	1037
$\gamma\gamma$	seen	1149

$f_2(2340)$

$I^G(J^{PC}) = 0^+(2^{++})$

Mass $m = 2345^{+50}_{-40}$ MeV
Full width $\Gamma = 322^{+70}_{-60}$ MeV

$f_2(2340)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\phi\phi$	seen	580
$\eta\eta$	seen	1037

STRANGE MESONS
($S = \pm 1$, $C = B = 0$)

$K^+ = u\bar{s}$, $K^0 = d\bar{s}$, $\overline{K}^0 = \bar{d}s$, $K^- = \bar{u}s$, similarly for K^*'s

$K^\pm$

$I(J^P) = \frac{1}{2}(0^-)$

Mass $m = 493.677 \pm 0.016$ MeV [u] (S = 2.8)
Mean life $\tau = (1.2380 \pm 0.0020) \times 10^{-8}$ s (S = 1.8)
$c\tau = 3.711$ m

CPT violation parameters (Δ = rate difference/sum)

$\Delta(K^\pm \to \mu^\pm \nu_\mu) = (-0.27 \pm 0.21)\%$
$\Delta(K^\pm \to \pi^\pm \pi^0) = (0.4 \pm 0.6)\%$ [v]

CP violation parameters (Δ = rate difference/sum)

$\Delta(K^\pm \to \pi^\pm e^+ e^-) = (-2.2 \pm 1.6) \times 10^{-2}$
$\Delta(K^\pm \to \pi^\pm \mu^+ \mu^-) = 0.010 \pm 0.023$
$\Delta(K^\pm \to \pi^\pm \pi^0 \gamma) = (0.0 \pm 1.2) \times 10^{-3}$
$\Delta(K^\pm \to \pi^\pm \pi^+ \pi^-) = (0.04 \pm 0.06)\%$
$\Delta(K^\pm \to \pi^\pm \pi^0 \pi^0) = (-0.02 \pm 0.28)\%$

T violation parameters

$K^+ \to \pi^0 \mu^+ \nu_\mu \quad P_T = (-1.7 \pm 2.5) \times 10^{-3}$
$K^+ \to \mu^+ \nu_\mu \gamma \quad P_T = (-0.6 \pm 1.9) \times 10^{-2}$
$K^+ \to \pi^0 \mu^+ \nu_\mu \quad \mathrm{Im}(\xi) = -0.006 \pm 0.008$

Slope parameter *g* [x]

(See Particle Listings for quadratic coefficients and alternative parametrization related to $\pi\pi$ scattering)

$K^\pm \to \pi^\pm \pi^+ \pi^- \; g = -0.21134 \pm 0.00017$
$(g_+ - g_-) \,/\, (g_+ + g_-) = (-1.5 \pm 2.2) \times 10^{-4}$
$K^\pm \to \pi^\pm \pi^0 \pi^0 \; g = 0.626 \pm 0.007$
$(g_+ - g_-) \,/\, (g_+ + g_-) = (1.8 \pm 1.8) \times 10^{-4}$

$K^\pm$ decay form factors [a,y]

Assuming μ-e universality

$\lambda_+(K^+_{\mu 3}) = \lambda_+(K^+_{e3}) = (2.97 \pm 0.05) \times 10^{-2}$
$\lambda_0(K^+_{\mu 3}) = (1.95 \pm 0.12) \times 10^{-2}$

Not assuming μ-e universality

$\lambda_+(K^+_{e3}) = (2.98 \pm 0.05) \times 10^{-2}$

$\lambda_+(K^+_{\mu 3}) = (2.96 \pm 0.17) \times 10^{-2}$

$\lambda_0(K^+_{\mu 3}) = (1.96 \pm 0.13) \times 10^{-2}$

K_{e3} form factor quadratic fit

$\lambda'_+ (K^\pm_{e3})$ linear coeff. $= (2.49 \pm 0.17) \times 10^{-2}$

$\lambda''_+(K^\pm_{e3})$ quadratic coeff. $= (0.19 \pm 0.09) \times 10^{-2}$

K^+_{e3} $\left|f_S/f_+\right| = (-0.3^{+0.8}_{-0.7}) \times 10^{-2}$

K^+_{e3} $\left|f_T/f_+\right| = (-1.2 \pm 2.3) \times 10^{-2}$

$K^+_{\mu 3}$ $\left|f_S/f_+\right| = (0.2 \pm 0.6) \times 10^{-2}$

$K^+_{\mu 3}$ $\left|f_T/f_+\right| = (-0.1 \pm 0.7) \times 10^{-2}$

$K^+ \to e^+ \nu_e \gamma$ $\left|F_A + F_V\right| = 0.133 \pm 0.008$ (S = 1.3)

$K^+ \to \mu^+ \nu_\mu \gamma$ $\left|F_A + F_V\right| = 0.165 \pm 0.013$

$K^+ \to e^+ \nu_e \gamma$ $\left|F_A - F_V\right| < 0.49$, CL = 90%

$K^+ \to \mu^+ \nu_\mu \gamma$ $\left|F_A - F_V\right| = -0.24$ to 0.04, CL = 90%

Charge radius

$\langle r \rangle = 0.560 \pm 0.031$ fm

Forward-backward asymmetry

$A_{FB}(K^\pm_{\pi\mu\mu}) = \frac{\Gamma(cos(\theta_{K\mu})>0)-\Gamma(cos(\theta_{K\mu})<0)}{\Gamma(cos(\theta_{K\mu})>0)+\Gamma(cos(\theta_{K\mu})<0)} < 2.3 \times 10^{-2}$, CL = 90%

K^- modes are charge conjugates of the modes below.

K^+ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Leptonic and semileptonic modes			
$e^+ \nu_e$	(1.582±0.007) × 10^{-5}		247
$\mu^+ \nu_\mu$	(63.56 ±0.11) %	S=1.2	236
$\pi^0 e^+ \nu_e$	(5.07 ±0.04) %	S=2.1	228
Called K^+_{e3}.			
$\pi^0 \mu^+ \nu_\mu$	(3.352±0.033) %	S=1.9	215
Called $K^+_{\mu 3}$.			
$\pi^0 \pi^0 e^+ \nu_e$	(2.55 ±0.04) × 10^{-5}	S=1.1	206
$\pi^+ \pi^- e^+ \nu_e$	(4.247±0.024) × 10^{-5}		203
$\pi^+ \pi^- \mu^+ \nu_\mu$	(1.4 ±0.9) × 10^{-5}		151
$\pi^0 \pi^0 \pi^0 e^+ \nu_e$	< 3.5 × 10^{-6}	CL=90%	135

Hadronic modes

$\pi^+\pi^0$		(	20.67	± 0.08) %		S=1.2	205
$\pi^+\pi^0\pi^0$		(	1.760	± 0.023) %		S=1.1	133
$\pi^+\pi^+\pi^-$		(	5.583	± 0.024) %			125

Leptonic and semileptonic modes with photons

$\mu^+\nu_\mu\gamma$	[z,aa]	(	6.2	± 0.8)	$\times 10^{-3}$		236
$\mu^+\nu_\mu\gamma(\mathrm{SD}^+)$	[a,bb]	(	1.33	± 0.22)	$\times 10^{-5}$		–
$\mu^+\nu_\mu\gamma(\mathrm{SD}^+\mathrm{INT})$	[a,bb]	<	2.7		$\times 10^{-5}$	CL=90%	–
$\mu^+\nu_\mu\gamma(\mathrm{SD}^- + \mathrm{SD}^-\mathrm{INT})$	[a,bb]	<	2.6		$\times 10^{-4}$	CL=90%	–
$e^+\nu_e\gamma$		(	9.4	± 0.4)	$\times 10^{-6}$		247
$\pi^0 e^+\nu_e\gamma$	[z,aa]	(	2.56	± 0.16)	$\times 10^{-4}$		228
$\pi^0 e^+\nu_e\gamma(\mathrm{SD})$	[a,bb]	<	5.3		$\times 10^{-5}$	CL=90%	228
$\pi^0\mu^+\nu_\mu\gamma$	[z,aa]	(	1.25	± 0.25)	$\times 10^{-5}$		215
$\pi^0\pi^0 e^+\nu_e\gamma$		<	5		$\times 10^{-6}$	CL=90%	206

Hadronic modes with photons or $\ell\overline{\ell}$ pairs

$\pi^+\pi^0\gamma(\mathrm{INT})$		(–	4.2	± 0.9)	$\times 10^{-6}$		–
$\pi^+\pi^0\gamma(\mathrm{DE})$	[z,cc]	(	6.0	± 0.4)	$\times 10^{-6}$		205
$\pi^+\pi^0\pi^0\gamma$	[z,aa]	(	7.6	$^{+6.0}_{-3.0}$)	$\times 10^{-6}$		133
$\pi^+\pi^+\pi^-\gamma$	[z,aa]	(	1.04	± 0.31)	$\times 10^{-4}$		125
$\pi^+\gamma\gamma$	[z]	(	1.01	± 0.06)	$\times 10^{-6}$		227
$\pi^+ 3\gamma$	[z]	<	1.0		$\times 10^{-4}$	CL=90%	227
$\pi^+ e^+ e^-\gamma$		(	1.19	± 0.13)	$\times 10^{-8}$		227

Leptonic modes with $\ell\overline{\ell}$ pairs

$e^+\nu_e\nu\overline{\nu}$		<	6		$\times 10^{-5}$	CL=90%	247
$\mu^+\nu_\mu\nu\overline{\nu}$		<	6.0		$\times 10^{-6}$	CL=90%	236
$e^+\nu_e e^+ e^-$		(	2.48	± 0.20)	$\times 10^{-8}$		247
$\mu^+\nu_\mu e^+ e^-$		(	7.06	± 0.31)	$\times 10^{-8}$		236
$e^+\nu_e\mu^+\mu^-$		(	1.7	± 0.5)	$\times 10^{-8}$		223
$\mu^+\nu_\mu\mu^+\mu^-$		<	4.1		$\times 10^{-7}$	CL=90%	185

Lepton family number (LF), Lepton number (L), $\Delta S = \Delta Q$ (SQ) violating modes, or $\Delta S = 1$ weak neutral current ($S1$) modes

$\pi^+\pi^+ e^-\overline{\nu}_e$	SQ		<	1.3		$\times 10^{-8}$	CL=90%	203
$\pi^+\pi^+\mu^-\overline{\nu}_\mu$	SQ		<	3.0		$\times 10^{-6}$	CL=95%	151
$\pi^+ e^+ e^-$	$S1$		(	3.00	± 0.09)	$\times 10^{-7}$		227
$\pi^+\mu^+\mu^-$	$S1$		(	9.4	± 0.6)	$\times 10^{-8}$	S=2.6	172
$\pi^+\nu\overline{\nu}$	$S1$		(	1.7	± 1.1)	$\times 10^{-10}$		227
$\pi^+\pi^0\nu\overline{\nu}$	$S1$		<	4.3		$\times 10^{-5}$	CL=90%	205
$\mu^-\nu e^+ e^+$	LF		<	2.1		$\times 10^{-8}$	CL=90%	236
$\mu^+\nu_e$	LF	[d]	<	4		$\times 10^{-3}$	CL=90%	236

$\pi^+ \mu^+ e^-$	LF	$<$	1.3	$\times 10^{-11}$	CL=90%	214
$\pi^+ \mu^- e^+$	LF	$<$	5.2	$\times 10^{-10}$	CL=90%	214
$\pi^- \mu^+ e^+$	L	$<$	5.0	$\times 10^{-10}$	CL=90%	214
$\pi^- e^+ e^+$	L	$<$	6.4	$\times 10^{-10}$	CL=90%	227
$\pi^- \mu^+ \mu^+$	L	[d] $<$	1.1	$\times 10^{-9}$	CL=90%	172
$\mu^+ \overline{\nu}_e$	L	[d] $<$	3.3	$\times 10^{-3}$	CL=90%	236
$\pi^0 e^+ \overline{\nu}_e$	L	$<$	3	$\times 10^{-3}$	CL=90%	228
$\pi^+ \gamma$		[dd] $<$	2.3	$\times 10^{-9}$	CL=90%	227

K^0

$I(J^P) = \frac{1}{2}(0^-)$

50% K_S, 50% K_L

Mass $m = 497.611 \pm 0.013$ MeV (S = 1.2)

$m_{K^0} - m_{K^\pm} = 3.934 \pm 0.020$ MeV (S = 1.6)

Mean square charge radius

$\langle r^2 \rangle = -0.077 \pm 0.010$ fm^2

T-violation parameters in K^0-$\overline{K}^0$ mixing [y]

Asymmetry A_T in K^0-$\overline{K}^0$ mixing $= (6.6 \pm 1.6) \times 10^{-3}$

CP-violation parameters

Re(ϵ) $= (1.596 \pm 0.013) \times 10^{-3}$

CPT-violation parameters [y]

Re $\delta = (2.5 \pm 2.3) \times 10^{-4}$

Im $\delta = (-1.5 \pm 1.6) \times 10^{-5}$

Re(y), K_{e3} parameter $= (0.4 \pm 2.5) \times 10^{-3}$

Re(x$_-$), K_{e3} parameter $= (-2.9 \pm 2.0) \times 10^{-3}$

$\left| m_{K^0} - m_{\overline{K}^0} \right| / m_{\text{average}} < 6 \times 10^{-19}$, CL = 90% [ee]

$(\Gamma_{K^0} - \Gamma_{\overline{K}^0})/m_{\text{average}} = (8 \pm 8) \times 10^{-18}$

Tests of $\Delta S = \Delta Q$

Re(x$_+$), K_{e3} parameter $= (-0.9 \pm 3.0) \times 10^{-3}$

K^0_S

$I(J^P) = \frac{1}{2}(0^-)$

Mean life $\tau = (0.8954 \pm 0.0004) \times 10^{-10}$ s (S = 1.1) Assuming CPT

Mean life $\tau = (0.89564 \pm 0.00033) \times 10^{-10}$ s Not assuming CPT

$c\tau = 2.6844$ cm Assuming CPT

CP-violation parameters [*ff*]

$\mathrm{Im}(\eta_{+-0}) = -0.002 \pm 0.009$
$\mathrm{Im}(\eta_{000}) = -0.001 \pm 0.016$
$|\eta_{000}| = |A(K_S^0 \to 3\pi^0)/A(K_L^0 \to 3\pi^0)| < 0.0088$, CL = 90%
CP asymmetry A in $\pi^+\pi^- e^+ e^- = (-0.4 \pm 0.8)\%$

K_S^0 DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Hadronic modes				
$\pi^0\pi^0$		(30.69±0.05) %		209
$\pi^+\pi^-$		(69.20±0.05) %		206
$\pi^+\pi^-\pi^0$		$(3.5\ ^{+1.1}_{-0.9}) \times 10^{-7}$		133
Modes with photons or $\ell\bar{\ell}$ pairs				
$\pi^+\pi^-\gamma$	[*aa*,*gg*]	$(1.79\pm0.05) \times 10^{-3}$		206
$\pi^+\pi^- e^+ e^-$		$(4.79\pm0.15) \times 10^{-5}$		206
$\pi^0\gamma\gamma$	[*gg*]	$(4.9 \pm1.8) \times 10^{-8}$		230
$\gamma\gamma$		$(2.63\pm0.17) \times 10^{-6}$	S=3.0	249
Semileptonic modes				
$\pi^\pm e^\mp \nu_e$	[*hh*]	$(7.04\pm0.08) \times 10^{-4}$		229
***CP* violating (*CP*) and $\Delta S = 1$ weak neutral current (*S1*) modes**				
$3\pi^0$	*CP*	$< 2.6 \times 10^{-8}$	CL=90%	139
$\mu^+\mu^-$	*S1*	$< 9 \times 10^{-9}$	CL=90%	225
$e^+ e^-$	*S1*	$< 9 \times 10^{-9}$	CL=90%	249
$\pi^0 e^+ e^-$	*S1* [*gg*]	$(3.0\ ^{+1.5}_{-1.2}) \times 10^{-9}$		230
$\pi^0\mu^+\mu^-$	*S1*	$(2.9\ ^{+1.5}_{-1.2}) \times 10^{-9}$		177

K_L^0

$I(J^P) = \frac{1}{2}(0^-)$

$m_{K_L} - m_{K_S}$
$= (0.5293 \pm 0.0009) \times 10^{10}\ \hbar\ \mathrm{s}^{-1}$ (S = 1.3) Assuming *CPT*
$= (3.484 \pm 0.006) \times 10^{-12}$ MeV Assuming *CPT*
$= (0.5289 \pm 0.0010) \times 10^{10}\ \hbar\ \mathrm{s}^{-1}$ Not assuming *CPT*
Mean life $\tau = (5.116 \pm 0.021) \times 10^{-8}$ s (S = 1.1)
$c\tau = 15.34$ m

Slope parameters [x]

(See Particle Listings for other linear and quadratic coefficients)

$K_L^0 \to \pi^+\pi^-\pi^0$: $g = 0.678 \pm 0.008$ (S = 1.5)
$K_L^0 \to \pi^+\pi^-\pi^0$: $h = 0.076 \pm 0.006$
$K_L^0 \to \pi^+\pi^-\pi^0$: $k = 0.0099 \pm 0.0015$
$K_L^0 \to \pi^0\pi^0\pi^0$: $h = (0.6 \pm 1.2) \times 10^{-3}$

K_L decay form factors [y]

Linear parametrization assuming μ-e universality

$\lambda_+(K^0_{\mu 3}) = \lambda_+(K^0_{e3}) = (2.82 \pm 0.04) \times 10^{-2}$ (S = 1.1)
$\lambda_0(K^0_{\mu 3}) = (1.38 \pm 0.18) \times 10^{-2}$ (S = 2.2)

Quadratic parametrization assuming μ-e universality

$\lambda'_+(K^0_{\mu 3}) = \lambda'_+(K^0_{e3}) = (2.40 \pm 0.12) \times 10^{-2}$ (S = 1.2)
$\lambda''_+(K^0_{\mu 3}) = \lambda''_+(K^0_{e3}) = (0.20 \pm 0.05) \times 10^{-2}$ (S = 1.2)
$\lambda_0(K^0_{\mu 3}) = (1.16 \pm 0.09) \times 10^{-2}$ (S = 1.2)

Pole parametrization assuming μ-e universality

$M_V^{\mu}\ (K^0_{\mu 3}) = M_V^{e}\ (K^0_{e3}) = 878 \pm 6$ MeV (S = 1.1)
$M_S^{\mu}\ (K^0_{\mu 3}) = 1252 \pm 90$ MeV (S = 2.6)

Dispersive parametrization assuming μ-e universality

$\Lambda_+ = (0.251 \pm 0.006) \times 10^{-1}$ (S = 1.5)
$\ln(C) = (1.75 \pm 0.18) \times 10^{-1}$ (S = 2.0)

K^0_{e3} $|f_S/f_+| = (1.5^{+1.4}_{-1.6}) \times 10^{-2}$
K^0_{e3} $|f_T/f_+| = (5^{+4}_{-5}) \times 10^{-2}$
$K^0_{\mu 3}$ $|f_T/f_+| = (12 \pm 12) \times 10^{-2}$

$K_L \to \ell^+\ell^-\gamma$, $K_L \to \ell^+\ell^-\ell'^+\ell'^-$: $\alpha_{K^*} = -0.205 \pm 0.022$ (S = 1.8)
$K_L^0 \to \ell^+\ell^-\gamma$, $K_L^0 \to \ell^+\ell^-\ell'^+\ell'^-$: $\alpha_{DIP} = -1.69 \pm 0.08$ (S = 1.7)
$K_L \to \pi^+\pi^- e^+ e^-$: $a_1/a_2 = -0.737 \pm 0.014$ GeV^2
$K_L \to \pi^0 2\gamma$: $a_V = -0.43 \pm 0.06$ (S = 1.5)

CP-violation parameters [ff]

$A_L = (0.332 \pm 0.006)\%$
$|\eta_{00}| = (2.220 \pm 0.011) \times 10^{-3}$ (S = 1.8)
$|\eta_{+-}| = (2.232 \pm 0.011) \times 10^{-3}$ (S = 1.8)
$|\epsilon| = (2.228 \pm 0.011) \times 10^{-3}$ (S = 1.8)
$|\eta_{00}/\eta_{+-}| = 0.9950 \pm 0.0007$ [ii] (S = 1.6)
$\mathrm{Re}(\epsilon'/\epsilon) = (1.66 \pm 0.23) \times 10^{-3}$ [ii] (S = 1.6)

Assuming *CPT*

$\phi_{+-} = (43.51 \pm 0.05)^\circ$ (S = 1.2)
$\phi_{00} = (43.52 \pm 0.05)^\circ$ (S = 1.3)
$\phi_\epsilon = \phi_{SW} = (43.52 \pm 0.05)^\circ$ (S = 1.2)
$\mathrm{Im}(\epsilon'/\epsilon) = -(\phi_{00} - \phi_{+-})/3 = (-0.002 \pm 0.005)^\circ$ (S = 1.7)

Not assuming *CPT*

$\phi_{+-} = (43.4 \pm 0.5)^\circ$ (S = 1.2)
$\phi_{00} = (43.7 \pm 0.6)^\circ$ (S = 1.2)
$\phi_\epsilon = (43.5 \pm 0.5)^\circ$ (S = 1.3)

CP asymmetry *A* in $K_L^0 \to \pi^+\pi^- e^+ e^- = (13.7 \pm 1.5)\%$
β_{CP} from $K_L^0 \to e^+ e^- e^+ e^- = -0.19 \pm 0.07$
γ_{CP} from $K_L^0 \to e^+ e^- e^+ e^- = 0.01 \pm 0.11$ (S = 1.6)
j for $K_L^0 \to \pi^+\pi^-\pi^0 = 0.0012 \pm 0.0008$
f for $K_L^0 \to \pi^+\pi^-\pi^0 = 0.004 \pm 0.006$
$|\eta_{+-\gamma}| = (2.35 \pm 0.07) \times 10^{-3}$
$\phi_{+-\gamma} = (44 \pm 4)^\circ$
$|\epsilon'_{+-\gamma}|/\epsilon < 0.3$, CL = 90%
$|g_{E1}|$ for $K_L^0 \to \pi^+\pi^-\gamma < 0.21$, CL = 90%

T-violation parameters

$\mathrm{Im}(\xi)$ in $K^0_{\mu 3} = -0.007 \pm 0.026$

CPT invariance tests

$\phi_{00} - \phi_{+-} = (0.34 \pm 0.32)^\circ$
$\mathrm{Re}(\frac{2}{3}\eta_{+-} + \frac{1}{3}\eta_{00}) - \frac{A_L}{2} = (-3 \pm 35) \times 10^{-6}$

$\Delta S = -\Delta Q$ in $K^0_{\ell 3}$ decay

Re $x = -0.002 \pm 0.006$
Im $x = 0.0012 \pm 0.0021$

K^0_L DECAY MODES			Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Semileptonic modes					
$\pi^\pm e^\mp \nu_e$ Called K^0_{e3}.		[hh]	(40.55 ±0.11) %	S=1.7	229
$\pi^\pm \mu^\mp \nu_\mu$ Called $K^0_{\mu 3}$.		[hh]	(27.04 ±0.07) %	S=1.1	216
$(\pi\mu\text{atom})\nu$			(1.05 ±0.11) × 10^{-7}		188
$\pi^0\pi^\pm e^\mp \nu$		[hh]	(5.20 ±0.11) × 10^{-5}		207
$\pi^\pm e^\mp \nu e^+ e^-$		[hh]	(1.26 ±0.04) × 10^{-5}		229
Hadronic modes, including Charge conjugation×Parity Violating (*CPV*) modes					
$3\pi^0$			(19.52 ±0.12) %	S=1.6	139
$\pi^+\pi^-\pi^0$			(12.54 ±0.05) %		133
$\pi^+\pi^-$	*CPV*	[jj]	(1.967±0.010) × 10^{-3}	S=1.5	206
$\pi^0\pi^0$	*CPV*		(8.64 ±0.06) × 10^{-4}	S=1.8	209
Semileptonic modes with photons					
$\pi^\pm e^\mp \nu_e \gamma$		[aa,hh,kk]	(3.79 ±0.06) × 10^{-3}		229
$\pi^\pm \mu^\mp \nu_\mu \gamma$			(5.65 ±0.23) × 10^{-4}		216
Hadronic modes with photons or $\ell\bar{\ell}$ pairs					
$\pi^0\pi^0\gamma$			< 2.43 × 10^{-7}	CL=90%	209
$\pi^+\pi^-\gamma$		[aa,kk]	(4.15 ±0.15) × 10^{-5}	S=2.8	206
$\pi^+\pi^-\gamma$(DE)			(2.84 ±0.11) × 10^{-5}	S=2.0	206
$\pi^0 2\gamma$		[kk]	(1.273±0.033) × 10^{-6}		230
$\pi^0\gamma e^+ e^-$			(1.62 ±0.17) × 10^{-8}		230
Other modes with photons or $\ell\bar{\ell}$ pairs					
2γ			(5.47 ±0.04) × 10^{-4}	S=1.1	249
3γ			< 7.4 × 10^{-8}	CL=90%	249
$e^+ e^-\gamma$			(9.4 ±0.4) × 10^{-6}	S=2.0	249
$\mu^+\mu^-\gamma$			(3.59 ±0.11) × 10^{-7}	S=1.3	225
$e^+ e^-\gamma\gamma$		[kk]	(5.95 ±0.33) × 10^{-7}		249
$\mu^+\mu^-\gamma\gamma$		[kk]	(1.0 $^{+0.8}_{-0.6}$) × 10^{-8}		225
Charge conjugation × Parity (*CP*) or Lepton Family number (*LF*) violating modes, or $\Delta S = 1$ weak neutral current (*S1*) modes					
$\mu^+\mu^-$	*S1*		(6.84 ±0.11) × 10^{-9}		225
$e^+ e^-$	*S1*		(9 $^{+6}_{-4}$) × 10^{-12}		249
$\pi^+\pi^- e^+ e^-$	*S1*	[kk]	(3.11 ±0.19) × 10^{-7}		206
$\pi^0\pi^0 e^+ e^-$	*S1*		< 6.6 × 10^{-9}	CL=90%	209
$\pi^0\pi^0\mu^+\mu^-$	*S1*		< 9.2 × 10^{-11}	CL=90%	57
$\mu^+\mu^- e^+ e^-$	*S1*		(2.69 ±0.27) × 10^{-9}		225

$e^+ e^- e^+ e^-$	*S1*	(3.56 ±0.21)	$\times 10^{-8}$			249
$\pi^0 \mu^+ \mu^-$	*CP,S1*	[*l*] < 3.8	$\times 10^{-10}$	CL=90%		177
$\pi^0 e^+ e^-$	*CP,S1*	[*l*] < 2.8	$\times 10^{-10}$	CL=90%		230
$\pi^0 \nu\overline{\nu}$	*CP,S1*	[*nn*] < 2.6	$\times 10^{-8}$	CL=90%		230
$\pi^0 \pi^0 \nu\overline{\nu}$	*S1*	< 8.1	$\times 10^{-7}$	CL=90%		209
$e^\pm \mu^\mp$	*LF*	[*hh*] < 4.7	$\times 10^{-12}$	CL=90%		238
$e^\pm e^\pm \mu^\mp \mu^\mp$	*LF*	[*hh*] < 4.12	$\times 10^{-11}$	CL=90%		225
$\pi^0 \mu^\pm e^\mp$	*LF*	[*hh*] < 7.6	$\times 10^{-11}$	CL=90%		217
$\pi^0 \pi^0 \mu^\pm e^\mp$	*LF*	< 1.7	$\times 10^{-10}$	CL=90%		159

$K^*(892)$

$I(J^P) = \frac{1}{2}(1^-)$

$K^*(892)^\pm$ hadroproduced mass $m = 891.66 \pm 0.26$ MeV
$K^*(892)^\pm$ in τ decays mass $m = 895.5 \pm 0.8$ MeV
$K^*(892)^0$ mass $m = 895.81 \pm 0.19$ MeV (S = 1.4)
$K^*(892)^\pm$ hadroproduced full width $\Gamma = 50.8 \pm 0.9$ MeV
$K^*(892)^\pm$ in τ decays full width $\Gamma = 46.2 \pm 1.3$ MeV
$K^*(892)^0$ full width $\Gamma = 47.4 \pm 0.6$ MeV (S = 2.2)

$K^*(892)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$K\pi$	~ 100 %		289
$K^0\gamma$	(2.46±0.21) $\times 10^{-3}$		307
$K^\pm\gamma$	(9.9 ±0.9) $\times 10^{-4}$		309
$K\pi\pi$	< 7 $\times 10^{-4}$	95%	223

$K_1(1270)$

$I(J^P) = \frac{1}{2}(1^+)$

Mass $m = 1272 \pm 7$ MeV [*l*]
Full width $\Gamma = 90 \pm 20$ MeV [*l*]

$K_1(1270)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\rho$	(42 ±6) %	46
$K_0^*(1430)\pi$	(28 ±4) %	†
$K^*(892)\pi$	(16 ±5) %	302
$K\omega$	(11.0±2.0) %	†
$K f_0(1370)$	(3.0±2.0) %	†
γK^0	seen	539

$K_1(1400)$

$I(J^P) = \frac{1}{2}(1^+)$

Mass $m = 1403 \pm 7$ MeV
Full width $\Gamma = 174 \pm 13$ MeV (S = 1.6)

$K_1(1400)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K^*(892)\pi$	(94 ±6) %	402
$K\rho$	(3.0±3.0) %	293
$K f_0(1370)$	(2.0±2.0) %	†
$K\omega$	(1.0±1.0) %	284
$K_0^*(1430)\pi$	not seen	†
γK^0	seen	613

$K^*(1410)$

$I(J^P) = \frac{1}{2}(1^-)$

Mass $m = 1414 \pm 15$ MeV (S = 1.3)
Full width $\Gamma = 232 \pm 21$ MeV (S = 1.1)

$K^*(1410)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$K^*(892)\pi$	> 40 %	95%	410
$K\pi$	(6.6±1.3) %		612
$K\rho$	< 7 %	95%	305
γK^0	seen		619

$K_0^*(1430)$ [oo]

$I(J^P) = \frac{1}{2}(0^+)$

Mass $m = 1425 \pm 50$ MeV
Full width $\Gamma = 270 \pm 80$ MeV

$K_0^*(1430)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\pi$	(93 ±10) %	619
$K\eta$	($8.6^{+\ 2.7}_{-\ 3.4}$) %	486
$K\eta'(958)$	seen	†

$K_2^*(1430)$

$I(J^P) = \frac{1}{2}(2^+)$

$K_2^*(1430)^\pm$ mass $m = 1425.6 \pm 1.5$ MeV (S = 1.1)
$K_2^*(1430)^0$ mass $m = 1432.4 \pm 1.3$ MeV
$K_2^*(1430)^\pm$ full width $\Gamma = 98.5 \pm 2.7$ MeV (S = 1.1)
$K_2^*(1430)^0$ full width $\Gamma = 109 \pm 5$ MeV (S = 1.9)

$K_2^*(1430)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$K\pi$	(49.9±1.2) %		619
$K^*(892)\pi$	(24.7±1.5) %		419
$K^*(892)\pi\pi$	(13.4±2.2) %		372
$K\rho$	(8.7±0.8) %	S=1.2	318
$K\omega$	(2.9±0.8) %		311
$K^+\gamma$	(2.4±0.5) $\times 10^{-3}$	S=1.1	627
$K\eta$	($1.5^{+3.4}_{-1.0}$) $\times 10^{-3}$	S=1.3	486
$K\omega\pi$	$<$ 7.2 $\times 10^{-4}$	CL=95%	100
$K^0\gamma$	$<$ 9 $\times 10^{-4}$	CL=90%	626

$K^*(1680)$

$I(J^P) = \frac{1}{2}(1^-)$

Mass $m = 1717 \pm 27$ MeV (S = 1.4)
Full width $\Gamma = 322 \pm 110$ MeV (S = 4.2)

$K^*(1680)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\pi$	(38.7±2.5) %	781
$K\rho$	($31.4^{+5.0}_{-2.1}$) %	571
$K^*(892)\pi$	($29.9^{+2.2}_{-5.0}$) %	618

$K_2(1770)$ [pp]

$I(J^P) = \frac{1}{2}(2^-)$

Mass $m = 1773 \pm 8$ MeV
Full width $\Gamma = 186 \pm 14$ MeV

$K_2(1770)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\pi\pi$		794
$K_2^*(1430)\pi$	dominant	288
$K^*(892)\pi$	seen	654
$Kf_2(1270)$	seen	52
$K\phi$	seen	441
$K\omega$	seen	607

$K_3^*(1780)$

$I(J^P) = \frac{1}{2}(3^-)$

Mass $m = 1776 \pm 7$ MeV (S = 1.1)
Full width $\Gamma = 159 \pm 21$ MeV (S = 1.3)

$K_3^*(1780)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$K\rho$	(31 ± 9) %		613
$K^*(892)\pi$	(20 ± 5) %		656
$K\pi$	(18.8± 1.0) %		813
$K\eta$	(30 ±13) %		719
$K_2^*(1430)\pi$	< 16 %	95%	291

$K_2(1820)$ [qq]

$I(J^P) = \frac{1}{2}(2^-)$

Mass $m = 1816 \pm 13$ MeV
Full width $\Gamma = 276 \pm 35$ MeV

$K_2(1820)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K_2^*(1430)\pi$	seen	327
$K^*(892)\pi$	seen	681
$Kf_2(1270)$	seen	185
$K\omega$	seen	638

$K_4^*(2045)$

$I(J^P) = \frac{1}{2}(4^+)$

Mass $m = 2045 \pm 9$ MeV (S = 1.1)
Full width $\Gamma = 198 \pm 30$ MeV

$K_4^*(2045)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\pi$	(9.9±1.2) %	958
$K^*(892)\pi\pi$	(9 ±5) %	802
$K^*(892)\pi\pi\pi$	(7 ±5) %	768
$\rho K\pi$	(5.7±3.2) %	741
$\omega K\pi$	(5.0±3.0) %	738
$\phi K\pi$	(2.8±1.4) %	594
$\phi K^*(892)$	(1.4±0.7) %	363

CHARMED MESONS ($C = \pm 1$)

$D^+ = c\overline{d}$, $D^0 = c\overline{u}$, $\overline{D}^0 = \overline{c}u$, $D^- = \overline{c}d$, similarly for D^*'s

$D^\pm$

$I(J^P) = \frac{1}{2}(0^-)$

Mass $m = 1869.58 \pm 0.09$ MeV
Mean life $\tau = (1040 \pm 7) \times 10^{-15}$ s
$c\tau = 311.8$ μm

c-quark decays

$\Gamma(c \to \ \ell^+ \text{anything})/\Gamma(c \to \ \text{anything}) = 0.096 \pm 0.004$ [rr]
$\Gamma(c \to \ D^*(2010)^+ \text{anything})/\Gamma(c \to \ \text{anything}) = 0.255 \pm 0.017$

CP-violation decay-rate asymmetries

$A_{CP}(\mu^\pm\nu) = (8 \pm 8)\%$
$A_{CP}(K^0_L e^\pm \nu) = (-0.6 \pm 1.6)\%$
$A_{CP}(K^0_S \pi^\pm) = (-0.41 \pm 0.09)\%$
$A_{CP}(K^\mp 2\pi^\pm) = (-0.18 \pm 0.16)\%$
$A_{CP}(K^\mp \pi^\pm \pi^\pm \pi^0) = (-0.3 \pm 0.7)\%$
$A_{CP}(K^0_S \pi^\pm \pi^0) = (-0.1 \pm 0.7)\%$
$A_{CP}(K^0_S \pi^\pm \pi^+ \pi^-) = (0.0 \pm 1.2)\%$
$A_{CP}(\pi^\pm \pi^0) = (2.9 \pm 2.9)\%$
$A_{CP}(\pi^\pm \eta) = (1.0 \pm 1.5)\%$ (S = 1.4)
$A_{CP}(\pi^\pm \eta'(958)) = (-0.5 \pm 1.2)\%$ (S = 1.1)
$A_{CP}(\overline{K}^0 / K^0 K^\pm) = (0.11 \pm 0.17)\%$
$A_{CP}(K^0_S K^\pm) = (-0.11 \pm 0.25)\%$
$A_{CP}(K^+ K^- \pi^\pm) = (0.37 \pm 0.29)\%$
$A_{CP}(K^\pm K^{*0}) = (-0.3 \pm 0.4)\%$
$A_{CP}(\phi\pi^\pm) = (0.09 \pm 0.19)\%$ (S = 1.2)
$A_{CP}(K^\pm K^*_0(1430)^0) = (8^{+7}_{-6})\%$
$A_{CP}(K^\pm K^*_2(1430)^0) = (43^{+20}_{-26})\%$
$A_{CP}(K^\pm K^*_0(800)) = (-12^{+18}_{-13})\%$
$A_{CP}(a_0(1450)^0 \pi^\pm) = (-19^{+14}_{-16})\%$
$A_{CP}(\phi(1680)\pi^\pm) = (-9 \pm 26)\%$
$A_{CP}(\pi^+\pi^-\pi^\pm) = (-2 \pm 4)\%$
$A_{CP}(K^0_S K^\pm \pi^+ \pi^-) = (-4 \pm 7)\%$
$A_{CP}(K^\pm \pi^0) = (-4 \pm 11)\%$

χ^2 tests of *CP*-violation (*CPV*)

Local *CPV* in $D^\pm \to \pi^+\pi^-\pi^\pm = 78.1\%$
Local *CPV* in $D^\pm \to K^+K^-\pi^\pm = 31\%$

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

$A_T(K^0_S K^\pm \pi^+\pi^-) = (-12 \pm 11) \times 10^{-3}$ [ss]

D^+ form factors

$f_+(0)|V_{cs}|$ in $\overline{K}^0 \ell^+ \nu_\ell = 0.725 \pm 0.015$ (S = 1.7)
$r_1 \equiv a_1/a_0$ in $\overline{K}^0 \ell^+ \nu_\ell = -1.8 \pm 0.4$
$r_2 \equiv a_2/a_0$ in $\overline{K}^0 \ell^+ \nu_\ell = -3 \pm 12$ (S = 1.5)
$f_+(0)|V_{cd}|$ in $\pi^0 \ell^+ \nu_\ell = 0.146 \pm 0.007$
$r_1 \equiv a_1/a_0$ in $\pi^0 \ell^+ \nu_\ell = -1.4 \pm 0.9$
$r_2 \equiv a_2/a_0$ in $\pi^0 \ell^+ \nu_\ell = -4 \pm 5$
$f_+(0)|V_{cd}|$ in $D^+ \to \eta e^+ \nu_e = 0.086 \pm 0.006$
$r_1 \equiv a_1/a_0$ in $D^+ \to \eta e^+ \nu_e = -1.8 \pm 2.2$
$r_v \equiv V(0)/A_1(0)$ in $D^+ \to \omega e^+ \nu_e = 1.24 \pm 0.11$
$r_2 \equiv A_2(0)/A_1(0)$ in $D^+ \to \omega e^+ \nu_e = 1.06 \pm 0.16$
$r_v \equiv V(0)/A_1(0)$ in $D^+, D^0 \to \rho e^+ \nu_e = 1.48 \pm 0.16$
$r_2 \equiv A_2(0)/A_1(0)$ in $D^+, D^0 \to \rho e^+ \nu_e = 0.83 \pm 0.12$
$r_v \equiv V(0)/A_1(0)$ in $\overline{K}^*(892)^0 \ell^+ \nu_\ell = 1.51 \pm 0.07$ (S = 2.2)
$r_2 \equiv A_2(0)/A_1(0)$ in $\overline{K}^*(892)^0 \ell^+ \nu_\ell = 0.807 \pm 0.025$
$r_3 \equiv A_3(0)/A_1(0)$ in $\overline{K}^*(892)^0 \ell^+ \nu_\ell = 0.0 \pm 0.4$
Γ_L/Γ_T in $\overline{K}^*(892)^0 \ell^+ \nu_\ell = 1.13 \pm 0.08$
Γ_+/Γ_- in $\overline{K}^*(892)^0 \ell^+ \nu_\ell = 0.22 \pm 0.06$ (S = 1.6)

Most decay modes (other than the semileptonic modes) that involve a neutral K meson are now given as K^0_S modes, not as $\overline{K}^0$ modes. Nearly always it is a K^0_S that is measured, and interference between Cabibbo-allowed and doubly Cabibbo-suppressed modes can invalidate the assumption that $2\,\Gamma(K^0_S) = \Gamma(\overline{K}^0)$.

D^+ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Inclusive modes			
e^+ semileptonic	(16.07 ± 0.30) %		–
μ^+ anything	(17.6 ± 3.2) %		–
K^- anything	(25.7 ± 1.4) %		–
$\overline{K}^0$ anything + K^0 anything	(61 ± 5) %		–
K^+ anything	(5.9 ± 0.8) %		–
$K^*(892)^-$ anything	(6 ± 5) %		–
$\overline{K}^*(892)^0$ anything	(23 ± 5) %		–
$K^*(892)^0$ anything	< 6.6 %	CL=90%	–

η anything	(6.3 ± 0.7) %			–
η' anything	(1.04± 0.18) %			–
ϕ anything	(1.03± 0.12) %			–

Leptonic and semileptonic modes

$e^+\nu_e$	< 8.8	$\times 10^{-6}$	CL=90%	935
$\mu^+\nu_\mu$	(3.74± 0.17)	$\times 10^{-4}$		932
$\tau^+\nu_\tau$	< 1.2	$\times 10^{-3}$	CL=90%	90
$\overline{K}^0 e^+\nu_e$	(8.90± 0.15) %			869
$\overline{K}^0\mu^+\nu_\mu$	(9.3 ± 0.7) %			865
$K^-\pi^+ e^+\nu_e$	(3.91± 0.11) %			864
$\overline{K}^*(892)^0 e^+\nu_e$, $\overline{K}^*(892)^0 \to K^-\pi^+$	(3.68± 0.10) %			722
$(K^-\pi^+)_{S-wave}\, e^+\nu_e$	(2.26± 0.11)	$\times 10^{-3}$		–
$\overline{K}^*(1410)^0 e^+\nu_e$, $\overline{K}^*(1410)^0 \to K^-\pi^+$	< 6	$\times 10^{-3}$	CL=90%	–
$\overline{K}_2^*(1430)^0 e^+\nu_e$, $\overline{K}_2^*(1430)^0 \to K^-\pi^+$	< 5	$\times 10^{-4}$	CL=90%	–
$K^-\pi^+ e^+\nu_e$ nonresonant	< 7	$\times 10^{-3}$	CL=90%	864
$K^-\pi^+\mu^+\nu_\mu$	(3.9 ± 0.4) %			851
$\overline{K}^*(892)^0\mu^+\nu_\mu$, $\overline{K}^*(892)^0 \to K^-\pi^+$	(3.52± 0.10) %			717
$K^-\pi^+\mu^+\nu_\mu$ nonresonant	(2.1 ± 0.5)	$\times 10^{-3}$		851
$K^-\pi^+\pi^0\mu^+\nu_\mu$	< 1.6	$\times 10^{-3}$	CL=90%	825
$\pi^0 e^+\nu_e$	(4.05± 0.18)	$\times 10^{-3}$		930
$\eta e^+\nu_e$	(1.14± 0.10)	$\times 10^{-3}$		855
$\rho^0 e^+\nu_e$	($2.18^{+\ 0.17}_{-\ 0.25}$)	$\times 10^{-3}$		774
$\rho^0\mu^+\nu_\mu$	(2.4 ± 0.4)	$\times 10^{-3}$		770
$\omega e^+\nu_e$	(1.69± 0.11)	$\times 10^{-3}$		771
$\eta'(958) e^+\nu_e$	(2.2 ± 0.5)	$\times 10^{-4}$		689
$\phi e^+\nu_e$	< 1.3	$\times 10^{-5}$	CL=90%	657

Fractions of some of the following modes with resonances have already appeared above as submodes of particular charged-particle modes.

$\overline{K}^*(892)^0 e^+\nu_e$	(5.52± 0.15) %			722
$\overline{K}^*(892)^0\mu^+\nu_\mu$	(5.30± 0.15) %			717
$\overline{K}_0^*(1430)^0\mu^+\nu_\mu$	< 2.5	$\times 10^{-4}$	CL=90%	380
$\overline{K}^*(1680)^0\mu^+\nu_\mu$	< 1.6	$\times 10^{-3}$	CL=90%	105

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

$K_S^0\pi^+$	(1.53± 0.06) %		S=2.8	863
$K_L^0\pi^+$	(1.46± 0.05) %			863
$K^-2\pi^+$	[tt] (9.46± 0.24) %		S=2.0	846

$(K^-\pi^+)_{S-\text{wave}}\pi^+$		(7.58± 0.22) %		846
$\overline{K}_0^*(1430)^0\pi^+$, $\overline{K}_0^*(1430)^0 \to K^-\pi^+$	[uu]	(1.26± 0.07) %		382
$\overline{K}^*(892)^0\pi^+$, $\overline{K}^*(892)^0 \to K^-\pi^+$		(1.05± 0.12) %		714
$\overline{K}^*(1410)^0\pi^+$, $\overline{K}^{*0} \to K^-\pi^+$		not seen		381
$\overline{K}_2^*(1430)^0\pi^+$, $\overline{K}_2^*(1430)^0 \to K^-\pi^+$	[uu]	(2.3 ± 0.8) × 10^{-4}		371
$\overline{K}^*(1680)^0\pi^+$, $\overline{K}^*(1680)^0 \to K^-\pi^+$	[uu]	(2.2 ± 1.1) × 10^{-4}		58
$K^-(2\pi^+)_{I=2}$		(1.47± 0.27) %		–
$K_S^0\pi^+\pi^0$	[tt]	(7.24± 0.17) %		845
$K_S^0\rho^+$		($6.04^{+\ 0.60}_{-\ 0.34}$) %		677
$K_S^0\rho(1450)^+$, $\rho^+ \to \pi^+\pi^0$		($1.5\ ^{+\ 1.2}_{-\ 1.4}$) × 10^{-3}		–
$\overline{K}^*(892)^0\pi^+$, $\overline{K}^*(892)^0 \to K_S^0\pi^0$		(2.59± 0.31) × 10^{-3}		714
$\overline{K}_0^*(1430)^0\pi^+$, $\overline{K}_0^{*0} \to K_S^0\pi^0$		(2.7 ± 0.9) × 10^{-3}		–
$\overline{K}_0^*(1680)^0\pi^+$, $\overline{K}_0^{*0} \to K_S^0\pi^0$		($9\ ^{+\ 7}_{-10}$) × 10^{-4}		–
$\overline{\kappa}^0\pi^+$, $\overline{\kappa}^0 \to K_S^0\pi^0$		($6\ ^{+\ 5}_{-\ 4}$) × 10^{-3}		–
$K_S^0\pi^+\pi^0$ nonresonant		(3 ± 4) × 10^{-3}		845
$K_S^0\pi^+\pi^0$ nonresonant and $\overline{\kappa}^0\pi^+$		($1.35^{+\ 0.21}_{-\ 0.40}$) %		–
$(K_S^0\pi^0)_{S-\text{wave}}\pi^+$		($1.25^{+\ 0.27}_{-\ 0.33}$) %		845
$K^-2\pi^+\pi^0$	[vv]	(6.14± 0.16) %		816
$K_S^0 2\pi^+\pi^-$	[vv]	(3.05± 0.09) %		814
$K^-3\pi^+\pi^-$	[tt]	(5.8 ± 0.5) × 10^{-3}	S=1.1	772
$\overline{K}^*(892)^0 2\pi^+\pi^-$, $\overline{K}^*(892)^0 \to K^-\pi^+$		(1.2 ± 0.4) × 10^{-3}		645
$\overline{K}^*(892)^0\rho^0\pi^+$, $\overline{K}^*(892)^0 \to K^-\pi^+$		(2.3 ± 0.4) × 10^{-3}		239
$\overline{K}^*(892)^0 a_1(1260)^+$	[xx]	(9.4 ± 1.9) × 10^{-3}		†
$K^-\rho^0 2\pi^+$		(1.74± 0.28) × 10^{-3}		524
$K^-3\pi^+\pi^-$ nonresonant		(4.1 ± 3.0) × 10^{-4}		772
$K^+ 2K_S^0$		(4.6 ± 2.1) × 10^{-3}		545
$K^+K^-K_S^0\pi^+$		(2.3 ± 0.5) × 10^{-4}		436

Pionic modes

$\pi^+\pi^0$		$(\ 1.24\pm\ 0.06)\times10^{-3}$		925
$2\pi^+\pi^-$		$(\ 3.29\pm\ 0.20)\times10^{-3}$		909
$\rho^0\pi^+$		$(\ 8.4\ \pm\ 1.5\ )\times10^{-4}$		767
$\pi^+(\pi^+\pi^-)_{S-\text{wave}}$		$(\ 1.85\pm\ 0.17)\times10^{-3}$		909
$\sigma\pi^+$, $\sigma\to\ \pi^+\pi^-$		$(\ 1.39\pm\ 0.12)\times10^{-3}$		–
$f_0(980)\pi^+$, $f_0(980)\to\ \pi^+\pi^-$		$(\ 1.58\pm\ 0.34)\times10^{-4}$		669
$f_0(1370)\pi^+$, $f_0(1370)\to\ \pi^+\pi^-$		$(\ 8\ \ \pm\ 4\ \ )\times10^{-5}$		–
$f_2(1270)\pi^+$, $f_2(1270)\to\ \pi^+\pi^-$		$(\ 5.1\ \pm\ 0.9\ )\times10^{-4}$		485
$\rho(1450)^0\pi^+$, $\rho(1450)^0\to\ \pi^+\pi^-$		$<\ 8\ \times10^{-5}$	CL=95%	338
$f_0(1500)\pi^+$, $f_0(1500)\to\ \pi^+\pi^-$		$(\ 1.1\ \pm\ 0.4\ )\times10^{-4}$		–
$f_0(1710)\pi^+$, $f_0(1710)\to\ \pi^+\pi^-$		$<\ 5\ \times10^{-5}$	CL=95%	–
$f_0(1790)\pi^+$, $f_0(1790)\to\ \pi^+\pi^-$		$<\ 7\ \times10^{-5}$	CL=95%	–
$(\pi^+\pi^+)_{S-\text{wave}}\pi^-$		$<\ 1.2\ \times10^{-4}$	CL=95%	909
$2\pi^+\pi^-$ nonresonant		$<\ 1.2\ \times10^{-4}$	CL=95%	909
$\pi^+2\pi^0$		$(\ 4.7\ \pm\ 0.4\ )\times10^{-3}$		910
$2\pi^+\pi^-\pi^0$		$(\ 1.17\pm\ 0.08)\ \%$		883
$\eta\pi^+$, $\eta\to\ \pi^+\pi^-\pi^0$		$(\ 8.0\ \pm\ 0.5\ )\times10^{-4}$		848
$\omega\pi^+$, $\omega\to\ \pi^+\pi^-\pi^0$		$<\ 3\ \times10^{-4}$	CL=90%	763
$3\pi^+2\pi^-$		$(\ 1.67\pm\ 0.16)\times10^{-3}$		845

Fractions of some of the following modes with resonances have already appeared above as submodes of particular charged-particle modes.

$\eta\pi^+$		$(\ 3.66\pm\ 0.22)\times10^{-3}$		848
$\eta\pi^+\pi^0$		$(\ 1.38\pm\ 0.35)\times10^{-3}$		830
$\omega\pi^+$		$<\ 3.4\ \times10^{-4}$	CL=90%	764
$\eta'(958)\pi^+$		$(\ 4.84\pm\ 0.31)\times10^{-3}$		681
$\eta'(958)\pi^+\pi^0$		$(\ 1.6\ \pm\ 0.5\ )\times10^{-3}$		654

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

$K^+K^0_S$		$(\ 2.95\pm\ 0.15)\times10^{-3}$	S=2.8	793
$K^+K^-\pi^+$	[tt]	$(\ 9.96\pm\ 0.26)\times10^{-3}$	S=1.3	744
$\phi\pi^+$, $\phi\to\ K^+K^-$		$(\ 2.77^{+\ 0.09}_{-\ 0.10})\times10^{-3}$		647
$K^+\overline{K}^*(892)^0$, $\overline{K}^*(892)^0\to\ K^-\pi^+$		$(\ 2.56^{+\ 0.09}_{-\ 0.15})\times10^{-3}$		613
$K^+\overline{K}^*_0(1430)^0$, $\overline{K}^*_0(1430)^0\to\ K^-\pi^+$		$(\ 1.9\ \pm\ 0.4\ )\times10^{-3}$		–

$K^+\overline{K}_2^*(1430)^0,\ \overline{K}_2^* \to K^-\pi^+$		$(\ 1.7\ ^{+\ 1.3}_{-\ 0.8}\ )\times10^{-4}$		–
$K^+\overline{K}_0^*(800),\ \overline{K}_0^* \to\ K^-\pi^+$		$(\ 7.0\ ^{+\ 4.0}_{-\ 2.2}\ )\times10^{-4}$		–
$a_0(1450)^0\pi^+,\ a_0^0 \to K^+K^-$		$(\ 4.6\ ^{+\ 7.0}_{-\ 1.9}\ )\times10^{-4}$		–
$\phi(1680)\pi^+,\ \phi \to\ K^+K^-$		$(\ 5.1\ ^{+\ 4.0}_{-\ 1.9}\ )\times10^{-5}$		–
$K^+K^-\pi^+$ nonresonant		not seen		744
$K^+K_S^0\pi^+\pi^-$		$(\ 1.71\pm\ 0.18)\times10^{-3}$		678
$K_S^0K^-2\pi^+$		$(\ 2.34\pm\ 0.17)\times10^{-3}$		678
$K^+K^-2\pi^+\pi^-$		$(\ 2.3\ \pm\ 1.2\ )\times10^{-4}$		600

A few poorly measured branching fractions:

$\phi\pi^+\pi^0$		$(\ 2.3\ \pm\ 1.0\ )$ %		619
$\phi\rho^+$		$<\ 1.5$ %	CL=90%	260
$K^+K^-\pi^+\pi^0$ non-ϕ		$(\ 1.5\ ^{+\ 0.7}_{-\ 0.6}\ )$ %		682
$K^*(892)^+K_S^0$		$(\ 1.7\ \pm\ 0.8\ )$ %		611

Doubly Cabibbo-suppressed modes

$K^+\pi^0$		$(\ 1.89\pm\ 0.25)\times10^{-4}$	S=1.2	864
$K^+\eta$		$(\ 1.12\pm\ 0.18)\times10^{-4}$		776
$K^+\eta'(958)$		$(\ 1.83\pm\ 0.23)\times10^{-4}$		571
$K^+\pi^+\pi^-$		$(\ 5.46\pm\ 0.25)\times10^{-4}$		846
$K^+\rho^0$		$(\ 2.1\ \pm\ 0.5\ )\times10^{-4}$		679
$K^*(892)^0\pi^+,\ K^*(892)^0 \to K^+\pi^-$		$(\ 2.6\ \pm\ 0.4\ )\times10^{-4}$		714
$K^+f_0(980),\ f_0(980) \to \pi^+\pi^-$		$(\ 4.9\ \pm\ 2.9\ )\times10^{-5}$		–
$K_2^*(1430)^0\pi^+,\ K_2^*(1430)^0 \to K^+\pi^-$		$(\ 4.4\ \pm\ 3.0\ )\times10^{-5}$		–
$K^+\pi^+\pi^-$ nonresonant		not seen		846
$2K^+K^-$		$(\ 9.0\ \pm\ 2.1\ )\times10^{-5}$		550

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

$\pi^+e^+e^-$	*C1*	$<\ 1.1$	$\times10^{-6}$	CL=90%	930
$\pi^+\phi,\ \phi \to\ e^+e^-$	[*yy*]	$(\ 1.7\ ^{+\ 1.4}_{-\ 0.9}\ )\times10^{-6}$			–
$\pi^+\mu^+\mu^-$	*C1*	$<\ 7.3$	$\times10^{-8}$	CL=90%	918
$\pi^+\phi,\ \phi \to\ \mu^+\mu^-$	[*yy*]	$(\ 1.8\ \pm\ 0.8\ )\times10^{-6}$			–
$\rho^+\mu^+\mu^-$	*C1*	$<\ 5.6$	$\times10^{-4}$	CL=90%	757
$K^+e^+e^-$	[*zz*]	$<\ 1.0$	$\times10^{-6}$	CL=90%	870
$K^+\mu^+\mu^-$	[*zz*]	$<\ 4.3$	$\times10^{-6}$	CL=90%	856
$\pi^+e^+\mu^-$	*LF*	$<\ 2.9$	$\times10^{-6}$	CL=90%	927

$\pi^+ e^- \mu^+$	LF	<	3.6	$\times 10^{-6}$	CL=90%	927
$K^+ e^+ \mu^-$	LF	<	1.2	$\times 10^{-6}$	CL=90%	866
$K^+ e^- \mu^+$	LF	<	2.8	$\times 10^{-6}$	CL=90%	866
$\pi^- 2e^+$	L	<	1.1	$\times 10^{-6}$	CL=90%	930
$\pi^- 2\mu^+$	L	<	2.2	$\times 10^{-8}$	CL=90%	918
$\pi^- e^+ \mu^+$	L	<	2.0	$\times 10^{-6}$	CL=90%	927
$\rho^- 2\mu^+$	L	<	5.6	$\times 10^{-4}$	CL=90%	757
$K^- 2e^+$	L	<	9	$\times 10^{-7}$	CL=90%	870
$K^- 2\mu^+$	L	<	1.0	$\times 10^{-5}$	CL=90%	856
$K^- e^+ \mu^+$	L	<	1.9	$\times 10^{-6}$	CL=90%	866
$K^*(892)^- 2\mu^+$	L	<	8.5	$\times 10^{-4}$	CL=90%	703

D^0

$I(J^P) = \frac{1}{2}(0^-)$

Mass $m = 1864.83 \pm 0.05$ MeV
$m_{D^\pm} - m_{D^0} = 4.75 \pm 0.08$ MeV
Mean life $\tau = (410.1 \pm 1.5) \times 10^{-15}$ s
$c\tau = 122.9$ μm

Mixing and related parameters

$|m_{D_1^0} - m_{D_2^0}| = (0.95^{+0.41}_{-0.44}) \times 10^{10}$ $\hbar$ s^{-1}
$(\Gamma_{D_1^0} - \Gamma_{D_2^0})/\Gamma = 2y = (1.29^{+0.14}_{-0.18}) \times 10^{-2}$
$|q/p| = 0.92^{+0.12}_{-0.09}$
$A_\Gamma = (-0.125 \pm 0.526) \times 10^{-3}$
$K^+\pi^-$ relative strong phase: $\cos\delta = 0.97 \pm 0.11$
$K^-\pi^+\pi^0$ coherence factor $R_{K\pi\pi^0} = 0.82 \pm 0.07$
$K^-\pi^+\pi^0$ average relative strong phase $\delta^{K\pi\pi^0} = (164^{+20}_{-14})^\circ$
$K^-\pi^-2\pi^+$ coherence factor $R_{K3\pi} = 0.32^{+0.20}_{-0.28}$
$K^-\pi^-2\pi^+$ average relative strong phase $\delta^{K3\pi} = (225^{+21}_{-80})^\circ$
$K^0_S K^+\pi^-$ coherence factor $R_{K^0_S K\pi} = 0.73 \pm 0.08$
$K^0_S K^+\pi^-$ average relative strong phase $\delta^{K^0_S K\pi} = (8 \pm 15)^\circ$
$K^* K$ coherence factor $R_{K^* K} = 1.00 \pm 0.16$
$K^* K$ average relative strong phase $\delta^{K^* K} = (26 \pm 16)^\circ$

CP-violation decay-rate asymmetries (labeled by the D^0 decay)

$A_{CP}(K^+K^-) = (-0.14 \pm 0.12)\%$
$A_{CP}(2K^0_S) = (-5 \pm 5)\%$
$A_{CP}(\pi^+\pi^-) = (0.01 \pm 0.15)\%$
$A_{CP}(2\pi^0) = (0.0 \pm 0.6)\%$
$A_{CP}(\pi^+\pi^-\pi^0) = (0.3 \pm 0.4)\%$
$A_{CP}(\rho(770)^+\pi^- \to \pi^+\pi^-\pi^0) = (1.2 \pm 0.9)\%$ [aaa]

$A_{CP}(\rho(770)^0\pi^0 \to \pi^+\pi^-\pi^0) = (-3.1 \pm 3.0)\%$ [aaa]
$A_{CP}(\rho(770)^-\pi^+ \to \pi^+\pi^-\pi^0) = (-1.0 \pm 1.7)\%$ [aaa]
$A_{CP}(\rho(1450)^+\pi^- \to \pi^+\pi^-\pi^0) = (0 \pm 70)\%$ [aaa]
$A_{CP}(\rho(1450)^0\pi^0 \to \pi^+\pi^-\pi^0) = (-20 \pm 40)\%$ [aaa]
$A_{CP}(\rho(1450)^-\pi^+ \to \pi^+\pi^-\pi^0) = (6 \pm 9)\%$ [aaa]
$A_{CP}(\rho(1700)^+\pi^- \to \pi^+\pi^-\pi^0) = (-5 \pm 14)\%$ [aaa]
$A_{CP}(\rho(1700)^0\pi^0 \to \pi^+\pi^-\pi^0) = (13 \pm 9)\%$ [aaa]
$A_{CP}(\rho(1700)^-\pi^+ \to \pi^+\pi^-\pi^0) = (8 \pm 11)\%$ [aaa]
$A_{CP}(f_0(980)\pi^0 \to \pi^+\pi^-\pi^0) = (0 \pm 35)\%$ [aaa]
$A_{CP}(f_0(1370)\pi^0 \to \pi^+\pi^-\pi^0) = (25 \pm 18)\%$ [aaa]
$A_{CP}(f_0(1500)\pi^0 \to \pi^+\pi^-\pi^0) = (0 \pm 18)\%$ [aaa]
$A_{CP}(f_0(1710)\pi^0 \to \pi^+\pi^-\pi^0) = (0 \pm 24)\%$ [aaa]
$A_{CP}(f_2(1270)\pi^0 \to \pi^+\pi^-\pi^0) = (-4 \pm 6)\%$ [aaa]
$A_{CP}(\sigma(400)\pi^0 \to \pi^+\pi^-\pi^0) = (6 \pm 8)\%$ [aaa]
$A_{CP}(\text{nonresonant } \pi^+\pi^-\pi^0) = (-13 \pm 23)\%$ [aaa]
$A_{CP}(K^+K^-\pi^0) = (-1.0 \pm 1.7)\%$
$A_{CP}(K^*(892)^+K^- \to K^+K^-\pi^0) = (-0.9 \pm 1.3)\%$ [aaa]
$A_{CP}(K^*(1410)^+K^- \to K^+K^-\pi^0) = (-21 \pm 24)\%$ [aaa]
$A_{CP}((K^+\pi^0)_{S-wave}K^- \to K^+K^-\pi^0) = (7 \pm 15)\%$ [aaa]
$A_{CP}(\phi(1020)\pi^0 \to K^+K^-\pi^0) = (1.1 \pm 2.2)\%$ [aaa]
$A_{CP}(f_0(980)\pi^0 \to K^+K^-\pi^0) = (-3 \pm 19)\%$ [aaa]
$A_{CP}(a_0(980)^0\pi^0 \to K^+K^-\pi^0) = (-5 \pm 16)\%$ [aaa]
$A_{CP}(f_2'(1525)\pi^0 \to K^+K^-\pi^0) = (0 \pm 160)\%$ [aaa]
$A_{CP}(K^*(892)^-K^+ \to K^+K^-\pi^0) = (-5 \pm 4)\%$ [aaa]
$A_{CP}(K^*(1410)^-K^+ \to K^+K^-\pi^0) = (-17 \pm 29)\%$ [aaa]
$A_{CP}((K^-\pi^0)_{S-wave}K^+ \to K^+K^-\pi^0) = (-10 \pm 40)\%$ [aaa]
$A_{CP}(K^0_S\pi^0) = (-0.20 \pm 0.17)\%$
$A_{CP}(K^0_S\eta) = (0.5 \pm 0.5)\%$
$A_{CP}(K^0_S\eta') = (1.0 \pm 0.7)\%$
$A_{CP}(K^0_S\phi) = (-3 \pm 9)\%$
$A_{CP}(K^-\pi^+) = (0.3 \pm 0.7)\%$
$A_{CP}(K^+\pi^-) = (0.0 \pm 1.6)\%$
$A_{CP}(D_{CP(\pm1)} \to K^\mp\pi^\pm) = (12.7 \pm 1.5)\%$
$A_{CP}(K^-\pi^+\pi^0) = (0.1 \pm 0.5)\%$
$A_{CP}(K^+\pi^-\pi^0) = (0 \pm 5)\%$
$A_{CP}(K^0_S\pi^+\pi^-) = (-0.1 \pm 0.8)\%$
$A_{CP}(K^*(892)^-\pi^+ \to K^0_S\pi^+\pi^-) = (0.4 \pm 0.5)\%$
$A_{CP}(K^*(892)^+\pi^- \to K^0_S\pi^+\pi^-) = (1 \pm 6)\%$
$A_{CP}(\overline{K}^0\rho^0 \to K^0_S\pi^+\pi^-) = (-0.1 \pm 0.5)\%$
$A_{CP}(\overline{K}^0\omega \to K^0_S\pi^+\pi^-) = (-13 \pm 7)\%$
$A_{CP}(\overline{K}^0 f_0(980) \to K^0_S\pi^+\pi^-) = (-0.4 \pm 2.7)\%$
$A_{CP}(\overline{K}^0 f_2(1270) \to K^0_S\pi^+\pi^-) = (-4 \pm 5)\%$

$A_{CP}(\overline{K}^0 f_0(1370) \to K^0_S \pi^+\pi^-) = (-1 \pm 9)\%$
$A_{CP}(\overline{K}^0 \rho^0(1450) \to K^0_S \pi^+\pi^-) = (-4 \pm 10)\%$
$A_{CP}(\overline{K}^0 f_0(600) \to K^0_S \pi^+\pi^-) = (-3 \pm 5)\%$
$A_{CP}(K^*(1410)^-\pi^+ \to K^0_S \pi^+\pi^-) = (-2 \pm 9)\%$
$A_{CP}(K^*_0(1430)^-\pi^+ \to K^0_S \pi^+\pi^-) = (4 \pm 4)\%$
$A_{CP}(K^*_0(1430)^+\pi^- \to K^0_S \pi^+\pi^-) = (12 \pm 15)\%$
$A_{CP}(K^*_2(1430)^-\pi^+ \to K^0_S \pi^+\pi^-) = (3 \pm 6)\%$
$A_{CP}(K^*_2(1430)^+\pi^- \to K^0_S \pi^+\pi^-) = (-10 \pm 32)\%$
$A_{CP}(K^-\pi^+\pi^+\pi^-) = (0.2 \pm 0.5)\%$
$A_{CP}(K^+\pi^-\pi^+\pi^-) = (-2 \pm 4)\%$
$A_{CP}(K^+K^-\pi^+\pi^-) = (-8 \pm 7)\%$
$A_{CP}(K^*_1(1270)^+K^- \to K^{*0}\pi^+K^-) = (-1 \pm 10)\%$
$A_{CP}(K^*_1(1270)^-K^+ \to \overline{K}^{*0}\pi^-K^+) = (-10 \pm 32)\%$
$A_{CP}(K^*_1(1270)^+K^- \to \rho^0 K^+K^-) = (-7 \pm 17)\%$
$A_{CP}(K^*_1(1270)^-K^+ \to \rho^0 K^-K^+) = (10 \pm 13)\%$
$A_{CP}(K^*(1410)^+K^- \to K^{*0}\pi^+K^-) = (-20 \pm 17)\%$
$A_{CP}(K^*(1410)^-K^+ \to \overline{K}^{*0}\pi^-K^+) = (-1 \pm 14)\%$
$A_{CP}(K^{*0}\overline{K}^{*0}$ S-wave$) = (10 \pm 14)\%$
$A_{CP}(\phi\rho^0$ S-wave$) = (-3 \pm 5)\%$
$A_{CP}(\phi\rho^0$ D-wave$) = (-37 \pm 19)\%$
$A_{CP}(\phi(\pi^+\pi^-)_{S-wave}) = (-9 \pm 10)\%$
$A_{CP}((K^-\pi^+)_{P-wave}\,(K^+\pi^-)_{S-wave}) = (3 \pm 11)\%$
CP-even fraction in $D^0 \to \pi^+\pi^-\pi^0$ decays $= (97.3 \pm 1.7)\%$
CP-even fraction in $D^0 \to K^+K^-\pi^0$ decays $= (73 \pm 6)\%$
CP-even fraction in $D^0 \to \pi^+\pi^-\pi^+\pi^-$ decays $= (73.7 \pm 2.8)\%$

CP-violation asymmetry difference

$\Delta A_{CP} = A_{CP}(K^+K^-) - A_{CP}(\pi^+\pi^-) = (-0.32 \pm 0.22)\%$ (S = 1.9)

χ^2 tests of *CP*-violation (*CPV*)

Local CPV in $D^0, \overline{D}^0 \to \pi^+\pi^-\pi^0 = 4.9\%$
Local CPV in $D^0, \overline{D}^0 \to \pi^+\pi^-\pi^+\pi^- = 41\%$
Local CPV in $D^0, \overline{D}^0 \to K^0_S\pi^+\pi^- = 96\%$
Local CPV in $D^0, \overline{D}^0 \to K^+K^-\pi^0 = 16.6\%$
Local CPV in $D^0, \overline{D}^0 \to K^+K^-\pi^+\pi^- = 9.1\%$

T-violation decay-rate asymmetry

$A_T(K^+K^-\pi^+\pi^-) = (1.7 \pm 2.7) \times 10^{-3}$ [ss]

CPT-violation decay-rate asymmetry

$A_{CPT}(K^\mp\pi^\pm) = 0.008 \pm 0.008$

Form factors

$r_V \equiv V(0)/A_1(0)$ in $D^0 \to K^*(892)^- \ell^+ \nu_\ell = 1.7 \pm 0.8$
$r_2 \equiv A_2(0)/A_1(0)$ in $D^0 \to K^*(892)^- \ell^+ \nu_\ell = 0.9 \pm 0.4$
$f_+(0)$ in $D^0 \to K^- \ell^+ \nu_\ell = 0.736 \pm 0.004$
$f_+(0)|V_{cs}|$ in $D^0 \to K^- \ell^+ \nu_\ell = 0.719 \pm 0.004$
$r_1 \equiv a_1/a_0$ in $D^0 \to K^- \ell^+ \nu_\ell = -2.40 \pm 0.16$
$r_2 \equiv a_2/a_0$ in $D^0 \to K^- \ell^+ \nu_\ell = 5 \pm 4$
$f_+(0)$ in $D^0 \to \pi^- \ell^+ \nu_\ell = 0.637 \pm 0.009$
$f_+(0)|V_{cd}|$ in $D^0 \to \pi^- \ell^+ \nu_\ell = 0.1436 \pm 0.0026$ (S = 1.5)
$r_1 \equiv a_1/a_0$ in $D^0 \to \pi^- \ell^+ \nu_\ell = -1.97 \pm 0.28$ (S = 1.4)
$r_2 \equiv a_1/a_0$ in $D^0 \to \pi^- \ell^+ \nu_\ell = -0.2 \pm 2.2$ (S = 1.7)

Most decay modes (other than the semileptonic modes) that involve a neutral K meson are now given as K^0_S modes, not as $\overline{K}^0$ modes. Nearly always it is a K^0_S that is measured, and interference between Cabibbo-allowed and doubly Cabibbo-suppressed modes can invalidate the assumption that $2\,\Gamma(K^0_S) = \Gamma(\overline{K}^0)$.

D^0 DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Topological modes				
0-prongs	[*bbb*]	(15 ± 6) %		–
2-prongs		(70 ± 6) %		–
4-prongs	[*ccc*]	(14.5 ± 0.5) %		–
6-prongs	[*ddd*]	(6.4 ± 1.3) $\times 10^{-4}$		–
Inclusive modes				
e^+ anything	[*eee*]	(6.49 ± 0.11) %		–
μ^+ anything		(6.7 ± 0.6) %		–
K^- anything		(54.7 ± 2.8) %	S=1.3	–
$\overline{K}^0$ anything + K^0 anything		(47 ± 4) %		–
K^+ anything		(3.4 ± 0.4) %		–
$K^*(892)^-$ anything		(15 ± 9) %		–
$\overline{K}^*(892)^0$ anything		(9 ± 4) %		–
$K^*(892)^+$ anything		< 3.6 %	CL=90%	–
$K^*(892)^0$ anything		(2.8 ± 1.3) %		–
η anything		(9.5 ± 0.9) %		–
η' anything		(2.48 ± 0.27) %		–
ϕ anything		(1.05 ± 0.11) %		–
Semileptonic modes				
$K^- e^+ \nu_e$		(3.538± 0.033) %	S=1.3	867
$K^- \mu^+ \nu_\mu$		(3.33 ± 0.13) %		864
$K^*(892)^- e^+ \nu_e$		(2.16 ± 0.16) %		719

$K^*(892)^- \mu^+ \nu_\mu$		(1.92 ± 0.25) %			714
$K^- \pi^0 e^+ \nu_e$		(1.6 $^{+\ 1.3}_{-\ 0.5}$) %			861
$\overline{K}^0 \pi^- e^+ \nu_e$		(2.7 $^{+\ 0.9}_{-\ 0.7}$) %			860
$K^- \pi^+ \pi^- e^+ \nu_e$		(2.8 $^{+\ 1.4}_{-\ 1.1}$) $\times 10^{-4}$			843
$K_1(1270)^- e^+ \nu_e$		(7.6 $^{+\ 4.0}_{-\ 3.1}$) $\times 10^{-4}$			498
$K^- \pi^+ \pi^- \mu^+ \nu_\mu$		< 1.2	$\times 10^{-3}$	CL=90%	821
$(\overline{K}^*(892)\pi)^- \mu^+ \nu_\mu$		< 1.4	$\times 10^{-3}$	CL=90%	692
$\pi^- e^+ \nu_e$		(2.91 ± 0.04) $\times 10^{-3}$		S=1.1	927
$\pi^- \mu^+ \nu_\mu$		(2.38 ± 0.24) $\times 10^{-3}$			924
$\rho^- e^+ \nu_e$		(1.77 ± 0.16) $\times 10^{-3}$			771

Hadronic modes with one $\overline{K}$

$K^- \pi^+$		(3.93 ± 0.04) %		S=1.2	861
$K^+ \pi^-$		(1.398± 0.027) $\times 10^{-4}$			861
$K^0_S \pi^0$		(1.20 ± 0.04) %			860
$K^0_L \pi^0$		(10.0 ± 0.7) $\times 10^{-3}$			860
$K^0_S \pi^+ \pi^-$	[*tt*]	(2.85 ± 0.20) %		S=1.1	842
$K^0_S \rho^0$		(6.4 $^{+\ 0.7}_{-\ 0.8}$) $\times 10^{-3}$			674
$K^0_S \omega$, $\omega \to \pi^+ \pi^-$		(2.1 ± 0.6) $\times 10^{-4}$			670
$K^0_S (\pi^+ \pi^-)_{S-\text{wave}}$		(3.4 ± 0.8) $\times 10^{-3}$			842
$K^0_S f_0(980)$, $f_0(980) \to \pi^+ \pi^-$		(1.23 $^{+\ 0.40}_{-\ 0.24}$) $\times 10^{-3}$			549
$K^0_S f_0(1370)$, $f_0(1370) \to \pi^+ \pi^-$		(2.8 $^{+\ 0.9}_{-\ 1.3}$) $\times 10^{-3}$			†
$K^0_S f_2(1270)$, $f_2(1270) \to \pi^+ \pi^-$		(9 $^{+10}_{-\ 6}$) $\times 10^{-5}$			262
$K^*(892)^- \pi^+$, $K^*(892)^- \to K^0_S \pi^-$		(1.68 $^{+\ 0.15}_{-\ 0.18}$) %			711
$K^*_0(1430)^- \pi^+$, $K^*_0(1430)^- \to K^0_S \pi^-$		(2.73 $^{+\ 0.40}_{-\ 0.34}$) $\times 10^{-3}$			378
$K^*_2(1430)^- \pi^+$, $K^*_2(1430)^- \to K^0_S \pi^-$		(3.4 $^{+\ 1.9}_{-\ 1.0}$) $\times 10^{-4}$			367
$K^*(1680)^- \pi^+$, $K^*(1680)^- \to K^0_S \pi^-$		(4 ± 4) $\times 10^{-4}$			46
$K^*(892)^+ \pi^-$, $K^*(892)^+ \to K^0_S \pi^+$	[*fff*]	(1.15 $^{+\ 0.60}_{-\ 0.34}$) $\times 10^{-4}$			711
$K^*_0(1430)^+ \pi^-$, $K^*_0(1430)^+ \to K^0_S \pi^+$	[*fff*]	< 1.4	$\times 10^{-5}$	CL=95%	–

$K_2^*(1430)^+\pi^-$, $K_2^*(1430)^+ \to K_S^0\pi^+$	[*fff*]	< 3.4	$\times 10^{-5}$	CL=95%	–
$K_S^0\pi^+\pi^-$ nonresonant		$(2.6\ ^{+\ 6.0}_{-\ 1.6})\times 10^{-4}$			842
$K^-\pi^+\pi^0$	[*tt*]	(14.3 ± 0.8) %		S=3.1	844
$K^-\rho^+$		(11.1 ± 0.9) %			675
$K^-\rho(1700)^+$, $\rho(1700)^+ \to \pi^+\pi^0$		$(8.1 \pm 1.8)\times 10^{-3}$			†
$K^*(892)^-\pi^+$, $K^*(892)^- \to K^-\pi^0$		$(2.28\ ^{+\ 0.40}_{-\ 0.23})$ %			711
$\overline{K}^*(892)^0\pi^0$, $\overline{K}^*(892)^0 \to K^-\pi^+$		(1.93 ± 0.26) %			711
$K_0^*(1430)^-\pi^+$, $K_0^*(1430)^- \to K^-\pi^0$		$(4.7 \pm 2.2)\times 10^{-3}$			378
$\overline{K}_0^*(1430)^0\pi^0$, $\overline{K}_0^*(1430)^0 \to K^-\pi^+$		$(5.8\ ^{+\ 5.0}_{-\ 1.6})\times 10^{-3}$			379
$K^*(1680)^-\pi^+$, $K^*(1680)^- \to K^-\pi^0$		$(1.9 \pm 0.7)\times 10^{-3}$			46
$K^-\pi^+\pi^0$ nonresonant		$(1.14\ ^{+\ 0.50}_{-\ 0.21})$ %			844
$K_S^0 2\pi^0$		$(9.1 \pm 1.1)\times 10^{-3}$		S=2.2	843
$K_S^0(2\pi^0)$-*S*-wave		$(2.6 \pm 0.7)\times 10^{-3}$			–
$\overline{K}^*(892)^0\pi^0$, $\overline{K}^*(892)^0 \to K_S^0\pi^0$		$(7.9 \pm 0.7)\times 10^{-3}$			711
$\overline{K}^*(1430)^0\pi^0$, $\overline{K}^{*0} \to K_S^0\pi^0$		$(4 \pm 23)\times 10^{-5}$			–
$\overline{K}^*(1680)^0\pi^0$, $\overline{K}^{*0} \to K_S^0\pi^0$		$(1.0 \pm 0.4)\times 10^{-3}$			–
$K_S^0 f_2(1270)$, $f_2 \to 2\pi^0$		$(2.3 \pm 1.1)\times 10^{-4}$			–
$2K_S^0$, one $K_S^0 \to 2\pi^0$		$(3.2 \pm 1.1)\times 10^{-4}$			–
$K^-2\pi^+\pi^-$	[*tt*]	(8.06 ± 0.23) %		S=1.5	813
$K^-\pi^+\rho^0$ total		(6.73 ± 0.34) %			609
$K^-\pi^+\rho^0$ 3-body		$(5.1 \pm 2.3)\times 10^{-3}$			609
$\overline{K}^*(892)^0\rho^0$, $\overline{K}^*(892)^0 \to K^-\pi^+$		(1.05 ± 0.23) %			416
$K^-a_1(1260)^+$, $a_1(1260)^+ \to 2\pi^+\pi^-$		(3.6 ± 0.6) %			327
$\overline{K}^*(892)^0\pi^+\pi^-$ total, $\overline{K}^*(892)^0 \to K^-\pi^+$		(1.6 ± 0.4) %			685
$\overline{K}^*(892)^0\pi^+\pi^-$ 3-body, $\overline{K}^*(892)^0 \to K^-\pi^+$		$(9.9 \pm 2.3)\times 10^{-3}$			685
$K_1(1270)^-\pi^+$, $K_1(1270)^- \to K^-\pi^+\pi^-$	[*ggg*]	$(2.9 \pm 0.3)\times 10^{-3}$			484

$K^-2\pi^+\pi^-$ nonresonant		(1.88	± 0.26) %			813
$K^0_S\pi^+\pi^-\pi^0$	[hhh]	(5.2	± 0.6) %			813
$K^0_S\eta$, $\eta\to\ \pi^+\pi^-\pi^0$		(1.02	± 0.09)	$\times10^{-3}$		772
$K^0_S\omega$, $\omega\to\ \pi^+\pi^-\pi^0$		(9.9	± 0.5)	$\times10^{-3}$		670
$K^-2\pi^+\pi^-\pi^0$		(4.2	± 0.4) %			771
$\overline{K}^*(892)^0\pi^+\pi^-\pi^0$, $\overline{K}^*(892)^0\to\ K^-\pi^+$		(1.3	± 0.6) %			643
$K^-\pi^+\omega$, $\omega\to\ \pi^+\pi^-\pi^0$		(2.7	± 0.5) %			605
$\overline{K}^*(892)^0\omega$, $\overline{K}^*(892)^0\to\ K^-\pi^+$, $\omega\to\ \pi^+\pi^-\pi^0$		(6.5	± 3.0)	$\times10^{-3}$		410
$K^0_S\eta\pi^0$		(5.5	± 1.1)	$\times10^{-3}$		721
$K^0_S a_0(980)$, $a_0(980)\to\ \eta\pi^0$		(6.6	± 2.0)	$\times10^{-3}$		–
$\overline{K}^*(892)^0\eta$, $\overline{K}^*(892)^0\to\ K^0_S\pi^0$		(1.6	± 0.5)	$\times10^{-3}$		–
$K^0_S2\pi^+2\pi^-$		(2.71	± 0.31)	$\times10^{-3}$		768
$K^0_S\rho^0\pi^+\pi^-$, no $K^*(892)^-$		(1.1	± 0.7)	$\times10^{-3}$		–
$K^*(892)^-2\pi^+\pi^-$, $K^*(892)^-\to\ K^0_S\pi^-$, no ρ^0		(5	± 8)	$\times10^{-4}$		642
$K^*(892)^-\rho^0\pi^+$, $K^*(892)^-\to\ K^0_S\pi^-$		(1.6	± 0.6)	$\times10^{-3}$		230
$K^0_S2\pi^+2\pi^-$ nonresonant		< 1.2		$\times10^{-3}$	CL=90%	768
$K^-3\pi^+2\pi^-$		(2.2	± 0.6)	$\times10^{-4}$		713

Fractions of many of the following modes with resonances have already appeared above as submodes of particular charged-particle modes. (Modes for which there are only upper limits and $\overline{K}^*(892)\rho$ submodes only appear below.)

$K^0_S\eta$		(4.85	± 0.30)	$\times10^{-3}$		772
$K^0_S\omega$		(1.11	± 0.06) %			670
$K^0_S\eta'(958)$		(9.5	± 0.5)	$\times10^{-3}$		565
$K^-a_1(1260)^+$		(7.8	± 1.1) %			327
$K^-a_2(1320)^+$		< 2		$\times10^{-3}$	CL=90%	198
$\overline{K}^*(892)^0\pi^+\pi^-$ total		(2.4	± 0.5) %			685
$\overline{K}^*(892)^0\pi^+\pi^-$ 3-body		(1.48	± 0.34) %			685
$\overline{K}^*(892)^0\rho^0$		(1.57	± 0.35) %			417
$\overline{K}^*(892)^0\rho^0$ transverse		(1.7	± 0.6) %			417
$\overline{K}^*(892)^0\rho^0$ S-wave		(3.0	± 0.6) %			417
$\overline{K}^*(892)^0\rho^0$ S-wave long.		< 3		$\times10^{-3}$	CL=90%	417
$\overline{K}^*(892)^0\rho^0$ P-wave		< 3		$\times10^{-3}$	CL=90%	417
$\overline{K}^*(892)^0\rho^0$ D-wave		(2.1	± 0.6) %			417

$K_1(1270)^-\pi^+$	[*ggg*]	(1.6 ± 0.8) %			484
$K_1(1400)^-\pi^+$		< 1.2	%	CL=90%	386
$\overline{K}^*(892)^0\pi^+\pi^-\pi^0$		(1.9 ± 0.9) %			643
$K^-\pi^+\omega$		(3.1 ± 0.6) %			605
$\overline{K}^*(892)^0\omega$		(1.1 ± 0.5) %			410
$K^-\pi^+\eta'(958)$		(7.5 ± 1.9) $\times 10^{-3}$			479
$\overline{K}^*(892)^0\eta'(958)$		< 1.1	$\times 10^{-3}$	CL=90%	119

Hadronic modes with three K's

$K^0_S K^+ K^-$		(4.51 ± 0.34) $\times 10^{-3}$			544
$K^0_S a_0(980)^0$, $a_0^0 \to K^+K^-$		(3.0 ± 0.4) $\times 10^{-3}$			–
$K^- a_0(980)^+$, $a_0^+ \to K^+K^0_S$		(6.0 ± 1.8) $\times 10^{-4}$			–
$K^+ a_0(980)^-$, $a_0^- \to K^-K^0_S$		< 1.1	$\times 10^{-4}$	CL=95%	–
$K^0_S f_0(980)$, $f_0 \to K^+K^-$		< 9	$\times 10^{-5}$	CL=95%	–
$K^0_S \phi$, $\phi \to K^+K^-$		(2.07 ± 0.16) $\times 10^{-3}$			520
$K^0_S f_0(1370)$, $f_0 \to K^+K^-$		(1.7 ± 1.1) $\times 10^{-4}$			–
$3K^0_S$		(9.2 ± 1.3) $\times 10^{-4}$			539
$K^+ 2K^-\pi^+$		(2.21 ± 0.32) $\times 10^{-4}$			434
$K^+K^-\overline{K}^*(892)^0$, $\overline{K}^*(892)^0 \to K^-\pi^+$		(4.4 ± 1.7) $\times 10^{-5}$			†
$K^-\pi^+\phi$, $\phi \to K^+K^-$		(4.0 ± 1.7) $\times 10^{-5}$			422
$\phi\overline{K}^*(892)^0$, $\phi \to K^+K^-$, $\overline{K}^*(892)^0 \to K^-\pi^+$		(1.06 ± 0.20) $\times 10^{-4}$			†
$K^+ 2K^-\pi^+$ nonresonant		(3.3 ± 1.5) $\times 10^{-5}$			434
$2K^0_S K^\pm\pi^\mp$		(6.1 ± 1.3) $\times 10^{-4}$			427

Pionic modes

$\pi^+\pi^-$		(1.420± 0.025) $\times 10^{-3}$		S=1.1	922
$2\pi^0$		(8.25 ± 0.25) $\times 10^{-4}$			923
$\pi^+\pi^-\pi^0$		(1.47 ± 0.09) %		S=3.0	907
$\rho^+\pi^-$		(1.00 ± 0.06) %			764
$\rho^0\pi^0$		(3.82 ± 0.29) $\times 10^{-3}$			764
$\rho^-\pi^+$		(5.09 ± 0.34) $\times 10^{-3}$			764
$\rho(1450)^+\pi^-$, $\rho(1450)^+ \to \pi^+\pi^0$		(1.6 ± 2.0) $\times 10^{-5}$			–
$\rho(1450)^0\pi^0$, $\rho(1450)^0 \to \pi^+\pi^-$		(4.4 ± 1.9) $\times 10^{-5}$			–
$\rho(1450)^-\pi^+$, $\rho(1450)^- \to \pi^-\pi^0$		(2.6 ± 0.4) $\times 10^{-4}$			–
$\rho(1700)^+\pi^-$, $\rho(1700)^+ \to \pi^+\pi^0$		(6.0 ± 1.5) $\times 10^{-4}$			–
$\rho(1700)^0\pi^0$, $\rho(1700)^0 \to \pi^+\pi^-$		(7.4 ± 1.8) $\times 10^{-4}$			–
$\rho(1700)^-\pi^+$, $\rho(1700)^- \to \pi^-\pi^0$		(4.7 ± 1.1) $\times 10^{-4}$			–

$f_0(980)\pi^0$, $f_0(980) \to \pi^+\pi^-$		$(3.7 \pm 0.9) \times 10^{-5}$			–
$f_0(500)\pi^0$, $f_0(500) \to \pi^+\pi^-$		$(1.21 \pm 0.22) \times 10^{-4}$			–
$f_0(1370)\pi^0$, $f_0(1370) \to \pi^+\pi^-$		$(5.4 \pm 2.1) \times 10^{-5}$			–
$f_0(1500)\pi^0$, $f_0(1500) \to \pi^+\pi^-$		$(5.7 \pm 1.6) \times 10^{-5}$			–
$f_0(1710)\pi^0$, $f_0(1710) \to \pi^+\pi^-$		$(4.6 \pm 1.6) \times 10^{-5}$			–
$f_2(1270)\pi^0$, $f_2(1270) \to \pi^+\pi^-$		$(1.94 \pm 0.22) \times 10^{-4}$			–
$\pi^+\pi^-\pi^0$ nonresonant		$(1.2 \pm 0.4) \times 10^{-4}$			907
$3\pi^0$		$< 3.5 \times 10^{-4}$		CL=90%	908
$2\pi^+2\pi^-$		$(7.45 \pm 0.22) \times 10^{-3}$		S=1.2	880
$a_1(1260)^+\pi^-$, $a_1^+ \to 2\pi^+\pi^-$ total		$(4.47 \pm 0.32) \times 10^{-3}$			–
$a_1(1260)^+\pi^-$, $a_1^+ \to \rho^0\pi^+$ S-wave		$(3.23 \pm 0.25) \times 10^{-3}$			–
$a_1(1260)^+\pi^-$, $a_1^+ \to \rho^0\pi^+$ D-wave		$(1.9 \pm 0.5) \times 10^{-4}$			–
$a_1(1260)^+\pi^-$, $a_1^+ \to \sigma\pi^+$		$(6.2 \pm 0.7) \times 10^{-4}$			–
$2\rho^0$ total		$(1.83 \pm 0.13) \times 10^{-3}$			518
$2\rho^0$, parallel helicities		$(8.2 \pm 3.2) \times 10^{-5}$			–
$2\rho^0$, perpendicular helicities		$(4.8 \pm 0.6) \times 10^{-4}$			–
$2\rho^0$, longitudinal helicities		$(1.25 \pm 0.10) \times 10^{-3}$			–
Resonant $(\pi^+\pi^-)\pi^+\pi^-$ 3-body total		$(1.49 \pm 0.12) \times 10^{-3}$			–
$\sigma\pi^+\pi^-$		$(6.1 \pm 0.9) \times 10^{-4}$			–
$f_0(980)\pi^+\pi^-$, $f_0 \to \pi^+\pi^-$		$(1.8 \pm 0.5) \times 10^{-4}$			–
$f_2(1270)\pi^+\pi^-$, $f_2 \to \pi^+\pi^-$		$(3.7 \pm 0.6) \times 10^{-4}$			–
$\pi^+\pi^-2\pi^0$		(1.01 ± 0.09) %			882
$\eta\pi^0$	[*iii*]	$(6.9 \pm 0.7) \times 10^{-4}$			846
$\omega\pi^0$	[*iii*]	$< 2.6 \times 10^{-4}$		CL=90%	761
$2\pi^+2\pi^-\pi^0$		$(4.2 \pm 0.5) \times 10^{-3}$			844
$\eta\pi^+\pi^-$	[*iii*]	$(1.09 \pm 0.16) \times 10^{-3}$			827
$\omega\pi^+\pi^-$	[*iii*]	$(1.6 \pm 0.5) \times 10^{-3}$			738
$3\pi^+3\pi^-$		$(4.2 \pm 1.2) \times 10^{-4}$			795
$\eta'(958)\pi^0$		$(9.1 \pm 1.4) \times 10^{-4}$			678
$\eta'(958)\pi^+\pi^-$		$(4.5 \pm 1.7) \times 10^{-4}$			650
2η		$(1.70 \pm 0.20) \times 10^{-3}$			754
$\eta\eta'(958)$		$(1.06 \pm 0.27) \times 10^{-3}$			537

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

K^+K^-	$(\ 4.01 \pm 0.07\ ) \times 10^{-3}$	S=1.5	791
$2K^0_S$	$(\ 1.8 \pm 0.4\ ) \times 10^{-4}$	S=2.5	789
$K^0_S K^-\pi^+$	$(\ 3.6 \pm 0.5\ ) \times 10^{-3}$	S=1.2	739
$\overline{K}^*(892)^0 K^0_S,\ \overline{K}^{*0} \to K^-\pi^+$	$< 5 \times 10^{-4}$	CL=90%	608
$K^0_S K^+\pi^-$	$(\ 2.2 \pm 0.4\ ) \times 10^{-3}$	S=1.3	739
$K^*(892)^0 K^0_S,\ K^{*0} \to K^+\pi^-$	$< 1.8 \times 10^{-4}$	CL=90%	608
$K^+K^-\pi^0$	$(\ 3.38 \pm 0.21\ ) \times 10^{-3}$		743
$K^*(892)^+K^-,\ K^*(892)^+ \to K^+\pi^0$	$(\ 1.50 \pm 0.10\ ) \times 10^{-3}$		–
$K^*(892)^-K^+,\ K^*(892)^- \to K^-\pi^0$	$(\ 5.4 \pm 0.5\ ) \times 10^{-4}$		–
$(K^+\pi^0)_{S-wave}K^-$	$(\ 2.40 \pm 0.21\ ) \times 10^{-3}$		743
$(K^-\pi^0)_{S-wave}K^+$	$(\ 1.3 \pm 0.5\ ) \times 10^{-4}$		743
$f_0(980)\pi^0,\ f_0 \to K^+K^-$	$(\ 3.5 \pm 0.6\ ) \times 10^{-4}$		–
$\phi\pi^0,\ \phi \to K^+K^-$	$(\ 6.6 \pm 0.5\ ) \times 10^{-4}$		–
$2K^0_S\pi^0$	$< 5.9 \times 10^{-4}$		740
$K^+K^-\pi^+\pi^-$	$(\ 2.42 \pm 0.12\ ) \times 10^{-3}$		677
$\phi(\pi^+\pi^-)_{S-wave},\ \phi \to K^+K^-$	$(\ 2.50 \pm 0.34\ ) \times 10^{-4}$		614
$(\phi\rho^0)_{S-wave},\ \phi \to K^+K^-$	$(\ 9.3 \pm 1.2\ ) \times 10^{-4}$		250
$(\phi\rho^0)_{D-wave},\ \phi \to K^+K^-$	$(\ 8.2 \pm 2.3\ ) \times 10^{-5}$		–
$(K^{*0}\overline{K}^{*0})_{S-wave},\ K^{*0} \to K^\pm\pi^\mp$	$(\ 1.48 \pm 0.30\ ) \times 10^{-4}$		–
$(K^-\pi^+)_{P-wave}$, $(K^+\pi^-)_{S-wave}$,	$(\ 2.6 \pm 0.5\ ) \times 10^{-4}$		–
$K_1(1270)^+K^-$, $K_1(1270)^+ \to K^{*0}\pi^+$	$(\ 1.8 \pm 0.5\ ) \times 10^{-4}$		–
$K_1(1270)^+K^-$, $K_1(1270)^+ \to \rho^0 K^+$	$(\ 1.14 \pm 0.26\ ) \times 10^{-4}$		–
$K_1(1270)^-K^+$, $K_1(1270)^- \to \overline{K}^{*0}\pi^-$	$(\ 2.2 \pm 1.2\ ) \times 10^{-5}$		–
$K_1(1270)^-K^+$, $K_1(1270)^- \to \rho^0 K^-$	$(\ 1.45 \pm 0.25\ ) \times 10^{-4}$		–
$K^*(1410)^+K^-$, $K^*(1410)^+ \to K^{*0}\pi^+$	$(\ 1.02 \pm 0.26\ ) \times 10^{-4}$		–
$K^*(1410)^-K^+$, $K^*(1410)^- \to \overline{K}^{*0}\pi^-$	$(\ 1.14 \pm 0.25\ ) \times 10^{-4}$		–
$2K^0_S\pi^+\pi^-$	$(\ 1.24 \pm 0.24\ ) \times 10^{-3}$		673
$K^0_S K^-2\pi^+\pi^-$	$< 1.5 \times 10^{-4}$	CL=90%	595
$K^+K^-\pi^+\pi^-\pi^0$	$(\ 3.1 \pm 2.0\ ) \times 10^{-3}$		600

Other $K\overline{K}X$ modes. They include all decay modes of the ϕ, η, and ω.

$\phi\eta$		$(\ 1.4 \pm 0.5\ ) \times 10^{-4}$			489
$\phi\omega$		< 2.1	$\times 10^{-3}$	CL=90%	238

Radiative modes

$\rho^0\gamma$		< 2.4	$\times 10^{-4}$	CL=90%	771
$\omega\gamma$		< 2.4	$\times 10^{-4}$	CL=90%	768
$\phi\gamma$		$(\ 2.73 \pm 0.35\ ) \times 10^{-5}$			654
$\overline{K}^*(892)^0\gamma$		$(\ 3.31 \pm 0.34\ ) \times 10^{-4}$			719

Doubly Cabibbo suppressed (*DC*) modes or $\Delta C = 2$ forbidden via mixing (*C2M*) modes

$K^+\ell^-\overline{\nu}_\ell$ via $\overline{D}^0$		< 2.2	$\times 10^{-5}$	CL=90%	–
K^+ or $K^*(892)^+ e^-\overline{\nu}_e$ via $\overline{D}^0$		< 6	$\times 10^{-5}$	CL=90%	–
$K^+\pi^-$	*DC*	$(\ 1.49 \pm 0.07\ ) \times 10^{-4}$		S=2.9	861
$K^+\pi^-$ via DCS		$(\ 1.33 \pm 0.09\ ) \times 10^{-4}$			–
$K^+\pi^-$ via $\overline{D}^0$		< 1.6	$\times 10^{-5}$	CL=95%	861
$K^0_S\pi^+\pi^-$ in $D^0 \to \overline{D}^0$		< 1.8	$\times 10^{-4}$	CL=95%	–
$K^*(892)^+\pi^-$, $K^*(892)^+ \to K^0_S\pi^+$	*DC*	$(\ 1.15\ ^{+\ 0.60}_{-\ 0.34}\ ) \times 10^{-4}$			711
$K^*_0(1430)^+\pi^-$, $K^*_0(1430)^+ \to K^0_S\pi^+$	*DC*	< 1.4	$\times 10^{-5}$		–
$K^*_2(1430)^+\pi^-$, $K^*_2(1430)^+ \to K^0_S\pi^+$	*DC*	< 3.4	$\times 10^{-5}$		–
$K^+\pi^-\pi^0$	*DC*	$(\ 3.13 \pm 0.23\ ) \times 10^{-4}$			844
$K^+\pi^-\pi^0$ via $\overline{D}^0$		$(\ 7.5 \pm 0.6\ ) \times 10^{-4}$			–
$K^+\pi^+2\pi^-$	*DC*	$(\ 2.62 \pm 0.11\ ) \times 10^{-4}$			813
$K^+\pi^+2\pi^-$ via $\overline{D}^0$		< 4	$\times 10^{-4}$	CL=90%	812
μ^- anything via $\overline{D}^0$		< 4	$\times 10^{-4}$	CL=90%	–

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

$\gamma\gamma$	*C1*	< 2.2	$\times 10^{-6}$	CL=90%	932
e^+e^-	*C1*	< 7.9	$\times 10^{-8}$	CL=90%	932
$\mu^+\mu^-$	*C1*	< 6.2	$\times 10^{-9}$	CL=90%	926
$\pi^0 e^+e^-$	*C1*	< 4.5	$\times 10^{-5}$	CL=90%	928
$\pi^0\mu^+\mu^-$	*C1*	< 1.8	$\times 10^{-4}$	CL=90%	915
ηe^+e^-	*C1*	< 1.1	$\times 10^{-4}$	CL=90%	852
$\eta\mu^+\mu^-$	*C1*	< 5.3	$\times 10^{-4}$	CL=90%	838
$\pi^+\pi^- e^+e^-$	*C1*	< 3.73	$\times 10^{-4}$	CL=90%	922
$\rho^0 e^+e^-$	*C1*	< 1.0	$\times 10^{-4}$	CL=90%	771
$\pi^+\pi^-\mu^+\mu^-$	*C1*	< 5.5	$\times 10^{-7}$	CL=90%	894
$\rho^0\mu^+\mu^-$	*C1*	< 2.2	$\times 10^{-5}$	CL=90%	754

$\omega e^+ e^-$	C1		< 1.8	$\times 10^{-4}$	CL=90%	768
$\omega \mu^+ \mu^-$	C1		< 8.3	$\times 10^{-4}$	CL=90%	751
$K^- K^+ e^+ e^-$	C1		< 3.15	$\times 10^{-4}$	CL=90%	791
$\phi e^+ e^-$	C1		< 5.2	$\times 10^{-5}$	CL=90%	654
$K^- K^+ \mu^+ \mu^-$	C1		< 3.3	$\times 10^{-5}$	CL=90%	710
$\phi \mu^+ \mu^-$	C1		< 3.1	$\times 10^{-5}$	CL=90%	631
$\overline{K}^0 e^+ e^-$		[zz]	< 1.1	$\times 10^{-4}$	CL=90%	866
$\overline{K}^0 \mu^+ \mu^-$		[zz]	< 2.6	$\times 10^{-4}$	CL=90%	852
$K^- \pi^+ e^+ e^-$	C1		< 3.85	$\times 10^{-4}$	CL=90%	861
$\overline{K}^*(892)^0 e^+ e^-$		[zz]	< 4.7	$\times 10^{-5}$	CL=90%	719
$K^- \pi^+ \mu^+ \mu^-$	C1		< 3.59	$\times 10^{-4}$	CL=90%	829
$\overline{K}^*(892)^0 \mu^+ \mu^-$		[zz]	< 2.4	$\times 10^{-5}$	CL=90%	700
$\pi^+ \pi^- \pi^0 \mu^+ \mu^-$	C1		< 8.1	$\times 10^{-4}$	CL=90%	863
$\mu^\pm e^\mp$	LF	[hh]	< 2.6	$\times 10^{-7}$	CL=90%	929
$\pi^0 e^\pm \mu^\mp$	LF	[hh]	< 8.6	$\times 10^{-5}$	CL=90%	924
$\eta e^\pm \mu^\mp$	LF	[hh]	< 1.0	$\times 10^{-4}$	CL=90%	848
$\pi^+ \pi^- e^\pm \mu^\mp$	LF	[hh]	< 1.5	$\times 10^{-5}$	CL=90%	911
$\rho^0 e^\pm \mu^\mp$	LF	[hh]	< 4.9	$\times 10^{-5}$	CL=90%	767
$\omega e^\pm \mu^\mp$	LF	[hh]	< 1.2	$\times 10^{-4}$	CL=90%	764
$K^- K^+ e^\pm \mu^\mp$	LF	[hh]	< 1.8	$\times 10^{-4}$	CL=90%	754
$\phi e^\pm \mu^\mp$	LF	[hh]	< 3.4	$\times 10^{-5}$	CL=90%	648
$\overline{K}^0 e^\pm \mu^\mp$	LF	[hh]	< 1.0	$\times 10^{-4}$	CL=90%	863
$K^- \pi^+ e^\pm \mu^\mp$	LF	[hh]	< 5.53	$\times 10^{-4}$	CL=90%	848
$\overline{K}^*(892)^0 e^\pm \mu^\mp$	LF	[hh]	< 8.3	$\times 10^{-5}$	CL=90%	714
$2\pi^- 2e^+ +$ c.c.	L		< 1.12	$\times 10^{-4}$	CL=90%	922
$2\pi^- 2\mu^+ +$ c.c.	L		< 2.9	$\times 10^{-5}$	CL=90%	894
$K^- \pi^- 2e^+ +$ c.c.	L		< 2.06	$\times 10^{-4}$	CL=90%	861
$K^- \pi^- 2\mu^+ +$ c.c.	L		< 3.9	$\times 10^{-4}$	CL=90%	829
$2K^- 2e^+ +$ c.c.	L		< 1.52	$\times 10^{-4}$	CL=90%	791
$2K^- 2\mu^+ +$ c.c.	L		< 9.4	$\times 10^{-5}$	CL=90%	710
$\pi^- \pi^- e^+ \mu^+ +$ c.c.	L		< 7.9	$\times 10^{-5}$	CL=90%	911
$K^- \pi^- e^+ \mu^+ +$ c.c.	L		< 2.18	$\times 10^{-4}$	CL=90%	848
$2K^- e^+ \mu^+ +$ c.c.	L		< 5.7	$\times 10^{-5}$	CL=90%	754
$p e^-$	L,B	[jjj]	< 1.0	$\times 10^{-5}$	CL=90%	696
$\overline{p} e^+$	L,B	[kkk]	< 1.1	$\times 10^{-5}$	CL=90%	696

$D^*(2007)^0$

$I(J^P) = \frac{1}{2}(1^-)$
I, J, P need confirmation.

Mass $m = 2006.85 \pm 0.05$ MeV (S = 1.1)
$m_{D^{*0}} - m_{D^0} = 142.016 \pm 0.030$ MeV (S = 1.5)
Full width $\Gamma < 2.1$ MeV, CL = 90%

$\overline{D}^*(2007)^0$ modes are charge conjugates of modes below.

$D^*(2007)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^0\pi^0$	(64.7±0.9) %	43
$D^0\gamma$	(35.3±0.9) %	137

$D^*(2010)^\pm$

$I(J^P) = \frac{1}{2}(1^-)$
I, J, P need confirmation.

Mass $m = 2010.26 \pm 0.05$ MeV
$m_{D^*(2010)^+} - m_{D^+} = 140.68 \pm 0.08$ MeV
$m_{D^*(2010)^+} - m_{D^0} = 145.4257 \pm 0.0017$ MeV
Full width $\Gamma = 83.4 \pm 1.8$ keV

$D^*(2010)^-$ modes are charge conjugates of the modes below.

$D^*(2010)^\pm$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^0\pi^+$	(67.7±0.5) %	39
$D^+\pi^0$	(30.7±0.5) %	38
$D^+\gamma$	(1.6±0.4) %	136

$D_0^*(2400)^0$

$I(J^P) = \frac{1}{2}(0^+)$

Mass $m = 2318 \pm 29$ MeV (S = 1.7)
Full width $\Gamma = 267 \pm 40$ MeV

$D_0^*(2400)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^+\pi^-$	seen	385

$D_1(2420)^0$

$I(J^P) = \frac{1}{2}(1^+)$
I needs confirmation.

Mass $m = 2420.8 \pm 0.5$ MeV (S = 1.3)
$m_{D_1^0} - m_{D^{*+}} = 410.6 \pm 0.5$ (S = 1.3)
Full width $\Gamma = 31.7 \pm 2.5$ MeV (S = 3.5)

$\overline{D}_1(2420)^0$ modes are charge conjugates of modes below.

$D_1(2420)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^*(2010)^+\pi^-$	seen	353
$D^0\pi^+\pi^-$	seen	425
$D^+\pi^-$	not seen	472
$D^{*0}\pi^+\pi^-$	not seen	279

$D_2^*(2460)^0$ $I(J^P) = \frac{1}{2}(2^+)$

$J^P = 2^+$ assignment strongly favored.

Mass $m = 2460.57 \pm 0.15$ MeV (S = 1.1)
$m_{D_2^{*0}} - m_{D^+} = 590.98 \pm 0.18$ MeV (S = 1.1)
$m_{D_2^{*0}} - m_{D^{*+}} = 450.31 \pm 0.16$ MeV (S = 1.1)
Full width $\Gamma = 47.7 \pm 1.3$ MeV (S = 2.0)

$\overline{D}_2^*(2460)^0$ modes are charge conjugates of modes below.

$D_2^*(2460)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^+\pi^-$	seen	505
$D^*(2010)^+\pi^-$	seen	389
$D^0\pi^+\pi^-$	not seen	462
$D^{*0}\pi^+\pi^-$	not seen	324

$D_2^*(2460)^\pm$ $I(J^P) = \frac{1}{2}(2^+)$

$J^P = 2^+$ assignment strongly favored.

Mass $m = 2465.4 \pm 1.3$ MeV (S = 3.1)
$m_{D_2^*(2460)^\pm} - m_{D_2^*(2460)^0} = 2.4 \pm 1.7$ MeV
Full width $\Gamma = 46.7 \pm 1.2$ MeV

$D_2^*(2460)^-$ modes are charge conjugates of modes below.

$D_2^*(2460)^\pm$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$D^0\pi^+$	seen	513
$D^{*0}\pi^+$	seen	396
$D^+\pi^+\pi^-$	not seen	462
$D^{*+}\pi^+\pi^-$	not seen	326

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

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

$D_s^\pm$

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

Mass $m = 1968.27 \pm 0.10$ MeV
$m_{D_s^\pm} - m_{D^\pm} = 98.69 \pm 0.05$ MeV
Mean life $\tau = (500 \pm 7) \times 10^{-15}$ s (S = 1.3)
$c\tau = 149.9$ μm

CP-violating decay-rate asymmetries

$A_{CP}(\mu^\pm\nu) = (5 \pm 6)\%$
$A_{CP}(K^\pm K_S^0) = (0.08 \pm 0.26)\%$
$A_{CP}(K^+K^-\pi^\pm) = (-0.5 \pm 0.9)\%$
$A_{CP}(\phi\pi^\pm) = (-0.38 \pm 0.27)\%$
$A_{CP}(K^\pm K_S^0\pi^0) = (-2 \pm 6)\%$
$A_{CP}(2K_S^0\pi^\pm) = (3 \pm 5)\%$
$A_{CP}(K^+K^-\pi^\pm\pi^0) = (0.0 \pm 3.0)\%$
$A_{CP}(K^\pm K_S^0\pi^+\pi^-) = (-6 \pm 5)\%$
$A_{CP}(K_S^0 K^\mp 2\pi^\pm) = (4.1 \pm 2.8)\%$
$A_{CP}(\pi^+\pi^-\pi^\pm) = (-0.7 \pm 3.1)\%$
$A_{CP}(\pi^\pm\eta) = (1.1 \pm 3.1)\%$
$A_{CP}(\pi^\pm\eta') = (-2.2 \pm 2.3)\%$
$A_{CP}(\eta\pi^\pm\pi^0) = (-1 \pm 4)\%$
$A_{CP}(\eta'\pi^\pm\pi^0) = (0 \pm 8)\%$
$A_{CP}(K^\pm\pi^0) = (-27 \pm 24)\%$
$A_{CP}(\overline{K}^0/K^0\pi^\pm) = (0.4 \pm 0.5)\%$
$A_{CP}(K_S^0\pi^\pm) = (3.1 \pm 2.6)\%$ (S = 1.7)
$A_{CP}(K^\pm\pi^+\pi^-) = (4 \pm 5)\%$
$A_{CP}(K^\pm\eta) = (9 \pm 15)\%$
$A_{CP}(K^\pm\eta'(958)) = (6 \pm 19)\%$

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

$A_T(K_S^0 K^\pm\pi^+\pi^-) = (-14 \pm 8) \times 10^{-3}$ [ss]

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

$r_2 = 0.84 \pm 0.11$ (S = 2.4)
$r_v = 1.80 \pm 0.08$
$\Gamma_L/\Gamma_T = 0.72 \pm 0.18$

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	[*lll*]	(6.5 ±0.4) %		–
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_S^0 anything		(19.0 ±1.1) %		–
η anything	[*nnn*]	(29.9 ±2.8) %		–
ω anything		(6.1 ±1.4) %		–
η' anything	[*ooo*]	(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) %		–
$K_S^0 K^+$ anything		(5.8 ±0.5) %		–
$K_S^0 K^-$ anything		(1.9 ±0.4) %		–
$2K_S^0$ anything		(1.70±0.32) %		–
$2K^+$ anything		< 2.6 $\times 10^{-3}$	CL=90%	–
$2K^-$ anything		< 6 $\times 10^{-4}$	CL=90%	–
Leptonic and semileptonic modes				
$e^+\nu_e$		< 8.3 $\times 10^{-5}$	CL=90%	984
$\mu^+\nu_\mu$		(5.56±0.25) $\times 10^{-3}$		981
$\tau^+\nu_\tau$		(5.55±0.24) %		182
$K^+K^-e^+\nu_e$		—		851
$\phi e^+\nu_e$	[*ppp*]	(2.39±0.23) %	S=1.8	720
$\eta e^+\nu_e + \eta'(958) e^+\nu_e$	[*ppp*]	(2.96±0.29) %		–
$\eta e^+\nu_e$	[*ppp*]	(2.28±0.24) %		908
$\eta'(958) e^+\nu_e$	[*ppp*]	(6.8 ±1.6) $\times 10^{-3}$		751
$\omega e^+\nu_e$	[*qqq*]	< 2.0 $\times 10^{-3}$	CL=90%	829
$K^0 e^+\nu_e$		(3.9 ±0.9) $\times 10^{-3}$		921
$K^*(892)^0 e^+\nu_e$	[*ppp*]	(1.8 ±0.4) $\times 10^{-3}$		782
Hadronic modes with a $K\overline{K}$ pair				
$K^+K_S^0$		(1.50±0.05) %		850
$K^+\overline{K}^0$		(2.95±0.14) %		850
$K^+K^-\pi^+$	[*tt*]	(5.45±0.17) %	S=1.2	805
$\phi\pi^+$	[*ppp,rrr*]	(4.5 ±0.4) %		712
$\phi\pi^+,\ \phi \to K^+K^-$	[*rrr*]	(2.27±0.08) %		712

$K^+\overline{K}^*(892)^0$, $\overline{K}^{*0} \to K^-\pi^+$		(2.61±0.09) %			416
$f_0(980)\pi^+$, $f_0 \to K^+K^-$		(1.15±0.32) %			732
$f_0(1370)\pi^+$, $f_0 \to K^+K^-$		(7 ±5) × 10^{-4}			–
$f_0(1710)\pi^+$, $f_0 \to K^+K^-$		(6.7 ±2.9) × 10^{-4}			198
$K^+\overline{K}_0^*(1430)^0$, $\overline{K}_0^* \to K^-\pi^+$		(1.9 ±0.4) × 10^{-3}			218
$K^+K_S^0\pi^0$		(1.52±0.22) %			805
$2K_S^0\pi^+$		(7.7 ±0.6) × 10^{-3}			802
$K^0\overline{K}^0\pi^+$		—			802
$K^*(892)^+\overline{K}^0$	[ppp]	(5.4 ±1.2) %			683
$K^+K^-\pi^+\pi^0$		(6.3 ±0.6) %			748
$\phi\rho^+$	[ppp]	(8.4 $^{+1.9}_{-2.3}$) %			401
$K_S^0K^-2\pi^+$		(1.67±0.10) %			744
$K^*(892)^+\overline{K}^*(892)^0$	[ppp]	(7.2 ±2.6) %			416
$K^+K_S^0\pi^+\pi^-$		(1.03±0.10) %			744
$K^+K^-2\pi^+\pi^-$		(8.7 ±1.5) × 10^{-3}			673
$\phi 2\pi^+\pi^-$	[ppp]	(1.21±0.16) %			640
$K^+K^-\rho^0\pi^+$ non-ϕ		< 2.6 × 10^{-4}		CL=90%	249
$\phi\rho^0\pi^+$, $\phi \to K^+K^-$		(6.5 ±1.3) × 10^{-3}			181
$\phi a_1(1260)^+$, $\phi \to K^+K^-$, $a_1^+ \to \rho^0\pi^+$		(7.5 ±1.2) × 10^{-3}			†
$K^+K^-2\pi^+\pi^-$ nonresonant		(9 ±7) × 10^{-4}			673
$2K_S^0 2\pi^+\pi^-$		(9 ±4) × 10^{-4}			669

Hadronic modes without K's

$\pi^+\pi^0$		< 3.5 × 10^{-4}		CL=90%	975
$2\pi^+\pi^-$		(1.09±0.05) %		S=1.1	959
$\rho^0\pi^+$		(2.0 ±1.2) × 10^{-4}			825
$\pi^+(\pi^+\pi^-)_{S-\text{wave}}$	[sss]	(9.1 ±0.4) × 10^{-3}			959
$f_2(1270)\pi^+$, $f_2 \to \pi^+\pi^-$		(1.10±0.20) × 10^{-3}			559
$\rho(1450)^0\pi^+$, $\rho^0 \to \pi^+\pi^-$		(3.0 ±2.0) × 10^{-4}			421
$\pi^+2\pi^0$		(6.5 ±1.3) × 10^{-3}			960
$2\pi^+\pi^-\pi^0$		—			935
$\eta\pi^+$	[ppp]	(1.70±0.09) %		S=1.1	902
$\omega\pi^+$	[ppp]	(2.4 ±0.6) × 10^{-3}			822
$3\pi^+2\pi^-$		(8.0 ±0.8) × 10^{-3}			899
$2\pi^+\pi^-2\pi^0$		—			902
$\eta\rho^+$	[ppp]	(8.9 ±0.8) %			724
$\eta\pi^+\pi^0$		(9.2 ±1.2) %			885
$\omega\pi^+\pi^0$	[ppp]	(2.8 ±0.7) %			802
$3\pi^+2\pi^-\pi^0$		(4.9 ±3.2) %			856
$\omega 2\pi^+\pi^-$	[ppp]	(1.6 ±0.5) %			766

$\eta'(958)\pi^+$	[ooo,ppp]	(	3.94±0.25) %			743
$3\pi^+2\pi^-2\pi^0$			—			803
$\omega\eta\pi^+$	[ppp]	<	2.13	%	CL=90%	654
$\eta'(958)\rho^+$	[ooo,ppp]	(	5.8 ±1.5) %			465
$\eta'(958)\pi^+\pi^0$		(	5.6 ±0.8) %			720
$\eta'(958)\pi^+\pi^0$ nonresonant		<	5.1	%	CL=90%	720

Modes with one or three K's

$K^+\pi^0$		(	6.3 ±2.1) × 10^{-4}			917
$K^0_S\pi^+$		(	1.22±0.06) × 10^{-3}			916
$K^+\eta$	[ppp]	(	1.77±0.35) × 10^{-3}			835
$K^+\omega$	[ppp]	<	2.4	× 10^{-3}	CL=90%	741
$K^+\eta'(958)$	[ppp]	(	1.8 ±0.6) × 10^{-3}			646
$K^+\pi^+\pi^-$		(	6.6 ±0.4) × 10^{-3}			900
$K^+\rho^0$		(	2.5 ±0.4) × 10^{-3}			745
$K^+\rho(1450)^0$, $\rho^0\to\ \pi^+\pi^-$		(	7.0 ±2.4) × 10^{-4}			–
$K^*(892)^0\pi^+$, $K^{*0}\to$ $K^+\pi^-$		(	1.42±0.24) × 10^{-3}			775
$K^*(1410)^0\pi^+$, $K^{*0}\to$ $K^+\pi^-$		(	1.24±0.29) × 10^{-3}			–
$K^*(1430)^0\pi^+$, $K^{*0}\to$ $K^+\pi^-$		(	5.0 ±3.5) × 10^{-4}			–
$K^+\pi^+\pi^-$ nonresonant		(	1.04±0.34) × 10^{-3}			900
$K^0\pi^+\pi^0$		(	1.00±0.18) %			899
$K^0_S2\pi^+\pi^-$		(	3.0 ±1.1) × 10^{-3}			870
$K^+\omega\pi^0$	[ppp]	<	8.2	× 10^{-3}	CL=90%	684
$K^+\omega\pi^+\pi^-$	[ppp]	<	5.4	× 10^{-3}	CL=90%	603
$K^+\omega\eta$	[ppp]	<	7.9	× 10^{-3}	CL=90%	366
$2K^+K^-$		(	2.18±0.21) × 10^{-4}			627
ϕK^+, $\phi\to\ K^+K^-$		(	8.9 ±2.0) × 10^{-5}			–

Doubly Cabibbo-suppressed modes

$2K^+\pi^-$		(	1.27±0.13) × 10^{-4}			805
$K^+K^*(892)^0$, $K^{*0}\to$ $K^+\pi^-$		(	6.0 ±3.4) × 10^{-5}			–

Baryon-antibaryon mode

$p\overline{n}$		(	1.3 ±0.4) × 10^{-3}			295

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

$\pi^+e^+e^-$	[zz]	<	1.3	× 10^{-5}	CL=90%	979
$\pi^+\phi,\ \phi\to\ e^+e^-$	[yy]	(	6 $^{+8}_{-4}$) × 10^{-6}			–
$\pi^+\mu^+\mu^-$	[zz]	<	4.1	× 10^{-7}	CL=90%	968
$K^+e^+e^-$	C1	<	3.7	× 10^{-6}	CL=90%	922

$K^+\mu^+\mu^-$	C1	<	2.1	$\times 10^{-5}$	CL=90%	909
$K^*(892)^+\mu^+\mu^-$	C1	<	1.4	$\times 10^{-3}$	CL=90%	765
$\pi^+e^+\mu^-$	LF	<	1.2	$\times 10^{-5}$	CL=90%	976
$\pi^+e^-\mu^+$	LF	<	2.0	$\times 10^{-5}$	CL=90%	976
$K^+e^+\mu^-$	LF	<	1.4	$\times 10^{-5}$	CL=90%	919
$K^+e^-\mu^+$	LF	<	9.7	$\times 10^{-6}$	CL=90%	919
π^-2e^+	L	<	4.1	$\times 10^{-6}$	CL=90%	979
$\pi^-2\mu^+$	L	<	1.2	$\times 10^{-7}$	CL=90%	968
$\pi^-e^+\mu^+$	L	<	8.4	$\times 10^{-6}$	CL=90%	976
K^-2e^+	L	<	5.2	$\times 10^{-6}$	CL=90%	922
$K^-2\mu^+$	L	<	1.3	$\times 10^{-5}$	CL=90%	909
$K^-e^+\mu^+$	L	<	6.1	$\times 10^{-6}$	CL=90%	919
$K^*(892)^-2\mu^+$	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 $m = 2112.1 \pm 0.4$ 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)
$D_s^+\gamma$	(93.5±0.7) %	139
$D_s^+\pi^0$	(5.8±0.7) %	48
$D_s^+e^+e^-$	(6.7±1.6) $\times 10^{-3}$	139

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

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

J^P is natural, low mass consistent with 0^+.

Mass $m = 2317.7 \pm 0.6$ MeV (S = 1.1)
$m_{D_{s0}^*(2317)^{\pm}} - m_{D_s^{\pm}} = 349.4 \pm 0.6$ MeV (S = 1.1)
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)	p (MeV/c)
$D_s^+\pi^0$	seen	298
$D_s^+\pi^0\pi^0$	not seen	205

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

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

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)
$m_{D_{s1}(2460)^{\pm}} - m_{D_s^{\pm}} = 491.2 \pm 0.6$ 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 $m = 2535.10 \pm 0.06$ MeV
Full width $\Gamma = 0.92 \pm 0.05$ MeV

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

$D_{s1}(2536)^+$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$D^*(2010)^+K^0$	0.85 ±0.12		149
$(D^*(2010)^+K^0)_{S-wave}$	0.61 ±0.09		149
$D^+\pi^-K^+$	0.028±0.005		176
$D^*(2007)^0K^+$	**DEFINED AS 1**		167
D^+K^0	<0.34	90%	381
D^0K^+	<0.12	90%	391
$D_s^{*+}\gamma$	possibly seen		388
$D_s^+\pi^+\pi^-$	seen		437

$D_{s2}^*(2573)$

$I(J^P) = 0(2^+)$

J^P is natural, width and decay modes consistent with 2^+.
Mass $m = 2569.1 \pm 0.8$ MeV (S = 2.4)
Full width $\Gamma = 16.9 \pm 0.8$ 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^0K^+	seen	431
$D^*(2007)^0K^+$	not seen	238

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

Mass $m = 2708.3^{+4.0}_{-3.4}$ MeV
Full width $\Gamma = 120 \pm 11$ MeV

BOTTOM MESONS ($B = \pm 1$)

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

B-particle organization

Many measurements of B decays involve admixtures of B hadrons. Previously we arbitrarily included such admixtures in the $B^\pm$ section, but because of their importance we have created two new sections: "$B^\pm/B^0$ Admixture" for $\Upsilon(4S)$ results and "$B^\pm/B^0/B^0_s/b$-baryon Admixture" for results at higher energies. Most inclusive decay branching fractions and χ_b at high energy are found in the Admixture sections. B^0-$\overline{B}^0$ mixing data are found in the B^0 section, while B^0_s-$\overline{B}^0_s$ mixing data and B-$\overline{B}$ mixing data for a B^0/B^0_s admixture are found in the B^0_s section. CP-violation data are found in the $B^\pm$, B^0, and $B^\pm$ B^0 Admixture sections. b-baryons are found near the end of the Baryon section.

The organization of the B sections is now as follows, where bullets indicate particle sections and brackets indicate reviews.

- $B^\pm$

  mass, mean life, CP violation, branching fractions
- B^0

  mass, mean life, B^0-$\overline{B}^0$ mixing, CP violation, branching fractions
- $B^\pm/B^0$ Admixtures

  CP violation, branching fractions
- $B^\pm/B^0/B^0_s/b$-baryon Admixtures

  mean life, production fractions, branching fractions
- B^*

mass

- $B_1(5721)^+$

  mass

- $B_1(5721)^0$

  mass

- $B_2^*(5747)^+$

  mass

- $B_2^*(5747)^0$

  mass

- $B_J^*(5970)^+$

  mass

- $B_J^*(5970)^0$

  mass

- B_s^0

  mass, mean life, B_s^0-$\overline{B}_s^0$ mixing, *CP* violation, branching fractions

- B_s^*

  mass

- $B_{s1}(5830)^0$

  mass

- $B_{s2}^*(5840)^0$

  mass

- $B_c^\pm$

  mass, mean life, branching fractions

At the end of Baryon Listings:

- Λ_b

  mass, mean life, branching fractions

- $\Lambda_b(5912)^0$

  mass, mean life

- $\Lambda_b(5920)^0$

  mass, mean life

- Σ_b

  mass

- Σ_b^*

mass

- Ξ_b^0, Ξ_b^-

  mass, mean life, branching fractions

- $\Xi_b'(5935)^-$

  mass

- $\Xi_b(5945)^0$

  mass

- $\Xi_b^*(5955)^-$

  mass

- Ω_b^-

  mass, branching fractions

- *b*-baryon Admixture

  mean life, branching fractions

$B^\pm$ $I(J^P) = \frac{1}{2}(0^-)$

I, *J*, *P* need confirmation. Quantum numbers shown are quark-model predictions.

Mass $m_{B^\pm} = 5279.31 \pm 0.15$ MeV (S = 1.1)
Mean life $\tau_{B^\pm} = (1.638 \pm 0.004) \times 10^{-12}$ s
$c\tau = 491.1$ μm

CP violation

$A_{CP}(B^+ \to J/\psi(1S)K^+) = 0.003 \pm 0.006$ (S = 1.8)
$A_{CP}(B^+ \to J/\psi(1S)\pi^+) = (0.1 \pm 2.8) \times 10^{-2}$ (S = 1.2)
$A_{CP}(B^+ \to J/\psi\rho^+) = -0.11 \pm 0.14$
$A_{CP}(B^+ \to J/\psi K^*(892)^+) = -0.048 \pm 0.033$
$A_{CP}(B^+ \to \eta_c K^+) = 0.01 \pm 0.07$ (S = 2.2)
$A_{CP}(B^+ \to \psi(2S)\pi^+) = 0.03 \pm 0.06$
$A_{CP}(B^+ \to \psi(2S)K^+) = 0.012 \pm 0.020$ (S = 1.5)
$A_{CP}(B^+ \to \psi(2S)K^*(892)^+) = 0.08 \pm 0.21$
$A_{CP}(B^+ \to \chi_{c1}(1P)\pi^+) = 0.07 \pm 0.18$
$A_{CP}(B^+ \to \chi_{c0}K^+) = -0.20 \pm 0.18$ (S = 1.5)
$A_{CP}(B^+ \to \chi_{c1}K^+) = -0.009 \pm 0.033$
$A_{CP}(B^+ \to \chi_{c1}K^*(892)^+) = 0.5 \pm 0.5$
$A_{CP}(B^+ \to \overline{D}^0\pi^+) = -0.007 \pm 0.007$
$A_{CP}(B^+ \to D_{CP(+1)}\pi^+) = 0.035 \pm 0.024$
$A_{CP}(B^+ \to D_{CP(-1)}\pi^+) = 0.017 \pm 0.026$
$A_{CP}([K^\mp\pi^\pm\pi^+\pi^-]_D\pi^+) = 0.13 \pm 0.10$
$A_{CP}(B^+ \to \overline{D}^0K^+) = 0.007 \pm 0.025$ (S = 1.5)

$A_{CP}([K^{\mp}\pi^{\pm}\pi^{+}\pi^{-}]_D K^{+}) = -0.42 \pm 0.22$
$r_B(B^{+} \to D^0 K^{+}) = 0.095 \pm 0.008$
$\delta_B(B^{+} \to D^0 K^{+}) = (123 \pm 10)^{\circ}$
$r_B(B^{+} \to \overline{D}^0 K^{*+}) = 0.17 \pm 0.11$ (S = 2.3)
$\delta_B(B^{+} \to D^0 K^{*+}) = (155 \pm 70)^{\circ}$ (S = 2.0)
$A_{CP}(B^{+} \to [K^{-}\pi^{+}]_D K^{+}) = -0.58 \pm 0.21$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}\pi^{0}]_D K^{+}) = 0.07 \pm 0.30$ (S = 1.5)
$A_{CP}(B^{+} \to [K^{+}K^{-}\pi^{0}]_D K^{+}) = 0.30 \pm 0.20$
$A_{CP}(B^{+} \to [\pi^{+}\pi^{-}\pi^{0}]_D K^{+}) = 0.05 \pm 0.09$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}]_{\overline{D}} K^{*}(892)^{+}) = -0.3 \pm 0.5$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}]_D \pi^{+}) = 0.00 \pm 0.09$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}\pi^{0}]_D \pi^{+}) = 0.35 \pm 0.16$
$A_{CP}(B^{+} \to [K^{+}K^{-}\pi^{0}]_D \pi^{+}) = -0.03 \pm 0.04$
$A_{CP}(B^{+} \to [\pi^{+}\pi^{-}\pi^{0}]_D \pi^{+}) = -0.016 \pm 0.020$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}]_{(D\pi)} \pi^{+}) = -0.09 \pm 0.27$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}]_{(D\gamma)} \pi^{+}) = -0.7 \pm 0.6$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}]_{(D\pi)} K^{+}) = 0.8 \pm 0.4$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}]_{(D\gamma)} K^{+}) = 0.4 \pm 1.0$
$A_{CP}(B^{+} \to [\pi^{+}\pi^{-}\pi^{0}]_D K^{+}) = -0.02 \pm 0.15$
$A_{CP}(B^{+} \to [K^0_S K^{+}\pi^{-}]_D K^{+}) = 0.04 \pm 0.09$
$A_{CP}(B^{+} \to [K^0_S K^{-}\pi^{+}]_D K^{+}) = 0.23 \pm 0.13$
$A_{CP}(B^{+} \to [K^0_S K^{-}\pi^{+}]_D \pi^{+}) = -0.052 \pm 0.034$
$A_{CP}(B^{+} \to [K^0_S K^{+}\pi^{-}]_D \pi^{+}) = -0.025 \pm 0.026$
$A_{CP}(B^{+} \to [K^{*}(892)^{-}K^{+}]_D K^{+}) = 0.03 \pm 0.11$
$A_{CP}(B^{+} \to [K^{*}(892)^{+}K^{-}]_D K^{+}) = 0.34 \pm 0.21$
$A_{CP}(B^{+} \to [K^{*}(892)^{+}K^{-}]_D \pi^{+}) = -0.05 \pm 0.05$
$A_{CP}(B^{+} \to [K^{*}(892)^{-}K^{+}]_D \pi^{+}) = -0.012 \pm 0.030$
$\boldsymbol{A_{CP}(B^{+} \to D_{CP(+1)} K^{+})} = 0.170 \pm 0.033$ (S = 1.2)
$A_{ADS}(B^{+} \to D K^{+}) = -0.52 \pm 0.15$
$A_{ADS}(B^{+} \to D \pi^{+}) = 0.14 \pm 0.06$
$A_{ADS}(B^{+} \to [K^{-}\pi^{+}]_D K^{+}\pi^{-}\pi^{+}) = -0.33 \pm 0.35$
$A_{ADS}(B^{+} \to [K^{-}\pi^{+}]_D \pi^{+}\pi^{-}\pi^{+}) = -0.01 \pm 0.09$
$A_{CP}(B^{+} \to D_{CP(-1)} K^{+}) = -0.10 \pm 0.07$
$A_{CP}(B^{+} \to [K^{+}K^{-}]_D K^{+}\pi^{-}\pi^{+}) = -0.04 \pm 0.06$
$A_{CP}(B^{+} \to [\pi^{+}\pi^{-}]_D K^{+}\pi^{-}\pi^{+}) = -0.05 \pm 0.10$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}]_D K^{+}\pi^{-}\pi^{+}) = 0.013 \pm 0.023$
$A_{CP}(B^{+} \to [K^{+}K^{-}]_D \pi^{+}\pi^{-}\pi^{+}) = -0.019 \pm 0.015$
$A_{CP}(B^{+} \to [\pi^{+}\pi^{-}]_D \pi^{+}\pi^{-}\pi^{+}) = -0.013 \pm 0.019$
$A_{CP}(B^{+} \to [K^{-}\pi^{+}]_D \pi^{+}\pi^{-}\pi^{+}) = -0.002 \pm 0.011$
$A_{CP}(B^{+} \to \overline{D}^{*0}\pi^{+}) = -0.014 \pm 0.015$
$A_{CP}(B^{+} \to (D^{*}_{CP(+1)})^{0}\pi^{+}) = -0.02 \pm 0.05$

$A_{CP}(B^+ \to (D^*_{CP(-1)})^0\pi^+) = -0.09 \pm 0.05$
$A_{CP}(B^+ \to D^{*0}K^+) = -0.07 \pm 0.04$
$r^*_B(B^+ \to D^{*0}K^+) = 0.114^{+0.023}_{-0.040}$ (S = 1.2)
$\delta^*_B(B^+ \to D^{*0}K^+) = (310^{+22}_{-28})^\circ$ (S = 1.3)
$A_{CP}(B^+ \to D^{*0}_{CP(+1)}K^+) = -0.12 \pm 0.08$
$A_{CP}(B^+ \to D^*_{CP(-1)}K^+) = 0.07 \pm 0.10$
$A_{CP}(B^+ \to D_{CP(+1)}K^*(892)^+) = 0.09 \pm 0.14$
$A_{CP}(B^+ \to D_{CP(-1)}K^*(892)^+) = -0.23 \pm 0.22$
$A_{CP}(B^+ \to D_s^+\phi) = 0.0 \pm 0.4$
$A_{CP}(B^+ \to D^{*+}\overline{D}^{*0}) = -0.15 \pm 0.11$
$A_{CP}(B^+ \to D^{*+}\overline{D}^0) = -0.06 \pm 0.13$
$A_{CP}(B^+ \to D^+\overline{D}^{*0}) = 0.13 \pm 0.18$
$A_{CP}(B^+ \to D^+\overline{D}^0) = -0.03 \pm 0.07$
$A_{CP}(B^+ \to K^0_S\pi^+) = -0.017 \pm 0.016$
$A_{CP}(B^+ \to K^+\pi^0) = 0.037 \pm 0.021$
$A_{CP}(B^+ \to \eta' K^+) = 0.004 \pm 0.011$
$A_{CP}(B^+ \to \eta' K^*(892)^+) = -0.26 \pm 0.27$
$A_{CP}(B^+ \to \eta' K^*_0(1430)^+) = 0.06 \pm 0.20$
$A_{CP}(B^+ \to \eta' K^*_2(1430)^+) = 0.15 \pm 0.13$
$A_{CP}(B^+ \to \eta K^+) = -0.37 \pm 0.08$
$A_{CP}(B^+ \to \eta K^*(892)^+) = 0.02 \pm 0.06$
$A_{CP}(B^+ \to \eta K^*_0(1430)^+) = 0.05 \pm 0.13$
$A_{CP}(B^+ \to \eta K^*_2(1430)^+) = -0.45 \pm 0.30$
$A_{CP}(B^+ \to \omega K^+) = -0.02 \pm 0.04$
$A_{CP}(B^+ \to \omega K^{*+}) = 0.29 \pm 0.35$
$A_{CP}(B^+ \to \omega(K\pi)^{*+}_0) = -0.10 \pm 0.09$
$A_{CP}(B^+ \to \omega K^*_2(1430)^+) = 0.14 \pm 0.15$
$A_{CP}(B^+ \to K^{*0}\pi^+) = -0.04 \pm 0.09$ (S = 2.1)
$A_{CP}(B^+ \to K^*(892)^+\pi^0) = -0.06 \pm 0.24$
$A_{CP}(B^+ \to K^+\pi^-\pi^+) = 0.027 \pm 0.008$
$A_{CP}(B^+ \to K^+K^-K^+ \text{nonresonant}) = 0.06 \pm 0.05$
$A_{CP}(B^+ \to f(980)^0K^+) = -0.08 \pm 0.09$
$A_{CP}(B^+ \to f_2(1270)K^+) = -0.68^{+0.19}_{-0.17}$
$A_{CP}(B^+ \to f_0(1500)K^+) = 0.28 \pm 0.30$
$A_{CP}(B^+ \to f'_2(1525)^0K^+) = -0.08^{+0.05}_{-0.04}$
$A_{CP}(B^+ \to \rho^0K^+) = 0.37 \pm 0.10$
$A_{CP}(B^+ \to K^*_0(1430)^0\pi^+) = 0.055 \pm 0.033$
$A_{CP}(B^+ \to K^*_2(1430)^0\pi^+) = 0.05^{+0.29}_{-0.24}$
$A_{CP}(B^+ \to K^+\pi^0\pi^0) = -0.06 \pm 0.07$
$A_{CP}(B^+ \to K^0\rho^+) = -0.12 \pm 0.17$

$A_{CP}(B^+ \to K^{*+}\pi^+\pi^-) = 0.07 \pm 0.08$
$A_{CP}(B^+ \to \rho^0 K^*(892)^+) = 0.31 \pm 0.13$
$A_{CP}(B^+ \to K^*(892)^+ f_0(980)) = -0.15 \pm 0.12$
$A_{CP}(B^+ \to a_1^+ K^0) = 0.12 \pm 0.11$
$A_{CP}(B^+ \to b_1^+ K^0) = -0.03 \pm 0.15$
$A_{CP}(B^+ \to K^*(892)^0 \rho^+) = -0.01 \pm 0.16$
$A_{CP}(B^+ \to b_1^0 K^+) = -0.46 \pm 0.20$
$A_{CP}(B^+ \to K^0 K^+) = 0.04 \pm 0.14$
$A_{CP}(B^+ \to K_S^0 K^+) = -0.21 \pm 0.14$
$A_{CP}(B^+ \to K^+ K_S^0 K_S^0) = 0.04^{+0.04}_{-0.05}$
$A_{CP}(B^+ \to K^+K^-\pi^+) = -0.118 \pm 0.022$
$A_{CP}(B^+ \to K^+K^-K^+) = -0.033 \pm 0.008$
$A_{CP}(B^+ \to \phi K^+) = 0.024 \pm 0.028$ (S = 2.3)
$A_{CP}(B^+ \to X_0(1550) K^+) = -0.04 \pm 0.07$
$A_{CP}(B^+ \to K^{*+} K^+ K^-) = 0.11 \pm 0.09$
$A_{CP}(B^+ \to \phi K^*(892)^+) = -0.01 \pm 0.08$
$A_{CP}(B^+ \to \phi (K\pi)_0^{*+}) = 0.04 \pm 0.16$
$A_{CP}(B^+ \to \phi K_1(1270)^+) = 0.15 \pm 0.20$
$A_{CP}(B^+ \to \phi K_2^*(1430)^+) = -0.23 \pm 0.20$
$A_{CP}(B^+ \to K^+ \phi\phi) = -0.10 \pm 0.08$
$A_{CP}(B^+ \to K^+ [\phi\phi]_{\eta_c}) = 0.09 \pm 0.10$
$A_{CP}(B^+ \to K^*(892)^+ \gamma) = 0.018 \pm 0.029$
$A_{CP}(B^+ \to \eta K^+ \gamma) = -0.12 \pm 0.07$
$A_{CP}(B^+ \to \phi K^+ \gamma) = -0.13 \pm 0.11$ (S = 1.1)
$A_{CP}(B^+ \to \rho^+ \gamma) = -0.11 \pm 0.33$
$A_{CP}(B^+ \to \pi^+ \pi^0) = 0.03 \pm 0.04$
$A_{CP}(B^+ \to \pi^+\pi^-\pi^+) = 0.057 \pm 0.013$
$A_{CP}(B^+ \to \rho^0 \pi^+) = 0.18^{+0.09}_{-0.17}$
$A_{CP}(B^+ \to f_2(1270)\pi^+) = 0.41 \pm 0.30$
$A_{CP}(B^+ \to \rho^0(1450)\pi^+) = -0.1^{+0.4}_{-0.5}$
$A_{CP}(B^+ \to f_0(1370)\pi^+) = 0.72 \pm 0.22$
$A_{CP}(B^+ \to \pi^+\pi^-\pi^+ \text{ nonresonant}) = -0.14^{+0.23}_{-0.16}$
$A_{CP}(B^+ \to \rho^+ \pi^0) = 0.02 \pm 0.11$
$A_{CP}(B^+ \to \rho^+ \rho^0) = -0.05 \pm 0.05$
$A_{CP}(B^+ \to \omega \pi^+) = -0.04 \pm 0.06$
$A_{CP}(B^+ \to \omega \rho^+) = -0.20 \pm 0.09$
$A_{CP}(B^+ \to \eta \pi^+) = -0.14 \pm 0.07$ (S = 1.4)
$A_{CP}(B^+ \to \eta \rho^+) = 0.11 \pm 0.11$
$A_{CP}(B^+ \to \eta' \pi^+) = 0.06 \pm 0.16$
$A_{CP}(B^+ \to \eta' \rho^+) = 0.26 \pm 0.17$
$A_{CP}(B^+ \to b_1^0 \pi^+) = 0.05 \pm 0.16$

$A_{CP}(B^+ \to\ p\overline{p}\pi^+) = 0.00 \pm 0.04$
$A_{CP}(B^+ \to\ p\overline{p}K^+) = 0.00 \pm 0.04$ (S = 2.2)
$A_{CP}(B^+ \to\ p\overline{p}K^*(892)^+) = 0.21 \pm 0.16$ (S = 1.4)
$A_{CP}(B^+ \to\ p\overline{\Lambda}\gamma) = 0.17 \pm 0.17$
$A_{CP}(B^+ \to\ p\overline{\Lambda}\pi^0) = 0.01 \pm 0.17$
$A_{CP}(B^+ \to\ K^+\ell^+\ell^-) = -0.02 \pm 0.08$
$A_{CP}(B^+ \to\ K^+e^+e^-) = 0.14 \pm 0.14$
$A_{CP}(B^+ \to\ K^+\mu^+\mu^-) = 0.011 \pm 0.017$
$A_{CP}(B^+ \to\ \pi^+\mu^+\mu^-) = -0.11 \pm 0.12$
$A_{CP}(B^+ \to\ K^{*+}\ell^+\ell^-) = -0.09 \pm 0.14$
$A_{CP}(B^+ \to\ K^*e^+e^-) = -0.14 \pm 0.23$
$A_{CP}(B^+ \to\ K^*\mu^+\mu^-) = -0.12 \pm 0.24$
$\gamma(B^+ \to\ D^{(*)0}K^{(*)+}) = (70 \pm 9)^\circ$
$\gamma(B^+ \to\ DK^+\pi^-\pi^+,\ D\pi^+\pi^-\pi^+) = (74 \pm 20)^\circ$

B^- modes are charge conjugates of the modes below. Modes which do not identify the charge state of the B are listed in the $B^\pm/B^0$ ADMIXTURE section.

The branching fractions listed below assume 50% $B^0\overline{B}^0$ and 50% B^+B^- production at the $\Upsilon(4S)$. We have attempted to bring older measurements up to date by rescaling their assumed $\Upsilon(4S)$ production ratio to 50:50 and their assumed D, D_s, D^*, and ψ branching ratios to current values whenever this would affect our averages and best limits significantly.

Indentation is used to indicate a subchannel of a previous reaction. All resonant subchannels have been corrected for resonance branching fractions to the final state so the sum of the subchannel branching fractions can exceed that of the final state.

For inclusive branching fractions, *e.g.*, $B \to\ D^\pm$ anything, the values usually are multiplicities, not branching fractions. They can be greater than one.

B^+ DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Semileptonic and leptonic modes				
$\ell^+\nu_\ell$ anything	[*ttt*]	(10.99 ± 0.28) %		–
$e^+\nu_e X_c$		(10.8 ± 0.4) %		–
$D\ell^+\nu_\ell$ anything		(9.8 ± 0.7) %		–
$\overline{D}^0\ell^+\nu_\ell$	[*ttt*]	(2.27 ± 0.11) %		2310
$\overline{D}^0\tau^+\nu_\tau$		(7.7 ± 2.5) $\times 10^{-3}$		1911
$\overline{D}^*(2007)^0\ell^+\nu_\ell$	[*ttt*]	(5.69 ± 0.19) %		2258
$\overline{D}^*(2007)^0\tau^+\nu_\tau$		(1.88 ± 0.20) %		1839
$D^-\pi^+\ell^+\nu_\ell$		(4.2 ± 0.5) $\times 10^{-3}$		2306
$\overline{D}_0^*(2420)^0\ell^+\nu_\ell,\ \overline{D}_0^{*0} \to\ D^-\pi^+$		(2.5 ± 0.5) $\times 10^{-3}$		–
$\overline{D}_2^*(2460)^0\ell^+\nu_\ell,\ \overline{D}_2^{*0} \to\ D^-\pi^+$		(1.53 ± 0.16) $\times 10^{-3}$		2065

$D^{(*)}\,\mathrm{n}\,\pi\,\ell^+\nu_\ell(\mathrm{n}\ \geq\ 1)$		(	1.87	± 0.26	) %		–
$D^{*-}\pi^+\ell^+\nu_\ell$		(	6.1	± 0.6	) × 10^{-3}		2254
$\overline{D}_1(2420)^0\ell^+\nu_\ell,\ \overline{D}_1^0\ \to\ D^{*-}\pi^+$		(	3.03	± 0.20	) × 10^{-3}		2084
$\overline{D}'_1(2430)^0\ell^+\nu_\ell,\ \overline{D}_1'^0\ \to\ D^{*-}\pi^+$		(	2.7	± 0.6	) × 10^{-3}		–
$\overline{D}_2^*(2460)^0\ell^+\nu_\ell,\ \overline{D}_2^{*0}\ \to\ D^{*-}\pi^+$		(	1.01	± 0.24	) × 10^{-3}	S=2.0	2065
$\overline{D}^0\pi^+\pi^-\ell^+\nu_\ell$		(	1.6	± 0.4	) × 10^{-3}		2301
$\overline{D}^{*0}\pi^+\pi^-\ell^+\nu_\ell$		(	8	± 5	) × 10^{-4}		2248
$D_s^{(*)-}K^+\ell^+\nu_\ell$		(	6.1	± 1.0	) × 10^{-4}		–
$D_s^-K^+\ell^+\nu_\ell$		(	3.0	$^{+\ 1.4}_{-\ 1.2}$	) × 10^{-4}		2242
$D_s^{*-}K^+\ell^+\nu_\ell$		(	2.9	± 1.9	) × 10^{-4}		2185
$\pi^0\ell^+\nu_\ell$		(	7.80	± 0.27	) × 10^{-5}		2638
$\eta\ell^+\nu_\ell$		(	3.8	± 0.6	) × 10^{-5}		2611
$\eta'\ell^+\nu_\ell$		(	2.3	± 0.8	) × 10^{-5}		2553
$\omega\ell^+\nu_\ell$	[*ttt*]	(	1.19	± 0.09	) × 10^{-4}		2582
$\rho^0\ell^+\nu_\ell$	[*ttt*]	(	1.58	± 0.11	) × 10^{-4}		2583
$p\overline{p}\ell^+\nu_\ell$		(	5.8	$^{+\ 2.6}_{-\ 2.3}$	) × 10^{-6}		2467
$p\overline{p}\mu^+\nu_\mu$		<	8.5		× 10^{-6}	CL=90%	2446
$p\overline{p}e^+\nu_e$		(	8.2	$^{+\ 4.0}_{-\ 3.3}$	) × 10^{-6}		2467
$e^+\nu_e$		<	9.8		× 10^{-7}	CL=90%	2640
$\mu^+\nu_\mu$		<	1.0		× 10^{-6}	CL=90%	2639
$\tau^+\nu_\tau$		(	1.09	± 0.24	) × 10^{-4}	S=1.2	2341
$\ell^+\nu_\ell\gamma$		<	3.5		× 10^{-6}	CL=90%	2640
$e^+\nu_e\gamma$		<	6.1		× 10^{-6}	CL=90%	2640
$\mu^+\nu_\mu\gamma$		<	3.4		× 10^{-6}	CL=90%	2639
Inclusive modes							
D^0X		(	8.6	± 0.7	) %		–
$\overline{D}^0X$		(	79	± 4	) %		–
D^+X		(	2.5	± 0.5	) %		–
D^-X		(	9.9	± 1.2	) %		–
D_s^+X		(	7.9	$^{+\ 1.4}_{-\ 1.3}$	) %		–
D_s^-X		(	1.10	$^{+\ 0.40}_{-\ 0.32}$	) %		–
Λ_c^+X		(	2.1	$^{+\ 0.9}_{-\ 0.6}$	) %		–
$\overline{\Lambda}_c^-X$		(	2.8	$^{+\ 1.1}_{-\ 0.9}$	) %		–
$\overline{c}X$		(	97	± 4	) %		–
cX		(	23.4	$^{+\ 2.2}_{-\ 1.8}$	) %		–
$c/\overline{c}X$		(	120	± 6	) %		–

D, D^*, or D_s modes

$\overline{D}^0\pi^+$		(4.80 ± 0.15) $\times 10^{-3}$				2308
$D_{CP(+1)}\pi^+$	[uuu]	(2.19 ± 0.24) $\times 10^{-3}$				–
$D_{CP(-1)}\pi^+$	[uuu]	(2.1 ± 0.4) $\times 10^{-3}$				–
$\overline{D}^0\rho^+$		(1.34 ± 0.18) %				2237
$\overline{D}^0 K^+$		(3.69 ± 0.17) $\times 10^{-4}$				2281
$D_{CP(+1)}K^+$	[uuu]	(1.91 ± 0.14) $\times 10^{-4}$				–
$D_{CP(-1)}K^+$	[uuu]	(1.99 ± 0.19) $\times 10^{-4}$				–
$[K^-\pi^+]_D K^+$	[vvv]	< 2.8		$\times 10^{-7}$	CL=90%	–
$[K^+\pi^-]_D K^+$	[vvv]	< 1.8		$\times 10^{-5}$	CL=90%	–
$[K^-\pi^+\pi^0]_D K^+$		seen				–
$[K^+\pi^-\pi^0]_D K^+$		seen				–
$[K^-\pi^+\pi^+\pi^-]_D K^+$		seen				–
$[K^+\pi^-\pi^+\pi^-]_D K^+$		seen				–
$[K^-\pi^+]_D\pi^+$	[vvv]	(6.3 ± 1.1) $\times 10^{-7}$				–
$[K^+\pi^-]_D\pi^+$		(1.68 ± 0.31) $\times 10^{-4}$				–
$[K^-\pi^+\pi^0]_D\pi^+$		seen				–
$[K^+\pi^-\pi^0]_D\pi^+$		seen				–
$[K^-\pi^+\pi^+\pi^-]_D\pi^+$		seen				–
$[K^+\pi^-\pi^+\pi^-]_D\pi^+$		seen				–
$[\pi^+\pi^-\pi^0]_D K^-$		(4.6 ± 0.9) $\times 10^{-6}$				–
$[K^0_S K^+\pi^-]_D K^+$		seen				–
$[K^0_S K^-\pi^+]_D K^+$		seen				–
$[K^*(892)^+ K^-]_D K^+$		seen				–
$[K^0_S K^-\pi^+]_D\pi^+$		seen				–
$[K^*(892)^+ K^-]_D\pi^+$		seen				–
$[K^0_S K^+\pi^-]_D\pi^+$		seen				–
$[K^*(892)^- K^+]_D\pi^+$		seen				–
$\overline{D}^0 K^*(892)^+$		(5.3 ± 0.4) $\times 10^{-4}$				2213
$D_{CP(-1)}K^*(892)^+$	[uuu]	(2.7 ± 0.8) $\times 10^{-4}$				–
$D_{CP(+1)}K^*(892)^+$	[uuu]	(5.8 ± 1.1) $\times 10^{-4}$				–
$\overline{D}^0 K^+\pi^+\pi^-$		(5.4 ± 2.2) $\times 10^{-4}$				2237
$\overline{D}^0 K^+\overline{K}^0$		(5.5 ± 1.6) $\times 10^{-4}$				2189
$\overline{D}^0 K^+\overline{K}^*(892)^0$		(7.5 ± 1.7) $\times 10^{-4}$				2072
$\overline{D}^0\pi^+\pi^+\pi^-$		(5.7 ± 2.2) $\times 10^{-3}$			S=3.6	2289
$\overline{D}^0\pi^+\pi^+\pi^-$ nonresonant		(5 ± 4) $\times 10^{-3}$				2289
$\overline{D}^0\pi^+\rho^0$		(4.2 ± 3.0) $\times 10^{-3}$				2208
$\overline{D}^0 a_1(1260)^+$		(4 ± 4) $\times 10^{-3}$				2123
$\overline{D}^0\omega\pi^+$		(4.1 ± 0.9) $\times 10^{-3}$				2206
$D^*(2010)^-\pi^+\pi^+$		(1.35 ± 0.22) $\times 10^{-3}$				2247
$\overline{D}_1(2420)^0\pi^+$, $\overline{D}_1^0 \to D^*(2010)^-\pi^+$		(5.3 ± 2.3) $\times 10^{-4}$				2081
$D^-\pi^+\pi^+$		(1.07 ± 0.05) $\times 10^{-3}$				2299

$D^- K^+ \pi^+$		(	7.7	± 0.5	) × 10^{-5}			2260
$D_0^*(2400)^0 K^+,\ D_0^{*0} \to D^- \pi^+$		(	6.1	± 2.4	) × 10^{-4}			–
$D_1^*(2760)^0 K^+,\ D_1^{*0} \to D^- \pi^+$		(	3.6	± 1.2	) × 10^{-4}			–
$D_2^*(2460)^0 K^+,\ D_2^{*0} \to D^- \pi^+$		(	2.32	± 0.23	) × 10^{-3}			–
$D^+ K^0$		<	2.9		× 10^{-6}	CL=90%		2278
$D^+ K^{*0}$		<	1.8		× 10^{-6}	CL=90%		2211
$D^+ \overline{K}^{*0}$		<	1.4		× 10^{-6}	CL=90%		2211
$\overline{D}^*(2007)^0 \pi^+$		(	5.18	± 0.26	) × 10^{-3}			2256
$\overline{D}^{*0}_{CP(+1)} \pi^+$	[xxx]	(	2.9	± 0.7	) × 10^{-3}			–
$D^{*0}_{CP(-1)} \pi^+$	[xxx]	(	2.6	± 1.0	) × 10^{-3}			–
$\overline{D}^*(2007)^0 \omega \pi^+$		(	4.5	± 1.2	) × 10^{-3}			2149
$\overline{D}^*(2007)^0 \rho^+$		(	9.8	± 1.7	) × 10^{-3}			2181
$\overline{D}^*(2007)^0 K^+$		(	4.20	± 0.34	) × 10^{-4}			2227
$\overline{D}^{*0}_{CP(+1)} K^+$	[xxx]	(	2.8	± 0.4	) × 10^{-4}			–
$\overline{D}^{*0}_{CP(-1)} K^+$	[xxx]	(	2.31	± 0.33	) × 10^{-4}			–
$\overline{D}^*(2007)^0 K^*(892)^+$		(	8.1	± 1.4	) × 10^{-4}			2156
$\overline{D}^*(2007)^0 K^+ \overline{K}^0$		<	1.06		× 10^{-3}	CL=90%		2132
$\overline{D}^*(2007)^0 K^+ K^*(892)^0$		(	1.5	± 0.4	) × 10^{-3}			2009
$\overline{D}^*(2007)^0 \pi^+ \pi^+ \pi^-$		(	1.03	± 0.12	) %			2236
$\overline{D}^*(2007)^0 a_1(1260)^+$		(	1.9	± 0.5	) %			2063
$\overline{D}^*(2007)^0 \pi^- \pi^+ \pi^+ \pi^0$		(	1.8	± 0.4	) %			2219
$\overline{D}^{*0} 3\pi^+ 2\pi^-$		(	5.7	± 1.2	) × 10^{-3}			2196
$D^*(2010)^+ \pi^0$		<	3.6		× 10^{-6}			2255
$D^*(2010)^+ K^0$		<	9.0		× 10^{-6}	CL=90%		2225
$D^*(2010)^- \pi^+ \pi^+ \pi^0$		(	1.5	± 0.7	) %			2235
$D^*(2010)^- \pi^+ \pi^+ \pi^+ \pi^-$		(	2.6	± 0.4	) × 10^{-3}			2217
$\overline{D}^{**0} \pi^+$	[yyy]	(	5.9	± 1.3	) × 10^{-3}			–
$\overline{D}_1^*(2420)^0 \pi^+$		(	1.5	± 0.6	) × 10^{-3}		S=1.3	2082
$\overline{D}_1(2420)^0 \pi^+ \times$ B($\overline{D}_1^0 \to \overline{D}^0 \pi^+ \pi^-$)		(	2.5	$^{+\ 1.6}_{-\ 1.4}$	) × 10^{-4}		S=4.0	2082
$\overline{D}_1(2420)^0 \pi^+ \times$ B($\overline{D}_1^0 \to \overline{D}^0 \pi^+ \pi^-$ (nonresonant))		(	2.3	± 1.0	) × 10^{-4}			2082
$\overline{D}_2^*(2462)^0 \pi^+ \times$ B($\overline{D}_2^*(2462)^0 \to D^- \pi^+$)		(	3.5	± 0.4	) × 10^{-4}			–
$\overline{D}_2^*(2462)^0 \pi^+ \times$B($\overline{D}_2^{*0} \to \overline{D}^0 \pi^- \pi^+$)		(	2.3	± 1.1	) × 10^{-4}			–
$\overline{D}_2^*(2462)^0 \pi^+ \times$B($\overline{D}_2^{*0} \to \overline{D}^0 \pi^- \pi^+$ (nonresonant))		<	1.7		× 10^{-4}	CL=90%		–

$\overline{D}_2^*(2462)^0\pi^+\times$B($\overline{D}_2^{*0}\to$ $D^*(2010)^-\pi^+$)	(2.2	± 1.1)	$\times10^{-4}$		–
$\overline{D}_0^*(2400)^0\pi^+$ × B($\overline{D}_0^*(2400)^0\to$ $D^-\pi^+$)	(6.4	± 1.4)	$\times10^{-4}$		2128
$\overline{D}_1(2421)^0\pi^+$ × B($\overline{D}_1(2421)^0\to$ $D^{*-}\pi^+$)	(6.8	± 1.5)	$\times10^{-4}$		–
$\overline{D}_2^*(2462)^0\pi^+$ × B($\overline{D}_2^*(2462)^0\to$ $D^{*-}\pi^+$)	(1.8	± 0.5)	$\times10^{-4}$		–
$\overline{D}_1'(2427)^0\pi^+$ × B($\overline{D}_1'(2427)^0\to$ $D^{*-}\pi^+$)	(5.0	± 1.2)	$\times10^{-4}$		–
$\overline{D}_1(2420)^0\pi^+\times$B($\overline{D}_1^0\to$ $\overline{D}^{*0}\pi^+\pi^-$)	< 6		$\times10^{-6}$	CL=90%	2082
$\overline{D}_1^*(2420)^0\rho^+$	< 1.4		$\times10^{-3}$	CL=90%	1996
$\overline{D}_2^*(2460)^0\pi^+$	< 1.3		$\times10^{-3}$	CL=90%	2063
$\overline{D}_2^*(2460)^0\pi^+\times$B($\overline{D}_2^{*0}\to$ $\overline{D}^{*0}\pi^+\pi^-$)	< 2.2		$\times10^{-5}$	CL=90%	2063
$\overline{D}_2^*(2460)^0\rho^+$	< 4.7		$\times10^{-3}$	CL=90%	1977
$\overline{D}^0D_s^+$	(9.0	± 0.9)	$\times10^{-3}$		1815
$D_{s0}^*(2317)^+\overline{D}^0$, $D_{s0}^{*+}\to$ $D_s^+\pi^0$	(7.9	$^{+1.5}_{-1.3}$)	$\times10^{-4}$		1605
$D_{s0}(2317)^+\overline{D}^0\times$ B($D_{s0}(2317)^+\to$ $D_s^{*+}\gamma$)	< 7.6		$\times10^{-4}$	CL=90%	1605
$D_{s0}(2317)^+\overline{D}^*(2007)^0\times$ B($D_{s0}(2317)^+\to$ $D_s^+\pi^0$)	(9	± 7)	$\times10^{-4}$		1511
$D_{sJ}(2457)^+\overline{D}^0$	(3.1	$^{+1.0}_{-0.9}$)	$\times10^{-3}$		–
$D_{sJ}(2457)^+\overline{D}^0\times$ B($D_{sJ}(2457)^+\to$ $D_s^+\gamma$)	(4.6	$^{+1.3}_{-1.1}$)	$\times10^{-4}$		–
$D_{sJ}(2457)^+\overline{D}^0\times$ B($D_{sJ}(2457)^+\to$ $D_s^+\pi^+\pi^-$)	< 2.2		$\times10^{-4}$	CL=90%	–
$D_{sJ}(2457)^+\overline{D}^0\times$ B($D_{sJ}(2457)^+\to$ $D_s^+\pi^0$)	< 2.7		$\times10^{-4}$	CL=90%	–
$D_{sJ}(2457)^+\overline{D}^0\times$ B($D_{sJ}(2457)^+\to$ $D_s^{*+}\gamma$)	< 9.8		$\times10^{-4}$	CL=90%	–
$D_{sJ}(2457)^+\overline{D}^*(2007)^0$	(1.20	± 0.30) %			–
$D_{sJ}(2457)^+\overline{D}^*(2007)^0\times$ B($D_{sJ}(2457)^+\to$ $D_s^+\gamma$)	(1.4	$^{+0.7}_{-0.6}$)	$\times10^{-3}$		–

$\overline{D}^0 D_{s1}(2536)^+ \times$ B($D_{s1}(2536)^+ \to$ $D^*(2007)^0 K^+ +$ $D^*(2010)^+ K^0$)	(	4.0	± 1.0	) $\times 10^{-4}$		1447
$\overline{D}^0 D_{s1}(2536)^+ \times$ B($D_{s1}(2536)^+ \to$ $D^*(2007)^0 K^+$)	(	2.2	± 0.7	) $\times 10^{-4}$		1447
$\overline{D}^*(2007)^0 D_{s1}(2536)^+ \times$ B($D_{s1}(2536)^+ \to$ $D^*(2007)^0 K^+$)	(	5.5	± 1.6	) $\times 10^{-4}$		1339
$\overline{D}^0 D_{s1}(2536)^+ \times$ B($D_{s1}(2536)^+ \to D^{*+} K^0$)	(	2.3	± 1.1	) $\times 10^{-4}$		1447
$\overline{D}^0 D_{sJ}(2700)^+ \times$ B($D_{sJ}(2700)^+ \to D^0 K^+$)	(	5.6	± 1.8	) $\times 10^{-4}$	S=1.7	–
$\overline{D}^{*0} D_{s1}(2536)^+,\ D_{s1}^+ \to$ $D^{*+} K^0$	(	3.9	± 2.6	) $\times 10^{-4}$		1339
$\overline{D}^0 D_{sJ}(2573)^+,\ D_{sJ}^+ \to$ $D^0 K^+$	(	8	±15	) $\times 10^{-6}$		–
$\overline{D}^{*0} D_{sJ}(2573),\ D_{sJ}^+ \to$ $D^0 K^+$	<	2		$\times 10^{-4}$	CL=90%	1306
$\overline{D}^*(2007)^0 D_{sJ}(2573),\ D_{sJ}^+ \to$ $D^0 K^+$	<	5		$\times 10^{-4}$	CL=90%	1306
$\overline{D}^0 D_s^{*+}$	(	7.6	± 1.6	) $\times 10^{-3}$		1734
$\overline{D}^*(2007)^0 D_s^+$	(	8.2	± 1.7	) $\times 10^{-3}$		1737
$\overline{D}^*(2007)^0 D_s^{*+}$	(	1.71	± 0.24	) %		1651
$D_s^{(*)+} \overline{D}^{**0}$	(	2.7	± 1.2	) %		–
$\overline{D}^*(2007)^0 D^*(2010)^+$	(	8.1	± 1.7	) $\times 10^{-4}$		1713
$\overline{D}^0 D^*(2010)^+ +$ $\overline{D}^*(2007)^0 D^+$	<	1.30		%	CL=90%	1792
$\overline{D}^0 D^*(2010)^+$	(	3.9	± 0.5	) $\times 10^{-4}$		1792
$\overline{D}^0 D^+$	(	3.8	± 0.4	) $\times 10^{-4}$		1866
$\overline{D}^0 D^+ K^0$	(	1.55	± 0.21	) $\times 10^{-3}$		1571
$D^+ \overline{D}^*(2007)^0$	(	6.3	± 1.7	) $\times 10^{-4}$		1791
$\overline{D}^*(2007)^0 D^+ K^0$	(	2.1	± 0.5	) $\times 10^{-3}$		1475
$\overline{D}^0 D^*(2010)^+ K^0$	(	3.8	± 0.4	) $\times 10^{-3}$		1476
$\overline{D}^*(2007)^0 D^*(2010)^+ K^0$	(	9.2	± 1.2	) $\times 10^{-3}$		1362
$\overline{D}^0 D^0 K^+$	(	1.45	± 0.33	) $\times 10^{-3}$	S=2.6	1577
$\overline{D}^*(2007)^0 D^0 K^+$	(	2.26	± 0.23	) $\times 10^{-3}$		1481
$\overline{D}^0 D^*(2007)^0 K^+$	(	6.3	± 0.5	) $\times 10^{-3}$		1481
$\overline{D}^*(2007)^0 D^*(2007)^0 K^+$	(	1.12	± 0.13	) %		1368
$D^- D^+ K^+$	(	2.2	± 0.7	) $\times 10^{-4}$		1571
$D^- D^*(2010)^+ K^+$	(	6.3	± 1.1	) $\times 10^{-4}$		1475
$D^*(2010)^- D^+ K^+$	(	6.0	± 1.3	) $\times 10^{-4}$		1475
$D^*(2010)^- D^*(2010)^+ K^+$	(	1.32	± 0.18	) $\times 10^{-3}$		1363

$(\overline{D}+\overline{D}^*)(D+D^*)K$	(	4.05	$\pm$ 0.30	) %		–
$D_s^+\pi^0$	(	1.6	$\pm$ 0.5	) $\times 10^{-5}$		2270
$D_s^{*+}\pi^0$	$<$	2.6		$\times 10^{-4}$	CL=90%	2215
$D_s^+\eta$	$<$	4		$\times 10^{-4}$	CL=90%	2235
$D_s^{*+}\eta$	$<$	6		$\times 10^{-4}$	CL=90%	2178
$D_s^+\rho^0$	$<$	3.0		$\times 10^{-4}$	CL=90%	2197
$D_s^{*+}\rho^0$	$<$	4		$\times 10^{-4}$	CL=90%	2138
$D_s^+\omega$	$<$	4		$\times 10^{-4}$	CL=90%	2195
$D_s^{*+}\omega$	$<$	6		$\times 10^{-4}$	CL=90%	2136
$D_s^+ a_1(1260)^0$	$<$	1.8		$\times 10^{-3}$	CL=90%	2079
$D_s^{*+} a_1(1260)^0$	$<$	1.3		$\times 10^{-3}$	CL=90%	2015
$D_s^+\phi$	(	1.7	$^{+\ 1.2}_{-\ 0.7}$	) $\times 10^{-6}$		2141
$D_s^{*+}\phi$	$<$	1.2		$\times 10^{-5}$	CL=90%	2079
$D_s^+\overline{K}^0$	$<$	8		$\times 10^{-4}$	CL=90%	2242
$D_s^{*+}\overline{K}^0$	$<$	9		$\times 10^{-4}$	CL=90%	2185
$D_s^+\overline{K}^*(892)^0$	$<$	4.4		$\times 10^{-6}$	CL=90%	2172
$D_s^+ K^{*0}$	$<$	3.5		$\times 10^{-6}$	CL=90%	2172
$D_s^{*+}\overline{K}^*(892)^0$	$<$	3.5		$\times 10^{-4}$	CL=90%	2112
$D_s^-\pi^+K^+$	(	1.80	$\pm$ 0.22	) $\times 10^{-4}$		2222
$D_s^{*-}\pi^+K^+$	(	1.45	$\pm$ 0.24	) $\times 10^{-4}$		2164
$D_s^-\pi^+K^*(892)^+$	$<$	5		$\times 10^{-3}$	CL=90%	2138
$D_s^{*-}\pi^+K^*(892)^+$	$<$	7		$\times 10^{-3}$	CL=90%	2076
$D_s^-K^+K^+$	(	9.7	$\pm$ 2.1	) $\times 10^{-6}$		2149
$D_s^{*-}K^+K^+$	$<$	1.5		$\times 10^{-5}$	CL=90%	2088

Charmonium modes

$\eta_c K^+$	(	9.6	$\pm$ 1.1	) $\times 10^{-4}$		1751
$\eta_c K^+,\ \eta_c \to K_S^0 K^\mp\pi^\pm$	(	2.7	$\pm$ 0.6	) $\times 10^{-5}$		–
$\eta_c K^*(892)^+$	(	1.0	$^{+\ 0.5}_{-\ 0.4}$	) $\times 10^{-3}$		1646
$\eta_c K^+\pi^+\pi^-$	$<$	3.9		$\times 10^{-4}$	CL=90%	1684
$\eta_c K^+\omega(782)$	$<$	5.3		$\times 10^{-4}$	CL=90%	1476
$\eta_c K^+\eta$	$<$	2.2		$\times 10^{-4}$	CL=90%	1588
$\eta_c K^+\pi^0$	$<$	6.2		$\times 10^{-5}$	CL=90%	1723
$\eta_c(2S) K^+$	(	3.4	$\pm$ 1.8	) $\times 10^{-4}$		1319
$\eta_c(2S) K^+,\ \eta_c \to p\overline{p}$	$<$	1.06		$\times 10^{-7}$	CL=95%	–
$\eta_c(2S) K^+,\ \eta_c \to K_S^0 K^\mp\pi^\pm$	(	3.4	$^{+\ 2.3}_{-\ 1.6}$	) $\times 10^{-6}$		–
$h_c(1P) K^+,\ h_c \to J/\psi\pi^+\pi^-$	$<$	3.4		$\times 10^{-6}$	CL=90%	1401
$X(3730)^0 K^+,\ X^0 \to \eta_c\eta$	$<$	4.6		$\times 10^{-5}$	CL=90%	–
$X(3730)^0 K^+,\ X^0 \to \eta_c\pi^0$	$<$	5.7		$\times 10^{-6}$	CL=90%	–

$X(3872)K^+$		<	3.2		$\times 10^{-4}$	CL=90%	1141
$X(3872)K^+,\ X \to p\overline{p}$		<	1.7		$\times 10^{-8}$	CL=95%	–
$X(3872)K^+,\ X \to J/\psi\pi^+\pi^-$		(	8.6	± 0.8)	$\times 10^{-6}$		1141
$X(3872)K^+,\ X \to J/\psi\gamma$		(	2.1	± 0.4)	$\times 10^{-6}$	S=1.1	1141
$X(3872)K^+,\ X \to \psi(2S)\gamma$		(	4	± 4)	$\times 10^{-6}$	S=2.5	1141
$X(3872)K^+,\ X \to J/\psi(1S)\eta$		<	7.7		$\times 10^{-6}$	CL=90%	1141
$X(3872)K^+,\ X \to D^0\overline{D}^0$		<	6.0		$\times 10^{-5}$	CL=90%	1141
$X(3872)K^+,\ X \to D^+D^-$		<	4.0		$\times 10^{-5}$	CL=90%	1141
$X(3872)K^+,\ X \to D^0\overline{D}^0\pi^0$		(	1.0	± 0.4)	$\times 10^{-4}$		1141
$X(3872)K^+,\ X \to \overline{D}^{*0}D^0$		(	8.5	± 2.6)	$\times 10^{-5}$	S=1.4	1141
$X(3872)^0K^+,\ X^0 \to \eta_c\pi^+\pi^-$		<	3.0		$\times 10^{-5}$	CL=90%	–
$X(3872)^0K^+,\ X^0 \to \eta_c\omega(782)$		<	6.9		$\times 10^{-5}$	CL=90%	–
$X(3915)^0K^+,\ X^0 \to \eta_c\eta$		<	3.3		$\times 10^{-5}$	CL=90%	–
$X(3915)^0K^+,\ X^0 \to \eta_c\pi^0$		<	1.8		$\times 10^{-5}$	CL=90%	–
$X(4014)^0K^+,\ X^0 \to \eta_c\eta$		<	3.9		$\times 10^{-5}$	CL=90%	–
$X(4014)^0K^+,\ X^0 \to \eta_c\pi^0$		<	1.2		$\times 10^{-5}$	CL=90%	–
$X(3900)^0K^+,\ X^0 \to \eta_c\pi^+\pi^-$		<	4.7		$\times 10^{-5}$	CL=90%	–
$X(4020)^0K^+,\ X^0 \to \eta_c\pi^+\pi^-$		<	1.6		$\times 10^{-5}$	CL=90%	–
$X(3872)K^*(892)^+,\ X \to J/\psi\gamma$		<	4.8		$\times 10^{-6}$	CL=90%	939
$X(3872)K^*(892)^+,\ X \to \psi(2S)\gamma$		<	2.8		$\times 10^{-5}$	CL=90%	939
$X(3872)^+K^0,\ X^+ \to J/\psi(1S)\pi^+\pi^0$	[zzz]	<	6.1		$\times 10^{-6}$	CL=90%	–
$X(3872)K^0\pi^+,\ X \to J/\psi(1S)\pi^+\pi^-$		(	1.06	± 0.31)	$\times 10^{-5}$		–
$X(4430)^+K^0,\ X^+ \to J/\psi\pi^+$		<	1.5		$\times 10^{-5}$	CL=95%	–
$X(4430)^+K^0,\ X^+ \to \psi(2S)\pi^+$		<	4.7		$\times 10^{-5}$	CL=95%	–
$X(4260)^0K^+,\ X^0 \to J/\psi\pi^+\pi^-$		<	2.9		$\times 10^{-5}$	CL=95%	–
$X(3915)K^+,\ X \to J/\psi\gamma$		<	1.4		$\times 10^{-5}$	CL=90%	–
$X(3930)^0K^+,\ X^0 \to J/\psi\gamma$		<	2.5		$\times 10^{-6}$	CL=90%	–
$J/\psi(1S)K^+$		(	1.026	± 0.031)	$\times 10^{-3}$		1684
$J/\psi(1S)K^+\pi^+\pi^-$		(	8.1	± 1.3)	$\times 10^{-4}$	S=2.5	1612
$J/\psi(1S)K^+K^-K^+$		(	3.37	± 0.29)	$\times 10^{-5}$		1252
$X(3915)K^+,\ X \to p\overline{p}$		<	7.1		$\times 10^{-8}$	CL=95%	–

$J/\psi(1S)K^*(892)^+$	(	1.43 ± 0.08	)	$\times 10^{-3}$		1571
$J/\psi(1S)K(1270)^+$	(	1.8 ± 0.5	)	$\times 10^{-3}$		1390
$J/\psi(1S)K(1400)^+$	<	5		$\times 10^{-4}$	CL=90%	1308
$J/\psi(1S)\eta K^+$	(	1.24 ± 0.14	)	$\times 10^{-4}$		1510
$X^{c-odd}(3872)K^+$, $X^{c-odd} \to J/\psi\eta$	<	3.8		$\times 10^{-6}$	CL=90%	–
$\psi(4160)K^+$, $\psi \to J/\psi\eta$	<	7.4		$\times 10^{-6}$	CL=90%	–
$J/\psi(1S)\eta' K^+$	<	8.8		$\times 10^{-5}$	CL=90%	1273
$J/\psi(1S)\phi K^+$	(	5.0 ± 0.4	)	$\times 10^{-5}$		1227
$X(4140)K^+$, $X \to J/\psi(1S)\phi$	(	10 ± 4	)	$\times 10^{-6}$		–
$X(4274)K^+$, $X \to J/\psi(1S)\phi$	<	4		$\times 10^{-6}$	CL=90%	–
$J/\psi(1S)\omega K^+$	(	$3.20\ ^{+\ 0.60}_{-\ 0.32}$	)	$\times 10^{-4}$		1388
$X(3872)K^+$, $X \to J/\psi\omega$	(	6.0 ± 2.2	)	$\times 10^{-6}$		1141
$X(3915)K^+$, $X \to J/\psi\omega$	(	$3.0\ ^{+\ 0.9}_{-\ 0.7}$	)	$\times 10^{-5}$		1103
$J/\psi(1S)\pi^+$	(	4.1 ± 0.4	)	$\times 10^{-5}$	S=2.6	1728
$J/\psi(1S)\rho^+$	(	5.0 ± 0.8	)	$\times 10^{-5}$		1611
$J/\psi(1S)\pi^+\pi^0$ nonresonant	<	7.3		$\times 10^{-6}$	CL=90%	1717
$J/\psi(1S)a_1(1260)^+$	<	1.2		$\times 10^{-3}$	CL=90%	1415
$J/\psi p\overline{p}\pi^+$	<	5.0		$\times 10^{-7}$	CL=90%	643
$J/\psi(1S)p\overline{\Lambda}$	(	1.18 ± 0.31	)	$\times 10^{-5}$		567
$J/\psi(1S)\overline{\Sigma}^0 p$	<	1.1		$\times 10^{-5}$	CL=90%	–
$J/\psi(1S)D^+$	<	1.2		$\times 10^{-4}$	CL=90%	871
$J/\psi(1S)\overline{D}^0\pi^+$	<	2.5		$\times 10^{-5}$	CL=90%	665
$\psi(2S)\pi^+$	(	2.44 ± 0.30	)	$\times 10^{-5}$		1347
$\psi(2S)K^+$	(	6.26 ± 0.24	)	$\times 10^{-4}$		1284
$\psi(2S)K^*(892)^+$	(	6.7 ± 1.4	)	$\times 10^{-4}$	S=1.3	1116
$\psi(2S)K^+\pi^+\pi^-$	(	4.3 ± 0.5	)	$\times 10^{-4}$		1179
$\psi(3770)K^+$	(	4.9 ± 1.3	)	$\times 10^{-4}$		1218
$\psi(3770)K+, \psi \to D^0\overline{D}^0$	(	1.5 ± 0.5	)	$\times 10^{-4}$	S=1.4	1218
$\psi(3770)K+, \psi \to D^+D^-$	(	9.4 ± 3.5	)	$\times 10^{-5}$		1218
$\psi(4040)K^+$	<	1.3		$\times 10^{-4}$	CL=90%	1003
$\psi(4160)K^+$	(	5.1 ± 2.7	)	$\times 10^{-4}$		868
$\psi(4160)K^+$, $\psi \to \overline{D}^0 D^0$	(	8 ± 5	)	$\times 10^{-5}$		–
$\chi_{c0}\pi^+$, $\chi_{c0} \to \pi^+\pi^-$	<	1		$\times 10^{-7}$	CL=90%	1531
$\chi_{c0}(1P)K^+$	(	$1.50\ ^{+\ 0.15}_{-\ 0.14}$	)	$\times 10^{-4}$		1478
$\chi_{c0}K^*(892)^+$	<	2.1		$\times 10^{-4}$	CL=90%	1341
$\chi_{c2}\pi^+$, $\chi_{c2} \to \pi^+\pi^-$	<	1		$\times 10^{-7}$	CL=90%	1437
$\chi_{c2}K^+$	(	1.1 ± 0.4	)	$\times 10^{-5}$		1379
$\chi_{c2}K^*(892)^+$	<	1.2		$\times 10^{-4}$	CL=90%	1228
$\chi_{c1}(1P)\pi^+$	(	2.2 ± 0.5	)	$\times 10^{-5}$		1468

$\chi_{c1}(1P)K^+$	(	4.79 ± 0.23	) × 10^{-4}			1412
$\chi_{c1}(1P)K^*(892)^+$	(	3.0 ± 0.6	) × 10^{-4}	S=1.1		1265
$h_c(1P)K^+$	<	3.8	× 10^{-5}	CL=90%		1401
$h_c(1P)K^+,\ h_c \to p\overline{p}$	<	6.4	× 10^{-8}	CL=95%		–

K or K^* modes

$K^0\pi^+$	(	2.37 ± 0.08	) × 10^{-5}			2614
$K^+\pi^0$	(	1.29 ± 0.05	) × 10^{-5}			2615
$\eta' K^+$	(	7.06 ± 0.25	) × 10^{-5}			2528
$\eta' K^*(892)^+$	(	4.8 $^{+\ 1.8}_{-\ 1.6}$	) × 10^{-6}			2472
$\eta' K_0^*(1430)^+$	(	5.2 ± 2.1	) × 10^{-6}			–
$\eta' K_2^*(1430)^+$	(	2.8 ± 0.5	) × 10^{-5}			2346
ηK^+	(	2.4 ± 0.4	) × 10^{-6}	S=1.7		2588
$\eta K^*(892)^+$	(	1.93 ± 0.16	) × 10^{-5}			2534
$\eta K_0^*(1430)^+$	(	1.8 ± 0.4	) × 10^{-5}			–
$\eta K_2^*(1430)^+$	(	9.1 ± 3.0	) × 10^{-6}			2414
$\eta(1295)K^+ \times$ B($\eta(1295) \to \eta\pi\pi$)	(	2.9 $^{+\ 0.8}_{-\ 0.7}$	) × 10^{-6}			2455
$\eta(1405)K^+ \times$ B($\eta(1405) \to \eta\pi\pi$)	<	1.3	× 10^{-6}	CL=90%		2425
$\eta(1405)K^+ \times$ B($\eta(1405) \to K^*K$)	<	1.2	× 10^{-6}	CL=90%		2425
$\eta(1475)K^+ \times$ B($\eta(1475) \to K^*K$)	(	1.38 $^{+\ 0.21}_{-\ 0.18}$	) × 10^{-5}			2406
$f_1(1285)K^+$	<	2.0	× 10^{-6}	CL=90%		2458
$f_1(1420)K^+ \times$ B($f_1(1420) \to \eta\pi\pi$)	<	2.9	× 10^{-6}	CL=90%		2420
$f_1(1420)K^+ \times$ B($f_1(1420) \to K^*K$)	<	4.1	× 10^{-6}	CL=90%		2420
$\phi(1680)K^+ \times$ B($\phi(1680) \to K^*K$)	<	3.4	× 10^{-6}	CL=90%		2344
$f_0(1500)K^+$	(	3.7 ± 2.2	) × 10^{-6}			2398
ωK^+	(	6.5 ± 0.4	) × 10^{-6}			2558
$\omega K^*(892)^+$	<	7.4	× 10^{-6}	CL=90%		2503
$\omega(K\pi)_0^{*+}$	(	2.8 ± 0.4	) × 10^{-5}			–
$\omega K_0^*(1430)^+$	(	2.4 ± 0.5	) × 10^{-5}			–
$\omega K_2^*(1430)^+$	(	2.1 ± 0.4	) × 10^{-5}			2380
$a_0(980)^+K^0 \times$B($a_0(980)^+ \to \eta\pi^+$)	<	3.9	× 10^{-6}	CL=90%		–
$a_0(980)^0K^+ \times$B($a_0(980)^0 \to \eta\pi^0$)	<	2.5	× 10^{-6}	CL=90%		–
$K^*(892)^0\pi^+$	(	1.01 ± 0.09	) × 10^{-5}			2562
$K^*(892)^+\pi^0$	(	8.2 ± 1.9	) × 10^{-6}			2563

$K^+\pi^-\pi^+$	(	5.10	± 0.29	) × 10^{-5}		2609
$K^+\pi^-\pi^+$ nonresonant	(	1.63	$^{+\ 0.21}_{-\ 0.15}$	) × 10^{-5}		2609
$\omega(782)K^+$	(	6	± 9	) × 10^{-6}		2558
$K^+ f_0(980)\times$ B($f_0(980)\to\pi^+\pi^-$)	(	9.4	$^{+\ 1.0}_{-\ 1.2}$	) × 10^{-6}		2522
$f_2(1270)^0 K^+$	(	1.07	± 0.27	) × 10^{-6}		–
$f_0(1370)^0 K^+\times$ B($f_0(1370)^0\to\pi^+\pi^-$)	<	1.07		× 10^{-5}	CL=90%	–
$\rho^0(1450)K^+\times$ B($\rho^0(1450)\to\pi^+\pi^-$)	<	1.17		× 10^{-5}	CL=90%	–
$f_2'(1525)K^+\times$ B($f_2'(1525)\to\pi^+\pi^-$)	<	3.4		× 10^{-6}	CL=90%	2392
$K^+\rho^0$	(	3.7	± 0.5	) × 10^{-6}		2559
$K_0^*(1430)^0\pi^+$	(	4.5	$^{+\ 0.9}_{-\ 0.7}$	) × 10^{-5}	S=1.5	2445
$K_2^*(1430)^0\pi^+$	(	5.6	$^{+\ 2.2}_{-\ 1.5}$	) × 10^{-6}		2445
$K^*(1410)^0\pi^+$	<	4.5		× 10^{-5}	CL=90%	2448
$K^*(1680)^0\pi^+$	<	1.2		× 10^{-5}	CL=90%	2358
$K^+\pi^0\pi^0$	(	1.62	± 0.19	) × 10^{-5}		2610
$f_0(980)K^+\times$ B($f_0\to\pi^0\pi^0$)	(	2.8	± 0.8	) × 10^{-6}		2522
$K^-\pi^+\pi^+$	<	9.5		× 10^{-7}	CL=90%	2609
$K^-\pi^+\pi^+$ nonresonant	<	5.6		× 10^{-5}	CL=90%	2609
$K_1(1270)^0\pi^+$	<	4.0		× 10^{-5}	CL=90%	2484
$K_1(1400)^0\pi^+$	<	3.9		× 10^{-5}	CL=90%	2451
$K^0\pi^+\pi^0$	<	6.6		× 10^{-5}	CL=90%	2609
$K^0\rho^+$	(	8.0	± 1.5	) × 10^{-6}		2558
$K^*(892)^+\pi^+\pi^-$	(	7.5	± 1.0	) × 10^{-5}		2557
$K^*(892)^+\rho^0$	(	4.6	± 1.1	) × 10^{-6}		2504
$K^*(892)^+ f_0(980)$	(	4.2	± 0.7	) × 10^{-6}		2466
$a_1^+ K^0$	(	3.5	± 0.7	) × 10^{-5}		–
$b_1^+ K^0\times$ B($b_1^+\to\omega\pi^+$)	(	9.6	± 1.9	) × 10^{-6}		–
$K^*(892)^0\rho^+$	(	9.2	± 1.5	) × 10^{-6}		2504
$K_1(1400)^+\rho^0$	<	7.8		× 10^{-4}	CL=90%	2388
$K_2^*(1430)^+\rho^0$	<	1.5		× 10^{-3}	CL=90%	2381
$b_1^0 K^+\times$ B($b_1^0\to\omega\pi^0$)	(	9.1	± 2.0	) × 10^{-6}		–
$b_1^+ K^{*0}\times$ B($b_1^+\to\omega\pi^+$)	<	5.9		× 10^{-6}	CL=90%	–
$b_1^0 K^{*+}\times$ B($b_1^0\to\omega\pi^0$)	<	6.7		× 10^{-6}	CL=90%	–
$K^+\overline{K}^0$	(	1.31	± 0.17	) × 10^{-6}	S=1.2	2593
$\overline{K}^0 K^+\pi^0$	<	2.4		× 10^{-5}	CL=90%	2578
$K^+ K_S^0 K_S^0$	(	1.08	± 0.06	) × 10^{-5}		2521
$f_0(980)K^+,\ f_0\to K_S^0 K_S^0$	(	1.47	± 0.33	) × 10^{-5}		–

$f_0(1710)K^+,\ f_0 \to\ K^0_S K^0_S$	(	4.8	$^{+\ 4.0}_{-\ 2.6}$	$)\times10^{-7}$		–
$K^+K^0_SK^0_S$ nonresonant	(	2.0	$\pm$ 0.4	$)\times10^{-5}$		2521
$K^0_SK^0_S\pi^+$	$<$	5.1		$\times10^{-7}$	CL=90%	2577
$K^+K^-\pi^+$	(	5.0	$\pm$ 0.7	$)\times10^{-6}$		2578
$K^+K^-\pi^+$ nonresonant	$<$	7.5		$\times10^{-5}$	CL=90%	2578
$K^+\overline{K}^*(892)^0$	$<$	1.1		$\times10^{-6}$	CL=90%	2540
$K^+\overline{K}^*_0(1430)^0$	$<$	2.2		$\times10^{-6}$	CL=90%	2421
$K^+K^+\pi^-$	$<$	1.6		$\times10^{-7}$	CL=90%	2578
$K^+K^+\pi^-$ nonresonant	$<$	8.79		$\times10^{-5}$	CL=90%	2578
$f'_2(1525)K^+$	(	1.8	$\pm$ 0.5	$)\times10^{-6}$	S=1.1	2392
$K^{*+}\pi^+K^-$	$<$	1.18		$\times10^{-5}$	CL=90%	2524
$K^*(892)^+K^*(892)^0$	(	9.1	$\pm$ 2.9	$)\times10^{-7}$		2484
$K^{*+}K^+\pi^-$	$<$	6.1		$\times10^{-6}$	CL=90%	2524
$K^+K^-K^+$	(	3.40	$\pm$ 0.14	$)\times10^{-5}$	S=1.4	2523
$K^+\phi$	(	8.8	$^{+\ 0.7}_{-\ 0.6}$	$)\times10^{-6}$	S=1.1	2516
$f_0(980)K^+\times$ B($f_0(980)\to K^+K^-$)	(	9.4	$\pm$ 3.2	$)\times10^{-6}$		2522
$a_2(1320)K^+\times$ B($a_2(1320)\to\ K^+K^-$)	$<$	1.1		$\times10^{-6}$	CL=90%	2449
$X_0(1550)K^+\times$ B($X_0(1550)\to\ K^+K^-$)	(	4.3	$\pm$ 0.7	$)\times10^{-6}$		–
$\phi(1680)K^+\times$ B($\phi(1680)\to K^+K^-$)	$<$	8		$\times10^{-7}$	CL=90%	2344
$f_0(1710)K^+\times$ B($f_0(1710)\to K^+K^-$)	(	1.1	$\pm$ 0.6	$)\times10^{-6}$		2330
$K^+K^-K^+$ nonresonant	(	2.38	$^{+\ 0.28}_{-\ 0.50}$	$)\times10^{-5}$		2523
$K^*(892)^+K^+K^-$	(	3.6	$\pm$ 0.5	$)\times10^{-5}$		2466
$K^*(892)^+\phi$	(	10.0	$\pm$ 2.0	$)\times10^{-6}$	S=1.7	2460
$\phi(K\pi)^{*+}_0$	(	8.3	$\pm$ 1.6	$)\times10^{-6}$		–
$\phi K_1(1270)^+$	(	6.1	$\pm$ 1.9	$)\times10^{-6}$		2375
$\phi K_1(1400)^+$	$<$	3.2		$\times10^{-6}$	CL=90%	2339
$\phi K^*(1410)^+$	$<$	4.3		$\times10^{-6}$	CL=90%	–
$\phi K^*_0(1430)^+$	(	7.0	$\pm$ 1.6	$)\times10^{-6}$		–
$\phi K^*_2(1430)^+$	(	8.4	$\pm$ 2.1	$)\times10^{-6}$		2333
$\phi K^*_2(1770)^+$	$<$	1.50		$\times10^{-5}$	CL=90%	–
$\phi K^*_2(1820)^+$	$<$	1.63		$\times10^{-5}$	CL=90%	–
$a^+_1K^{*0}$	$<$	3.6		$\times10^{-6}$	CL=90%	–
$K^+\phi\phi$	(	5.0	$\pm$ 1.2	$)\times10^{-6}$	S=2.3	2306
$\eta'\eta'K^+$	$<$	2.5		$\times10^{-5}$	CL=90%	2338
$\omega\phi K^+$	$<$	1.9		$\times10^{-6}$	CL=90%	2374
$X(1812)K^+\times$ B($X\to\ \omega\phi$)	$<$	3.2		$\times10^{-7}$	CL=90%	–

$K^*(892)^+\gamma$	(	4.21	± 0.18	) × 10^{-5}		2564
$K_1(1270)^+\gamma$	(	4.3	± 1.3	) × 10^{-5}		2486
$\eta K^+\gamma$	(	7.9	± 0.9	) × 10^{-6}		2588
$\eta' K^+\gamma$	(	2.9	$^{+\ 1.0}_{-\ 0.9}$	) × 10^{-6}		2528
$\phi K^+\gamma$	(	2.7	± 0.4	) × 10^{-6}	S=1.2	2516
$K^+\pi^-\pi^+\gamma$	(	2.76	± 0.22	) × 10^{-5}	S=1.2	2609
$K^*(892)^0\pi^+\gamma$	(	2.0	$^{+\ 0.7}_{-\ 0.6}$	) × 10^{-5}		2562
$K^+\rho^0\gamma$	<	2.0		× 10^{-5}	CL=90%	2559
$K^+\pi^-\pi^+\gamma$ nonresonant	<	9.2		× 10^{-6}	CL=90%	2609
$K^0\pi^+\pi^0\gamma$	(	4.6	± 0.5	) × 10^{-5}		2609
$K_1(1400)^+\gamma$	<	1.5		× 10^{-5}	CL=90%	2453
$K_2^*(1430)^+\gamma$	(	1.4	± 0.4	) × 10^{-5}		2447
$K^*(1680)^+\gamma$	<	1.9		× 10^{-3}	CL=90%	2360
$K_3^*(1780)^+\gamma$	<	3.9		× 10^{-5}	CL=90%	2341
$K_4^*(2045)^+\gamma$	<	9.9		× 10^{-3}	CL=90%	2244

Light unflavored meson modes

$\rho^+\gamma$	(	9.8	± 2.5	) × 10^{-7}		2583
$\pi^+\pi^0$	(	5.5	± 0.4	) × 10^{-6}	S=1.2	2636
$\pi^+\pi^+\pi^-$	(	1.52	± 0.14	) × 10^{-5}		2630
$\rho^0\pi^+$	(	8.3	± 1.2	) × 10^{-6}		2581
$\pi^+ f_0(980)$, $f_0 \to \pi^+\pi^-$	<	1.5		× 10^{-6}	CL=90%	2545
$\pi^+ f_2(1270)$	(	1.6	$^{+\ 0.7}_{-\ 0.4}$	) × 10^{-6}		2484
$\rho(1450)^0\pi^+$, $\rho^0 \to \pi^+\pi^-$	(	1.4	$^{+\ 0.6}_{-\ 0.9}$	) × 10^{-6}		2434
$f_0(1370)\pi^+$, $f_0 \to \pi^+\pi^-$	<	4.0		× 10^{-6}	CL=90%	2460
$f_0(500)\pi^+$, $f_0 \to \pi^+\pi^-$	<	4.1		× 10^{-6}	CL=90%	–
$\pi^+\pi^-\pi^+$ nonresonant	(	5.3	$^{+\ 1.5}_{-\ 1.1}$	) × 10^{-6}		2630
$\pi^+\pi^0\pi^0$	<	8.9		× 10^{-4}	CL=90%	2631
$\rho^+\pi^0$	(	1.09	± 0.14	) × 10^{-5}		2581
$\pi^+\pi^-\pi^+\pi^0$	<	4.0		× 10^{-3}	CL=90%	2622
$\rho^+\rho^0$	(	2.40	± 0.19	) × 10^{-5}		2523
$\rho^+ f_0(980)$, $f_0 \to \pi^+\pi^-$	<	2.0		× 10^{-6}	CL=90%	2486
$a_1(1260)^+\pi^0$	(	2.6	± 0.7	) × 10^{-5}		2494
$a_1(1260)^0\pi^+$	(	2.0	± 0.6	) × 10^{-5}		2494
$\omega\pi^+$	(	6.9	± 0.5	) × 10^{-6}		2580
$\omega\rho^+$	(	1.59	± 0.21	) × 10^{-5}		2522
$\eta\pi^+$	(	4.02	± 0.27	) × 10^{-6}		2609
$\eta\rho^+$	(	7.0	± 2.9	) × 10^{-6}	S=2.8	2553
$\eta'\pi^+$	(	2.7	± 0.9	) × 10^{-6}	S=1.9	2551
$\eta'\rho^+$	(	9.7	± 2.2	) × 10^{-6}		2492
$\phi\pi^+$	<	1.5		× 10^{-7}	CL=90%	2539

$\phi\rho^+$	$<$	3.0		$\times 10^{-6}$	CL=90%	2480
$a_0(980)^0\pi^+,\ a_0^0 \to \eta\pi^0$	$<$	5.8		$\times 10^{-6}$	CL=90%	–
$a_0(980)^+\pi^0,\ a_0^+ \to \eta\pi^+$	$<$	1.4		$\times 10^{-6}$	CL=90%	–
$\pi^+\pi^+\pi^+\pi^-\pi^-$	$<$	8.6		$\times 10^{-4}$	CL=90%	2608
$\rho^0 a_1(1260)^+$	$<$	6.2		$\times 10^{-4}$	CL=90%	2433
$\rho^0 a_2(1320)^+$	$<$	7.2		$\times 10^{-4}$	CL=90%	2410
$b_1^0\pi^+,\ b_1^0 \to \omega\pi^0$	(	6.7	$\pm$ 2.0)	$\times 10^{-6}$		–
$b_1^+\pi^0,\ b_1^+ \to \omega\pi^+$	$<$	3.3		$\times 10^{-6}$	CL=90%	–
$\pi^+\pi^+\pi^+\pi^-\pi^-\pi^0$	$<$	6.3		$\times 10^{-3}$	CL=90%	2592
$b_1^+\rho^0,\ b_1^+ \to \omega\pi^+$	$<$	5.2		$\times 10^{-6}$	CL=90%	–
$a_1(1260)^+ a_1(1260)^0$	$<$	1.3		%	CL=90%	2336
$b_1^0\rho^+,\ b_1^0 \to \omega\pi^0$	$<$	3.3		$\times 10^{-6}$	CL=90%	–

Charged particle ($h^\pm$) modes

$h^\pm = K^\pm$ or $\pi^\pm$

$h^+\pi^0$	(	1.6	$^{+\ 0.7}_{-\ 0.6}$)	$\times 10^{-5}$		2636
ωh^+	(	1.38	$^{+\ 0.27}_{-\ 0.24}$)	$\times 10^{-5}$		2580
$h^+ X^0$ (Familon)	$<$	4.9		$\times 10^{-5}$	CL=90%	–

Baryon modes

$p\overline{p}\pi^+$	(	1.62	$\pm$ 0.20)	$\times 10^{-6}$		2439
$p\overline{p}\pi^+$ nonresonant	$<$	5.3		$\times 10^{-5}$	CL=90%	2439
$p\overline{p}K^+$	(	5.9	$\pm$ 0.5)	$\times 10^{-6}$	S=1.5	2348
$\Theta(1710)^{++}\overline{p},\ \Theta^{++} \to pK^+$	[*aaaa*] $<$	9.1		$\times 10^{-8}$	CL=90%	–
$f_J(2220)K^+,\ f_J \to p\overline{p}$	[*aaaa*] $<$	4.1		$\times 10^{-7}$	CL=90%	2135
$p\overline{\Lambda}(1520)$	(	3.1	$\pm$ 0.6)	$\times 10^{-7}$		2322
$p\overline{p}K^+$ nonresonant	$<$	8.9		$\times 10^{-5}$	CL=90%	2348
$p\overline{p}K^*(892)^+$	(	3.6	$^{+\ 0.8}_{-\ 0.7}$)	$\times 10^{-6}$		2215
$f_J(2220)K^{*+},\ f_J \to p\overline{p}$	$<$	7.7		$\times 10^{-7}$	CL=90%	2059
$p\overline{\Lambda}$	$<$	3.2		$\times 10^{-7}$	CL=90%	2430
$p\overline{\Lambda}\gamma$	(	2.4	$^{+\ 0.5}_{-\ 0.4}$)	$\times 10^{-6}$		2430
$p\overline{\Lambda}\pi^0$	(	3.0	$^{+\ 0.7}_{-\ 0.6}$)	$\times 10^{-6}$		2402
$p\overline{\Sigma}(1385)^0$	$<$	4.7		$\times 10^{-7}$	CL=90%	2362
$\Delta^+\overline{\Lambda}$	$<$	8.2		$\times 10^{-7}$	CL=90%	–
$p\overline{\Sigma}\gamma$	$<$	4.6		$\times 10^{-6}$	CL=90%	2413
$p\overline{\Lambda}\pi^+\pi^-$	(	5.9	$\pm$ 1.1)	$\times 10^{-6}$		2367
$p\overline{\Lambda}\rho^0$	(	4.8	$\pm$ 0.9)	$\times 10^{-6}$		2214
$p\overline{\Lambda}f_2(1270)$	(	2.0	$\pm$ 0.8)	$\times 10^{-6}$		2026
$\Lambda\overline{\Lambda}\pi^+$	$<$	9.4		$\times 10^{-7}$	CL=90%	2358
$\Lambda\overline{\Lambda}K^+$	(	3.4	$\pm$ 0.6)	$\times 10^{-6}$		2251

$\Lambda\overline{\Lambda}K^{*+}$		(	2.2	$^{+\ 1.2}_{-\ 0.9}$	) $\times 10^{-6}$		2098
$\overline{\Delta}^0 p$		<	1.38		$\times 10^{-6}$	CL=90%	2403
$\Delta^{++}\overline{p}$		<	1.4		$\times 10^{-7}$	CL=90%	2403
$D^+ p\overline{p}$		<	1.5		$\times 10^{-5}$	CL=90%	1860
$D^*(2010)^+ p\overline{p}$		<	1.5		$\times 10^{-5}$	CL=90%	1786
$\overline{D}^0 p\overline{p}\pi^+$		(	3.72	± 0.27	) $\times 10^{-4}$		1789
$\overline{D}^{*0} p\overline{p}\pi^+$		(	3.73	± 0.32	) $\times 10^{-4}$		1709
$D^- p\overline{p}\pi^+\pi^-$		(	1.66	± 0.30	) $\times 10^{-4}$		1705
$D^{*-} p\overline{p}\pi^+\pi^-$		(	1.86	± 0.25	) $\times 10^{-4}$		1621
$p\overline{\Lambda}^0\overline{D}^0$		(	1.43	± 0.32	) $\times 10^{-5}$		–
$p\overline{\Lambda}^0\overline{D}^*(2007)^0$		<	5		$\times 10^{-5}$	CL=90%	–
$\overline{\Lambda}_c^- p\pi^+$		(	2.2	± 0.4	) $\times 10^{-4}$	S=2.2	1980
$\overline{\Lambda}_c^- \Delta(1232)^{++}$		<	1.9		$\times 10^{-5}$	CL=90%	1928
$\overline{\Lambda}_c^- \Delta_X(1600)^{++}$		(	4.6	± 0.9	) $\times 10^{-5}$		–
$\overline{\Lambda}_c^- \Delta_X(2420)^{++}$		(	3.7	± 0.8	) $\times 10^{-5}$		–
$(\overline{\Lambda}_c^- p)_s\pi^+$	[bbaa]	(	3.1	± 0.7	) $\times 10^{-5}$		–
$\overline{\Sigma}_c(2520)^0 p$		<	3		$\times 10^{-6}$	CL=90%	1904
$\overline{\Sigma}_c(2800)^0 p$		(	2.6	± 0.9	) $\times 10^{-5}$		–
$\overline{\Lambda}_c^- p\pi^+\pi^0$		(	1.8	± 0.6	) $\times 10^{-3}$		1935
$\overline{\Lambda}_c^- p\pi^+\pi^+\pi^-$		(	2.2	± 0.7	) $\times 10^{-3}$		1880
$\overline{\Lambda}_c^- p\pi^+\pi^+\pi^-\pi^0$		<	1.34		%	CL=90%	1823
$\Lambda_c^+\Lambda_c^- K^+$		(	6.9	± 2.2	) $\times 10^{-4}$		–
$\overline{\Sigma}_c(2455)^0 p$		(	2.9	± 0.7	) $\times 10^{-5}$		1938
$\overline{\Sigma}_c(2455)^0 p\pi^0$		(	3.5	± 1.1	) $\times 10^{-4}$		1896
$\overline{\Sigma}_c(2455)^0 p\pi^-\pi^+$		(	3.5	± 1.0	) $\times 10^{-4}$		1845
$\overline{\Sigma}_c(2455)^{--} p\pi^+\pi^+$		(	2.34	± 0.20	) $\times 10^{-4}$		1845
$\overline{\Lambda}_c(2593)^-/\overline{\Lambda}_c(2625)^- p\pi^+$		<	1.9		$\times 10^{-4}$	CL=90%	–
$\overline{\Xi}_c^0\Lambda_c^+,\ \overline{\Xi}_c^0 \to \overline{\Xi}^+\pi^-$		(	2.4	± 0.9	) $\times 10^{-5}$	S=1.4	1144
$\overline{\Xi}_c^0\Lambda_c^+,\ \overline{\Xi}_c^0 \to \Lambda K^+\pi^-$		(	2.1	± 0.9	) $\times 10^{-5}$	S=1.5	1144

Lepton Family number (LF) or Lepton number (L) or Baryon number (B) violating modes, or/and $\Delta B = 1$ weak neutral current ($B1$) modes

$\pi^+\ell^+\ell^-$	$B1$		<	4.9		$\times 10^{-8}$	CL=90%	2638
$\pi^+ e^+ e^-$	$B1$		<	8.0		$\times 10^{-8}$	CL=90%	2638
$\pi^+\mu^+\mu^-$	$B1$		(	1.79	± 0.23	) $\times 10^{-8}$		2634
$\pi^+\nu\overline{\nu}$	$B1$		<	9.8		$\times 10^{-5}$	CL=90%	2638
$K^+\ell^+\ell^-$	$B1$	[ttt]	(	4.51	± 0.23	) $\times 10^{-7}$	S=1.1	2617
$K^+ e^+ e^-$	$B1$		(	5.5	± 0.7	) $\times 10^{-7}$		2617
$K^+\mu^+\mu^-$	$B1$		(	4.43	± 0.24	) $\times 10^{-7}$	S=1.2	2612
$K^+\overline{\nu}\nu$	$B1$		<	1.6		$\times 10^{-5}$	CL=90%	2617
$\rho^+\nu\overline{\nu}$	$B1$		<	2.13		$\times 10^{-4}$	CL=90%	2583
$K^*(892)^+\ell^+\ell^-$	$B1$	[ttt]	(	1.01	± 0.11	) $\times 10^{-6}$	S=1.1	2564

$K^*(892)^+ e^+ e^-$	*B1*	(	1.55	$^{+\ 0.40}_{-\ 0.31}$	) $\times 10^{-6}$			2564
$K^*(892)^+ \mu^+ \mu^-$	*B1*	(	9.6	$\pm$ 1.0	) $\times 10^{-7}$			2560
$K^*(892)^+ \nu\overline{\nu}$	*B1*	$<$	4.0		$\times 10^{-5}$	CL=90%		2564
$K^+ \pi^+ \pi^- \mu^+ \mu^-$	*B1*	(	4.4	$\pm$ 0.4	) $\times 10^{-7}$			2593
$\phi K^+ \mu^+ \mu^-$	*B1*	(	7.9	$^{+\ 2.1}_{-\ 1.7}$	) $\times 10^{-8}$			2490
$\pi^+ e^+ \mu^-$	*LF*	$<$	6.4		$\times 10^{-3}$	CL=90%		2637
$\pi^+ e^- \mu^+$	*LF*	$<$	6.4		$\times 10^{-3}$	CL=90%		2637
$\pi^+ e^\pm \mu^\mp$	*LF*	$<$	1.7		$\times 10^{-7}$	CL=90%		2637
$\pi^+ e^+ \tau^-$	*LF*	$<$	7.4		$\times 10^{-5}$	CL=90%		2338
$\pi^+ e^- \tau^+$	*LF*	$<$	2.0		$\times 10^{-5}$	CL=90%		2338
$\pi^+ e^\pm \tau^\mp$	*LF*	$<$	7.5		$\times 10^{-5}$	CL=90%		2338
$\pi^+ \mu^+ \tau^-$	*LF*	$<$	6.2		$\times 10^{-5}$	CL=90%		2333
$\pi^+ \mu^- \tau^+$	*LF*	$<$	4.5		$\times 10^{-5}$	CL=90%		2333
$\pi^+ \mu^\pm \tau^\mp$	*LF*	$<$	7.2		$\times 10^{-5}$	CL=90%		2333
$K^+ e^+ \mu^-$	*LF*	$<$	9.1		$\times 10^{-8}$	CL=90%		2615
$K^+ e^- \mu^+$	*LF*	$<$	1.3		$\times 10^{-7}$	CL=90%		2615
$K^+ e^\pm \mu^\mp$	*LF*	$<$	9.1		$\times 10^{-8}$	CL=90%		2615
$K^+ e^+ \tau^-$	*LF*	$<$	4.3		$\times 10^{-5}$	CL=90%		2312
$K^+ e^- \tau^+$	*LF*	$<$	1.5		$\times 10^{-5}$	CL=90%		2312
$K^+ e^\pm \tau^\mp$	*LF*	$<$	3.0		$\times 10^{-5}$	CL=90%		2312
$K^+ \mu^+ \tau^-$	*LF*	$<$	4.5		$\times 10^{-5}$	CL=90%		2298
$K^+ \mu^- \tau^+$	*LF*	$<$	2.8		$\times 10^{-5}$	CL=90%		2298
$K^+ \mu^\pm \tau^\mp$	*LF*	$<$	4.8		$\times 10^{-5}$	CL=90%		2298
$K^*(892)^+ e^+ \mu^-$	*LF*	$<$	1.3		$\times 10^{-6}$	CL=90%		2563
$K^*(892)^+ e^- \mu^+$	*LF*	$<$	9.9		$\times 10^{-7}$	CL=90%		2563
$K^*(892)^+ e^\pm \mu^\mp$	*LF*	$<$	1.4		$\times 10^{-6}$	CL=90%		2563
$\pi^- e^+ e^+$	*L*	$<$	2.3		$\times 10^{-8}$	CL=90%		2638
$\pi^- \mu^+ \mu^+$	*L*	$<$	4.0		$\times 10^{-9}$	CL=95%		2634
$\pi^- e^+ \mu^+$	*L*	$<$	1.5		$\times 10^{-7}$	CL=90%		2637
$\rho^- e^+ e^+$	*L*	$<$	1.7		$\times 10^{-7}$	CL=90%		2583
$\rho^- \mu^+ \mu^+$	*L*	$<$	4.2		$\times 10^{-7}$	CL=90%		2578
$\rho^- e^+ \mu^+$	*L*	$<$	4.7		$\times 10^{-7}$	CL=90%		2582
$K^- e^+ e^+$	*L*	$<$	3.0		$\times 10^{-8}$	CL=90%		2617
$K^- \mu^+ \mu^+$	*L*	$<$	4.1		$\times 10^{-8}$	CL=90%		2612
$K^- e^+ \mu^+$	*L*	$<$	1.6		$\times 10^{-7}$	CL=90%		2615
$K^*(892)^- e^+ e^+$	*L*	$<$	4.0		$\times 10^{-7}$	CL=90%		2564
$K^*(892)^- \mu^+ \mu^+$	*L*	$<$	5.9		$\times 10^{-7}$	CL=90%		2560
$K^*(892)^- e^+ \mu^+$	*L*	$<$	3.0		$\times 10^{-7}$	CL=90%		2563
$D^- e^+ e^+$	*L*	$<$	2.6		$\times 10^{-6}$	CL=90%		2309
$D^- e^+ \mu^+$	*L*	$<$	1.8		$\times 10^{-6}$	CL=90%		2307
$D^- \mu^+ \mu^+$	*L*	$<$	6.9		$\times 10^{-7}$	CL=95%		2303
$D^{*-} \mu^+ \mu^+$	*L*	$<$	2.4		$\times 10^{-6}$	CL=95%		2251
$D_s^- \mu^+ \mu^+$	*L*	$<$	5.8		$\times 10^{-7}$	CL=95%		2267

$\overline{D}^0 \pi^- \mu^+ \mu^+$	L	$<$	1.5	$\times 10^{-6}$	CL=95%	2295
$\Lambda^0 \mu^+$	L,B	$<$	6	$\times 10^{-8}$	CL=90%	–
$\Lambda^0 e^+$	L,B	$<$	3.2	$\times 10^{-8}$	CL=90%	–
$\overline{\Lambda}^0 \mu^+$	L,B	$<$	6	$\times 10^{-8}$	CL=90%	–
$\overline{\Lambda}^0 e^+$	L,B	$<$	8	$\times 10^{-8}$	CL=90%	–

B^0

$I(J^P) = \frac{1}{2}(0^-)$

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

Mass $m_{B^0} = 5279.62 \pm 0.15$ MeV (S = 1.1)
$m_{B^0} - m_{B^\pm} = 0.31 \pm 0.06$ MeV
Mean life $\tau_{B^0} = (1.520 \pm 0.004) \times 10^{-12}$ s
$c\tau = 455.7\ \mu$m
$\tau_{B^+}/\tau_{B^0} = 1.076 \pm 0.004$ (direct measurements)

B^0-$\overline{B}^0$ mixing parameters

$\chi_d = 0.1875 \pm 0.0017$
$\Delta m_{B^0} = m_{B^0_H} - m_{B^0_L} = (0.5096 \pm 0.0034) \times 10^{12}\ \hbar\ \text{s}^{-1}$
$= (3.354 \pm 0.022) \times 10^{-10}$ MeV
$x_d = \Delta m_{B^0}/\Gamma_{B^0} = 0.775 \pm 0.006$
$\text{Re}(\lambda_{CP} / |\lambda_{CP}|)\ \text{Re(z)} = 0.01 \pm 0.05$
$\Delta\Gamma\ \text{Re(z)} = -0.007 \pm 0.004$
$\text{Re(z)} = (2 \pm 5) \times 10^{-2}$
$\text{Im(z)} = (-0.8 \pm 0.4) \times 10^{-2}$

CP violation parameters

$\text{Re}(\epsilon_{B^0})/(1+|\epsilon_{B^0}|^2) = (-0.4 \pm 0.4) \times 10^{-3}$
$A_{T/CP} = 0.005 \pm 0.018$
$A_{CP}(B^0 \to D^*(2010)^+ D^-) = 0.037 \pm 0.034$
$A_{CP}(B^0 \to [K^+K^-]_D K^*(892)^0) = -0.20 \pm 0.15$
$A_{CP}(B^0 \to [K^+\pi^-]_D K^*(892)^0) = -0.03 \pm 0.04$
$R_d^+ = \Gamma(B^0 \to [\pi^+K^-]_D K^{*0}) / \Gamma(B^0 \to [\pi^-K^+]_D K^{*0}) =$
0.06 ± 0.032
$R_d^- = \Gamma(\overline{B}^0 \to [\pi^-K^+]_D K^{*0}) / \Gamma(\overline{B}^0 \to [\pi^+K^-]_D K^{*0}) =$
0.06 ± 0.032
$A_{CP}(B^0 \to [\pi^+\pi^-]_D K^*(892)^0) = -0.09 \pm 0.22$
$\boldsymbol{A_{CP}\ (B^0 \to\ K^+\pi^-)} = -0.082 \pm 0.006$
$A_{CP}(B^0 \to \eta' K^*(892)^0) = -0.07 \pm 0.18$
$A_{CP}(B^0 \to \eta' K_0^*(1430)^0) = -0.19 \pm 0.17$
$A_{CP}(B^0 \to \eta' K_2^*(1430)^0) = 0.14 \pm 0.18$

$\boldsymbol{A_{CP}(B^0 \to\ \eta K^*(892)^0)} = 0.19 \pm 0.05$
$A_{CP}(B^0 \to\ \eta K_0^*(1430)^0) = 0.06 \pm 0.13$
$A_{CP}(B^0 \to\ \eta K_2^*(1430)^0) = -0.07 \pm 0.19$
$A_{CP}(B^0 \to\ b_1 K^+) = -0.07 \pm 0.12$
$A_{CP}(B^0 \to\ \omega K^{*0}) = 0.45 \pm 0.25$
$A_{CP}(B^0 \to\ \omega (K\pi)_0^{*0}) = -0.07 \pm 0.09$
$A_{CP}(B^0 \to\ \omega K_2^*(1430)^0) = -0.37 \pm 0.17$
$A_{CP}(B^0 \to\ K^+\pi^-\pi^0) = (0 \pm 6) \times 10^{-2}$
$A_{CP}(B^0 \to\ \rho^- K^+) = 0.20 \pm 0.11$
$A_{CP}(B^0 \to\ \rho(1450)^- K^+) = -0.10 \pm 0.33$
$A_{CP}(B^0 \to\ \rho(1700)^- K^+) = -0.4 \pm 0.6$
$A_{CP}(B^0 \to\ K^+\pi^-\pi^0 \text{nonresonant}) = 0.10 \pm 0.18$
$A_{CP}(B^0 \to\ K^0\pi^+\pi^-) = -0.01 \pm 0.05$
$\boldsymbol{A_{CP}(B^0 \to\ K^*(892)^+\pi^-)} = -0.22 \pm 0.06$
$A_{CP}(B^0 \to\ (K\pi)_0^{*+}\pi^-) = 0.09 \pm 0.07$
$A_{CP}(B^0 \to\ (K\pi)_0^{*0}\pi^0) = -0.15 \pm 0.11$
$A_{CP}(B^0 \to\ K^{*0}\pi^0) = -0.15 \pm 0.13$
$A_{CP}(B^0 \to\ K^*(892)^0\pi^+\pi^-) = 0.07 \pm 0.05$
$A_{CP}(B^0 \to\ K^*(892)^0\rho^0) = -0.06 \pm 0.09$
$A_{CP}(B^0 \to\ K^{*0} f_0(980)) = 0.07 \pm 0.10$
$A_{CP}(B^0 \to\ K^{*+}\rho^-) = 0.21 \pm 0.15$
$A_{CP}(B^0 \to\ K^*(892)^0 K^+ K^-) = 0.01 \pm 0.05$
$A_{CP}(B^0 \to\ a_1^- K^+) = -0.16 \pm 0.12$
$A_{CP}(B^0 \to\ K^0 K^0) = -0.6 \pm 0.7$
$A_{CP}(B^0 \to\ K^*(892)^0\phi) = 0.00 \pm 0.04$
$A_{CP}(B^0 \to\ K^*(892)^0 K^-\pi^+) = 0.2 \pm 0.4$
$A_{CP}(B^0 \to\ \phi(K\pi)_0^{*0}) = 0.12 \pm 0.08$
$A_{CP}(B^0 \to\ \phi K_2^*(1430)^0) = -0.11 \pm 0.10$
$A_{CP}(B^0 \to\ K^*(892)^0\gamma) = -0.002 \pm 0.015$
$A_{CP}(B^0 \to\ K_2^*(1430)^0\gamma) = -0.08 \pm 0.15$
$A_{CP}(B^0 \to\ \rho^+\pi^-) = 0.13 \pm 0.06 \quad (\text{S} = 1.1)$
$A_{CP}(B^0 \to\ \rho^-\pi^+) = -0.08 \pm 0.08$
$A_{CP}(B^0 \to\ a_1(1260)^\pm\pi^\mp) = -0.07 \pm 0.06$
$A_{CP}(B^0 \to\ b_1^-\pi^+) = -0.05 \pm 0.10$
$A_{CP}(B^0 \to\ p\overline{p}K^*(892)^0) = 0.05 \pm 0.12$
$A_{CP}(B^0 \to\ p\overline{\Lambda}\pi^-) = 0.04 \pm 0.07$
$A_{CP}(B^0 \to\ K^{*0}\ell^+\ell^-) = -0.05 \pm 0.10$
$A_{CP}(B^0 \to\ K^{*0}e^+e^-) = -0.21 \pm 0.19$
$A_{CP}(B^0 \to\ K^{*0}\mu^+\mu^-) = -0.034 \pm 0.024$
$C_{D^{*-}D^+}\ (B^0 \to\ D^*(2010)^- D^+) = -0.01 \pm 0.11$
$\boldsymbol{S_{D^{*-}D^+}\ (B^0 \to\ D^*(2010)^- D^+)} = -0.72 \pm 0.15$
$C_{D^{*+}D^-}\ (B^0 \to\ D^*(2010)^+ D^-) = 0.00 \pm 0.13 \quad (\text{S} = 1.3)$

$\boldsymbol{S_{D^{*+}D^-}\ (B^0 \to\ D^*(2010)^+ D^-)} = -0.73 \pm 0.14$
$C_{D^{*+}D^{*-}}\ (B^0 \to\ D^{*+}D^{*-}) = 0.01 \pm 0.09$ (S = 1.6)
$\boldsymbol{S_{D^{*+}D^{*-}}\ (B^0 \to\ D^{*+}D^{*-})} = -0.59 \pm 0.14$ (S = 1.8)
$C_+\ (B^0 \to\ D^{*+}D^{*-}) = 0.00 \pm 0.10$ (S = 1.6)
$\boldsymbol{S_+\ (B^0 \to\ D^{*+}D^{*-})} = -0.73 \pm 0.09$
$C_-\ (B^0 \to\ D^{*+}D^{*-}) = 0.19 \pm 0.31$
$S_-\ (B^0 \to\ D^{*+}D^{*-}) = 0.1 \pm 1.6$ (S = 3.5)
$C\ (B^0 \to\ D^*(2010)^+ D^*(2010)^- K^0_S) = 0.01 \pm 0.29$
$S\ (B^0 \to\ D^*(2010)^+ D^*(2010)^- K^0_S) = 0.1 \pm 0.4$
$C_{D^+D^-}\ (B^0 \to\ D^+D^-) = -0.46 \pm 0.21$ (S = 1.8)
$\boldsymbol{S_{D^+D^-}\ (B^0 \to\ D^+D^-)} = -0.99^{+0.17}_{-0.14}$
$C_{J/\psi(1S)\pi^0}\ (B^0 \to\ J/\psi(1S)\pi^0) = -0.13 \pm 0.13$
$\boldsymbol{S_{J/\psi(1S)\pi^0}\ (B^0 \to\ J/\psi(1S)\pi^0)} = -0.94 \pm 0.29$ (S = 1.9)
$C(B^0 \to\ J/\psi(1S)\rho^0) = -0.06 \pm 0.06$
$\boldsymbol{S(B^0 \to\ J/\psi(1S)\rho^0)} = -0.66^{+0.16}_{-0.12}$
$C_{D^{(*)}_{CP}h^0}\ (B^0 \to\ D^{(*)}_{CP}h^0) = -0.02 \pm 0.08$
$\boldsymbol{S_{D^{(*)}_{CP}h^0}\ (B^0 \to\ D^{(*)}_{CP}h^0)} = -0.66 \pm 0.12$
$C_{K^0\pi^0}\ (B^0 \to\ K^0\pi^0) = 0.00 \pm 0.13$ (S = 1.4)
$\boldsymbol{S_{K^0\pi^0}\ (B^0 \to\ K^0\pi^0)} = 0.58 \pm 0.17$
$C_{\eta'(958)K^0_S}\ (B^0 \to\ \eta'(958)K^0_S) = -0.04 \pm 0.20$ (S = 2.5)
$S_{\eta'(958)K^0_S}\ (B^0 \to\ \eta'(958)K^0_S) = 0.43 \pm 0.17$ (S = 1.5)
$C_{\eta' K^0}\ (B^0 \to\ \eta' K^0) = -0.06 \pm 0.04$
$\boldsymbol{S_{\eta' K^0}\ (B^0 \to\ \eta' K^0)} = 0.63 \pm 0.06$
$C_{\omega K^0_S}\ (B^0 \to\ \omega K^0_S) = 0.0 \pm 0.4$ (S = 3.0)
$S_{\omega K^0_S}\ (B^0 \to\ \omega K^0_S) = 0.70 \pm 0.21$
$C\ (B^0 \to\ K^0_S\pi^0\pi^0) = 0.2 \pm 0.5$
$S\ (B^0 \to\ K^0_S\pi^0\pi^0) = 0.7 \pm 0.7$
$C_{\rho^0 K^0_S}\ (B^0 \to\ \rho^0 K^0_S) = -0.04 \pm 0.20$
$S_{\rho^0 K^0_S}\ (B^0 \to\ \rho^0 K^0_S) = 0.50^{+0.17}_{-0.21}$
$C_{f_0 K^0_S}\ (B^0 \to\ f_0(980)K^0_S) = 0.29 \pm 0.20$
$\boldsymbol{S_{f_0 K^0_S}\ (B^0 \to\ f_0(980)K^0_S)} = -0.50 \pm 0.16$
$S_{f_2 K^0_S}\ (B^0 \to\ f_2(1270)K^0_S) = -0.5 \pm 0.5$
$C_{f_2 K^0_S}\ (B^0 \to\ f_2(1270)K^0_S) = 0.3 \pm 0.4$
$S_{f_x K^0_S}\ (B^0 \to\ f_x(1300)K^0_S) = -0.2 \pm 0.5$

$C_{f_x K^0_S}$ $(B^0 \to f_x(1300) K^0_S) = 0.13 \pm 0.35$
$S_{K^0\pi^+\pi^-}$ $(B^0 \to K^0\pi^+\pi^-$ nonresonant$) = -0.01 \pm 0.33$
$C_{K^0\pi^+\pi^-}$ $(B^0 \to K^0\pi^+\pi^-$ nonresonant$) = 0.01 \pm 0.26$
$C_{K^0_S K^0_S}$ $(B^0 \to K^0_S K^0_S) = 0.0 \pm 0.4$ (S = 1.4)
$S_{K^0_S K^0_S}$ $(B^0 \to K^0_S K^0_S) = -0.8 \pm 0.5$
$C_{K^+K^-K^0_S}$ $(B^0 \to K^+K^-K^0_S$ nonresonant$) = 0.06 \pm 0.08$
$S_{K^+K^-K^0_S}$ $(B^0 \to K^+K^-K^0_S$ nonresonant$) = -0.66 \pm 0.11$
$C_{K^+K^-K^0_S}$ $(B^0 \to K^+K^-K^0_S$ inclusive$) = 0.01 \pm 0.09$
$S_{K^+K^-K^0_S}$ $(B^0 \to K^+K^-K^0_S$ inclusive$) = -0.65 \pm 0.12$
$C_{\phi K^0_S}$ $(B^0 \to \phi K^0_S) = 0.01 \pm 0.14$
$S_{\phi K^0_S}$ $(B^0 \to \phi K^0_S) = 0.59 \pm 0.14$
$C_{K_S K_S K_S}(B^0 \to K_S K_S K_S) = -0.23 \pm 0.14$
$S_{K_S K_S K_S}(B^0 \to K_S K_S K_S) = -0.5 \pm 0.6$ (S = 3.0)
$C_{K^0_S\pi^0\gamma}(B^0 \to K^0_S\pi^0\gamma) = 0.36 \pm 0.33$
$S_{K^0_S\pi^0\gamma}(B^0 \to K^0_S\pi^0\gamma) = -0.8 \pm 0.6$
$C_{K^{*0}\gamma}$ $(B^0 \to K^*(892)^0\gamma) = -0.04 \pm 0.16$ (S = 1.2)
$S_{K^{*0}\gamma}$ $(B^0 \to K^*(892)^0\gamma) = -0.15 \pm 0.22$
$C_{\eta K^0\gamma}$ $(B^0 \to \eta K^0\gamma) = -0.3 \pm 0.4$
$S_{\eta K^0\gamma}$ $(B^0 \to \eta K^0\gamma) = -0.2 \pm 0.5$
$C_{K^0\phi\gamma}$ $(B^0 \to K^0\phi\gamma) = -0.3 \pm 0.6$
$S_{K^0\phi\gamma}$ $(B^0 \to K^0\phi\gamma) = 0.7^{+0.7}_{-1.1}$
$C(B^0 \to K^0_S\rho^0\gamma) = -0.05 \pm 0.19$
$S(B^0 \to K^0_S\rho^0\gamma) = 0.11 \pm 0.34$
$C\,(B^0 \to \rho^0\gamma) = 0.4 \pm 0.5$
$S\,(B^0 \to \rho^0\gamma) = -0.8 \pm 0.7$
$C_{\pi\pi}$ $(B^0 \to \pi^+\pi^-) = -0.31 \pm 0.05$
$S_{\pi\pi}$ $(B^0 \to \pi^+\pi^-) = -0.67 \pm 0.06$
$C_{\pi^0\pi^0}(B^0 \to \pi^0\pi^0) = -0.43 \pm 0.24$
$C_{\rho\pi}$ $(B^0 \to \rho^+\pi^-) = -0.03 \pm 0.07$ (S = 1.2)
$S_{\rho\pi}$ $(B^0 \to \rho^+\pi^-) = 0.05 \pm 0.07$
$\Delta C_{\rho\pi}$ $(B^0 \to \rho^+\pi^-) = 0.27 \pm 0.06$
$\Delta S_{\rho\pi}$ $(B^0 \to \rho^+\pi^-) = 0.01 \pm 0.08$
$C_{\rho^0\pi^0}$ $(B^0 \to \rho^0\pi^0) = 0.27 \pm 0.24$
$S_{\rho^0\pi^0}$ $(B^0 \to \rho^0\pi^0) = -0.23 \pm 0.34$
$C_{a_1\pi}$ $(B^0 \to a_1(1260)^+\pi^-) = -0.05 \pm 0.11$
$S_{a_1\pi}$ $(B^0 \to a_1(1260)^+\pi^-) = -0.2 \pm 0.4$ (S = 3.2)

$\boldsymbol{\Delta C_{a_1\pi}\,(B^0 \to\ a_1(1260)^+\pi^-)} = 0.43 \pm 0.14$ (S = 1.3)
$\Delta S_{a_1\pi}\,(B^0 \to\ a_1(1260)^+\pi^-) = -0.11 \pm 0.12$
$C\,(B^0 \to\ b_1^-\,K^+) = -0.22 \pm 0.24$
$\boldsymbol{\Delta C\,(B^0 \to\ b_1^-\,\pi^+)} = -1.04 \pm 0.24$
$C_{\rho^0\rho^0}\,(B^0 \to\ \rho^0\rho^0) = 0.2 \pm 0.9$
$S_{\rho^0\rho^0}\,(B^0 \to\ \rho^0\rho^0) = 0.3 \pm 0.7$
$C_{\rho\rho}\,(B^0 \to\ \rho^+\rho^-) = 0.00 \pm 0.09$
$S_{\rho\rho}\,(B^0 \to\ \rho^+\rho^-) = -0.14 \pm 0.13$
$|\lambda|\,(B^0 \to\ J/\psi\,K^*(892)^0) <\ 0.25$, CL = 95%
$\cos 2\beta\,(B^0 \to\ J/\psi\,K^*(892)^0) = 1.7^{+0.7}_{-0.9}$ (S = 1.6)
$\cos 2\beta\,(B^0 \to\ [K^0_S\pi^+\pi^-]_{D^{(*)}}\,h^0) = 1.0^{+0.6}_{-0.7}$ (S = 1.8)
$(S_+ + S_-)/2\,(B^0 \to\ D^{*-}\pi^+) = -0.039 \pm 0.011$
$(S_- - S_+)/2\,(B^0 \to\ D^{*-}\pi^+) = -0.009 \pm 0.015$
$(S_+ + S_-)/2\,(B^0 \to\ D^-\pi^+) = -0.046 \pm 0.023$
$(S_- - S_+)/2\,(B^0 \to\ D^-\pi^+) = -0.022 \pm 0.021$
$(S_+ + S_-)/2\,(B^0 \to\ D^-\rho^+) = -0.024 \pm 0.032$
$(S_- - S_+)/2\,(B^0 \to\ D^-\rho^+) = -0.10 \pm 0.06$
$C_{\eta_c K^0_S}\,(B^0 \to\ \eta_c\,K^0_S) = 0.08 \pm 0.13$
$\boldsymbol{S_{\eta_c K^0_S}\,(B^0 \to\ \eta_c\,K^0_S)} = 0.93 \pm 0.17$
$C_{c\overline{c}K^{(*)0}}\,(B^0 \to\ c\overline{c}\,K^{(*)0}) = (0.5 \pm 1.7) \times 10^{-2}$
$\boldsymbol{\sin(2\beta)} = 0.679 \pm 0.020$
$C_{J/\psi(\mathrm{nS})\,K^0}\,(B^0 \to\ J/\psi(\mathrm{nS})\,K^0) = (0.5 \pm 2.0) \times 10^{-2}$
$\boldsymbol{S_{J/\psi(\mathrm{nS})\,K^0}\,(B^0 \to\ J/\psi(\mathrm{nS})\,K^0)} = 0.676 \pm 0.021$
$C_{J/\psi\,K^{*0}}\,(B^0 \to\ J/\psi\,K^{*0}) = 0.03 \pm 0.10$
$S_{J/\psi\,K^{*0}}\,(B^0 \to\ J/\psi\,K^{*0}) = 0.60 \pm 0.25$
$C_{\chi_{c0}K^0_S}\,(B^0 \to\ \chi_{c0}\,K^0_S) = -0.3^{+0.5}_{-0.4}$
$S_{\chi_{c0}K^0_S}\,(B^0 \to\ \chi_{c0}\,K^0_S) = -0.7 \pm 0.5$
$C_{\chi_{c1}K^0_S}\,(B^0 \to\ \chi_{c1}\,K^0_S) = 0.06 \pm 0.07$
$\boldsymbol{S_{\chi_{c1}K^0_S}\,(B^0 \to\ \chi_{c1}\,K^0_S)} = 0.63 \pm 0.10$
$\sin(2\beta_{\mathrm{eff}})(B^0 \to\ \phi K^0) = 0.22 \pm 0.30$
$\sin(2\beta_{\mathrm{eff}})(B^0 \to\ \phi K^*_0(1430)^0) = 0.97^{+0.03}_{-0.52}$
$\boldsymbol{\sin(2\beta_{\mathrm{eff}})(B^0 \to\ K^+K^-K^0_S)} = 0.77^{+0.13}_{-0.12}$
$\sin(2\beta_{\mathrm{eff}})(B^0 \to\ [K^0_S\pi^+\pi^-]_{D^{(*)}}\,h^0) = 0.45 \pm 0.28$
$2\beta_{\mathrm{eff}}(B^0 \to\ J/\psi\,\rho^0) = (42^{+10}_{-11})^\circ$
$|\lambda|\,(B^0 \to\ [K^0_S\pi^+\pi^-]_{D^{(*)}}\,h^0) = 1.01 \pm 0.08$
$|\sin(2\beta+\gamma)| >\ 0.40$, CL = 90%
$2\,\beta+\gamma = (83 \pm 60)^\circ$
$\gamma(B^0 \to\ D^0\,K^{*0}) = (162 \pm 60)^\circ$
$\alpha = (93 \pm 5)^\circ$

$\overline{B}^0$ modes are charge conjugates of the modes below. Reactions indicate the weak decay vertex and do not include mixing. Modes which do not identify the charge state of the B are listed in the $B^\pm/B^0$ ADMIXTURE section.

The branching fractions listed below assume 50% $B^0\overline{B}^0$ and 50% B^+B^- production at the $\Upsilon(4S)$. We have attempted to bring older measurements up to date by rescaling their assumed $\Upsilon(4S)$ production ratio to 50:50 and their assumed D, D_s, D^*, and ψ branching ratios to current values whenever this would affect our averages and best limits significantly.

Indentation is used to indicate a subchannel of a previous reaction. All resonant subchannels have been corrected for resonance branching fractions to the final state so the sum of the subchannel branching fractions can exceed that of the final state.

For inclusive branching fractions, *e.g.*, $B \to D^\pm$ anything, the values usually are multiplicities, not branching fractions. They can be greater than one.

B^0 DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\ell^+\nu_\ell$ anything	[*ttt*]	(10.33± 0.28) %		–
$e^+\nu_e X_c$		(10.1 ± 0.4) %		–
$D\ell^+\nu_\ell$ anything		(9.2 ± 0.8) %		–
$D^-\ell^+\nu_\ell$	[*ttt*]	(2.19± 0.12) %		2309
$D^-\tau^+\nu_\tau$		(1.03± 0.22) %		1909
$D^*(2010)^-\ell^+\nu_\ell$	[*ttt*]	(4.93± 0.11) %		2257
$D^*(2010)^-\tau^+\nu_\tau$		(1.78± 0.17) %	S=1.1	1838
$\overline{D}^0\pi^-\ell^+\nu_\ell$		(4.3 ± 0.6) $\times 10^{-3}$		2308
$D_0^*(2400)^-\ell^+\nu_\ell$, $D_0^{*-} \to \overline{D}^0\pi^-$		(3.0 ± 1.2) $\times 10^{-3}$	S=1.8	–
$D_2^*(2460)^-\ell^+\nu_\ell$, $D_2^{*-} \to \overline{D}^0\pi^-$		(1.21± 0.33) $\times 10^{-3}$	S=1.8	2065
$\overline{D}^{(*)}\,\mathrm{n}\,\pi\,\ell^+\nu_\ell(\mathrm{n} \geq 1)$		(2.3 ± 0.5) %		–
$\overline{D}^{*0}\pi^-\ell^+\nu_\ell$		(4.9 ± 0.8) $\times 10^{-3}$		2256
$D_1(2420)^-\ell^+\nu_\ell$, $D_1^- \to \overline{D}^{*0}\pi^-$		(2.80± 0.28) $\times 10^{-3}$		–
$D_1'(2430)^-\ell^+\nu_\ell$, $D_1'^- \to \overline{D}^{*0}\pi^-$		(3.1 ± 0.9) $\times 10^{-3}$		–
$D_2^*(2460)^-\ell^+\nu_\ell$, $D_2^{*-} \to \overline{D}^{*0}\pi^-$		(6.8 ± 1.2) $\times 10^{-4}$		2065
$D^-\pi^+\pi^-\ell^+\nu_\ell$		(1.3 ± 0.5) $\times 10^{-3}$		2299
$D^{*-}\pi^+\pi^-\ell^+\nu_\ell$		(1.4 ± 0.5) $\times 10^{-3}$		2247
$\rho^-\ell^+\nu_\ell$	[*ttt*]	(2.94± 0.21) $\times 10^{-4}$		2583
$\pi^-\ell^+\nu_\ell$	[*ttt*]	(1.45± 0.05) $\times 10^{-4}$		2638
$\pi^-\tau^+\nu_\tau$		< 2.5 $\times 10^{-4}$	CL=90%	2338

Inclusive modes

$K^\pm$ anything	(78 ± 8) %			–
$D^0 X$	(8.1 ± 1.5) %			–
$\overline{D}^0 X$	(47.4 ± 2.8) %			–
$D^+ X$	< 3.9	%	CL=90%	–
$D^- X$	(36.9 ± 3.3) %			–
$D_s^+ X$	(10.3 $^{+\ 2.1}_{-\ 1.8}$) %			–
$D_s^- X$	< 2.6	%	CL=90%	–
$\Lambda_c^+ X$	< 3.1	%	CL=90%	–
$\overline{\Lambda}_c^- X$	(5.0 $^{+\ 2.1}_{-\ 1.5}$) %			–
$\overline{c} X$	(95 ± 5) %			–
$c X$	(24.6 ± 3.1) %			–
$\overline{c} c X$	(119 ± 6) %			–

D, D^*, or D_s modes

$D^- \pi^+$	(2.52± 0.13) × 10^{-3}	S=1.1	2306
$D^- \rho^+$	(7.5 ± 1.2) × 10^{-3}		2235
$D^- K^0 \pi^+$	(4.9 ± 0.9) × 10^{-4}		2259
$D^- K^*(892)^+$	(4.5 ± 0.7) × 10^{-4}		2211
$D^- \omega \pi^+$	(2.8 ± 0.6) × 10^{-3}		2204
$D^- K^+$	(1.86± 0.20) × 10^{-4}		2279
$D^- K^+ \pi^+ \pi^-$	(3.5 ± 0.8) × 10^{-4}		2236
$D^- K^+ \overline{K}^0$	< 3.1 × 10^{-4}	CL=90%	2188
$D^- K^+ \overline{K}^*(892)^0$	(8.8 ± 1.9) × 10^{-4}		2070
$\overline{D}^0 \pi^+ \pi^-$	(8.8 ± 0.5) × 10^{-4}		2301
$D^*(2010)^- \pi^+$	(2.74± 0.13) × 10^{-3}		2255
$\overline{D}^0 K^+ K^-$	(4.9 ± 1.2) × 10^{-5}		2191
$D^- \pi^+ \pi^+ \pi^-$	(6.0 ± 0.7) × 10^{-3}	S=1.1	2287
($D^- \pi^+ \pi^+ \pi^-$) nonresonant	(3.9 ± 1.9) × 10^{-3}		2287
$D^- \pi^+ \rho^0$	(1.1 ± 1.0) × 10^{-3}		2206
$D^- a_1(1260)^+$	(6.0 ± 3.3) × 10^{-3}		2121
$D^*(2010)^- \pi^+ \pi^0$	(1.5 ± 0.5) %		2248
$D^*(2010)^- \rho^+$	(2.2 $^{+\ 1.8}_{-\ 2.7}$) × 10^{-3}	S=5.2	2180
$D^*(2010)^- K^+$	(2.12± 0.15) × 10^{-4}		2226
$D^*(2010)^- K^0 \pi^+$	(3.0 ± 0.8) × 10^{-4}		2205
$D^*(2010)^- K^*(892)^+$	(3.3 ± 0.6) × 10^{-4}		2155
$D^*(2010)^- K^+ \overline{K}^0$	< 4.7 × 10^{-4}	CL=90%	2131
$D^*(2010)^- K^+ \overline{K}^*(892)^0$	(1.29± 0.33) × 10^{-3}		2007
$D^*(2010)^- \pi^+ \pi^+ \pi^-$	(7.0 ± 0.8) × 10^{-3}	S=1.3	2235
($D^*(2010)^- \pi^+ \pi^+ \pi^-$) non-resonant	(0.0 ± 2.5) × 10^{-3}		2235
$D^*(2010)^- \pi^+ \rho^0$	(5.7 ± 3.2) × 10^{-3}		2150
$D^*(2010)^- a_1(1260)^+$	(1.30± 0.27) %		2061

$\overline{D}_1(2420)^0\pi^-\pi^+,\ \overline{D}_1^0\to D^{*-}\pi^+$		$(\ 1.4\ \pm\ 0.4\ )\times10^{-4}$			–
$D^*(2010)^-K^+\pi^-\pi^+$		$(\ 4.5\ \pm\ 0.7\ )\times10^{-4}$			2181
$D^*(2010)^-\pi^+\pi^+\pi^-\pi^0$		$(\ 1.76\pm\ 0.27)$ %			2218
$D^{*-}3\pi^+2\pi^-$		$(\ 4.7\ \pm\ 0.9\ )\times10^{-3}$			2195
$\overline{D}^*(2010)^-\omega\pi^+$		$(\ 2.46\pm\ 0.18)\times10^{-3}$		S=1.2	2148
$D_1(2430)^0\omega,\ D_1^0\to D^{*-}\pi^+$		$(\ 2.7\ {}^{+\ 0.8}_{-\ 0.4}\ )\times10^{-4}$			1992
$\overline{D}^{*-}\rho(1450)^+$		$(\ 1.07^{+\ 0.40}_{-\ 0.34})\times10^{-3}$			–
$\overline{D}_1(2420)^0\omega$		$(\ 7.0\ \pm\ 2.2\ )\times10^{-5}$			1995
$\overline{D}_2^*(2460)^0\omega$		$(\ 4.0\ \pm\ 1.4\ )\times10^{-5}$			1975
$\overline{D}^{*-}b_1(1235)^-,\ b_1^-\to\omega\pi^-$		$<\ 7$	$\times10^{-5}$	CL=90%	–
$\overline{D}^{**-}\pi^+$	[yyy]	$(\ 1.9\ \pm\ 0.9\ )\times10^{-3}$			–
$D_1(2420)^-\pi^+,\ D_1^-\to D^-\pi^+\pi^-$		$(\ 9.9\ {}^{+\ 2.0}_{-\ 2.5}\ )\times10^{-5}$			–
$D_1(2420)^-\pi^+,\ D_1^-\to D^{*-}\pi^+\pi^-$		$<\ 3.3$	$\times10^{-5}$	CL=90%	–
$\overline{D}_2^*(2460)^-\pi^+,\ (D_2^*)^-\to D^0\pi^-$		$(\ 2.38\pm\ 0.16)\times10^{-4}$			2062
$\overline{D}_0^*(2400)^-\pi^+,\ (D_0^*)^-\to D^0\pi^-$		$(\ 7.6\ \pm\ 0.8\ )\times10^{-5}$			2090
$D_2^*(2460)^-\pi^+,\ (D_2^*)^-\to D^{*-}\pi^+\pi^-$		$<\ 2.4$	$\times10^{-5}$	CL=90%	–
$\overline{D}_2^*(2460)^-\rho^+$		$<\ 4.9$	$\times10^{-3}$	CL=90%	1974
$D^0\overline{D}^0$		$(\ 1.4\ \pm\ 0.7\ )\times10^{-5}$			1868
$D^{*0}\overline{D}^0$		$<\ 2.9$	$\times10^{-4}$	CL=90%	1794
D^-D^+		$(\ 2.11\pm\ 0.18)\times10^{-4}$			1864
$D^\pm D^{*\mp}$ (*CP*-averaged)		$(\ 6.1\ \pm\ 0.6\ )\times10^{-4}$			–
$D^-D_s^+$		$(\ 7.2\ \pm\ 0.8\ )\times10^{-3}$			1813
$D^*(2010)^-D_s^+$		$(\ 8.0\ \pm\ 1.1\ )\times10^{-3}$			1735
$D^-D_s^{*+}$		$(\ 7.4\ \pm\ 1.6\ )\times10^{-3}$			1732
$D^*(2010)^-D_s^{*+}$		$(\ 1.77\pm\ 0.14)$ %			1649
$D_{s0}(2317)^-K^+,\ D_{s0}^-\to D_s^-\pi^0$		$(\ 4.2\ \pm\ 1.4\ )\times10^{-5}$			2097
$D_{s0}(2317)^-\pi^+,\ D_{s0}^-\to D_s^-\pi^0$		$<\ 2.5$	$\times10^{-5}$	CL=90%	2128
$D_{sJ}(2457)^-K^+,\ D_{sJ}^-\to D_s^-\pi^0$		$<\ 9.4$	$\times10^{-6}$	CL=90%	–
$D_{sJ}(2457)^-\pi^+,\ D_{sJ}^-\to D_s^-\pi^0$		$<\ 4.0$	$\times10^{-6}$	CL=90%	–
$D_s^-D_s^+$		$<\ 3.6$	$\times10^{-5}$	CL=90%	1759

$D_s^{*-} D_s^+$	$<$	1.3	$\times 10^{-4}$	CL=90%	1675
$D_s^{*-} D_s^{*+}$	$<$	2.4	$\times 10^{-4}$	CL=90%	1583
$D_{s0}^*(2317)^+ D^-$, $D_{s0}^{*+} \to$ $D_s^+ \pi^0$	(	1.04 $\pm$ 0.17)	$\times 10^{-3}$	S=1.1	1602
$D_{s0}(2317)^+ D^-$, $D_{s0}^+ \to$ $D_s^{*+} \gamma$	$<$	9.5	$\times 10^{-4}$	CL=90%	–
$D_{s0}(2317)^+ D^*(2010)^-$, $D_{s0}^+ \to D_s^+ \pi^0$	(	1.5 $\pm$ 0.6)	$\times 10^{-3}$		1509
$D_{sJ}(2457)^+ D^-$	(	3.5 $\pm$ 1.1)	$\times 10^{-3}$		–
$D_{sJ}(2457)^+ D^-$, $D_{sJ}^+ \to$ $D_s^+ \gamma$	(	$6.5 \,^{+\,1.7}_{-\,1.4}$)	$\times 10^{-4}$		–
$D_{sJ}(2457)^+ D^-$, $D_{sJ}^+ \to$ $D_s^{*+} \gamma$	$<$	6.0	$\times 10^{-4}$	CL=90%	–
$D_{sJ}(2457)^+ D^-$, $D_{sJ}^+ \to$ $D_s^+ \pi^+ \pi^-$	$<$	2.0	$\times 10^{-4}$	CL=90%	–
$D_{sJ}(2457)^+ D^-$, $D_{sJ}^+ \to$ $D_s^+ \pi^0$	$<$	3.6	$\times 10^{-4}$	CL=90%	–
$D^*(2010)^- D_{sJ}(2457)^+$	(	9.3 $\pm$ 2.2)	$\times 10^{-3}$		–
$D_{sJ}(2457)^+ D^*(2010)$, $D_{sJ}^+ \to$ $D_s^+ \gamma$	(	$2.3 \,^{+\,0.9}_{-\,0.7}$)	$\times 10^{-3}$		–
$D^- D_{s1}(2536)^+$, $D_{s1}^+ \to$ $D^{*0} K^+ + D^{*+} K^0$	(	2.8 $\pm$ 0.7)	$\times 10^{-4}$		1444
$D^- D_{s1}(2536)^+$, $D_{s1}^+ \to$ $D^{*0} K^+$	(	1.7 $\pm$ 0.6)	$\times 10^{-4}$		1444
$D^- D_{s1}(2536)^+$, $D_{s1}^+ \to$ $D^{*+} K^0$	(	2.6 $\pm$ 1.1)	$\times 10^{-4}$		1444
$D^*(2010)^- D_{s1}(2536)^+$, $D_{s1}^+ \to D^{*0} K^+ + D^{*+} K^0$	(	5.0 $\pm$ 1.4)	$\times 10^{-4}$		1336
$D^*(2010)^- D_{s1}(2536)^+$, $D_{s1}^+ \to D^{*0} K^+$	(	3.3 $\pm$ 1.1)	$\times 10^{-4}$		1336
$D^{*-} D_{s1}(2536)^+$, $D_{s1}^+ \to$ $D^{*+} K^0$	(	5.0 $\pm$ 1.7)	$\times 10^{-4}$		1336
$D^- D_{sJ}(2573)^+$, $D_{sJ}^+ \to$ $D^0 K^+$	(	3.4 $\pm$ 1.8)	$\times 10^{-5}$		1414
$D^*(2010)^- D_{sJ}(2573)^+$, $D_{sJ}^+ \to D^0 K^+$	$<$	2	$\times 10^{-4}$	CL=90%	1304
$D^- D_{sJ}(2700)^+$, $D_{sJ}^+ \to$ $D^0 K^+$	(	7.1 $\pm$ 1.2)	$\times 10^{-4}$		–
$D^+ \pi^-$	(	7.4 $\pm$ 1.3)	$\times 10^{-7}$		2306
$D_s^+ \pi^-$	(	2.16 $\pm$ 0.26)	$\times 10^{-5}$		2270

$D_s^{*+}\pi^-$	$(\ 2.1\ \pm\ 0.4\ )\times10^{-5}$	S=1.4	2215
$D_s^+\rho^-$	$<\ 2.4\ \times10^{-5}$	CL=90%	2197
$D_s^{*+}\rho^-$	$(\ 4.1\ \pm\ 1.3\ )\times10^{-5}$		2138
$D_s^+a_0^-$	$<\ 1.9\ \times10^{-5}$	CL=90%	–
$D_s^{*+}a_0^-$	$<\ 3.6\ \times10^{-5}$	CL=90%	–
$D_s^+a_1(1260)^-$	$<\ 2.1\ \times10^{-3}$	CL=90%	2080
$D_s^{*+}a_1(1260)^-$	$<\ 1.7\ \times10^{-3}$	CL=90%	2015
$D_s^+a_2^-$	$<\ 1.9\ \times10^{-4}$	CL=90%	–
$D_s^{*+}a_2^-$	$<\ 2.0\ \times10^{-4}$	CL=90%	–
$D_s^-K^+$	$(\ 2.7\ \pm\ 0.5\ )\times10^{-5}$	S=2.7	2242
$D_s^{*-}K^+$	$(\ 2.19\pm\ 0.30)\times10^{-5}$		2185
$D_s^-K^*(892)^+$	$(\ 3.5\ \pm\ 1.0\ )\times10^{-5}$		2172
$D_s^{*-}K^*(892)^+$	$(\ 3.2\ {}^{+\ 1.5}_{-\ 1.3}\ )\times10^{-5}$		2112
$D_s^-\pi^+K^0$	$(\ 9.7\ \pm\ 1.4\ )\times10^{-5}$		2222
$D_s^{*-}\pi^+K^0$	$<\ 1.10\ \times10^{-4}$	CL=90%	2164
$D_s^-K^+\pi^+\pi^-$	$(\ 1.7\ \pm\ 0.5\ )\times10^{-4}$		2198
$D_s^-\pi^+K^*(892)^0$	$<\ 3.0\ \times10^{-3}$	CL=90%	2138
$D_s^{*-}\pi^+K^*(892)^0$	$<\ 1.6\ \times10^{-3}$	CL=90%	2076
$\overline{D}^0K^0$	$(\ 5.2\ \pm\ 0.7\ )\times10^{-5}$		2280
$\overline{D}^0K^+\pi^-$	$(\ 8.8\ \pm\ 1.7\ )\times10^{-5}$		2261
$\quad\overline{D}^0K^*(892)^0$	$(\ 4.5\ \pm\ 0.6\ )\times10^{-5}$		2213
$\quad\overline{D}^0K^*(1410)^0$	$<\ 6.7\ \times10^{-5}$	CL=90%	2062
$\quad\overline{D}^0K_0^*(1430)^0$	$(\ 7\ \pm\ 7\ )\times10^{-6}$		2057
$\quad\overline{D}^0K_2^*(1430)^0$	$(\ 2.1\ \pm\ 0.9\ )\times10^{-5}$		2057
$\quad D_0^*(2400)^-,\ D_0^{*-}\to\ \overline{D}^0\pi^-$	$(\ 1.9\ \pm\ 0.9\ )\times10^{-5}$		–
$\quad D_2^*(2460)^-K^+,\ D_2^{*-}\to\ \overline{D}^0\pi^-$	$(\ 2.03\pm\ 0.35)\times10^{-5}$		2029
$\quad D_3^*(2760)^-K^+,\ D_3^{*-}\to\ \overline{D}^0\pi^-$	$<\ 1.0\ \times10^{-6}$	CL=90%	–
$\quad\overline{D}^0K^+\pi^-$ non-resonant	$<\ 3.7\ \times10^{-5}$	CL=90%	–
$[K^+K^-]_DK^*(892)^0$	$(\ 4.7\ \pm\ 0.9\ )\times10^{-5}$		–
$[\pi^+\pi^-]_DK^*(892)^0$	$(\ 5.5\ \pm\ 1.4\ )\times10^{-5}$		–
$\overline{D}^0\pi^0$	$(\ 2.63\pm\ 0.14)\times10^{-4}$		2308
$\overline{D}^0\rho^0$	$(\ 3.21\pm\ 0.21)\times10^{-4}$		2237
$\overline{D}^0f_2$	$(\ 1.56\pm\ 0.21)\times10^{-4}$		–
$\overline{D}^0\eta$	$(\ 2.36\pm\ 0.32)\times10^{-4}$	S=2.5	2274
$\overline{D}^0\eta'$	$(\ 1.38\pm\ 0.16)\times10^{-4}$	S=1.3	2198
$\overline{D}^0\omega$	$(\ 2.54\pm\ 0.16)\times10^{-4}$		2235
$D^0\phi$	$<\ 1.16\ \times10^{-5}$	CL=90%	2183
$D^0K^+\pi^-$	$(\ 5.3\ \pm\ 3.2\ )\times10^{-6}$		2261
$\quad D^0K^*(892)^0$	$<\ 1.1\ \times10^{-5}$	CL=90%	2213

$\overline{D}^{*0}\gamma$	$<$	2.5	$\times 10^{-5}$	CL=90%	2258
$\overline{D}^{*}(2007)^{0}\pi^{0}$	(	2.2 $\pm$ 0.6)	$\times 10^{-4}$	S=2.6	2256
$\overline{D}^{*}(2007)^{0}\rho^{0}$	$<$	5.1	$\times 10^{-4}$	CL=90%	2182
$\overline{D}^{*}(2007)^{0}\eta$	(	2.3 $\pm$ 0.6)	$\times 10^{-4}$	S=2.8	2220
$\overline{D}^{*}(2007)^{0}\eta'$	(	1.40 $\pm$ 0.22)	$\times 10^{-4}$		2141
$\overline{D}^{*}(2007)^{0}\pi^{+}\pi^{-}$	(	6.2 $\pm$ 2.2)	$\times 10^{-4}$		2249
$\overline{D}^{*}(2007)^{0}K^{0}$	(	3.6 $\pm$ 1.2)	$\times 10^{-5}$		2227
$\overline{D}^{*}(2007)^{0}K^{*}(892)^{0}$	$<$	6.9	$\times 10^{-5}$	CL=90%	2157
$D^{*}(2007)^{0}K^{*}(892)^{0}$	$<$	4.0	$\times 10^{-5}$	CL=90%	2157
$D^{*}(2007)^{0}\pi^{+}\pi^{+}\pi^{-}\pi^{-}$	(	2.7 $\pm$ 0.5)	$\times 10^{-3}$		2219
$D^{*}(2010)^{+}D^{*}(2010)^{-}$	(	8.0 $\pm$ 0.6)	$\times 10^{-4}$		1711
$\overline{D}^{*}(2007)^{0}\omega$	(	3.6 $\pm$ 1.1)	$\times 10^{-4}$	S=3.1	2180
$D^{*}(2010)^{+}D^{-}$	(	6.1 $\pm$ 1.5)	$\times 10^{-4}$	S=1.6	1790
$D^{*}(2007)^{0}\overline{D}^{*}(2007)^{0}$	$<$	9	$\times 10^{-5}$	CL=90%	1715
$D^{-}D^{0}K^{+}$	(	1.07 $\pm$ 0.11)	$\times 10^{-3}$		1574
$D^{-}D^{*}(2007)^{0}K^{+}$	(	3.5 $\pm$ 0.4)	$\times 10^{-3}$		1478
$D^{*}(2010)^{-}D^{0}K^{+}$	(	2.47 $\pm$ 0.21)	$\times 10^{-3}$		1479
$D^{*}(2010)^{-}D^{*}(2007)^{0}K^{+}$	(	1.06 $\pm$ 0.09) %			1366
$D^{-}D^{+}K^{0}$	(	7.5 $\pm$ 1.7)	$\times 10^{-4}$		1568
$D^{*}(2010)^{-}D^{+}K^{0}$ + $D^{-}D^{*}(2010)^{+}K^{0}$	(	6.4 $\pm$ 0.5)	$\times 10^{-3}$		1473
$D^{*}(2010)^{-}D^{*}(2010)^{+}K^{0}$	(	8.1 $\pm$ 0.7)	$\times 10^{-3}$		1360
$D^{*-}D_{s1}(2536)^{+}$, $D_{s1}^{+}\to D^{*+}K^{0}$	(	8.0 $\pm$ 2.4)	$\times 10^{-4}$		1336
$\overline{D}^{0}D^{0}K^{0}$	(	2.7 $\pm$ 1.1)	$\times 10^{-4}$		1574
$\overline{D}^{0}D^{*}(2007)^{0}K^{0}$ + $\overline{D}^{*}(2007)^{0}D^{0}K^{0}$	(	1.1 $\pm$ 0.5)	$\times 10^{-3}$		1478
$\overline{D}^{*}(2007)^{0}D^{*}(2007)^{0}K^{0}$	(	2.4 $\pm$ 0.9)	$\times 10^{-3}$		1365
$(\overline{D}+\overline{D}^{*})(D+D^{*})K$	(	3.68 $\pm$ 0.26) %			–

Charmonium modes

$\eta_c K^{0}$	(	8.0 $\pm$ 1.2)	$\times 10^{-4}$		1751
$\eta_c K^{*}(892)^{0}$	(	6.3 $\pm$ 0.9)	$\times 10^{-4}$		1646
$\eta_c(2S)K^{*0}$	$<$	3.9	$\times 10^{-4}$	CL=90%	1157
$h_c(1P)K^{*0}$	$<$	4	$\times 10^{-4}$	CL=90%	1253
$J/\psi(1S)K^{0}$	(	8.73 $\pm$ 0.32)	$\times 10^{-4}$		1683
$J/\psi(1S)K^{+}\pi^{-}$	(	1.15 $\pm$ 0.05)	$\times 10^{-3}$		1652
$J/\psi(1S)K^{*}(892)^{0}$	(	1.28 $\pm$ 0.05)	$\times 10^{-3}$		1571
$J/\psi(1S)\eta K_S^{0}$	(	5.4 $\pm$ 0.9)	$\times 10^{-5}$		1508
$J/\psi(1S)\eta' K_S^{0}$	$<$	2.5	$\times 10^{-5}$	CL=90%	1271
$J/\psi(1S)\phi K^{0}$	(	4.9 $\pm$ 1.0)	$\times 10^{-5}$	S=1.3	1224
$J/\psi(1S)\omega K^{0}$	(	2.3 $\pm$ 0.4)	$\times 10^{-4}$		1386
$X(3872)K^{0}$, $X\to J/\psi\omega$	(	6.0 $\pm$ 3.2)	$\times 10^{-6}$		1140
$X(3915)$, $X\to J/\psi\omega$	(	2.1 $\pm$ 0.9)	$\times 10^{-5}$		1102

$J/\psi(1S)K(1270)^0$		$(\ 1.3 \pm 0.5\ )\times10^{-3}$		1391
$J/\psi(1S)\pi^0$		$(\ 1.76\pm 0.16)\times10^{-5}$	S=1.1	1728
$J/\psi(1S)\eta$		$(\ 1.08\pm 0.24)\times10^{-5}$	S=1.5	1673
$J/\psi(1S)\pi^+\pi^-$		$(\ 4.03\pm 0.18)\times10^{-5}$		1716
$J/\psi(1S)\pi^+\pi^-$ nonresonant	$<$	1.2×10^{-5}	CL=90%	1716
$J/\psi(1S)f_0(500)$, $f_0\to\pi\pi$		$(\ 8.1\ ^{+\ 1.1}_{-\ 0.9}\ )\times10^{-6}$		–
$J/\psi(1S)f_2$		$(\ 3.3\ ^{+\ 0.5}_{-\ 0.6}\ )\times10^{-6}$	S=1.6	–
$J/\psi(1S)\rho^0$		$(\ 2.54\pm 0.14)\times10^{-5}$		1612
$J/\psi(1S)f_0(980)$, $f_0\to\pi^+\pi^-$	$<$	1.1×10^{-6}	CL=90%	–
$J/\psi(1S)\rho(1450)^0$, $\rho^0\to\pi\pi$		$(\ 3.0\ ^{+\ 1.6}_{-\ 0.7}\ )\times10^{-6}$		–
$J/\psi\rho(1700)^0$, $\rho^0\to\pi^+\pi^-$		$(\ 2.0 \pm 1.3\ )\times10^{-6}$		–
$J/\psi(1S)\omega$		$(\ 1.8\ ^{+\ 0.7}_{-\ 0.5}\ )\times10^{-5}$		1609
$J/\psi(1S)K^+K^-$		$(\ 2.6 \pm 0.4\ )\times10^{-6}$		1533
$J/\psi(1S)a_0(980)$, $a_0\to K^+K^-$		$(\ 4.7 \pm 3.4\ )\times10^{-7}$		–
$J/\psi(1S)\phi$	$<$	1.9×10^{-7}	CL=90%	1520
$J/\psi(1S)\eta'(958)$		$(\ 7.6 \pm 2.4\ )\times10^{-6}$		1546
$J/\psi(1S)K^0\pi^+\pi^-$		$(\ 4.4 \pm 0.4\ )\times10^{-4}$		1611
$J/\psi(1S)K^0K^-\pi^+ +$ c.c.	$<$	2.1×10^{-5}	CL=90%	1467
$J/\psi(1S)K^0K^+K^-$		$(\ 2.5 \pm 0.7\ )\times10^{-5}$	S=1.8	1249
$J/\psi(1S)K^0\rho^0$		$(\ 5.4 \pm 3.0\ )\times10^{-4}$		1390
$J/\psi(1S)K^*(892)^+\pi^-$		$(\ 8 \pm 4\ )\times10^{-4}$		1514
$J/\psi(1S)\pi^+\pi^-\pi^+\pi^-$		$(\ 1.45\pm 0.13)\times10^{-5}$		1670
$J/\psi(1S)f_1(1285)$		$(\ 8.4 \pm 2.1\ )\times10^{-6}$		1385
$J/\psi(1S)K^*(892)^0\pi^+\pi^-$		$(\ 6.6 \pm 2.2\ )\times10^{-4}$		1447
$X(3872)^-K^+$	$<$	5×10^{-4}	CL=90%	–
$X(3872)^-K^+$, $X(3872)^-\to J/\psi(1S)\pi^-\pi^0$	[zzz] $<$	4.2×10^{-6}	CL=90%	–
$X(3872)K^0$, $X\to J/\psi\pi^+\pi^-$		$(\ 4.3 \pm 1.3\ )\times10^{-6}$		1140
$X(3872)K^0$, $X\to J/\psi\gamma$	$<$	2.4×10^{-6}	CL=90%	1140
$X(3872)K^*(892)^0$, $X\to J/\psi\gamma$	$<$	2.8×10^{-6}	CL=90%	940
$X(3872)K^0$, $X\to\psi(2S)\gamma$	$<$	6.62×10^{-6}	CL=90%	1140
$X(3872)K^*(892)^0$, $X\to\psi(2S)\gamma$	$<$	4.4×10^{-6}	CL=90%	940
$X(3872)K^0$, $X\to D^0\overline{D}{}^0\pi^0$		$(\ 1.7 \pm 0.8\ )\times10^{-4}$		1140
$X(3872)K^0$, $X\to\overline{D}{}^{*0}D^0$		$(\ 1.2 \pm 0.4\ )\times10^{-4}$		1140
$X(3872)K^+\pi^-$, $X\to J/\psi\pi^+\pi^-$		$(\ 7.9 \pm 1.4\ )\times10^{-6}$		–
$X(3872)K^*(982)^0$, $X\to J/\psi\pi^+\pi^-$		$(\ 4.0 \pm 1.5\ )\times10^{-6}$		–

$X(4430)^{\pm} K^{\mp}$, $X^{\pm} \to \psi(2S)\pi^{\pm}$	$(6.0 \,^{+\ 3.0}_{-\ 2.4}) \times 10^{-5}$			583
$X(4430)^{\pm} K^{\mp}$, $X^{\pm} \to J/\psi\pi^{\pm}$	$(5.4 \,^{+\ 4.0}_{-\ 1.2}) \times 10^{-6}$			583
$X(3900)^{\pm} K^{\mp}$, $X^{\pm} \to J/\psi\pi^{\pm}$	$< 9 \times 10^{-7}$			–
$X(4200)^{\pm} K^{\mp}$, $X^{\pm} \to J/\psi\pi^{\pm}$	$(2.2 \,^{+\ 1.3}_{-\ 0.8}) \times 10^{-5}$			–
$J/\psi(1S)\, p\overline{p}$	$< 5.2 \times 10^{-7}$	CL=90%		862
$J/\psi(1S)\gamma$	$< 1.5 \times 10^{-6}$	CL=90%		1732
$J/\psi(1S)\overline{D}^0$	$< 1.3 \times 10^{-5}$	CL=90%		877
$\psi(2S)\pi^0$	$(1.17 \pm 0.19) \times 10^{-5}$			1348
$\psi(2S) K^0$	$(5.8 \pm 0.5) \times 10^{-4}$			1283
$\psi(3770) K^0$, $\psi \to \overline{D}^0 D^0$	$< 1.23 \times 10^{-4}$	CL=90%		1217
$\psi(3770) K^0$, $\psi \to D^- D^+$	$< 1.88 \times 10^{-4}$	CL=90%		1217
$\psi(2S)\pi^+\pi^-$	$(2.3 \pm 0.4) \times 10^{-5}$			1331
$\psi(2S) K^+\pi^-$	$(5.8 \pm 0.4) \times 10^{-4}$			1239
$\psi(2S) K^*(892)^0$	$(5.9 \pm 0.4) \times 10^{-4}$			1116
$\chi_{c0} K^0$	$(1.47 \pm 0.27) \times 10^{-4}$			1477
$\chi_{c0} K^*(892)^0$	$(1.7 \pm 0.4) \times 10^{-4}$			1342
$\chi_{c2} K^0$	$< 1.5 \times 10^{-5}$	CL=90%		1379
$\chi_{c2} K^*(892)^0$	$(4.9 \pm 1.2) \times 10^{-5}$	S=1.1		1228
$\chi_{c1}\pi^0$	$(1.12 \pm 0.28) \times 10^{-5}$			1468
$\chi_{c1} K^0$	$(3.93 \pm 0.27) \times 10^{-4}$			1411
$\chi_{c1} K^-\pi^+$	$(3.8 \pm 0.4) \times 10^{-4}$			1371
$\chi_{c1} K^*(892)^0$	$(2.39 \pm 0.19) \times 10^{-4}$	S=1.2		1265
$X(4051)^+ K^-$, $X^+ \to \chi_{c1}\pi^+$	$(3.0 \,^{+\ 4.0}_{-\ 1.8}) \times 10^{-5}$			–
$X(4248)^+ K^-$, $X^+ \to \chi_{c1}\pi^+$	$(4.0 \,^{+20.0}_{-\ 1.0}) \times 10^{-5}$			–

K or K^* modes

$K^+\pi^-$	$(1.96 \pm 0.05) \times 10^{-5}$			2615
$K^0\pi^0$	$(9.9 \pm 0.5) \times 10^{-6}$			2615
$\eta' K^0$	$(6.6 \pm 0.4) \times 10^{-5}$	S=1.4		2528
$\eta' K^*(892)^0$	$(2.8 \pm 0.6) \times 10^{-6}$			2472
$\eta' K_0^*(1430)^0$	$(6.3 \pm 1.6) \times 10^{-6}$			2346
$\eta' K_2^*(1430)^0$	$(1.37 \pm 0.32) \times 10^{-5}$			2346
ηK^0	$(1.23 \,^{+\ 0.27}_{-\ 0.24}) \times 10^{-6}$			2587
$\eta K^*(892)^0$	$(1.59 \pm 0.10) \times 10^{-5}$			2534
$\eta K_0^*(1430)^0$	$(1.10 \pm 0.22) \times 10^{-5}$			2415
$\eta K_2^*(1430)^0$	$(9.6 \pm 2.1) \times 10^{-6}$			2414
ωK^0	$(4.8 \pm 0.4) \times 10^{-6}$			2557
$a_0(980)^0 K^0$, $a_0^0 \to \eta\pi^0$	$< 7.8 \times 10^{-6}$	CL=90%		–
$b_1^0 K^0$, $b_1^0 \to \omega\pi^0$	$< 7.8 \times 10^{-6}$	CL=90%		–

$a_0(980)^{\pm} K^{\mp}$, $a_0^{\pm} \to \eta\pi^{\pm}$		$<$	1.9	$\times 10^{-6}$	CL=90%	–
$b_1^- K^+$, $b_1^- \to \omega\pi^-$		(	7.4 $\pm$ 1.4)	$\times 10^{-6}$		–
$b_1^0 K^{*0}$, $b_1^0 \to \omega\pi^0$		$<$	8.0	$\times 10^{-6}$	CL=90%	–
$b_1^- K^{*+}$, $b_1^- \to \omega\pi^-$		$<$	5.0	$\times 10^{-6}$	CL=90%	–
$a_0(1450)^{\pm} K^{\mp}$, $a_0^{\pm} \to \eta\pi^{\pm}$		$<$	3.1	$\times 10^{-6}$	CL=90%	–
$K_S^0 X^0$(Familon)		$<$	5.3	$\times 10^{-5}$	CL=90%	–
$\omega K^*(892)^0$		(	2.0 $\pm$ 0.5)	$\times 10^{-6}$		2503
$\omega(K\pi)_0^{*0}$		(	1.84 $\pm$ 0.25)	$\times 10^{-5}$		–
$\omega K_0^*(1430)^0$		(	1.60 $\pm$ 0.34)	$\times 10^{-5}$		2380
$\omega K_2^*(1430)^0$		(	1.01 $\pm$ 0.23)	$\times 10^{-5}$		2380
$\omega K^+\pi^-$ nonresonant		(	5.1 $\pm$ 1.0)	$\times 10^{-6}$		2542
$K^+\pi^-\pi^0$		(	3.78 $\pm$ 0.32)	$\times 10^{-5}$		2609
$K^+\rho^-$		(	7.0 $\pm$ 0.9)	$\times 10^{-6}$		2559
$K^+\rho(1450)^-$		(	2.4 $\pm$ 1.2)	$\times 10^{-6}$		–
$K^+\rho(1700)^-$		(	6 $\pm$ 7)	$\times 10^{-7}$		–
($K^+\pi^-\pi^0$) non-resonant		(	2.8 $\pm$ 0.6)	$\times 10^{-6}$		–
$(K\pi)_0^{*+}\pi^-$, $(K\pi)_0^{*+} \to K^+\pi^0$		(	3.4 $\pm$ 0.5)	$\times 10^{-5}$		–
$(K\pi)_0^{*0}\pi^0$, $(K\pi)_0^{*0} \to K^+\pi^-$		(	8.6 $\pm$ 1.7)	$\times 10^{-6}$		–
$K_2^*(1430)^0\pi^0$		$<$	4.0	$\times 10^{-6}$	CL=90%	2445
$K^*(1680)^0\pi^0$		$<$	7.5	$\times 10^{-6}$	CL=90%	2358
$K_x^{*0}\pi^0$	[*ccaa*]	(	6.1 $\pm$ 1.6)	$\times 10^{-6}$		–
$K^0\pi^+\pi^-$		(	5.20 $\pm$ 0.24)	$\times 10^{-5}$	S=1.3	2609
$K^0\pi^+\pi^-$ non-resonant		(	$1.47^{+\ 0.40}_{-\ 0.26}$)	$\times 10^{-5}$	S=2.1	–
$K^0\rho^0$		(	4.7 $\pm$ 0.6)	$\times 10^{-6}$		2558
$K^*(892)^+\pi^-$		(	8.4 $\pm$ 0.8)	$\times 10^{-6}$		2563
$K_0^*(1430)^+\pi^-$		(	3.3 $\pm$ 0.7)	$\times 10^{-5}$	S=2.0	–
$K_x^{*+}\pi^-$	[*ccaa*]	(	5.1 $\pm$ 1.6)	$\times 10^{-6}$		–
$K^*(1410)^+\pi^-$, $K^{*+} \to K^0\pi^+$		$<$	3.8	$\times 10^{-6}$	CL=90%	–
$f_0(980)K^0$, $f_0 \to \pi^+\pi^-$		(	7.0 $\pm$ 0.9)	$\times 10^{-6}$		2522
$f_2(1270)K^0$		(	$2.7\ ^{+\ 1.3}_{-\ 1.2}$)	$\times 10^{-6}$		2459
$f_x(1300)K0, f_x \to \pi^+\pi^-$		(	1.8 $\pm$ 0.7)	$\times 10^{-6}$		–
$K^*(892)^0\pi^0$		(	3.3 $\pm$ 0.6)	$\times 10^{-6}$		2563
$K_2^*(1430)^+\pi^-$		$<$	6	$\times 10^{-6}$	CL=90%	2445
$K^*(1680)^+\pi^-$		$<$	1.0	$\times 10^{-5}$	CL=90%	2358
$K^+\pi^-\pi^+\pi^-$	[*ddaa*]	$<$	2.3	$\times 10^{-4}$	CL=90%	2600
$\rho^0 K^+\pi^-$		(	2.8 $\pm$ 0.7)	$\times 10^{-6}$		2543
$f_0(980)K^+\pi^-$, $f_0 \to \pi\pi$		(	$1.4\ ^{+\ 0.5}_{-\ 0.6}$)	$\times 10^{-6}$		2506
$K^+\pi^-\pi^+\pi^-$ nonresonant		$<$	2.1	$\times 10^{-6}$	CL=90%	2600

$K^*(892)^0\pi^+\pi^-$		$(\ 5.5 \pm 0.5\ )\times10^{-5}$			2557
$K^*(892)^0\rho^0$		$(\ 3.9 \pm 1.3\ )\times10^{-6}$	S=1.9		2504
$K^*(892)^0 f_0(980),\ f_0\to\pi\pi$		$(\ 3.9\ ^{+\ 2.1}_{-\ 1.8}\ )\times10^{-6}$	S=3.9		2466
$K_1(1270)^+\pi^-$		$<\ 3.0$	$\times10^{-5}$	CL=90%	2484
$K_1(1400)^+\pi^-$		$<\ 2.7$	$\times10^{-5}$	CL=90%	2451
$a_1(1260)^- K^+$	[*ddaa*]	$(\ 1.6 \pm 0.4\ )\times10^{-5}$			2471
$K^*(892)^+\rho^-$		$(1.03\pm 0.26)\times10^{-5}$			2504
$K_0^*(1430)^+\rho^-$		$(\ 2.8 \pm 1.2\ )\times10^{-5}$			–
$K_1(1400)^0\rho^0$		$<\ 3.0$	$\times10^{-3}$	CL=90%	2388
$K_0^*(1430)^0\rho^0$		$(\ 2.7 \pm 0.6\ )\times10^{-5}$			2381
$K_0^*(1430)^0 f_0(980),\ f_0\to\pi\pi$		$(\ 2.7 \pm 0.9\ )\times10^{-6}$			–
$K_2^*(1430)^0 f_0(980),\ f_0\to\pi\pi$		$(\ 8.6 \pm 2.0\ )\times10^{-6}$			–
K^+K^-		$(\ 1.3 \pm 0.5\ )\times10^{-7}$			2593
$K^0\overline{K}^0$		$(1.21\pm 0.16)\times10^{-6}$			2592
$K^0K^-\pi^+$		$(\ 6.5 \pm 0.8\ )\times10^{-6}$			2578
$K^*(892)^\pm K^\mp$		$<\ 4$	$\times10^{-7}$	CL=90%	2540
$\overline{K}^{*0}K^0\ +\ K^{*0}\overline{K}^0$		$<\ 9.6$	$\times10^{-7}$	CL=90%	–
$K^+K^-\pi^0$		$(\ 2.2 \pm 0.6\ )\times10^{-6}$			2579
$K_S^0K_S^0\pi^0$		$<\ 9$	$\times10^{-7}$	CL=90%	2578
$K_S^0K_S^0\eta$		$<\ 1.0$	$\times10^{-6}$	CL=90%	2515
$K_S^0K_S^0\eta'$		$<\ 2.0$	$\times10^{-6}$	CL=90%	2452
$K^0K^+K^-$		$(2.49\pm 0.31)\times10^{-5}$	S=3.0		2522
$K^0\phi$		$(\ 7.3 \pm 0.7\ )\times10^{-6}$			2516
$f_0(980)K^0,\ f_0\to K^+K^-$		$(\ 7.0\ ^{+\ 3.5}_{-\ 3.0}\ )\times10^{-6}$			–
$f_0(1500)K^0$		$(\ 1.3\ ^{+\ 0.7}_{-\ 0.5}\ )\times10^{-5}$			2398
$f_2'(1525)^0K^0$		$(\ 3\ ^{+\ 5}_{-\ 4}\ )\times10^{-7}$			–
$f_0(1710)K^0,\ f_0\to K^+K^-$		$(\ 4.4 \pm 0.9\ )\times10^{-6}$			–
$K^0K^+K^-$ nonresonant		$(\ 3.3 \pm 1.0\ )\times10^{-5}$			2522
$K_S^0K_S^0K_S^0$		$(\ 6.0 \pm 0.5\ )\times10^{-6}$	S=1.1		2521
$f_0(980)K^0,\ f_0\to K_S^0K_S^0$		$(\ 2.7 \pm 1.8\ )\times10^{-6}$			–
$f_0(1710)K^0,\ f_0\to K_S^0K_S^0$		$(\ 5.0\ ^{+\ 5.0}_{-\ 2.6}\ )\times10^{-7}$			–
$f_0(2010)K^0,\ f_0\to K_S^0K_S^0$		$(\ 5\ \pm 6\ )\times10^{-7}$			–
$K_S^0K_S^0K_S^0$ nonresonant		$(1.33\pm 0.31)\times10^{-5}$			2521
$K_S^0K_S^0K_L^0$		$<\ 1.6$	$\times10^{-5}$	CL=90%	2521
$K^*(892)^0K^+K^-$		$(2.75\pm 0.26)\times10^{-5}$			2467
$K^*(892)^0\phi$		$(1.00\pm 0.05)\times10^{-5}$			2460
$K^+K^-\pi^+\pi^-$ nonresonant		$<\ 7.17$	$\times10^{-5}$	CL=90%	2559
$K^*(892)^0K^-\pi^+$		$(\ 4.5 \pm 1.3\ )\times10^{-6}$			2524
$K^*(892)^0\overline{K}^*(892)^0$		$(\ 8\ \pm 5\ )\times10^{-7}$	S=2.2		2485
$K^+K^+\pi^-\pi^-$ nonresonant		$<\ 6.0$	$\times10^{-6}$	CL=90%	2559

$K^*(892)^0 K^+ \pi^-$		$<$	2.2	$\times 10^{-6}$	CL=90%	2524
$K^*(892)^0 K^*(892)^0$		$<$	2	$\times 10^{-7}$	CL=90%	2485
$K^*(892)^+ K^*(892)^-$		$<$	2.0	$\times 10^{-6}$	CL=90%	2485
$K_1(1400)^0 \phi$		$<$	5.0	$\times 10^{-3}$	CL=90%	2339
$\phi(K\pi)_0^{*0}$		(	4.3 $\pm$ 0.4)	$\times 10^{-6}$		–
$\phi(K\pi)_0^{*0}$ $(1.60<m_{K\pi}<2.15)$	[eeaa]	$<$	1.7	$\times 10^{-6}$	CL=90%	–
$K_0^*(1430)^0 K^- \pi^+$		$<$	3.18	$\times 10^{-5}$	CL=90%	2403
$K_0^*(1430)^0 \overline{K}^*(892)^0$		$<$	3.3	$\times 10^{-6}$	CL=90%	2360
$K_0^*(1430)^0 \overline{K}_0^*(1430)^0$		$<$	8.4	$\times 10^{-6}$	CL=90%	2222
$K_0^*(1430)^0 \phi$		(	3.9 $\pm$ 0.8)	$\times 10^{-6}$		2333
$K_0^*(1430)^0 K^*(892)^0$		$<$	1.7	$\times 10^{-6}$	CL=90%	2360
$K_0^*(1430)^0 K_0^*(1430)^0$		$<$	4.7	$\times 10^{-6}$	CL=90%	2222
$K^*(1680)^0 \phi$		$<$	3.5	$\times 10^{-6}$	CL=90%	2238
$K^*(1780)^0 \phi$		$<$	2.7	$\times 10^{-6}$	CL=90%	–
$K^*(2045)^0 \phi$		$<$	1.53	$\times 10^{-5}$	CL=90%	–
$K_2^*(1430)^0 \rho^0$		$<$	1.1	$\times 10^{-3}$	CL=90%	2381
$K_2^*(1430)^0 \phi$		(	6.8 $\pm$ 0.9)	$\times 10^{-6}$	S=1.2	2333
$K^0 \phi\phi$		(	4.5 $\pm$ 0.9)	$\times 10^{-6}$		2305
$\eta'\eta' K^0$		$<$	3.1	$\times 10^{-5}$	CL=90%	2337
$\eta K^0 \gamma$		(	7.6 $\pm$ 1.8)	$\times 10^{-6}$		2587
$\eta' K^0 \gamma$		$<$	6.4	$\times 10^{-6}$	CL=90%	2528
$K^0 \phi\gamma$		(	2.7 $\pm$ 0.7)	$\times 10^{-6}$		2516
$K^+ \pi^- \gamma$		(	4.6 $\pm$ 1.4)	$\times 10^{-6}$		2615
$K^*(892)^0 \gamma$		(	4.33 $\pm$ 0.15)	$\times 10^{-5}$		2565
$K^*(1410)\gamma$		$<$	1.3	$\times 10^{-4}$	CL=90%	2451
$K^+ \pi^- \gamma$ nonresonant		$<$	2.6	$\times 10^{-6}$	CL=90%	2615
$K^*(892)^0 X(214)$, $X \to \mu^+\mu^-$	[ffaa]	$<$	2.26	$\times 10^{-8}$	CL=90%	–
$K^0 \pi^+ \pi^- \gamma$		(	1.95 $\pm$ 0.22)	$\times 10^{-5}$		2609
$K^+ \pi^- \pi^0 \gamma$		(	4.1 $\pm$ 0.4)	$\times 10^{-5}$		2609
$K_1(1270)^0 \gamma$		$<$	5.8	$\times 10^{-5}$	CL=90%	2486
$K_1(1400)^0 \gamma$		$<$	1.2	$\times 10^{-5}$	CL=90%	2454
$K_2^*(1430)^0 \gamma$		(	1.24 $\pm$ 0.24)	$\times 10^{-5}$		2447
$K^*(1680)^0 \gamma$		$<$	2.0	$\times 10^{-3}$	CL=90%	2361
$K_3^*(1780)^0 \gamma$		$<$	8.3	$\times 10^{-5}$	CL=90%	2341
$K_4^*(2045)^0 \gamma$		$<$	4.3	$\times 10^{-3}$	CL=90%	2244

Light unflavored meson modes

$\rho^0 \gamma$		(	8.6 $\pm$ 1.5)	$\times 10^{-7}$		2583
$\rho^0 X(214)$, $X \to \mu^+\mu^-$	[ffaa]	$<$	1.73	$\times 10^{-8}$	CL=90%	–
$\omega\gamma$		(	$4.4\ ^{+\ 1.8}_{-\ 1.6}$)	$\times 10^{-7}$		2582
$\phi\gamma$		$<$	8.5	$\times 10^{-7}$	CL=90%	2541
$\pi^+\pi^-$		(	5.12 $\pm$ 0.19)	$\times 10^{-6}$		2636

$\pi^0\pi^0$		$(\ 1.91\pm\ 0.22)\times10^{-6}$			2636
$\eta\pi^0$		$(\ 4.1\ \pm\ 1.7\ )\times10^{-7}$			2610
$\eta\eta$		$<\ 1.0\ \times10^{-6}$		CL=90%	2582
$\eta'\pi^0$		$(\ 1.2\ \pm\ 0.6\ )\times10^{-6}$		S=1.7	2551
$\eta'\eta'$		$<\ 1.7\ \times10^{-6}$		CL=90%	2460
$\eta'\eta$		$<\ 1.2\ \times10^{-6}$		CL=90%	2523
$\eta'\rho^0$		$<\ 1.3\ \times10^{-6}$		CL=90%	2492
$\eta' f_0(980),\ f_0\to\ \pi^+\pi^-$		$<\ 9\ \times10^{-7}$		CL=90%	2454
$\eta\rho^0$		$<\ 1.5\ \times10^{-6}$		CL=90%	2553
$\eta f_0(980),\ f_0\to\ \pi^+\pi^-$		$<\ 4\ \times10^{-7}$		CL=90%	2516
$\omega\eta$		$(\ 9.4\ {}^{+\ 4.0}_{-\ 3.1}\ )\times10^{-7}$			2552
$\omega\eta'$		$(\ 1.0\ {}^{+\ 0.5}_{-\ 0.4}\ )\times10^{-6}$			2491
$\omega\rho^0$		$<\ 1.6\ \times10^{-6}$		CL=90%	2522
$\omega f_0(980),\ f_0\to\ \pi^+\pi^-$		$<\ 1.5\ \times10^{-6}$		CL=90%	2485
$\omega\omega$		$(\ 1.2\ \pm\ 0.4\ )\times10^{-6}$			2521
$\phi\pi^0$		$<\ 1.5\ \times10^{-7}$		CL=90%	2540
$\phi\eta$		$<\ 5\ \times10^{-7}$		CL=90%	2511
$\phi\eta'$		$<\ 5\ \times10^{-7}$		CL=90%	2448
$\phi\rho^0$		$<\ 3.3\ \times10^{-7}$		CL=90%	2480
$\phi f_0(980),\ f_0\to\ \pi^+\pi^-$		$<\ 3.8\ \times10^{-7}$		CL=90%	2441
$\phi\omega$		$<\ 7\ \times10^{-7}$		CL=90%	2479
$\phi\phi$		$<\ 2.8\ \times10^{-8}$		CL=90%	2435
$a_0(980)^\pm\pi^\mp,\ a_0^\pm\to\ \eta\pi^\pm$		$<\ 3.1\ \times10^{-6}$		CL=90%	–
$a_0(1450)^\pm\pi^\mp,\ a_0^\pm\to\ \eta\pi^\pm$		$<\ 2.3\ \times10^{-6}$		CL=90%	–
$\pi^+\pi^-\pi^0$		$<\ 7.2\ \times10^{-4}$		CL=90%	2631
$\rho^0\pi^0$		$(\ 2.0\ \pm\ 0.5\ )\times10^{-6}$			2581
$\rho^\mp\pi^\pm$	[*hh*]	$(\ 2.30\pm\ 0.23)\times10^{-5}$			2581
$\pi^+\pi^-\pi^+\pi^-$		$<\ 1.12\ \times10^{-5}$		CL=90%	2621
$\rho^0\pi^+\pi^-$		$<\ 8.8\ \times10^{-6}$		CL=90%	2575
$\rho^0\rho^0$		$(\ 9.6\ \pm\ 1.5\ )\times10^{-7}$			2523
$f_0(980)\pi^+\pi^-,\ f_0\to\ \pi^+\pi^-$		$<\ 3.0\ \times10^{-6}$		CL=90%	–
$\rho^0 f_0(980),\ f_0\to\ \pi^+\pi^-$		$(\ 7.8\ \pm\ 2.5\ )\times10^{-7}$			2486
$f_0(980) f_0(980),\ f_0\to\ \pi^+\pi^-,\ f_0\to\ \pi^+\pi^-$		$<\ 1.9\ \times10^{-7}$		CL=90%	2447
$f_0(980) f_0(980),\ f_0\to\ \pi^+\pi^-,\ f_0\to\ K^+K^-$		$<\ 2.3\ \times10^{-7}$		CL=90%	2447
$a_1(1260)^\mp\pi^\pm$	[*hh*]	$(\ 2.6\ \pm\ 0.5\ )\times10^{-5}$		S=1.9	2494
$a_2(1320)^\mp\pi^\pm$	[*hh*]	$<\ 6.3\ \times10^{-6}$		CL=90%	2473
$\pi^+\pi^-\pi^0\pi^0$		$<\ 3.1\ \times10^{-3}$		CL=90%	2622
$\rho^+\rho^-$		$(\ 2.77\pm\ 0.19)\times10^{-5}$			2523
$a_1(1260)^0\pi^0$		$<\ 1.1\ \times10^{-3}$		CL=90%	2495
$\omega\pi^0$		$<\ 5\ \times10^{-7}$		CL=90%	2580

$\pi^+\pi^+\pi^-\pi^-\pi^0$	<	9.0	$\times 10^{-3}$	CL=90%	2609
$a_1(1260)^+\rho^-$	<	6.1	$\times 10^{-5}$	CL=90%	2433
$a_1(1260)^0\rho^0$	<	2.4	$\times 10^{-3}$	CL=90%	2433
$b_1^\mp\pi^\pm,\ b_1^\mp\to\omega\pi^\mp$	(	1.09± 0.15)	$\times 10^{-5}$		–
$b_1^0\pi^0,\ b_1^0\to\omega\pi^0$	<	1.9	$\times 10^{-6}$	CL=90%	–
$b_1^-\rho^+,\ b_1^-\to\omega\pi^-$	<	1.4	$\times 10^{-6}$	CL=90%	–
$b_1^0\rho^0,\ b_1^0\to\omega\pi^0$	<	3.4	$\times 10^{-6}$	CL=90%	–
$\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-$	<	3.0	$\times 10^{-3}$	CL=90%	2592
$a_1(1260)^+a_1(1260)^-,\ a_1^+\to 2\pi^+\pi^-,\ a_1^-\to 2\pi^-\pi^+$	(	1.18± 0.31)	$\times 10^{-5}$		2336
$\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^0$	<	1.1	%	CL=90%	2572

Baryon modes

$p\overline{p}$	(	$1.5\ ^{+\ 0.7}_{-\ 0.5}$)	$\times 10^{-8}$		2467
$p\overline{p}\pi^+\pi^-$	<	2.5	$\times 10^{-4}$	CL=90%	2406
$p\overline{p}K^0$	(	2.66± 0.32)	$\times 10^{-6}$		2347
$\Theta(1540)^+\overline{p},\ \Theta^+\to pK_S^0$ [ggaa]	<	5	$\times 10^{-8}$	CL=90%	2318
$f_J(2220)K^0,\ f_J\to p\overline{p}$	<	4.5	$\times 10^{-7}$	CL=90%	2135
$p\overline{p}K^*(892)^0$	(	$1.24^{+\ 0.28}_{-\ 0.25}$)	$\times 10^{-6}$		2216
$f_J(2220)K_0^*,\ f_J\to p\overline{p}$	<	1.5	$\times 10^{-7}$	CL=90%	–
$p\overline{\Lambda}\pi^-$	(	3.14± 0.29)	$\times 10^{-6}$		2401
$p\overline{\Lambda}\pi^-\gamma$	<	6.5	$\times 10^{-7}$	CL=90%	2401
$p\overline{\Sigma}(1385)^-$	<	2.6	$\times 10^{-7}$	CL=90%	2363
$\Delta^0\overline{\Lambda}$	<	9.3	$\times 10^{-7}$	CL=90%	2364
$p\overline{\Lambda}K^-$	<	8.2	$\times 10^{-7}$	CL=90%	2308
$p\overline{\Lambda}D^-$	(	2.5 ± 0.4)	$\times 10^{-5}$		1765
$p\overline{\Lambda}D^{*-}$	(	3.4 ± 0.8)	$\times 10^{-5}$		1685
$p\overline{\Sigma}^0\pi^-$	<	3.8	$\times 10^{-6}$	CL=90%	2383
$\overline{\Lambda}\Lambda$	<	3.2	$\times 10^{-7}$	CL=90%	2392
$\overline{\Lambda}\Lambda K^0$	(	$4.8\ ^{+\ 1.0}_{-\ 0.9}$)	$\times 10^{-6}$		2250
$\overline{\Lambda}\Lambda K^{*0}$	(	$2.5\ ^{+\ 0.9}_{-\ 0.8}$)	$\times 10^{-6}$		2098
$\overline{\Lambda}\Lambda D^0$	(	$1.00^{+\ 0.30}_{-\ 0.26}$)	$\times 10^{-5}$		1661
$D^0\Sigma^0\overline{\Lambda}+$ c.c.	<	3.1	$\times 10^{-5}$	CL=90%	1611
$\Delta^0\overline{\Delta}^0$	<	1.5	$\times 10^{-3}$	CL=90%	2335
$\Delta^{++}\overline{\Delta}^{--}$	<	1.1	$\times 10^{-4}$	CL=90%	2335
$\overline{D}^0p\overline{p}$	(	1.04± 0.07)	$\times 10^{-4}$		1863
$D_s^-\overline{\Lambda}p$	(	2.8 ± 0.9)	$\times 10^{-5}$		1710
$\overline{D}^*(2007)^0p\overline{p}$	(	9.9 ± 1.1)	$\times 10^{-5}$		1788
$D^*(2010)^-p\overline{n}$	(	1.4 ± 0.4)	$\times 10^{-3}$		1785
$D^-p\overline{p}\pi^+$	(	3.32± 0.31)	$\times 10^{-4}$		1786
$D^*(2010)^-p\overline{p}\pi^+$	(	4.7 ± 0.5)	$\times 10^{-4}$	S=1.2	1708

$\overline{D}^0 p\overline{p}\pi^+\pi^-$		(3.0 ± 0.5) × 10^{-4}			1708
$\overline{D}^{*0} p\overline{p}\pi^+\pi^-$		(1.9 ± 0.5) × 10^{-4}			1623
$\Theta_c \overline{p}\pi^+$, $\Theta_c \to D^- p$		< 9	× 10^{-6}	CL=90%	–
$\Theta_c \overline{p}\pi^+$, $\Theta_c \to D^{*-} p$		< 1.4	× 10^{-5}	CL=90%	–
$\overline{\Sigma}_c^{--}\Delta^{++}$		< 8	× 10^{-4}	CL=90%	1839
$\overline{\Lambda}_c^- p\pi^+\pi^-$		(1.01 ± 0.14) × 10^{-3}		S=1.3	1934
$\overline{\Lambda}_c^- p$		(1.52 ± 0.18) × 10^{-5}			2021
$\overline{\Lambda}_c^- p\pi^0$		(1.53 ± 0.18) × 10^{-4}			1982
$\Sigma_c(2455)^- p$		< 2.4	× 10^{-5}		–
$\overline{\Lambda}_c^- p\pi^+\pi^-\pi^0$		< 5.07	× 10^{-3}	CL=90%	1882
$\overline{\Lambda}_c^- p\pi^+\pi^-\pi^+\pi^-$		< 2.74	× 10^{-3}	CL=90%	1821
$\overline{\Lambda}_c^- p\pi^+\pi^-$ (nonresonant)		(5.4 ± 1.0) × 10^{-4}		S=1.3	1934
$\overline{\Sigma}_c(2520)^{--} p\pi^+$		(1.01 ± 0.18) × 10^{-4}			1860
$\overline{\Sigma}_c(2520)^0 p\pi^-$		< 3.1	× 10^{-5}	CL=90%	1860
$\overline{\Sigma}_c(2455)^0 p\pi^-$		(1.07 ± 0.16) × 10^{-4}			1895
$\overline{\Sigma}_c(2455)^0 N^0$, $N^0 \to p\pi^-$		(6.3 ± 1.6) × 10^{-5}			–
$\overline{\Sigma}_c(2455)^{--} p\pi^+$		(1.81 ± 0.24) × 10^{-4}			1895
$\Lambda_c^- pK^+\pi^-$		(3.4 ± 0.7) × 10^{-5}			–
$\overline{\Sigma}_c(2455)^{--} pK^+$, $\overline{\Sigma}_c^{--} \to \overline{\Lambda}_c^- \pi^-$		(8.7 ± 2.5) × 10^{-6}			1754
$\Lambda_c^- pK^*(892)^0$		< 2.42	× 10^{-5}	CL=90%	–
$\Lambda_c^- pK^+K^-$		(2.0 ± 0.4) × 10^{-5}			–
$\Lambda_c^- p\phi$		< 9	× 10^{-6}	CL=90%	–
$\Lambda_c^- p\overline{p}p$		< 2.8	× 10^{-6}		–
$\overline{\Lambda}_c^- \Lambda K^+$		(4.8 ± 1.1) × 10^{-5}			1767
$\overline{\Lambda}_c^- \Lambda_c^+$		< 1.6	× 10^{-5}	CL=95%	1319
$\overline{\Lambda}_c(2593)^-$ / $\overline{\Lambda}_c(2625)^- p$		< 1.1	× 10^{-4}	CL=90%	–
$\overline{\Xi}_c^- \Lambda_c^+$, $\overline{\Xi}_c^- \to \overline{\Xi}^+\pi^-\pi^-$		(1.7 ± 1.8) × 10^{-5}		S=2.2	1147
$\Lambda_c^+ \Lambda_c^- K^0$		(4.3 ± 2.2) × 10^{-4}			–

Lepton Family number (LF) or Lepton number (L) or Baryon number (B) violating modes, or/and $\Delta B = 1$ weak neutral current ($B1$) modes

$\gamma\gamma$	$B1$	<	3.2	× 10^{-7}	CL=90%	2640
e^+e^-	$B1$	<	8.3	× 10^{-8}	CL=90%	2640
$e^+e^-\gamma$	$B1$	<	1.2	× 10^{-7}	CL=90%	2640
$\mu^+\mu^-$	$B1$		($3.9^{+1.6}_{-1.4}$) × 10^{-10}			2638
$\mu^+\mu^-\gamma$	$B1$	<	1.6	× 10^{-7}	CL=90%	2638
$\mu^+\mu^-\mu^+\mu^-$	$B1$	<	5.3	× 10^{-9}	CL=90%	2629
SP, $S \to \mu^+\mu^-$, $P \to \mu^+\mu^-$	$B1$ [$hhaa$]	<	5.1	× 10^{-9}	CL=90%	–
$\tau^+\tau^-$	$B1$	<	4.1	× 10^{-3}	CL=90%	1952

$\pi^0 \ell^+ \ell^-$	*B1*		<	5.3	$\times 10^{-8}$	CL=90%	2638
$\pi^0 e^+ e^-$	*B1*		<	8.4	$\times 10^{-8}$	CL=90%	2638
$\pi^0 \mu^+ \mu^-$	*B1*		<	6.9	$\times 10^{-8}$	CL=90%	2634
$\eta \ell^+ \ell^-$	*B1*		<	6.4	$\times 10^{-8}$	CL=90%	2611
$\eta e^+ e^-$	*B1*		<	1.08	$\times 10^{-7}$	CL=90%	2611
$\eta \mu^+ \mu^-$	*B1*		<	1.12	$\times 10^{-7}$	CL=90%	2607
$\pi^0 \nu \overline{\nu}$	*B1*		<	6.9	$\times 10^{-5}$	CL=90%	2638
$K^0 \ell^+ \ell^-$	*B1*	[*ttt*]	(	$3.1 \,^{+\ 0.8}_{-\ 0.7}$)	$\times 10^{-7}$		2616
$K^0 e^+ e^-$	*B1*		(	$1.6 \,^{+\ 1.0}_{-\ 0.8}$)	$\times 10^{-7}$		2616
$K^0 \mu^+ \mu^-$	*B1*		(	3.39± 0.34)	$\times 10^{-7}$		2612
$K^0 \nu \overline{\nu}$	*B1*		<	4.9	$\times 10^{-5}$	CL=90%	2616
$\rho^0 \nu \overline{\nu}$	*B1*		<	2.08	$\times 10^{-4}$	CL=90%	2583
$K^*(892)^0 \ell^+ \ell^-$	*B1*	[*ttt*]	(	$9.9 \,^{+\ 1.2}_{-\ 1.1}$)	$\times 10^{-7}$		2565
$K^*(892)^0 e^+ e^-$	*B1*		(	$1.03^{+\ 0.19}_{-\ 0.17}$)	$\times 10^{-6}$		2565
$K^*(892)^0 \mu^+ \mu^-$	*B1*		(	1.02± 0.09)	$\times 10^{-6}$		2560
$\pi^+ \pi^- \mu^+ \mu^-$			(	2.1 ± 0.5)	$\times 10^{-8}$		2626
$K^*(892)^0 \nu \overline{\nu}$	*B1*		<	5.5	$\times 10^{-5}$	CL=90%	2565
$\phi \nu \overline{\nu}$	*B1*		<	1.27	$\times 10^{-4}$	CL=90%	2541
$e^\pm \mu^\mp$	*LF*	[*hh*]	<	2.8	$\times 10^{-9}$	CL=90%	2639
$\pi^0 e^\pm \mu^\mp$	*LF*		<	1.4	$\times 10^{-7}$	CL=90%	2637
$K^0 e^\pm \mu^\mp$	*LF*		<	2.7	$\times 10^{-7}$	CL=90%	2615
$K^*(892)^0 e^+ \mu^-$	*LF*		<	5.3	$\times 10^{-7}$	CL=90%	2563
$K^*(892)^0 e^- \mu^+$	*LF*		<	3.4	$\times 10^{-7}$	CL=90%	2563
$K^*(892)^0 e^\pm \mu^\mp$	*LF*		<	5.8	$\times 10^{-7}$	CL=90%	2563
$e^\pm \tau^\mp$	*LF*	[*hh*]	<	2.8	$\times 10^{-5}$	CL=90%	2341
$\mu^\pm \tau^\mp$	*LF*	[*hh*]	<	2.2	$\times 10^{-5}$	CL=90%	2339
invisible	*B1*		<	2.4	$\times 10^{-5}$	CL=90%	–
$\nu \overline{\nu} \gamma$	*B1*		<	1.7	$\times 10^{-5}$	CL=90%	2640
$\Lambda_c^+ \mu^-$	*L,B*		<	1.4	$\times 10^{-6}$	CL=90%	2143
$\Lambda_c^+ e^-$	*L,B*		<	4	$\times 10^{-6}$	CL=90%	2145

$B^\pm/B^0$ ADMIXTURE

CP violation

$A_{CP}(B \to\ K^*(892)\gamma) = -0.003 \pm 0.017$
$A_{CP}(b \to\ s\gamma) = 0.015 \pm 0.020$
$A_{CP}(b \to\ (s+d)\gamma) = 0.010 \pm 0.031$
$A_{CP}(B \to\ X_s \ell^+ \ell^-) = 0.04 \pm 0.11$
$A_{CP}(B \to\ X_s \ell^+ \ell^-)\ (1.0 < q^2 < 6.0\ \mathrm{GeV}^2/c^4) = -0.06 \pm 0.22$

$A_{CP}(B \to X_s \ell^+ \ell^-)$ ($10.1 < q^2 < 12.9$ or $q^2 > 14.2$ GeV$^2/c^4$) $= 0.19 \pm 0.18$
$A_{CP}(B \to K^* e^+ e^-) = -0.18 \pm 0.15$
$A_{CP}(B \to K^* \mu^+ \mu^-) = -0.03 \pm 0.13$
$A_{CP}(B \to K^* \ell^+ \ell^-) = -0.04 \pm 0.07$
$A_{CP}(B \to \eta\,\text{anything}) = -0.13^{+0.04}_{-0.05}$
$\Delta A_{CP}(X_s\gamma) = A_{CP}(B^\pm \to X_s\gamma) - A_{CP}(B^0 \to X_s\gamma) = 0.05 \pm 0.04$

The branching fraction measurements are for an admixture of B mesons at the $\Upsilon(4S)$. The values quoted assume that $B(\Upsilon(4S) \to B\overline{B}) = 100\%$.

For inclusive branching fractions, *e.g.*, $B \to D^\pm$ *anything*, the treatment of multiple D's in the final state must be defined. One possibility would be to count the number of events with one-or-more D's and divide by the total number of B's. Another possibility would be to count the total number of D's and divide by the total number of B's, which is the definition of average multiplicity. The two definitions are identical if only one D is allowed in the final state. Even though the "one-or-more" definition seems sensible, for practical reasons inclusive branching fractions are almost always measured using the multiplicity definition. For heavy final state particles, authors call their results inclusive branching fractions while for light particles some authors call their results multiplicities. In the B sections, we list all results as inclusive branching fractions, adopting a multiplicity definition. This means that inclusive branching fractions can exceed 100% and that inclusive partial widths can exceed total widths, just as inclusive cross sections can exceed total cross section.

$\overline{B}$ modes are charge conjugates of the modes below. Reactions indicate the weak decay vertex and do not include mixing.

B DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Semileptonic and leptonic modes				
$\ell^+ \nu_\ell$ anything	[*ttt,iiaa*]	(10.86 ± 0.16) %		–
$D^- \ell^+ \nu_\ell$ anything	[*ttt*]	(2.8 ± 0.9) %		–
$\overline{D}^0 \ell^+ \nu_\ell$ anything	[*ttt*]	(7.3 ± 1.5) %		–
$\overline{D} \ell^+ \nu_\ell$		(2.42 ± 0.12) %		2310
$D^{*-} \ell^+ \nu_\ell$ anything	[*jjaa*]	(6.7 ± 1.3) $\times 10^{-3}$		–
$D^* \ell^+ \nu_\ell$	[*kkaa*]	(4.95 ± 0.11) %		2257
$\overline{D}^{**} \ell^+ \nu_\ell$	[*ttt,llaa*]	(2.7 ± 0.7) %		–
$\overline{D}_1(2420) \ell^+ \nu_\ell$ anything		(3.8 ± 1.3) $\times 10^{-3}$	S=2.4	–
$D \pi \ell^+ \nu_\ell$ anything + $D^* \pi \ell^+ \nu_\ell$ anything		(2.6 ± 0.5) %	S=1.5	–
$D \pi \ell^+ \nu_\ell$ anything		(1.5 ± 0.6) %		–
$D^* \pi \ell^+ \nu_\ell$ anything		(1.9 ± 0.4) %		–
$\overline{D}_2^*(2460) \ell^+ \nu_\ell$ anything		(4.4 ± 1.6) $\times 10^{-3}$		–

$D^{*-}\pi^+\ell^+\nu_\ell$ anything		(	1.00	±	0.34) %			–
$\overline{D}\pi^+\pi^-\ell^+\nu_\ell$		(	1.62	±	0.32) $\times 10^{-3}$			2301
$\overline{D}^*\pi^+\pi^-\ell^+\nu_\ell$		(	9.4	±	3.2) $\times 10^{-4}$			2247
$D_s^-\ell^+\nu_\ell$ anything	[ttt]	<	7			$\times 10^{-3}$	CL=90%	–
$D_s^-\ell^+\nu_\ell K^+$ anything	[ttt]	<	5			$\times 10^{-3}$	CL=90%	–
$D_s^-\ell^+\nu_\ell K^0$ anything	[ttt]	<	7			$\times 10^{-3}$	CL=90%	–
$X_c\ell^+\nu_\ell$		(	10.65	±	0.16) %			–
$X_u\ell^+\nu_\ell$		(	2.14	±	0.31) $\times 10^{-3}$			–
$K^+\ell^+\nu_\ell$ anything	[ttt]	(	6.3	±	0.6) %			–
$K^-\ell^+\nu_\ell$ anything	[ttt]	(	10	±	4) $\times 10^{-3}$			–
$K^0/\overline{K}^0\ell^+\nu_\ell$ anything	[ttt]	(	4.6	±	0.5) %			–
$\overline{D}\tau^+\nu_\tau$		(	9.8	±	1.3) $\times 10^{-3}$			1911
$D^*\tau^+\nu_\tau$		(	1.58	±	0.12) %			1838

D, D^*, or D_s modes

$D^\pm$ anything		(	22.9	±	1.3) %			–
$D^0/\overline{D}^0$ anything		(	61.8	±	2.9) %		S=1.3	–
$D^*(2010)^\pm$ anything		(	22.5	±	1.5) %			–
$D^*(2007)^0$ anything		(	26.0	±	2.7) %			–
$D_s^\pm$ anything	[hh]	(	8.3	±	0.8) %			–
$D_s^{*\pm}$ anything		(	6.3	±	1.0) %			–
$D_s^{*\pm}\overline{D}^{(*)}$		(	3.4	±	0.6) %			–
$\overline{D}D_{s0}(2317)$			seen					1605
$\overline{D}D_{sJ}(2457)$			seen					–
$D^{(*)}\overline{D}^{(*)}K^0$ + $D^{(*)}\overline{D}^{(*)}K^\pm$	[hh,nnaa]	(	7.1	$^{+\ 2.7}_{-\ 1.7}$	) %			–
$b\to\ c\overline{c}s$		(	22	±	4) %			–
$D_s^{(*)}\overline{D}^{(*)}$	[hh,nnaa]	(	3.9	±	0.4) %			–
$D^*D^*(2010)^\pm$	[hh]	<	5.9			$\times 10^{-3}$	CL=90%	1711
$DD^*(2010)^\pm$ + $D^*D^\pm$	[hh]	<	5.5			$\times 10^{-3}$	CL=90%	–
$DD^\pm$	[hh]	<	3.1			$\times 10^{-3}$	CL=90%	1866
$D_s^{(*)\pm}\overline{D}^{(*)}X(n\pi^\pm)$	[hh,nnaa]	(	9	$^{+\ 5}_{-\ 4}$	) %			–
$D^*(2010)\gamma$		<	1.1			$\times 10^{-3}$	CL=90%	2257
$D_s^+\pi^-$, $D_s^{*+}\pi^-$, $D_s^+\rho^-$, $D_s^{*+}\rho^-$, $D_s^+\pi^0$, $D_s^{*+}\pi^0$, $D_s^+\eta$, $D_s^{*+}\eta$, $D_s^+\rho^0$, $D_s^{*+}\rho^0$, $D_s^+\omega$, $D_s^{*+}\omega$	[hh]	<	4			$\times 10^{-4}$	CL=90%	–
$D_{s1}(2536)^+$ anything		<	9.5			$\times 10^{-3}$	CL=90%	–

Charmonium modes

$J/\psi(1S)$ anything		(	1.094	±	0.032) %		S=1.1	–
$J/\psi(1S)$(direct) anything		(	7.8	±	0.4) $\times 10^{-3}$		S=1.1	–
$\psi(2S)$ anything		(	3.07	±	0.21) $\times 10^{-3}$			–

$\chi_{c1}(1P)$ anything		(	3.86	±	0.27	) × 10^{-3}		–
$\chi_{c1}(1P)$ (direct) anything		(	3.24	±	0.25	) × 10^{-3}		–
$\chi_{c2}(1P)$ anything		(	1.4	±	0.4	) × 10^{-3}	S=1.9	–
$\chi_{c2}(1P)$ (direct) anything		(	1.65	±	0.31	) × 10^{-3}		–
$\eta_c(1S)$ anything		<	9			× 10^{-3}	CL=90%	–
$KX(3872)$, $X \to D^0\overline{D}^0\pi^0$		(	1.2	±	0.4	) × 10^{-4}		1141
$KX(3872)$, $X \to D^{*0}D^0$		(	8.0	±	2.2	) × 10^{-5}		1141
$KX(3940)$, $X \to D^{*0}D^0$		<	6.7			× 10^{-5}	CL=90%	1084
$KX(3915)$, $X \to \omega J/\psi$	[*ooaa*]	(	7.1	±	3.4	) × 10^{-5}		1103

K or *K** modes

$K^\pm$ anything	[*hh*]	(	78.9	±	2.5	) %		–
K^+ anything		(	66	±	5	) %		–
K^- anything		(	13	±	4	) %		–
$K^0/\overline{K}^0$ anything	[*hh*]	(	64	±	4	) %		–
$K^*(892)^\pm$ anything		(	18	±	6	) %		–
$K^*(892)^0/\overline{K}^*(892)^0$ anything	[*hh*]	(	14.6	±	2.6	) %		–
$K^*(892)\gamma$		(	4.2	±	0.6	) × 10^{-5}		2565
$\eta K\gamma$		(	8.5	$^{+1.8}_{-1.6}$		) × 10^{-6}		2588
$K_1(1400)\gamma$		<	1.27			× 10^{-4}	CL=90%	2454
$K_2^*(1430)\gamma$		(	1.7	$^{+0.6}_{-0.5}$		) × 10^{-5}		2447
$K_2(1770)\gamma$		<	1.2			× 10^{-3}	CL=90%	2342
$K_3^*(1780)\gamma$		<	3.7			× 10^{-5}	CL=90%	2341
$K_4^*(2045)\gamma$		<	1.0			× 10^{-3}	CL=90%	2244
$K\eta'(958)$		(	8.3	±	1.1	) × 10^{-5}		2528
$K^*(892)\eta'(958)$		(	4.1	±	1.1	) × 10^{-6}		2472
$K\eta$		<	5.2			× 10^{-6}	CL=90%	2588
$K^*(892)\eta$		(	1.8	±	0.5	) × 10^{-5}		2534
$K\phi\phi$		(	2.3	±	0.9	) × 10^{-6}		2306
$\overline{b} \to \overline{s}\gamma$		(	3.49	±	0.19	) × 10^{-4}		–
$\overline{b} \to \overline{d}\gamma$		(	9.2	±	3.0	) × 10^{-6}		–
$\overline{b} \to \overline{s}$ gluon		<	6.8			%	CL=90%	–
η anything		(	2.6	$^{+0.5}_{-0.8}$		) × 10^{-4}		–
η' anything		(	4.2	±	0.9	) × 10^{-4}		–
K^+ gluon (charmless)		<	1.87			× 10^{-4}	CL=90%	–
K^0 gluon (charmless)		(	1.9	±	0.7	) × 10^{-4}		–

Light unflavored meson modes

$\rho\gamma$		(	1.39	±	0.25	) × 10^{-6}	S=1.2	2583
$\rho/\omega\gamma$		(	1.30	±	0.23	) × 10^{-6}	S=1.2	–
$\pi^\pm$ anything	[*hh,ppaa*]	(	358	±	7	) %		–
π^0 anything		(	235	±	11	) %		–
η anything		(	17.6	±	1.6	) %		–

ρ^0 anything			(21	± 5	) %		–
ω anything		<	81		%	CL=90%	–
ϕ anything			(3.43	± 0.12	) %		–
$\phi K^*(892)$		<	2.2		$\times 10^{-5}$	CL=90%	2460
π^+ gluon (charmless)			(3.7	± 0.8	) $\times 10^{-4}$		–

Baryon modes

Λ_c^+ / $\overline{\Lambda}_c^-$ anything			(3.5	± 0.4	) %		–
Λ_c^+ anything		<	1.3		%	CL=90%	–
$\overline{\Lambda}_c^-$ anything		<	7		%	CL=90%	–
$\overline{\Lambda}_c^- \ell^+$ anything		<	9		$\times 10^{-4}$	CL=90%	–
$\overline{\Lambda}_c^- e^+$ anything		<	1.8		$\times 10^{-3}$	CL=90%	–
$\overline{\Lambda}_c^- \mu^+$ anything		<	− 1.4		$\times 10^{-3}$	CL=90%	–
$\overline{\Lambda}_c^- p$ anything			(2.02	± 0.33	) %		–
$\overline{\Lambda}_c^- p e^+ \nu_e$		<	8		$\times 10^{-4}$	CL=90%	2021
$\overline{\Sigma}_c^{--}$ anything			(3.3	± 1.7	) $\times 10^{-3}$		–
$\overline{\Sigma}_c^-$ anything		<	8		$\times 10^{-3}$	CL=90%	–
$\overline{\Sigma}_c^0$ anything			(3.6	± 1.7	) $\times 10^{-3}$		–
$\overline{\Sigma}_c^0 N (N = p$ or $n)$		<	1.2		$\times 10^{-3}$	CL=90%	1938
Ξ_c^0 anything, $\Xi_c^0 \to \Xi^- \pi^+$			(1.93	± 0.30	) $\times 10^{-4}$	S=1.1	–
Ξ_c^+, $\Xi_c^+ \to \Xi^- \pi^+ \pi^+$			(4.5	$^{+\ 1.3}_{-\ 1.2}$	) $\times 10^{-4}$		–
$p/\overline{p}$ anything	[hh]		(8.0	± 0.4	) %		–
$p/\overline{p}$ (direct) anything	[hh]		(5.5	± 0.5	) %		–
$\overline{p} e^+ \nu_e$ anything		<	5.9		$\times 10^{-4}$	CL=90%	–
$\Lambda/\overline{\Lambda}$ anything	[hh]		(4.0	± 0.5	) %		–
Λ anything			seen				–
$\overline{\Lambda}$ anything			seen				–
$\Xi^-/\overline{\Xi}^+$ anything	[hh]		(2.7	± 0.6	) $\times 10^{-3}$		–
baryons anything			(6.8	± 0.6	) %		–
$p\overline{p}$ anything			(2.47	± 0.23	) %		–
$\Lambda\overline{p}/\overline{\Lambda}p$ anything	[hh]		(2.5	± 0.4	) %		–
$\Lambda\overline{\Lambda}$ anything		<	5		$\times 10^{-3}$	CL=90%	–

Lepton Family number (LF) violating modes or $\Delta B = 1$ weak neutral current ($B1$) modes

$s e^+ e^-$	$B1$		(6.7	± 1.7	) $\times 10^{-6}$	S=2.0	–
$s \mu^+ \mu^-$	$B1$		(4.3	± 1.0	) $\times 10^{-6}$		–
$s \ell^+ \ell^-$	$B1$	[ttt]	(5.8	± 1.3	) $\times 10^{-6}$	S=1.8	–
$\pi \ell^+ \ell^-$	$B1$	<	5.9		$\times 10^{-8}$	CL=90%	2638
$\pi e^+ e^-$	$B1$	<	1.10		$\times 10^{-7}$	CL=90%	2638
$\pi \mu^+ \mu^-$	$B1$	<	5.0		$\times 10^{-8}$	CL=90%	2634
$K e^+ e^-$	$B1$		(4.4	± 0.6	) $\times 10^{-7}$		2617
$K^*(892) e^+ e^-$	$B1$		(1.19	± 0.20	) $\times 10^{-6}$	S=1.2	2565

$K\mu^+\mu^-$	B1	(	4.4 ± 0.4)	$\times 10^{-7}$		2612
$K^*(892)\mu^+\mu^-$	B1	(	1.06 ± 0.09)	$\times 10^{-6}$		2560
$K\ell^+\ell^-$	B1	(	4.8 ± 0.4)	$\times 10^{-7}$		2617
$K^*(892)\ell^+\ell^-$	B1	(	1.05 ± 0.10)	$\times 10^{-6}$		2565
$K\nu\overline{\nu}$	B1	<	1.7	$\times 10^{-5}$	CL=90%	2617
$K^*\nu\overline{\nu}$	B1	<	7.6	$\times 10^{-5}$	CL=90%	–
$se^\pm\mu^\mp$	LF	[hh] <	2.2	$\times 10^{-5}$	CL=90%	–
$\pi e^\pm\mu^\mp$	LF	<	9.2	$\times 10^{-8}$	CL=90%	2637
$\rho e^\pm\mu^\mp$	LF	<	3.2	$\times 10^{-6}$	CL=90%	2582
$Ke^\pm\mu^\mp$	LF	<	3.8	$\times 10^{-8}$	CL=90%	2616
$K^*(892)e^\pm\mu^\mp$	LF	<	5.1	$\times 10^{-7}$	CL=90%	2563

$B^\pm/B^0/B_s^0$/b-baryon ADMIXTURE

These measurements are for an admixture of bottom particles at high energy (LHC, LEP, Tevatron, S$p\overline{p}$S).

Mean life $\tau = (1.566 \pm 0.003) \times 10^{-12}$ s

Mean life $\tau = (1.72 \pm 0.10) \times 10^{-12}$ s Charged b-hadron admixture

Mean life $\tau = (1.58 \pm 0.14) \times 10^{-12}$ s Neutral b-hadron admixture

$\tau_{\text{charged } b\text{-hadron}}/\tau_{\text{neutral } b\text{-hadron}} = 1.09 \pm 0.13$

$|\Delta\tau_b|/\tau_{b,\overline{b}} = -0.001 \pm 0.014$

$\text{Re}(\epsilon_b) \;/\; (1 + |\epsilon_b|^2) = (1.2 \pm 0.4) \times 10^{-3}$

The branching fraction measurements are for an admixture of B mesons and baryons at energies above the $\Upsilon(4S)$. Only the highest energy results (LHC, LEP, Tevatron, S$p\overline{p}$S) are used in the branching fraction averages. In the following, we assume that the production fractions are the same at the LHC, LEP, and at the Tevatron.

For inclusive branching fractions, *e.g.*, $B \rightarrow D^\pm$ anything, the values usually are multiplicities, not branching fractions. They can be greater than one.

The modes below are listed for a $\overline{b}$ initial state. b modes are their charge conjugates. Reactions indicate the weak decay vertex and do not include mixing.

$\overline{b}$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)

PRODUCTION FRACTIONS

The production fractions for weakly decaying b-hadrons at high energy have been calculated from the best values of mean lives, mixing parameters, and branching fractions in this edition by the Heavy Flavor Averaging Group (HFAG) as described in the note "B^0-$\overline{B}^0$ Mixing" in the B^0 Particle

Listings. The production fractions in b-hadronic Z decay or $p\overline{p}$ collisions at the Tevatron are also listed at the end of the section. Values assume

$\mathrm{B}(\overline{b} \rightarrow\ B^+) = \mathrm{B}(\overline{b} \rightarrow\ B^0)$
$\mathrm{B}(\overline{b} \rightarrow\ B^+) + \mathrm{B}(\overline{b} \rightarrow\ B^0) + \mathrm{B}(\overline{b} \rightarrow\ B_s^0) + \mathrm{B}(b \rightarrow\ b\text{-baryon}) = 100\%$.

The correlation coefficients between production fractions are also reported:
$cor(B_s^0,\ b\text{-baryon}) = -0.240$
$cor(B_s^0,\ B^{\pm}{=}B^0) = -0.161$
$cor(b\text{-baryon},\ B^{\pm}{=}B^0) = -0.920$.

The notation for production fractions varies in the literature (f_d, d_{B^0}, $f(b \rightarrow\ \overline{B}^0)$, $\mathrm{Br}(b \rightarrow\ \overline{B}^0)$). We use our own branching fraction notation here, $\mathrm{B}(\overline{b} \rightarrow\ B^0)$.

Note these production fractions are b-hadronization fractions, not the conventional branching fractions of b-quark to a B-hadron, which may have considerable dependence on the initial and final state kinematic and production environment.

B^+		(40.4 ± 0.6) %		–
B^0		(40.4 ± 0.6) %		–
B_s^0		(10.3 ± 0.5) %		–
b-baryon		(8.9 ± 1.3) %		–

DECAY MODES

Semileptonic and leptonic modes

ν anything		(23.1 ± 1.5) %		–
$\ell^+ \nu_\ell$ anything	[*ttt*]	(10.69± 0.22) %		–
$e^+ \nu_e$ anything		(10.86± 0.35) %		–
$\mu^+ \nu_\mu$ anything		($10.95^{+\ 0.29}_{-\ 0.25}$) %		–
$D^- \ell^+ \nu_\ell$ anything	[*ttt*]	(2.2 ± 0.4) %	S=1.9	–
$D^- \pi^+ \ell^+ \nu_\ell$ anything		(4.9 ± 1.9) $\times 10^{-3}$		–
$D^- \pi^- \ell^+ \nu_\ell$ anything		(2.6 ± 1.6) $\times 10^{-3}$		–
$\overline{D}^0 \ell^+ \nu_\ell$ anything	[*ttt*]	(6.81± 0.34) %		–
$\overline{D}^0 \pi^- \ell^+ \nu_\ell$ anything		(1.07± 0.27) %		–
$\overline{D}^0 \pi^+ \ell^+ \nu_\ell$ anything		(2.3 ± 1.6) $\times 10^{-3}$		–
$D^{*-} \ell^+ \nu_\ell$ anything	[*ttt*]	(2.75± 0.19) %		–
$D^{*-} \pi^- \ell^+ \nu_\ell$ anything		(6 ± 7) $\times 10^{-4}$		–
$D^{*-} \pi^+ \ell^+ \nu_\ell$ anything		(4.8 ± 1.0) $\times 10^{-3}$		–
$\overline{D}_j^0 \ell^+ \nu_\ell$ anything $\times$ $\mathrm{B}(\overline{D}_j^0 \rightarrow\ D^{*+} \pi^-)$	[*ttt,qqaa*]	(2.6 ± 0.9) $\times 10^{-3}$		–
$D_j^- \ell^+ \nu_\ell$ anything $\times$ $\mathrm{B}(D_j^- \rightarrow\ D^0 \pi^-)$	[*ttt,qqaa*]	(7.0 ± 2.3) $\times 10^{-3}$		–

$\overline{D}_2^*(2460)^0 \ell^+ \nu_\ell$ anything × B($\overline{D}_2^*(2460)^0 \to D^{*-}\pi^+$)		< 1.4	× 10^{-3} CL=90%	–
$D_2^*(2460)^- \ell^+ \nu_\ell$ anything × B($D_2^*(2460)^- \to D^0\pi^-$)		($4.2 \,^{+\,1.5}_{-\,1.8}$) × 10^{-3}		–
$\overline{D}_2^*(2460)^0 \ell^+ \nu_\ell$ anything × B($\overline{D}_2^*(2460)^0 \to D^-\pi^+$)		(1.6 ± 0.8) × 10^{-3}		–
charmless $\ell\overline{\nu}_\ell$	[*ttt*]	(1.7 ± 0.5) × 10^{-3}		–
$\tau^+ \nu_\tau$ anything		(2.41± 0.23) %		–
$D^{*-}\tau\nu_\tau$ anything		(9 ± 4) × 10^{-3}		–
$\overline{c} \to \ell^-\overline{\nu}_\ell$ anything	[*ttt*]	(8.02± 0.19) %		–
$c \to \ell^+\nu$ anything		($1.6 \,^{+\,0.4}_{-\,0.5}$) %		–

Charmed meson and baryon modes

$\overline{D}^0$ anything		(59.0 ± 2.9) %		–
$D^0 D_s^\pm$ anything	[*hh*]	($9.1 \,^{+\,4.0}_{-\,2.8}$) %		–
$D^\mp D_s^\pm$ anything	[*hh*]	($4.0 \,^{+\,2.3}_{-\,1.8}$) %		–
$\overline{D}^0 D^0$ anything	[*hh*]	($5.1 \,^{+\,2.0}_{-\,1.8}$) %		–
$D^0 D^\pm$ anything	[*hh*]	($2.7 \,^{+\,1.8}_{-\,1.6}$) %		–
$D^\pm D^\mp$ anything	[*hh*]	< 9	× 10^{-3} CL=90%	–
D^- anything		(22.5 ± 1.7) %		–
$D^*(2010)^+$ anything		(17.3 ± 2.0) %		–
$D_1(2420)^0$ anything		(5.0 ± 1.5) %		–
$D^*(2010)^\mp D_s^\pm$ anything	[*hh*]	($3.3 \,^{+\,1.6}_{-\,1.3}$) %		–
$D^0 D^*(2010)^\pm$ anything	[*hh*]	($3.0 \,^{+\,1.1}_{-\,0.9}$) %		–
$D^*(2010)^\pm D^\mp$ anything	[*hh*]	($2.5 \,^{+\,1.2}_{-\,1.0}$) %		–
$D^*(2010)^\pm D^*(2010)^\mp$ anything	[*hh*]	(1.2 ± 0.4) %		–
$\overline{D}D$ anything		($10 \,^{+11}_{-10}$) %		–
$D_2^*(2460)^0$ anything		(4.7 ± 2.7) %		–
D_s^- anything		(14.7 ± 2.1) %		–
D_s^+ anything		(10.1 ± 3.1) %		–
$\Lambda_c^\pm$ anything		(7.6 ± 1.1) %		–
$\overline{c}/c$ anything	[*ppaa*]	(116.2 ± 3.2) %		–

Charmonium modes				
$J/\psi(1S)$anything		(1.16± 0.10) %		–
$\psi(2S)$anything		(2.83± 0.29) $\times 10^{-3}$		–
$\chi_{c1}(1P)$anything		(1.4 ± 0.4) %		–
K* or *K* **modes**				
$\overline{s}\gamma$		(3.1 ± 1.1) $\times 10^{-4}$		–
$\overline{s}\overline{\nu}\nu$	*B1*	< 6.4	$\times 10^{-4}$ CL=90%	–
$K^{\pm}$anything		(74 ± 6) %		–
K^0_Sanything		(29.0 ± 2.9) %		–
Pion modes				
$\pi^{\pm}$anything		(397 ±21) %		–
π^0anything	[*ppaa*]	(278 ±60) %		–
ϕanything		(2.82± 0.23) %		–
Baryon modes				
$p/\overline{p}$anything		(13.1 ± 1.1) %		–
$\Lambda/\overline{\Lambda}$anything		(5.9 ± 0.6) %		–
b-baryon anything		(10.2 ± 2.8) %		–
Other modes				
charged anything	[*ppaa*]	(497 ± 7) %		–
hadron$^+$ hadron$^-$		(1.7 $^{+\ 1.0}_{-\ 0.7}$) $\times 10^{-5}$		–
charmless		(7 ±21) $\times 10^{-3}$		–
$\Delta B = 1$ weak neutral current (*B1*) modes				
$\mu^+\mu^-$anything	*B1*	< 3.2	$\times 10^{-4}$ CL=90%	–

*B**

$I(J^P) = \frac{1}{2}(1^-)$

I, *J*, *P* need confirmation. Quantum numbers shown are quark-model predictions.

Mass $m_{B^*} = 5324.65 \pm 0.25$ MeV
$m_{B^*} - m_B = 45.18 \pm 0.23$ MeV
$m_{B^{*+}} - m_{B^+} = 45.34 \pm 0.23$ MeV

B* **DECAY MODES**	Fraction (Γ_i/Γ)	*p* (MeV/*c*)
$B\gamma$	dominant	45

$B_1(5721)^+$

$I(J^P) = \frac{1}{2}(1^+)$
I, J, P need confirmation.

Mass $m = 5725.9^{+2.5}_{-2.7}$ MeV
$m_{B_1^+} - m_{B^{*0}} = 401.2^{+2.4}_{-2.7}$ MeV
Full width $\Gamma = 31 \pm 6$ MeV (S = 1.1)

$B_1(5721)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B^{*0}\pi^+$	seen	363

$B_1(5721)^0$

$I(J^P) = \frac{1}{2}(1^+)$
I, J, P need confirmation.

$B_1(5721)^0$ MASS = 5726.0 ± 1.3 MeV (S = 1.2)
$m_{B_1^0} - m_{B^+} = 446.7 \pm 1.3$ MeV (S = 1.2)
$m_{B_1^0} - m_{B^{*+}} = 401.4 \pm 1.2$ MeV (S = 1.2)
Full width $\Gamma = 27.5 \pm 3.4$ MeV (S = 1.1)

$B_1(5721)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B^{*+}\pi^-$	dominant	363

$B_2^*(5747)^+$

$I(J^P) = \frac{1}{2}(2^+)$
I, J, P need confirmation.

Mass $m = 5737.2 \pm 0.7$ MeV
$m_{B_2^{*+}} - m_{B^0} = 457.5 \pm 0.7$ MeV
Full width $\Gamma = 20 \pm 5$ MeV (S = 2.2)

$B_2^*(5747)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B^0\pi^+$	seen	418
$B^{*0}\pi^+$	seen	374

$B_2^*(5747)^0$

$I(J^P) = \frac{1}{2}(2^+)$
I, J, P need confirmation.

$B_2^*(5747)^0$ MASS = 5739.5 ± 0.7 MeV (S = 1.4)
$m_{B_2^{*0}} - m_{B_1^0} = 13.5 \pm 1.4$ MeV (S = 1.3)
$m_{B_2^{*0}} - m_{B^+} = 460.2 \pm 0.6$ MeV (S = 1.4)
Full width $\Gamma = 24.2 \pm 1.7$ MeV

$B_2^*(5747)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B^+\pi^-$	dominant	421
$B^{*+}\pi^-$	dominant	376

$B_J(5970)^+$

$I(J^P) = \frac{1}{2}(?^?)$
I, J, P need confirmation.

Mass $m = 5964 \pm 5$ MeV
$m_{B_J(5970)^+} - m_{B^0} = 685 \pm 5$ MeV
$m_{B_J(5970)^+} - m_{B^{*0}}$
Full width $\Gamma = 62 \pm 20$ MeV

$B_J(5970)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B^0\pi^+$	possibly seen	632
$B^{*0}\pi^+$	seen	591

$B_J(5970)^0$

$I(J^P) = \frac{1}{2}(?^?)$
I, J, P need confirmation.

Mass $m = 5971 \pm 5$ MeV
$m_{B_J(5970)^0} - m_{B^+} = 691 \pm 5$ MeV
$m_{B_J(5970)^0} - m_{B^{*+}}$
Full width $\Gamma = 81 \pm 12$ MeV

$B_J(5970)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B^+\pi^-$	possibly seen	638
$B^{*+}\pi^-$	seen	597

BOTTOM, STRANGE MESONS ($B = \pm 1, S = \mp 1$)

$B_s^0 = s\overline{b}$, $\overline{B}_s^0 = \overline{s}\,b$, similarly for B_s^*'s

B_s^0

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

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

Mass $m_{B_s^0} = 5366.82 \pm 0.22$ MeV

$m_{B_s^0} - m_B = 87.35 \pm 0.20$ MeV

Mean life $\tau = (1.510 \pm 0.005) \times 10^{-12}$ s

$c\tau = 452.7\ \mu$m

$\Delta\Gamma_{B_s^0} = \Gamma_{B_{sL}^0} - \Gamma_{B_{sH}^0} = (0.082 \pm 0.007) \times 10^{12}$ s^{-1}

B_s^0-$\overline{B}_s^0$ mixing parameters

$\Delta m_{B_s^0} = m_{B_{sH}^0} - m_{B_{sL}^0} = (17.757 \pm 0.021) \times 10^{12}\ \hbar$ s^{-1}

$= (1.1688 \pm 0.0014) \times 10^{-8}$ MeV

$x_s = \Delta m_{B_s^0}/\Gamma_{B_s^0} = 26.81 \pm 0.10$

$\chi_s = 0.499308 \pm 0.000005$

CP violation parameters in B_s^0

$\mathrm{Re}(\epsilon_{B^0}) \,/\, (1 + |\epsilon_{B_s^0}|^2) = (-1.9 \pm 1.0) \times 10^{-3}$

$C_{KK}(B_s^0 \to K^+K^-) = 0.14 \pm 0.11$

$S_{KK}(B_s^0 \to K^+K^-) = 0.30 \pm 0.13$

$\gamma = (65 \pm 7)^\circ$

$\delta_B(B_s^0 \to D_s^\pm K^\mp) = (3 \pm 20)^\circ$

$r_B(B_s^0 \to D_s^\mp K^\pm) = 0.53 \pm 0.17$

CP Violation phase $\beta_s = (0.6 \pm 1.9) \times 10^{-2}$ rad

$|\lambda|\ (B_s^0 \to J/\psi(1S)\phi) = 0.964 \pm 0.020$

$|\lambda| = 1.02 \pm 0.07$

A, CP violation parameter $= 0.5^{+0.8}_{-0.7}$

C, CP violation parameter $= -0.3 \pm 0.4$

S, CP violation parameter $= -0.1 \pm 0.4$

$A_{CP}^L(B_s \to J/\psi\overline{K}^*(892)^0) = -0.05 \pm 0.06$

$A_{CP}^{\parallel}(B_s \to J/\psi\overline{K}^*(892)^0) = 0.17 \pm 0.15$

$A_{CP}^{\perp}(B_s \to J/\psi\overline{K}^*(892)^0) = -0.05 \pm 0.10$

$\boldsymbol{A_{CP}(B_s \to \pi^+K^-)} = 0.263 \pm 0.035$

$A_{CP}(B_s^0 \to [K^+K^-]_D \overline{K}^*(892)^0) = -0.04 \pm 0.07$
$A_{CP}(B_s^0 \to [\pi^+K^-]_D K^*(892)^0) = -0.01 \pm 0.04$
$A_{CP}(B_s^0 \to [\pi^+\pi^-]_D K^*(892)^0) = 0.06 \pm 0.13$
$\Delta a_\perp < 1.2 \times 10^{-12}$ GeV, CL = 95%

These branching fractions all scale with B($\overline{b} \to B_s^0$).

The branching fraction B($B_s^0 \to D_s^- \ell^+ \nu_\ell$ anything) is not a pure measurement since the measured product branching fraction B($\overline{b} \to B_s^0$) × B($B_s^0 \to D_s^- \ell^+ \nu_\ell$ anything) was used to determine B($\overline{b} \to B_s^0$), as described in the note on "B^0-$\overline{B}^0$ Mixing"

For inclusive branching fractions, *e.g.*, $B \to D^\pm$ anything, the values usually are multiplicities, not branching fractions. They can be greater than one.

B_s^0 DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
D_s^- anything		(93 ±25) %		–
$\ell \nu_\ell X$		(9.6 ± 0.8) %		–
$e^+ \nu X^-$		(9.1 ± 0.8) %		–
$\mu^+ \nu X^-$		(10.2 ± 1.0) %		–
$D_s^- \ell^+ \nu_\ell$ anything	[*rraa*]	(8.1 ± 1.3) %		–
$D_s^{*-} \ell^+ \nu_\ell$ anything		(5.4 ± 1.1) %		–
$D_{s1}(2536)^- \mu^+ \nu_\mu$, $D_{s1}^- \to D^{*-} K_S^0$		(2.6 ± 0.7) × 10^{-3}		–
$D_{s1}(2536)^- X \mu^+ \nu$, $D_{s1}^- \to \overline{D}^0 K^+$		(4.4 ± 1.3) × 10^{-3}		–
$D_{s2}(2573)^- X \mu^+ \nu$, $D_{s2}^- \to \overline{D}^0 K^+$		(2.7 ± 1.0) × 10^{-3}		–
$D_s^- \pi^+$		(3.00± 0.23) × 10^{-3}		2320
$D_s^- \rho^+$		(6.9 ± 1.4) × 10^{-3}		2249
$D_s^- \pi^+ \pi^+ \pi^-$		(6.1 ± 1.0) × 10^{-3}		2301
$D_{s1}(2536)^- \pi^+$, $D_{s1}^- \to D_s^- \pi^+ \pi^-$		(2.5 ± 0.8) × 10^{-5}		–
$D_s^\mp K^\pm$		(2.27± 0.19) × 10^{-4}		2293
$D_s^- K^+ \pi^+ \pi^-$		(3.2 ± 0.6) × 10^{-4}		2249
$D_s^+ D_s^-$		(4.4 ± 0.5) × 10^{-3}		1824
$D_s^- D^+$		(2.8 ± 0.5) × 10^{-4}		1875
$D^+ D^-$		(2.2 ± 0.6) × 10^{-4}		1925
$D^0 \overline{D}^0$		(1.9 ± 0.5) × 10^{-4}		1930
$D_s^{*-} \pi^+$		(2.0 ± 0.5) × 10^{-3}		2265
$D_s^{*\mp} K^\pm$		(1.33± 0.35) × 10^{-4}		–

$D_s^{*-}\rho^+$	$(\ 9.6\ \pm\ 2.1\ )\times10^{-3}$		2191
$D_s^{*+}D_s^- + D_s^{*-}D_s^+$	$(\ 1.29\pm\ 0.22)$ %	S=1.1	1742
$D_s^{*+}D_s^{*-}$	$(\ 1.86\pm\ 0.30)$ %		1655
$D_s^{(*)+}D_s^{(*)-}$	$(\ 4.5\ \pm\ 1.4\ )$ %		–
$\overline{D}^0K^-\pi^+$	$(\ 1.04\pm\ 0.13)\times10^{-3}$		2312
$\overline{D}^0\overline{K}^*(892)^0$	$(\ 4.4\ \pm\ 0.6\ )\times10^{-4}$		2264
$\overline{D}^0\overline{K}^*(1410)$	$(\ 3.9\ \pm\ 3.5\ )\times10^{-4}$		2117
$\overline{D}^0\overline{K}_0^*(1430)$	$(\ 3.0\ \pm\ 0.7\ )\times10^{-4}$		2113
$\overline{D}^0\overline{K}_2^*(1430)$	$(\ 1.1\ \pm\ 0.4\ )\times10^{-4}$		2113
$\overline{D}^0\overline{K}^*(1680)$	$<\ 7.8\ \times10^{-5}$	CL=90%	1998
$\overline{D}^0\overline{K}_0^*(1950)$	$<\ 1.1\ \times10^{-4}$	CL=90%	1890
$\overline{D}^0\overline{K}_3^*(1780)$	$<\ 2.6\ \times10^{-5}$	CL=90%	1971
$\overline{D}^0\overline{K}_4^*(2045)$	$<\ 3.1\ \times10^{-5}$	CL=90%	1837
$\overline{D}^0K^-\pi^+$(non-resonant)	$(\ 2.1\ \pm\ 0.8\ )\times10^{-4}$		2312
$D_{s2}^*(2573)^-\pi^+$, $D_{s2}^*\to\overline{D}^0K^-$	$(\ 2.6\ \pm\ 0.4\ )\times10^{-4}$		–
$D_{s1}^*(2700)^-\pi^+$, $D_{s1}^*\to\overline{D}^0K^-$	$(\ 1.6\ \pm\ 0.8\ )\times10^{-5}$		–
$D_{s1}^*(2860)^-\pi^+$, $D_{s1}^*\to\overline{D}^0K^-$	$(\ 5\ \pm\ 4\ )\times10^{-5}$		–
$D_{s3}^*(2860)^-\pi^+$, $D_{s3}^*\to\overline{D}^0K^-$	$(\ 2.2\ \pm\ 0.6\ )\times10^{-5}$		–
$\overline{D}^0K^+K^-$	$(\ 4.4\ \pm\ 2.0\ )\times10^{-5}$		2243
$\overline{D}^0f_0(980)$	$<\ 3.1\ \times10^{-6}$	CL=90%	2242
$\overline{D}^0\phi$	$(\ 3.0\ \pm\ 0.8\ )\times10^{-5}$		2235
$D^{*\mp}\pi^\pm$	$<\ 6.1\ \times10^{-6}$	CL=90%	–
$J/\psi(1S)\phi$	$(\ 1.07\pm\ 0.08)\times10^{-3}$		1588
$J/\psi(1S)\pi^0$	$<\ 1.2\ \times10^{-3}$	CL=90%	1786
$J/\psi(1S)\eta$	$(\ 3.9\ \pm\ 0.7\ )\times10^{-4}$	S=1.4	1733
$J/\psi(1S)K_S^0$	$(\ 1.89\pm\ 0.12)\times10^{-5}$		1743
$J/\psi(1S)\overline{K}^*(892)^0$	$(\ 4.1\ \pm\ 0.4\ )\times10^{-5}$		1637
$J/\psi(1S)\eta'$	$(\ 3.3\ \pm\ 0.4\ )\times10^{-4}$		1612
$J/\psi(1S)\pi^+\pi^-$	$(\ 2.13\pm\ 0.18)\times10^{-4}$		1775
$J/\psi(1S)f_0(500)$, $f_0\to\pi^+\pi^-$	$<\ 1.7\ \times10^{-6}$	CL=90%	–
$J/\psi(1S)\rho$, $\rho\to\pi^+\pi^-$	$<\ 1.2\ \times10^{-6}$	CL=90%	–
$J/\psi(1S)f_0(980)$, $f_0\to\pi^+\pi^-$	$(\ 1.34\pm\ 0.15)\times10^{-4}$		–
$J/\psi(1S)f_0(980)_0$, $f_0\to\pi^+\pi^-$	$(\ 5.1\ \pm\ 0.9\ )\times10^{-5}$		–

$J/\psi(1S) f_2(1270)_0$, $f_2 \to \pi^+\pi^-$	$(2.6 \pm 0.7) \times 10^{-7}$		–
$J/\psi(1S) f_2(1270)_\parallel$, $f_2 \to \pi^+\pi^-$	$(3.8 \pm 1.3) \times 10^{-7}$		–
$J/\psi(1S) f_2(1270)_\perp$, $f_2 \to \pi^+\pi^-$	$(4.6 \pm 2.7) \times 10^{-7}$		–
$J/\psi(1S) f_0(1500)$, $f_0 \to \pi^+\pi^-$	$(7.3 \,^{+\ 1.6}_{-\ 1.4}) \times 10^{-6}$		–
$J/\psi(1S) f_2'(1525)_0$, $f_2' \to \pi^+\pi^-$	$(3.7 \pm 1.0) \times 10^{-7}$		–
$J/\psi(1S) f_2'(1525)_\parallel$, $f_2' \to \pi^+\pi^-$	$(4.3 \,^{+\ 9.0}_{-\ 3.1}) \times 10^{-8}$		–
$J/\psi(1S) f_2'(1525)_\perp$, $f_2' \to \pi^+\pi^-$	$(1.9 \pm 1.4) \times 10^{-7}$		–
$J/\psi(1S) f_0(1790)$, $f_0 \to \pi^+\pi^-$	$(1.7 \,^{+\ 4.0}_{-\ 0.4}) \times 10^{-6}$		–
$J/\psi(1S) \overline{K}^0 \pi^+\pi^-$	$< 4.4 \times 10^{-5}$	CL=90%	1675
$J/\psi(1S) K^+ K^-$	$(7.9 \pm 0.7) \times 10^{-4}$		1601
$J/\psi(1S) K^0 K^- \pi^+ +$ c.c.	$(9.3 \pm 1.3) \times 10^{-4}$		1538
$J/\psi(1S) \overline{K}^0 K^+ K^-$	$< 1.2 \times 10^{-5}$	CL=90%	1333
$J/\psi(1S) f_2'(1525)$	$(2.6 \pm 0.6) \times 10^{-4}$		1304
$J/\psi(1S) p\overline{p}$	$< 4.8 \times 10^{-6}$	CL=90%	982
$J/\psi(1S)\gamma$	$< 7.3 \times 10^{-6}$	CL=90%	1790
$J/\psi(1S)\pi^+\pi^-\pi^+\pi^-$	$(7.9 \pm 0.9) \times 10^{-5}$		1731
$J/\psi(1S) f_1(1285)$	$(7.1 \pm 1.4) \times 10^{-5}$		1460
$\psi(2S)\eta$	$(3.3 \pm 0.9) \times 10^{-4}$		1338
$\psi(2S)\eta'$	$(1.29 \pm 0.35) \times 10^{-4}$		1158
$\psi(2S)\pi^+\pi^-$	$(7.2 \pm 1.2) \times 10^{-5}$		1397
$\psi(2S)\phi$	$(5.4 \pm 0.5) \times 10^{-4}$		1120
$\psi(2S) K^-\pi^+$	$(3.12 \pm 0.30) \times 10^{-5}$		1310
$\psi(2S) \overline{K}^*(892)^0$	$(3.3 \pm 0.5) \times 10^{-5}$		1196
$\chi_{c1}\phi$	$(2.03 \pm 0.29) \times 10^{-4}$		1274
$\pi^+\pi^-$	$(7.7 \pm 2.0) \times 10^{-7}$	S=1.4	2680
$\pi^0\pi^0$	$< 2.1 \times 10^{-4}$	CL=90%	2680
$\eta\pi^0$	$< 1.0 \times 10^{-3}$	CL=90%	2654
$\eta\eta$	$< 1.5 \times 10^{-3}$	CL=90%	2627
$\rho^0\rho^0$	$< 3.20 \times 10^{-4}$	CL=90%	2569
$\eta'\eta'$	$(3.3 \pm 0.7) \times 10^{-5}$		2507
$\phi\rho^0$	$< 6.17 \times 10^{-4}$	CL=90%	2526
$\phi\phi$	$(1.87 \pm 0.15) \times 10^{-5}$		2482
$\pi^+ K^-$	$(5.6 \pm 0.6) \times 10^{-6}$		2659
$K^+ K^-$	$(2.52 \pm 0.17) \times 10^{-5}$		2638

$K^0\overline{K}^0$		$< 6.6 \times 10^{-5}$	CL=90%		2637
$K^0\pi^+\pi^-$		$(1.5 \pm 0.4) \times 10^{-5}$			2653
$K^0 K^\pm \pi^\mp$		$(7.7 \pm 1.0) \times 10^{-5}$			2622
$K^*(892)^-\pi^+$		$(3.3 \pm 1.2) \times 10^{-6}$			2607
$K^*(892)^\pm K^\mp$		$(1.25 \pm 0.26) \times 10^{-5}$			2585
$K^0_S\overline{K}^*(892)^0 +$ c.c.		$(1.6 \pm 0.4) \times 10^{-5}$			2585
$K^0 K^+ K^-$		$< 3.5 \times 10^{-6}$	CL=90%		2568
$\overline{K}^*(892)^0\rho^0$		$< 7.67 \times 10^{-4}$	CL=90%		2550
$\overline{K}^*(892)^0 K^*(892)^0$		$(1.11 \pm 0.27) \times 10^{-5}$			2531
$\phi K^*(892)^0$		$(1.14 \pm 0.30) \times 10^{-6}$			2507
$p\overline{p}$		$(2.8 \,^{+\,2.2}_{-\,1.7}) \times 10^{-8}$			2514
$\Lambda_c^-\Lambda\pi^+$		$(3.6 \pm 1.6) \times 10^{-4}$			–
$\Lambda_c^-\Lambda_c^+$		$< 8.0 \times 10^{-5}$	CL=95%		–
$\gamma\gamma$	*B1*	$< 3.1 \times 10^{-6}$	CL=90%		2683
$\phi\gamma$		$(3.52 \pm 0.34) \times 10^{-5}$			2587

Lepton Family number (*LF*) violating modes or $\Delta B = 1$ weak neutral current (*B1*) modes

$\mu^+\mu^-$	*B1*	$(2.9 \,^{+\,0.7}_{-\,0.6}) \times 10^{-9}$			2681
e^+e^-	*B1*	$< 2.8 \times 10^{-7}$	CL=90%		2683
$\mu^+\mu^-\mu^+\mu^-$	*B1*	$< 1.2 \times 10^{-8}$	CL=90%		2673
$SP,\ S \to \mu^+\mu^-,\ P \to \mu^+\mu^-$	*B1*	[*hhaa*] $< 1.2 \times 10^{-8}$	CL=90%		–
$\phi(1020)\mu^+\mu^-$	*B1*	$(8.2 \pm 1.2) \times 10^{-7}$			2582
$\pi^+\pi^-\mu^+\mu^-$	*B1*	$(8.4 \pm 1.7) \times 10^{-8}$			2670
$\phi\nu\overline{\nu}$	*B1*	$< 5.4 \times 10^{-3}$	CL=90%		2587
$e^\pm\mu^\mp$	*LF*	[*hh*] $< 1.1 \times 10^{-8}$	CL=90%		2682

B_s^*

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

I, *J*, *P* need confirmation. Quantum numbers shown are quark-model predictions.

Mass $m = 5415.4^{+1.8}_{-1.5}$ MeV (S = 3.0)

$m_{B_s^*} - m_{B_s} = 48.6^{+1.8}_{-1.6}$ MeV (S = 2.8)

B_s^* DECAY MODES	Fraction (Γ_i/Γ)	*p* (MeV/*c*)
$B_s\gamma$	dominant	–

$B_{s1}(5830)^0$

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

Mass $m = 5828.63 \pm 0.27$ MeV
$m_{B_{s1}^0} - m_{B^{*+}} = 503.98 \pm 0.18$ MeV
Full width $\Gamma = 0.5 \pm 0.4$ MeV

$B_{s1}(5830)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B^{*+}K^-$	dominant	97

$B_{s2}^*(5840)^0$

$I(J^P) = 0(2^+)$
I, J, P need confirmation.

Mass $m = 5839.84 \pm 0.18$ MeV (S = 1.1)
$m_{B_{s2}^{*0}} - m_{B_{s1}^0}$
$m_{B_{s2}^{*0}} - m_{B^+} = 560.53 \pm 0.18$ MeV (S = 1.1)
Full width $\Gamma = 1.47 \pm 0.33$ MeV

$B_{s2}^*(5840)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
B^+K^-	dominant	252

BOTTOM, CHARMED MESONS ($B = C = \pm 1$)

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

B_c^+

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

Quantum numbers shown are quark-model predicitions.

Mass $m = 6275.1 \pm 1.0$ MeV
Mean life $\tau = (0.507 \pm 0.009) \times 10^{-12}$ s

B_c^- modes are charge conjugates of the modes below.

B_c^+ DECAY MODES × B($\overline{b} \to B_c$)	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
The following quantities are not pure branching ratios; rather the fraction $\Gamma_i/\Gamma \times$ B($\overline{b} \to B_c$).			
$J/\psi(1S)\ell^+\nu_\ell$ anything	$(5.2\ ^{+2.4}_{-2.1}) \times 10^{-5}$		–
$J/\psi(1S)\pi^+$	seen		2371
$J/\psi(1S)K^+$	seen		2341
$J/\psi(1S)\pi^+\pi^+\pi^-$	seen		2350

$J/\psi(1S)\,a_1(1260)$	< 1.2	$\times 10^{-3}$	90%	2170
$J/\psi(1S)\,K^+K^-\pi^+$	seen			2203
$J/\psi(1S)\,\pi^+\pi^+\pi^+\pi^-\pi^-$	seen			2309
$\psi(2S)\,\pi^+$	seen			2052
$J/\psi(1S)\,D_s^+$	seen			1822
$J/\psi(1S)\,D_s^{*+}$	seen			1728
$J/\psi(1S)\,p\overline{p}\pi^+$	seen			1792
$D^*(2010)^+\overline{D}^0$	< 6.2	$\times 10^{-3}$	90%	2467
D^+K^{*0}	< 0.20	$\times 10^{-6}$	90%	2783
$D^+\overline{K}^{*0}$	< 0.16	$\times 10^{-6}$	90%	2783
$D_s^+K^{*0}$	< 0.28	$\times 10^{-6}$	90%	2751
$D_s^+\overline{K}^{*0}$	< 0.4	$\times 10^{-6}$	90%	2751
$D_s^+\phi$	< 0.32	$\times 10^{-6}$	90%	2727
K^+K^0	< 4.6	$\times 10^{-7}$	90%	3098
$B_s^0\pi^+ /\ \mathrm{B}(\overline{b} \to\ B_s)$	$(2.37^{+0.37}_{-0.35})\times 10^{-3}$			–

$c\overline{c}$ MESONS

$\eta_c(1S)$

$I^G(J^{PC}) = 0^+(0^{-+})$

Mass $m = 2983.4 \pm 0.5$ MeV (S = 1.2)
Full width $\Gamma = 31.8 \pm 0.8$ MeV

$\eta_c(1S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
Decays involving hadronic resonances			
$\eta'(958)\,\pi\pi$	(4.1 ±1.7) %		1323
$\rho\rho$	(1.8 ±0.5) %		1274
$K^*(892)^0\,K^-\pi^+$ + c.c.	(2.0 ±0.7) %		1277
$K^*(892)\,\overline{K}^*(892)$	(7.0 ±1.3) $\times 10^{-3}$		1196
$K^*(892)^0\,\overline{K}^*(892)^0\,\pi^+\pi^-$	(1.1 ±0.5) %		1073
ϕK^+K^-	(2.9 ±1.4) $\times 10^{-3}$		1104
$\phi\phi$	(1.75±0.20) $\times 10^{-3}$		1089
$\phi 2(\pi^+\pi^-)$	< 4 $\times 10^{-3}$	90%	1251
$a_0(980)\,\pi$	< 2 %	90%	1327
$a_2(1320)\,\pi$	< 2 %	90%	1196
$K^*(892)\,\overline{K}$ + c.c.	< 1.28 %	90%	1309
$f_2(1270)\,\eta$	< 1.1 %	90%	1145
$\omega\omega$	< 3.1 $\times 10^{-3}$	90%	1270
$\omega\phi$	< 1.7 $\times 10^{-3}$	90%	1185

$f_2(1270)f_2(1270)$	(9.8 ±2.5) × 10^{-3}	774
$f_2(1270)f_2'(1525)$	(9.7 ±3.2) × 10^{-3}	513
$f_0(980)\eta$	seen	1264
$f_0(1500)\eta$	seen	1026
$f_0(2200)\eta$	seen	496
$a_0(980)\pi$	seen	1327
$a_0(1320)\pi$	seen	–
$a_0(1450)\pi$	seen	1123
$a_0(1950)\pi$	seen	859
$a_2(1950)\pi$	not seen	–
$K_0^*(1430)\overline{K}$	seen	–
$K_2^*(1430)\overline{K}$	seen	–
$K_0^*(1950)\overline{K}$	seen	–

Decays into stable hadrons

$K\overline{K}\pi$	(7.3 ±0.5) %	1381
$K\overline{K}\eta$	(1.35±0.16) %	1265
$\eta\pi^+\pi^-$	(1.7 ±0.5) %	1427
$\eta 2(\pi^+\pi^-)$	(4.4 ±1.3) %	1385
$K^+K^-\pi^+\pi^-$	(6.9 ±1.1) × 10^{-3}	1345
$K^+K^-\pi^+\pi^-\pi^0$	(3.5 ±0.6) %	1304
$K^0K^-\pi^+\pi^-\pi^+$ +c.c.	(5.6 ±1.5) %	–
$K^+K^-2(\pi^+\pi^-)$	(7.5 ±2.4) × 10^{-3}	1253
$2(K^+K^-)$	(1.46±0.30) × 10^{-3}	1055
$\pi^+\pi^-\pi^0\pi^0$	(4.7 ±1.0) %	1460
$2(\pi^+\pi^-)$	(9.7 ±1.2) × 10^{-3}	1459
$2(\pi^+\pi^-\pi^0)$	(17.4 ±3.3) %	1409
$3(\pi^+\pi^-)$	(1.8 ±0.4) %	1406
$p\overline{p}$	(1.50±0.16) × 10^{-3}	1160
$p\overline{p}\pi^0$	(3.6 ±1.3) × 10^{-3}	1101
$\Lambda\overline{\Lambda}$	(1.09±0.24) × 10^{-3}	990
$\Sigma^+\overline{\Sigma}^-$	(2.1 ±0.6) × 10^{-3}	900
$\Xi^-\overline{\Xi}^+$	(8.9 ±2.7) × 10^{-4}	692
$\pi^+\pi^-p\overline{p}$	(5.3 ±1.8) × 10^{-3}	1027

Radiative decays

$\gamma\gamma$	(1.59±0.13) × 10^{-4}	1492

Charge conjugation (*C*), Parity (*P*), Lepton family number (*LF*) violating modes

$\pi^+\pi^-$	*P*,*CP*	< 1.1	× 10^{-4}	90%	1485
$\pi^0\pi^0$	*P*,*CP*	< 4	× 10^{-5}	90%	1486
K^+K^-	*P*,*CP*	< 6	× 10^{-4}	90%	1408
$K_S^0K_S^0$	*P*,*CP*	< 3.1	× 10^{-4}	90%	1406

$J/\psi(1S)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 3096.900 \pm 0.006$ MeV
Full width $\Gamma = 92.9 \pm 2.8$ keV (S = 1.1)
$\Gamma_{ee} = 5.55 \pm 0.14 \pm 0.02$ keV

$J/\psi(1S)$ DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
hadrons		(87.7 ±0.5) %		–
virtual $\gamma \to$ hadrons		(13.50 ±0.30) %		–
ggg		(64.1 ±1.0) %		–
γgg		(8.8 ±1.1) %		–
e^+e^-		(5.971±0.032) %		1548
$e^+e^-\gamma$	[ssaa]	(8.8 ±1.4) $\times 10^{-3}$		1548
$\mu^+\mu^-$		(5.961±0.033) %		1545
Decays involving hadronic resonances				
$\rho\pi$		(1.69 ±0.15) %	S=2.4	1448
$\rho^0\pi^0$		(5.6 ±0.7) $\times 10^{-3}$		1448
$a_2(1320)\rho$		(1.09 ±0.22) %		1123
$\omega\pi^+\pi^+\pi^-\pi^-$		(8.5 ±3.4) $\times 10^{-3}$		1392
$\omega\pi^+\pi^-\pi^0$		(4.0 ±0.7) $\times 10^{-3}$		1418
$\omega\pi^+\pi^-$		(8.6 ±0.7) $\times 10^{-3}$	S=1.1	1435
$\omega f_2(1270)$		(4.3 ±0.6) $\times 10^{-3}$		1142
$K^*(892)^0\overline{K}^*(892)^0$		(2.3 ±0.7) $\times 10^{-4}$		1266
$K^*(892)^\pm K^*(892)^\mp$		(1.00 $^{+0.22}_{-0.40}$) $\times 10^{-3}$		1266
$K^*(892)^\pm K^*(800)^\mp$		(1.1 $^{+1.0}_{-0.6}$) $\times 10^{-3}$		–
$\eta K^*(892)^0\overline{K}^*(892)^0$		(1.15 ±0.26) $\times 10^{-3}$		1003
$K^*(892)^0\overline{K}_2^*(1430)^0$ + c.c.		(6.0 ±0.6) $\times 10^{-3}$		1012
$K^*(892)^0\overline{K}_2(1770)^0$ + c.c. $\to$ $K^*(892)^0K^-\pi^+$ + c.c.		(6.9 ±0.9) $\times 10^{-4}$		–
$\omega K^*(892)\overline{K}$ + c.c.		(6.1 ±0.9) $\times 10^{-3}$		1097
$K^+K^*(892)^-$ + c.c.		(5.12 ±0.30) $\times 10^{-3}$		1373
$K^+K^*(892)^-$ + c.c. $\to$ $K^+K^-\pi^0$		(1.97 ±0.20) $\times 10^{-3}$		–
$K^+K^*(892)^-$ + c.c. $\to$ $K^0K^\pm\pi^\mp$ + c.c.		(3.0 ±0.4) $\times 10^{-3}$		–
$K^0\overline{K}^*(892)^0$ + c.c.		(4.39 ±0.31) $\times 10^{-3}$		1373
$K^0\overline{K}^*(892)^0$ + c.c. $\to$ $K^0K^\pm\pi^\mp$ + c.c.		(3.2 ±0.4) $\times 10^{-3}$		–
$K_1(1400)^\pm K^\mp$		(3.8 ±1.4) $\times 10^{-3}$		1170
$\overline{K}^*(892)^0K^+\pi^-$ + c.c.		seen		1343
$\omega\pi^0\pi^0$		(3.4 ±0.8) $\times 10^{-3}$		1436
$b_1(1235)^\pm\pi^\mp$	[hh]	(3.0 ±0.5) $\times 10^{-3}$		1300
$\omega K^\pm K_S^0\pi^\mp$	[hh]	(3.4 ±0.5) $\times 10^{-3}$		1210

$b_1(1235)^0\pi^0$		$(2.3 \pm 0.6) \times 10^{-3}$		1300
$\eta K^\pm K_S^0 \pi^\mp$	[*hh*]	$(2.2 \pm 0.4) \times 10^{-3}$		1278
$\phi K^*(892)\overline{K}$ + c.c.		$(2.18 \pm 0.23) \times 10^{-3}$		969
$\omega K \overline{K}$		$(1.70 \pm 0.32) \times 10^{-3}$		1268
$\omega f_0(1710) \rightarrow \omega K \overline{K}$		$(4.8 \pm 1.1) \times 10^{-4}$		878
$\phi 2(\pi^+\pi^-)$		$(1.66 \pm 0.23) \times 10^{-3}$		1318
$\Delta(1232)^{++}\overline{p}\pi^-$		$(1.6 \pm 0.5) \times 10^{-3}$		1030
$\omega\eta$		$(1.74 \pm 0.20) \times 10^{-3}$	S=1.6	1394
$\phi K \overline{K}$		$(1.83 \pm 0.24) \times 10^{-3}$	S=1.5	1179
$\phi f_0(1710) \rightarrow \phi K \overline{K}$		$(3.6 \pm 0.6) \times 10^{-4}$		875
$\phi f_2(1270)$		$(7.2 \pm 1.3) \times 10^{-4}$		1036
$\Delta(1232)^{++}\overline{\Delta}(1232)^{--}$		$(1.10 \pm 0.29) \times 10^{-3}$		938
$\Sigma(1385)^-\overline{\Sigma}(1385)^+$ (or c.c.)	[*hh*]	$(1.10 \pm 0.12) \times 10^{-3}$		697
$\phi f_2'(1525)$		$(8 \pm 4) \times 10^{-4}$	S=2.7	871
$\phi\pi^+\pi^-$		$(9.4 \pm 0.9) \times 10^{-4}$	S=1.2	1365
$\phi\pi^0\pi^0$		$(5.6 \pm 1.6) \times 10^{-4}$		1366
$\phi K^\pm K_S^0 \pi^\mp$	[*hh*]	$(7.2 \pm 0.8) \times 10^{-4}$		1114
$\omega f_1(1420)$		$(6.8 \pm 2.4) \times 10^{-4}$		1062
$\phi\eta$		$(7.5 \pm 0.8) \times 10^{-4}$	S=1.5	1320
$\Xi^0\overline{\Xi}^0$		$(1.20 \pm 0.24) \times 10^{-3}$		818
$\Xi(1530)^-\overline{\Xi}^+$		$(5.9 \pm 1.5) \times 10^{-4}$		600
$pK^-\overline{\Sigma}(1385)^0$		$(5.1 \pm 3.2) \times 10^{-4}$		646
$\omega\pi^0$		$(4.5 \pm 0.5) \times 10^{-4}$	S=1.4	1446
$\phi\eta'(958)$		$(4.0 \pm 0.7) \times 10^{-4}$	S=2.1	1192
$\phi f_0(980)$		$(3.2 \pm 0.9) \times 10^{-4}$	S=1.9	1178
$\phi f_0(980) \rightarrow \phi\pi^+\pi^-$		$(1.8 \pm 0.4) \times 10^{-4}$		–
$\phi f_0(980) \rightarrow \phi\pi^0\pi^0$		$(1.7 \pm 0.7) \times 10^{-4}$		–
$\phi\pi^0 f_0(980) \rightarrow \phi\pi^0\pi^+\pi^-$		$(4.5 \pm 1.0) \times 10^{-6}$		–
$\phi\pi^0 f_0(980) \rightarrow \phi\pi^0 p^0\pi^0$		$(1.7 \pm 0.6) \times 10^{-6}$		1045
$\eta\phi f_0(980) \rightarrow \eta\phi\pi^+\pi^-$		$(3.2 \pm 1.0) \times 10^{-4}$		–
$\phi a_0(980)^0 \rightarrow \phi\eta\pi^0$		$(5 \pm 4) \times 10^{-6}$		–
$\Xi(1530)^0\overline{\Xi}^0$		$(3.2 \pm 1.4) \times 10^{-4}$		608
$\Sigma(1385)^-\overline{\Sigma}^+$ (or c.c.)	[*hh*]	$(3.1 \pm 0.5) \times 10^{-4}$		855
$\phi f_1(1285)$		$(2.6 \pm 0.5) \times 10^{-4}$		1032
$\phi f_1(1285) \rightarrow \phi\pi^0 f_0(980) \rightarrow \phi\pi^0\pi^+\pi^-$		$(9.4 \pm 2.8) \times 10^{-7}$		952
$\phi f_1(1285) \rightarrow \phi\pi^0 f_0(980) \rightarrow \phi\pi^0\pi^0\pi^0$		$(2.1 \pm 2.2) \times 10^{-7}$		955
$\eta\pi^+\pi^-$		$(4.0 \pm 1.7) \times 10^{-4}$		1487
$\eta\rho$		$(1.93 \pm 0.23) \times 10^{-4}$		1396
$\omega\eta'(958)$		$(1.82 \pm 0.21) \times 10^{-4}$		1279
$\omega f_0(980)$		$(1.4 \pm 0.5) \times 10^{-4}$		1267

$\rho\eta'(958)$		$(\ 1.05\ \pm 0.18\ ) \times 10^{-4}$			1281
$a_2(1320)^{\pm}\pi^{\mp}$	[hh]	$<\ 4.3$	$\times 10^{-3}$	CL=90%	1263
$K\overline{K}_2^*(1430)+$ c.c.		$<\ 4.0$	$\times 10^{-3}$	CL=90%	1159
$K_1(1270)^{\pm}K^{\mp}$		$<\ 3.0$	$\times 10^{-3}$	CL=90%	1231
$K_2^*(1430)^0\overline{K}_2^*(1430)^0$		$<\ 2.9$	$\times 10^{-3}$	CL=90%	604
$\phi\pi^0$		3×10^{-6} or 1×10^{-7}			1377
$\phi\eta(1405) \rightarrow\ \phi\eta\pi^+\pi^-$		$(\ 2.0\ \pm 1.0\ ) \times 10^{-5}$			946
$\omega f_2'(1525)$		$<\ 2.2$	$\times 10^{-4}$	CL=90%	1003
$\omega X(1835) \rightarrow\ \omega p\overline{p}$		$<\ 3.9$	$\times 10^{-6}$	CL=95%	–
$\phi X(1835) \rightarrow\ \phi\eta\pi^+\pi^-$		$<\ 2.8$	$\times 10^{-4}$	CL=90%	578
$\phi X(1870) \rightarrow\ \phi\eta\pi^+\pi^-$		$<\ 6.13$	$\times 10^{-5}$	CL=90%	–
$\eta\phi(2170) \rightarrow\ \eta\phi f_0(980) \rightarrow$ $\eta\phi\pi^+\pi^-$		$(\ 1.2\ \pm 0.4\ ) \times 10^{-4}$			628
$\eta\phi(2170) \rightarrow$ $\eta K^*(892)^0\overline{K}^*(892)^0$		$<\ 2.52$	$\times 10^{-4}$	CL=90%	–
$\Sigma(1385)^0\overline{\Lambda}+$ c.c.		$<\ 8.2$	$\times 10^{-6}$	CL=90%	912
$\Delta(1232)^+\overline{p}$		$<\ 1$	$\times 10^{-4}$	CL=90%	1100
$\Lambda(1520)\overline{\Lambda}+$ c.c. $\rightarrow\ \gamma\Lambda\overline{\Lambda}$		$<\ 4.1$	$\times 10^{-6}$	CL=90%	–
$\Theta(1540)\overline{\Theta}(1540) \rightarrow$ $K_S^0 pK^-\overline{n}+$ c.c.		$<\ 1.1$	$\times 10^{-5}$	CL=90%	–
$\Theta(1540)K^-\overline{n} \rightarrow\ K_S^0 pK^-\overline{n}$		$<\ 2.1$	$\times 10^{-5}$	CL=90%	–
$\Theta(1540)K_S^0\overline{p} \rightarrow\ K_S^0\overline{p}K^+n$		$<\ 1.6$	$\times 10^{-5}$	CL=90%	–
$\overline{\Theta}(1540)K^+n \rightarrow\ K_S^0\overline{p}K^+n$		$<\ 5.6$	$\times 10^{-5}$	CL=90%	–
$\overline{\Theta}(1540)K_S^0 p \rightarrow\ K_S^0 pK^-\overline{n}$		$<\ 1.1$	$\times 10^{-5}$	CL=90%	–
$\Sigma^0\overline{\Lambda}$		$<\ 9$	$\times 10^{-5}$	CL=90%	1032

Decays into stable hadrons

$2(\pi^+\pi^-)\pi^0$	$(\ 4.1\ \pm 0.5\ )\ \%$		S=2.4	1496
$3(\pi^+\pi^-)\pi^0$	$(\ 2.9\ \pm 0.6\ )\ \%$			1433
$\pi^+\pi^-\pi^0$	$(\ 2.11\ \pm 0.07\ )\ \%$		S=1.5	1533
$\pi^+\pi^-\pi^0K^+K^-$	$(\ 1.79\ \pm 0.29\ )\ \%$		S=2.2	1368
$4(\pi^+\pi^-)\pi^0$	$(\ 9.0\ \pm 3.0\ ) \times 10^{-3}$			1345
$\pi^+\pi^-K^+K^-$	$(\ 6.6\ \pm 0.5\ ) \times 10^{-3}$			1407
$\pi^+\pi^-K^+K^-\eta$	$(\ 1.84\ \pm 0.28\ ) \times 10^{-3}$			1221
$\pi^0\pi^0K^+K^-$	$(\ 2.45\ \pm 0.31\ ) \times 10^{-3}$			1410
$K\overline{K}\pi$	$(\ 6.1\ \pm 1.0\ ) \times 10^{-3}$			1442
$2(\pi^+\pi^-)$	$(\ 3.57\ \pm 0.30\ ) \times 10^{-3}$			1517
$3(\pi^+\pi^-)$	$(\ 4.3\ \pm 0.4\ ) \times 10^{-3}$			1466
$2(\pi^+\pi^-\pi^0)$	$(\ 1.62\ \pm 0.21\ )\ \%$			1468
$2(\pi^+\pi^-)\eta$	$(\ 2.29\ \pm 0.24\ ) \times 10^{-3}$			1446
$3(\pi^+\pi^-)\eta$	$(\ 7.2\ \pm 1.5\ ) \times 10^{-4}$			1379
$p\overline{p}$	$(\ 2.120 \pm 0.029) \times 10^{-3}$			1232
$p\overline{p}\pi^0$	$(\ 1.19\ \pm 0.08\ ) \times 10^{-3}$		S=1.1	1176
$p\overline{p}\pi^+\pi^-$	$(\ 6.0\ \pm 0.5\ ) \times 10^{-3}$		S=1.3	1107

$p\overline{p}\pi^+\pi^-\pi^0$	[ttaa]	$(2.3 \pm 0.9) \times 10^{-3}$	S=1.9	1033
$p\overline{p}\eta$		$(2.00 \pm 0.12) \times 10^{-3}$		948
$p\overline{p}\rho$		$< 3.1 \times 10^{-4}$	CL=90%	774
$p\overline{p}\omega$		$(9.8 \pm 1.0) \times 10^{-4}$	S=1.3	768
$p\overline{p}\eta'(958)$		$(2.1 \pm 0.4) \times 10^{-4}$		596
$p\overline{p}a_0(980) \rightarrow p\overline{p}\pi^0\eta$		$(6.8 \pm 1.8) \times 10^{-5}$		–
$p\overline{p}\phi$		$(4.5 \pm 1.5) \times 10^{-5}$		527
$n\overline{n}$		$(2.09 \pm 0.16) \times 10^{-3}$		1231
$n\overline{n}\pi^+\pi^-$		$(4 \pm 4) \times 10^{-3}$		1106
$\Sigma^+\overline{\Sigma}^-$		$(1.50 \pm 0.24) \times 10^{-3}$		992
$\Sigma^0\overline{\Sigma}^0$		$(1.29 \pm 0.09) \times 10^{-3}$		988
$2(\pi^+\pi^-)K^+K^-$		$(4.7 \pm 0.7) \times 10^{-3}$	S=1.3	1320
$p\overline{n}\pi^-$		$(2.12 \pm 0.09) \times 10^{-3}$		1174
$nN(1440)$		seen		984
$nN(1520)$		seen		928
$nN(1535)$		seen		914
$\Xi^-\overline{\Xi}^+$		$(8.6 \pm 1.1) \times 10^{-4}$	S=1.2	807
$\Lambda\overline{\Lambda}$		$(1.61 \pm 0.15) \times 10^{-3}$	S=1.9	1074
$\Lambda\overline{\Sigma}^-\pi^+$ (or c.c.)	[hh]	$(8.3 \pm 0.7) \times 10^{-4}$	S=1.2	950
$pK^-\overline{\Lambda}$		$(8.9 \pm 1.6) \times 10^{-4}$		876
$2(K^+K^-)$		$(7.6 \pm 0.9) \times 10^{-4}$		1131
$pK^-\overline{\Sigma}^0$		$(2.9 \pm 0.8) \times 10^{-4}$		819
K^+K^-		$(2.86 \pm 0.21) \times 10^{-4}$		1468
$K^0_S K^0_L$		$(2.1 \pm 0.4) \times 10^{-4}$	S=3.2	1466
$\Lambda\overline{\Lambda}\pi^+\pi^-$		$(4.3 \pm 1.0) \times 10^{-3}$		903
$\Lambda\overline{\Lambda}\eta$		$(1.62 \pm 0.17) \times 10^{-4}$		672
$\Lambda\overline{\Lambda}\pi^0$		$(3.8 \pm 0.4) \times 10^{-5}$		998
$\overline{\Lambda}nK^0_S$ + c.c.		$(6.5 \pm 1.1) \times 10^{-4}$		872
$\pi^+\pi^-$		$(1.47 \pm 0.14) \times 10^{-4}$		1542
$\Lambda\overline{\Sigma}$ + c.c.		$(2.83 \pm 0.23) \times 10^{-5}$		1034
$K^0_S K^0_S$		$< 1 \times 10^{-6}$	CL=95%	1466

Radiative decays

3γ		$(1.16 \pm 0.22) \times 10^{-5}$		1548
4γ		$< 9 \times 10^{-6}$	CL=90%	1548
5γ		$< 1.5 \times 10^{-5}$	CL=90%	1548
$\gamma\pi^0\pi^0$		$(1.15 \pm 0.05) \times 10^{-3}$		1543
$\gamma\eta_c(1S)$		(1.7 ±0.4) %	S=1.5	111
$\gamma\eta_c(1S) \rightarrow 3\gamma$		$(3.8 \,^{+1.3}_{-1.0}) \times 10^{-6}$	S=1.1	–
$\gamma\pi^+\pi^-2\pi^0$		$(8.3 \pm 3.1) \times 10^{-3}$		1518
$\gamma\eta\pi\pi$		$(6.1 \pm 1.0) \times 10^{-3}$		1487
$\gamma\eta_2(1870) \rightarrow \gamma\eta\pi^+\pi^-$		$(6.2 \pm 2.4) \times 10^{-4}$		–
$\gamma\eta(1405/1475) \rightarrow \gamma K\overline{K}\pi$	[o]	$(2.8 \pm 0.6) \times 10^{-3}$	S=1.6	1223
$\gamma\eta(1405/1475) \rightarrow \gamma\gamma\rho^0$		$(7.8 \pm 2.0) \times 10^{-5}$	S=1.8	1223

$\gamma\eta(1405/1475) \rightarrow \gamma\eta\pi^+\pi^-$	(3.0	± 0.5)	$\times 10^{-4}$		–
$\gamma\eta(1405/1475) \rightarrow \gamma\gamma\phi$	$<$ 8.2		$\times 10^{-5}$	CL=95%	–
$\gamma\rho\rho$	(4.5	± 0.8)	$\times 10^{-3}$		1340
$\gamma\rho\omega$	$<$ 5.4		$\times 10^{-4}$	CL=90%	1338
$\gamma\rho\phi$	$<$ 8.8		$\times 10^{-5}$	CL=90%	1258
$\gamma\eta'(958)$	(5.15	± 0.16)	$\times 10^{-3}$	S=1.2	1400
$\gamma 2\pi^+ 2\pi^-$	(2.8	± 0.5)	$\times 10^{-3}$	S=1.9	1517
$\gamma f_2(1270) f_2(1270)$	(9.5	± 1.7)	$\times 10^{-4}$		878
$\gamma f_2(1270) f_2(1270)$ (non resonant)	(8.2	± 1.9)	$\times 10^{-4}$		–
$\gamma K^+ K^- \pi^+ \pi^-$	(2.1	± 0.6)	$\times 10^{-3}$		1407
$\gamma f_4(2050)$	(2.7	± 0.7)	$\times 10^{-3}$		891
$\gamma\omega\omega$	(1.61	± 0.33)	$\times 10^{-3}$		1336
$\gamma\eta(1405/1475) \rightarrow \gamma\rho^0\rho^0$	(1.7	± 0.4)	$\times 10^{-3}$	S=1.3	1223
$\gamma f_2(1270)$	(1.64	± 0.12)	$\times 10^{-3}$	S=1.3	1286
$\gamma f_0(1370) \rightarrow \gamma K\overline{K}$	(4.2	± 1.5)	$\times 10^{-4}$		–
$\gamma f_0(1710) \rightarrow \gamma K\overline{K}$	(1.00	$^{+0.11}_{-0.09}$)	$\times 10^{-3}$	S=1.5	1075
$\gamma f_0(1710) \rightarrow \gamma\pi\pi$	(3.8	± 0.5)	$\times 10^{-4}$		–
$\gamma f_0(1710) \rightarrow \gamma\omega\omega$	(3.1	± 1.0)	$\times 10^{-4}$		–
$\gamma f_0(1710) \rightarrow \gamma\eta\eta$	(2.4	$^{+1.2}_{-0.7}$)	$\times 10^{-4}$		–
$\gamma\eta$	(1.104	± 0.034)	$\times 10^{-3}$		1500
$\gamma f_1(1420) \rightarrow \gamma K\overline{K}\pi$	(7.9	± 1.3)	$\times 10^{-4}$		1220
$\gamma f_1(1285)$	(6.1	± 0.8)	$\times 10^{-4}$		1283
$\gamma f_1(1510) \rightarrow \gamma\eta\pi^+\pi^-$	(4.5	± 1.2)	$\times 10^{-4}$		–
$\gamma f_2'(1525)$	(5.7	$^{+0.8}_{-0.5}$)	$\times 10^{-4}$	S=1.5	1173
$\gamma f_2'(1525) \rightarrow \gamma\eta\eta$	(3.4	± 1.4)	$\times 10^{-5}$		–
$\gamma f_2(1640) \rightarrow \gamma\omega\omega$	(2.8	± 1.8)	$\times 10^{-4}$		–
$\gamma f_2(1910) \rightarrow \gamma\omega\omega$	(2.0	± 1.4)	$\times 10^{-4}$		–
$\gamma f_0(1800) \rightarrow \gamma\omega\phi$	(2.5	± 0.6)	$\times 10^{-4}$		–
$\gamma f_2(1810) \rightarrow \gamma\eta\eta$	(5.4	$^{+3.5}_{-2.4}$)	$\times 10^{-5}$		–
$\gamma f_2(1950) \rightarrow \gamma K^*(892)\overline{K}^*(892)$	(7.0	± 2.2)	$\times 10^{-4}$		–
$\gamma K^*(892)\overline{K}^*(892)$	(4.0	± 1.3)	$\times 10^{-3}$		1266
$\gamma\phi\phi$	(4.0	± 1.2)	$\times 10^{-4}$	S=2.1	1166
$\gamma p\overline{p}$	(3.8	± 1.0)	$\times 10^{-4}$		1232
$\gamma\eta(2225)$	(3.3	± 0.5)	$\times 10^{-4}$		749
$\gamma\eta(1760) \rightarrow \gamma\rho^0\rho^0$	(1.3	± 0.9)	$\times 10^{-4}$		1048
$\gamma\eta(1760) \rightarrow \gamma\omega\omega$	(1.98	± 0.33)	$\times 10^{-3}$		–
$\gamma X(1835) \rightarrow \gamma\pi^+\pi^-\eta'$	(2.6	± 0.4)	$\times 10^{-4}$		1006
$\gamma X(1835) \rightarrow \gamma p\overline{p}$	(7.7	$^{+1.5}_{-0.9}$)	$\times 10^{-5}$		–

$\gamma X(1835) \rightarrow \gamma K_S^0 K_S^0 \eta$		$(3.3 \ ^{+2.0}_{-1.3}) \times 10^{-5}$			–
$\gamma X(1840) \rightarrow \gamma 3(\pi^+\pi^-)$		$(2.4 \ ^{+0.7}_{-0.8}) \times 10^{-5}$			–
$\gamma(K\overline{K}\pi)$ $[J^{PC} = 0^{-+}]$		$(7 \pm 4) \times 10^{-4}$		S=2.1	1442
$\gamma\pi^0$		$(3.49 \ ^{+0.33}_{-0.30}) \times 10^{-5}$			1546
$\gamma p\overline{p}\pi^+\pi^-$		< 7.9	$\times 10^{-4}$	CL=90%	1107
$\gamma\Lambda\overline{\Lambda}$		< 1.3	$\times 10^{-4}$	CL=90%	1074
$\gamma f_0(2100) \rightarrow \gamma\eta\eta$		$(1.13 \ ^{+0.60}_{-0.30}) \times 10^{-4}$			–
$\gamma f_0(2100) \rightarrow \gamma\pi\pi$		$(6.2 \pm 1.0) \times 10^{-4}$			–
$\gamma f_0(2200) \rightarrow \gamma K\overline{K}$		$(5.9 \pm 1.3) \times 10^{-4}$			–
$\gamma f_J(2220) \rightarrow \gamma\pi\pi$		< 3.9	$\times 10^{-5}$	CL=90%	–
$\gamma f_J(2220) \rightarrow \gamma K\overline{K}$		< 4.1	$\times 10^{-5}$	CL=90%	–
$\gamma f_J(2220) \rightarrow \gamma p\overline{p}$		$(1.5 \pm 0.8) \times 10^{-5}$			–
$\gamma f_2(2340) \rightarrow \gamma\eta\eta$		$(5.6 \ ^{+2.4}_{-2.2}) \times 10^{-5}$			–
$\gamma f_0(1500) \rightarrow \gamma\pi\pi$		$(1.09 \pm 0.24) \times 10^{-4}$			1183
$\gamma f_0(1500) \rightarrow \gamma\eta\eta$		$(1.7 \ ^{+0.6}_{-1.4}) \times 10^{-5}$			–
$\gamma A \rightarrow \gamma$invisible	[*uuaa*]	< 6.3	$\times 10^{-6}$	CL=90%	–
$\gamma A^0 \rightarrow \gamma\mu^+\mu^-$	[*vvaa*]	< 2.1	$\times 10^{-5}$	CL=90%	–
Dalitz decays					
$\pi^0 e^+ e^-$		$(7.6 \pm 1.4) \times 10^{-7}$			1546
$\eta e^+ e^-$		$(1.16 \pm 0.09) \times 10^{-5}$			1500
$\eta'(958) e^+ e^-$		$(5.81 \pm 0.35) \times 10^{-5}$			1400
Weak decays					
$D^- e^+ \nu_e$ + c.c.		< 1.2	$\times 10^{-5}$	CL=90%	984
$\overline{D}^0 e^+ e^-$ + c.c.		< 1.1	$\times 10^{-5}$	CL=90%	987
$D_s^- e^+ \nu_e$ + c.c.		< 1.3	$\times 10^{-6}$	CL=90%	923
$D_s^{*-} e^+ \nu_e$ + c.c.		< 1.8	$\times 10^{-6}$	CL=90%	828
$D^- \pi^+$ + c.c.		< 7.5	$\times 10^{-5}$	CL=90%	977
$\overline{D}^0 \overline{K}^0$ + c.c.		< 1.7	$\times 10^{-4}$	CL=90%	898
$\overline{D}^0 \overline{K}^{*0}$ + c.c.		< 2.5	$\times 10^{-6}$	CL=90%	670
$D_s^- \pi^+$ + c.c.		< 1.3	$\times 10^{-4}$	CL=90%	916
$D_s^- \rho^+$ + c.c.		< 1.3	$\times 10^{-5}$	CL=90%	663
Charge conjugation (C), Parity (P), Lepton Family number (LF) violating modes					
$\gamma\gamma$	*C*	< 2.7	$\times 10^{-7}$	CL=90%	1548
$\gamma\phi$	*C*	< 1.4	$\times 10^{-6}$	CL=90%	1381
$e^\pm\mu^\mp$	*LF*	< 1.6	$\times 10^{-7}$	CL=90%	1547
$e^\pm\tau^\mp$	*LF*	< 8.3	$\times 10^{-6}$	CL=90%	1039
$\mu^\pm\tau^\mp$	*LF*	< 2.0	$\times 10^{-6}$	CL=90%	1035
Other decays					
invisible		< 7	$\times 10^{-4}$	CL=90%	–

$\chi_{c0}(1P)$

$I^G(J^{PC}) = 0^+(0^{++})$

Mass $m = 3414.75 \pm 0.31$ MeV
Full width $\Gamma = 10.5 \pm 0.6$ MeV

$\chi_{c0}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Hadronic decays			
$2(\pi^+\pi^-)$	(2.24 ± 0.18) %		1679
$\rho^0\pi^+\pi^-$	$(8.7\ \pm2.8\ )\times10^{-3}$		1607
$f_0(980)f_0(980)$	$(6.5\ \pm2.1\ )\times10^{-4}$		1391
$\pi^+\pi^-\pi^0\pi^0$	$(3.3\ \pm0.4\ )$ %		1680
$\rho^+\pi^-\pi^0$ + c.c.	$(2.8\ \pm0.4\ )$ %		1607
$4\pi^0$	$(3.2\ \pm0.4\ )\times10^{-3}$		1681
$\pi^+\pi^-K^+K^-$	(1.75 ± 0.14) %		1580
$K_0^*(1430)^0\overline{K}_0^*(1430)^0 \to \pi^+\pi^-K^+K^-$	$(9.6\ ^{+3.5}_{-2.8}\ )\times10^{-4}$		–
$K_0^*(1430)^0\overline{K}_2^*(1430)^0$ + c.c. $\to \pi^+\pi^-K^+K^-$	$(7.8\ ^{+1.9}_{-2.4}\ )\times10^{-4}$		–
$K_1(1270)^+K^-$ + c.c. $\to \pi^+\pi^-K^+K^-$	$(6.1\ \pm1.9\ )\times10^{-3}$		–
$K_1(1400)^+K^-$ + c.c. $\to \pi^+\pi^-K^+K^-$	$< 2.6 \times10^{-3}$	CL=90%	–
$f_0(980)f_0(980)$	$(1.6\ ^{+1.0}_{-0.9}\ )\times10^{-4}$		1391
$f_0(980)f_0(2200)$	$(7.8\ ^{+2.0}_{-2.5}\ )\times10^{-4}$		584
$f_0(1370)f_0(1370)$	$< 2.7 \times10^{-4}$	CL=90%	1019
$f_0(1370)f_0(1500)$	$< 1.7 \times10^{-4}$	CL=90%	921
$f_0(1370)f_0(1710)$	$(6.6\ ^{+3.5}_{-2.3}\ )\times10^{-4}$		720
$f_0(1500)f_0(1370)$	$< 1.3 \times10^{-4}$	CL=90%	921
$f_0(1500)f_0(1500)$	$< 5 \times10^{-5}$	CL=90%	807
$f_0(1500)f_0(1710)$	$< 7 \times10^{-5}$	CL=90%	557
$K^+K^-\pi^+\pi^-\pi^0$	$(8.6\ \pm0.9\ )\times10^{-3}$		1545
$K_S^0K^\pm\pi^\mp\pi^+\pi^-$	$(4.2\ \pm0.4\ )\times10^{-3}$		1544
$K^+K^-\pi^0\pi^0$	$(5.4\ \pm0.9\ )\times10^{-3}$		1582
$K^+\pi^-\overline{K}^0\pi^0$ + c.c.	(2.44 ± 0.33) %		1581
$\rho^+K^-K^0$ + c.c.	(1.18 ± 0.21) %		1458
$K^*(892)^-K^+\pi^0 \to K^+\pi^-\overline{K}^0\pi^0$ + c.c.	$(4.5\ \pm1.1\ )\times10^{-3}$		–
$K_S^0K_S^0\pi^+\pi^-$	$(5.6\ \pm1.0\ )\times10^{-3}$		1579
$K^+K^-\eta\pi^0$	$(3.0\ \pm0.7\ )\times10^{-3}$		1468
$3(\pi^+\pi^-)$	(1.20 ± 0.18) %		1633
$K^+\overline{K}^*(892)^0\pi^-$ + c.c.	$(7.2\ \pm1.6\ )\times10^{-3}$		1523

$K^*(892)^0\overline{K}^*(892)^0$	$(1.7\ \pm0.6\ )\times10^{-3}$		1456
$\pi\pi$	$(8.33\pm0.35)\times10^{-3}$		1702
$\pi^0\eta$	$<1.8\times10^{-4}$		1661
$\pi^0\eta'$	$<1.1\times10^{-3}$		1570
$\pi^0\eta_c$	$<1.6\times10^{-3}$	CL=90%	384
$\eta\eta$	$(2.95\pm0.19)\times10^{-3}$		1617
$\eta\eta'$	$<2.3\times10^{-4}$	CL=90%	1521
$\eta'\eta'$	$(1.96\pm0.21)\times10^{-3}$		1413
$\omega\omega$	$(9.5\ \pm1.1\ )\times10^{-4}$		1517
$\omega\phi$	$(1.16\pm0.21)\times10^{-4}$		1447
ωK^+K^-	$(1.94\pm0.21)\times10^{-3}$		1457
K^+K^-	$(5.91\pm0.32)\times10^{-3}$		1634
$K^0_SK^0_S$	$(3.10\pm0.18)\times10^{-3}$		1633
$\pi^+\pi^-\eta$	$<1.9\times10^{-4}$	CL=90%	1651
$\pi^+\pi^-\eta'$	$<3.5\times10^{-4}$	CL=90%	1560
$\overline{K}^0K^+\pi^-+$ c.c.	$<9\times10^{-5}$	CL=90%	1610
$K^+K^-\pi^0$	$<6\times10^{-5}$	CL=90%	1611
$K^+K^-\eta$	$<2.2\times10^{-4}$	CL=90%	1512
$K^+K^-K^0_SK^0_S$	$(1.4\ \pm0.5\ )\times10^{-3}$		1331
$K^+K^-K^+K^-$	$(2.75\pm0.28)\times10^{-3}$		1333
$K^+K^-\phi$	$(9.5\ \pm2.4\ )\times10^{-4}$		1381
$\overline{K}^0K^+\pi^-\phi+$ c.c.	$(3.7\ \pm0.6\ )\times10^{-3}$		1326
$K^+K^-\pi^0\phi$	$(1.90\pm0.35)\times10^{-3}$		1329
$\phi\pi^+\pi^-\pi^0$	$(1.18\pm0.15)\times10^{-3}$		1525
$\phi\phi$	$(7.7\ \pm0.7\ )\times10^{-4}$		1370
$p\overline{p}$	$(2.25\pm0.09)\times10^{-4}$		1426
$p\overline{p}\pi^0$	$(6.8\ \pm0.7\ )\times10^{-4}$	S=1.3	1379
$p\overline{p}\eta$	$(3.5\ \pm0.4\ )\times10^{-4}$		1187
$p\overline{p}\omega$	$(5.1\ \pm0.6\ )\times10^{-4}$		1043
$p\overline{p}\phi$	$(5.9\ \pm1.4\ )\times10^{-5}$		876
$p\overline{p}\pi^+\pi^-$	$(2.1\ \pm0.7\ )\times10^{-3}$	S=1.4	1320
$p\overline{p}\pi^0\pi^0$	$(1.02\pm0.27)\times10^{-3}$		1324
$p\overline{p}K^+K^-$(non-resonant)	$(1.19\pm0.26)\times10^{-4}$		890
$p\overline{p}K^0_SK^0_S$	$<8.8\times10^{-4}$	CL=90%	884
$p\overline{n}\pi^-$	$(1.24\pm0.11)\times10^{-3}$		1376
$\overline{p}n\pi^+$	$(1.34\pm0.12)\times10^{-3}$		1376
$p\overline{n}\pi^-\pi^0$	$(2.29\pm0.21)\times10^{-3}$		1321
$\overline{p}n\pi^+\pi^0$	$(2.16\pm0.18)\times10^{-3}$		1321
$\Lambda\overline{\Lambda}$	$(3.21\pm0.25)\times10^{-4}$		1292
$\Lambda\overline{\Lambda}\pi^+\pi^-$	$(1.15\pm0.13)\times10^{-3}$		1153
$\Lambda\overline{\Lambda}\pi^+\pi^-$(non-resonant)	$<5\times10^{-4}$	CL=90%	1153
$\Sigma(1385)^+\overline{\Lambda}\pi^-+$ c.c.	$<5\times10^{-4}$	CL=90%	1083
$\Sigma(1385)^-\overline{\Lambda}\pi^++$ c.c.	$<5\times10^{-4}$	CL=90%	1083
$K^+\overline{p}\Lambda+$ c.c.	$(1.22\pm0.12)\times10^{-3}$	S=1.3	1132

$K^+\overline{p}\Lambda(1520)+$ c.c.	$(2.9\ \pm0.7\ )\times10^{-4}$		858
$\Lambda(1520)\overline{\Lambda}(1520)$	$(3.1\ \pm1.2\ )\times10^{-4}$		779
$\Sigma^0\overline{\Sigma}^0$	$(4.4\ \pm0.4\ )\times10^{-4}$		1222
$\Sigma^+\overline{\Sigma}^-$	$(3.9\ \pm0.7\ )\times10^{-4}$	S=1.7	1225
$\Sigma(1385)^+\overline{\Sigma}(1385)^-$	$(1.6\ \pm0.6\ )\times10^{-4}$		1001
$\Sigma(1385)^-\overline{\Sigma}(1385)^+$	$(2.3\ \pm0.6\ )\times10^{-4}$		1001
$K^-\Lambda\overline{\Xi}^+$ + c.c.	$(1.90\pm0.34)\times10^{-4}$		873
$\Xi^0\overline{\Xi}^0$	$(3.1\ \pm0.8\ )\times10^{-4}$		1089
$\Xi^-\overline{\Xi}^+$	$(4.7\ \pm0.7\ )\times10^{-4}$		1081
$\eta_c\pi^+\pi^-$	$< 7\ \times10^{-4}$	CL=90%	308

Radiative decays

$\gamma J/\psi(1S)$	(1.27 ± 0.06) %		303
$\gamma\rho^0$	$< 9\ \times10^{-6}$	CL=90%	1619
$\gamma\omega$	$< 8\ \times10^{-6}$	CL=90%	1618
$\gamma\phi$	$< 6\ \times10^{-6}$	CL=90%	1555
$\gamma\gamma$	$(2.23\pm0.13)\times10^{-4}$		1707

$\chi_{c1}(1P)$

$I^G(J^{PC}) = 0^+(1^{++})$

Mass $m = 3510.66 \pm 0.07$ MeV (S = 1.5)
Full width $\Gamma = 0.84 \pm 0.04$ MeV

$\chi_{c1}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)

Hadronic decays

$3(\pi^+\pi^-)$	$(\ 5.8\ \pm1.4\ )\times10^{-3}$	S=1.2	1683
$2(\pi^+\pi^-)$	$(\ 7.6\ \pm2.6\ )\times10^{-3}$		1728
$\pi^+\pi^-\pi^0\pi^0$	$(\ 1.22\pm0.16)$ %		1729
$\rho^+\pi^-\pi^0+$ c.c.	$(\ 1.48\pm0.25)$ %		1658
$\rho^0\pi^+\pi^-$	$(\ 3.9\ \pm3.5\ )\times10^{-3}$		1657
$4\pi^0$	$(\ 5.5\ \pm0.8\ )\times10^{-4}$		1729
$\pi^+\pi^-K^+K^-$	$(\ 4.5\ \pm1.0\ )\times10^{-3}$		1632
$K^+K^-\pi^0\pi^0$	$(\ 1.14\pm0.28)\times10^{-3}$		1634
$K^+K^-\pi^+\pi^-\pi^0$	$(\ 1.15\pm0.13)$ %		1598
$K^0_SK^\pm\pi^\mp\pi^+\pi^-$	$(\ 7.5\ \pm0.8\ )\times10^{-3}$		1596
$K^+\pi^-\overline{K}^0\pi^0+$ c.c.	$(\ 8.7\ \pm1.4\ )\times10^{-3}$		1632
$\rho^-K^+\overline{K}^0+$ c.c.	$(\ 5.1\ \pm1.2\ )\times10^{-3}$		1514
$K^*(892)^0\overline{K}^0\pi^0\to K^+\pi^-\overline{K}^0\pi^0+$ c.c.	$(\ 2.4\ \pm0.7\ )\times10^{-3}$		–
$K^+K^-\eta\pi^0$	$(\ 1.14\pm0.35)\times10^{-3}$		1523
$\pi^+\pi^-K^0_SK^0_S$	$(\ 7.0\ \pm3.0\ )\times10^{-4}$		1630
$K^+K^-\eta$	$(\ 3.2\ \pm1.0\ )\times10^{-4}$		1566
$\overline{K}^0K^+\pi^-+$ c.c.	$(\ 7.1\ \pm0.6\ )\times10^{-3}$		1661

$K^*(892)^0\overline{K}^0$ + c.c.	$(\ 1.0\ \pm 0.4\ )\times 10^{-3}$		1602
$K^*(892)^+K^-$ + c.c.	$(\ 1.5\ \pm 0.7\ )\times 10^{-3}$		1602
$K_J^*(1430)^0\overline{K}^0$ + c.c. $\rightarrow$ $K_S^0K^+\pi^-$ + c.c.	$<\ 8\ \times 10^{-4}$	CL=90%	–
$K_J^*(1430)^+K^-$ + c.c. $\rightarrow$ $K_S^0K^+\pi^-$ + c.c.	$<\ 2.2\ \times 10^{-3}$	CL=90%	–
$K^+K^-\pi^0$	$(\ 1.85\pm 0.25)\times 10^{-3}$		1662
$\eta\pi^+\pi^-$	$(\ 4.9\ \pm 0.5\ )\times 10^{-3}$		1701
$a_0(980)^+\pi^-$ + c.c. $\rightarrow$ $\eta\pi^+\pi^-$	$(\ 1.8\ \pm 0.6\ )\times 10^{-3}$		–
$f_2(1270)\eta$	$(\ 2.7\ \pm 0.8\ )\times 10^{-3}$		1467
$\pi^+\pi^-\eta'$	$(\ 2.3\ \pm 0.5\ )\times 10^{-3}$		1612
$K^+K^-\eta'(958)$	$(\ 8.8\ \pm 0.9\ )\times 10^{-4}$		1461
$K_0^*(1430)^+K^-$ + c.c.	$(\ 6.4\ ^{+2.2}_{-2.8}\ )\times 10^{-4}$		–
$f_0(980)\eta'(958)$	$(\ 1.6\ ^{+1.4}_{-0.7}\ )\times 10^{-4}$		1460
$f_0(1710)\eta'(958)$	$(\ 7\ \ ^{+7}_{-5}\ )\times 10^{-5}$		1106
$f_2'(1525)\eta'(958)$	$(\ 9\ \ \pm 6\ \ )\times 10^{-5}$		1225
$\pi^0 f_0(980)\rightarrow\ \pi^0\pi^+\pi^-$	$<\ 6\ \times 10^{-6}$	CL=90%	–
$K^+\overline{K}^*(892)^0\pi^-$ + c.c.	$(\ 3.2\ \pm 2.1\ )\times 10^{-3}$		1577
$K^*(892)^0\overline{K}^*(892)^0$	$(\ 1.5\ \pm 0.4\ )\times 10^{-3}$		1512
$K^+K^-K_S^0K_S^0$	$<\ 4\ \times 10^{-4}$	CL=90%	1390
$K^+K^-K^+K^-$	$(\ 5.5\ \pm 1.1\ )\times 10^{-4}$		1393
$K^+K^-\phi$	$(\ 4.2\ \pm 1.6\ )\times 10^{-4}$		1440
$\overline{K}^0K^+\pi^-\phi$ + c.c.	$(\ 3.3\ \pm 0.5\ )\times 10^{-3}$		1387
$K^+K^-\pi^0\phi$	$(\ 1.62\pm 0.30)\times 10^{-3}$		1390
$\phi\pi^+\pi^-\pi^0$	$(\ 7.5\ \pm 1.0\ )\times 10^{-4}$		1578
$\omega\omega$	$(\ 5.8\ \pm 0.7\ )\times 10^{-4}$		1571
ωK^+K^-	$(\ 7.8\ \pm 0.9\ )\times 10^{-4}$		1513
$\omega\phi$	$(\ 2.1\ \pm 0.6\ )\times 10^{-5}$		1503
$\phi\phi$	$(\ 4.2\ \pm 0.5\ )\times 10^{-4}$		1429
$p\overline{p}$	$(\ 7.72\pm 0.35)\times 10^{-5}$		1484
$p\overline{p}\pi^0$	$(\ 1.59\pm 0.19)\times 10^{-4}$		1438
$p\overline{p}\eta$	$(\ 1.48\pm 0.25)\times 10^{-4}$		1254
$p\overline{p}\omega$	$(\ 2.16\pm 0.31)\times 10^{-4}$		1117
$p\overline{p}\phi$	$<\ 1.8\ \times 10^{-5}$	CL=90%	962
$p\overline{p}\pi^+\pi^-$	$(\ 5.0\ \pm 1.9\ )\times 10^{-4}$		1381
$p\overline{p}K^+K^-$(non-resonant)	$(\ 1.30\pm 0.23)\times 10^{-4}$		974
$p\overline{p}K_S^0K_S^0$	$<\ 4.5\ \times 10^{-4}$	CL=90%	968
$p\overline{n}\pi^-$	$(\ 3.9\ \pm 0.5\ )\times 10^{-4}$		1435
$\overline{p}n\pi^+$	$(\ 4.0\ \pm 0.5\ )\times 10^{-4}$		1435
$p\overline{n}\pi^-\pi^0$	$(\ 1.05\pm 0.12)\times 10^{-3}$		1383
$\overline{p}n\pi^+\pi^0$	$(\ 1.03\pm 0.12)\times 10^{-3}$		1383
$\Lambda\overline{\Lambda}$	$(\ 1.16\pm 0.12)\times 10^{-4}$		1355

$\Lambda\overline{\Lambda}\pi^+\pi^-$	(3.0 ±0.5)	$\times 10^{-4}$		1223
$\Lambda\overline{\Lambda}\pi^+\pi^-$ (non-resonant)	(2.5 ±0.6)	$\times 10^{-4}$		1223
$\Sigma(1385)^+\overline{\Lambda}\pi^-$ + c.c.	< 1.3	$\times 10^{-4}$	CL=90%	1157
$\Sigma(1385)^-\overline{\Lambda}\pi^+$ + c.c.	< 1.3	$\times 10^{-4}$	CL=90%	1157
$K^+\overline{p}\Lambda$	(4.2 ±0.4)	$\times 10^{-4}$	S=1.1	1203
$K^+\overline{p}\Lambda(1520)$ + c.c.	(1.7 ±0.5)	$\times 10^{-4}$		950
$\Lambda(1520)\overline{\Lambda}(1520)$	< 1.0	$\times 10^{-4}$	CL=90%	879
$\Sigma^0\overline{\Sigma}^0$	< 4	$\times 10^{-5}$	CL=90%	1288
$\Sigma^+\overline{\Sigma}^-$	< 6	$\times 10^{-5}$	CL=90%	1291
$\Sigma(1385)^+\overline{\Sigma}(1385)^-$	< 1.0	$\times 10^{-4}$	CL=90%	1081
$\Sigma(1385)^-\overline{\Sigma}(1385)^+$	< 5	$\times 10^{-5}$	CL=90%	1081
$K^-\Lambda\overline{\Xi}^+$ + c.c.	(1.38±0.25)	$\times 10^{-4}$		963
$\Xi^0\overline{\Xi}^0$	< 6	$\times 10^{-5}$	CL=90%	1163
$\Xi^-\overline{\Xi}^+$	(8.2 ±2.2)	$\times 10^{-5}$		1155
$\pi^+\pi^-$ + K^+K^-	< 2.1	$\times 10^{-3}$		–
$K^0_S K^0_S$	< 6	$\times 10^{-5}$	CL=90%	1683
$\eta_c\pi^+\pi^-$	< 3.2	$\times 10^{-3}$	CL=90%	413

Radiative decays

$\gamma J/\psi(1S)$	(33.9 ±1.2) %			389
$\gamma\rho^0$	(2.20±0.18)	$\times 10^{-4}$		1670
$\gamma\omega$	(6.9 ±0.8)	$\times 10^{-5}$		1668
$\gamma\phi$	(2.5 ±0.5)	$\times 10^{-5}$		1607

$h_c(1P)$

$I^G(J^{PC}) = ?^?(1^{+-})$

Mass $m = 3525.38 \pm 0.11$ MeV
Full width $\Gamma = 0.7 \pm 0.4$ MeV

$h_c(1P)$ DECAY MODES	Fraction (Γ_i/Γ)		Confidence level	p (MeV/c)
$J/\psi(1S)\pi\pi$	not seen			312
$p\overline{p}$	< 1.5	$\times 10^{-4}$	90%	1492
$\eta_c(1S)\gamma$	(51 ±6) %			500
$\pi^+\pi^-\pi^0$	< 2.2	$\times 10^{-3}$		1749
$2\pi^+2\pi^-\pi^0$	($2.2^{+0.8}_{-0.7}$) %			1716
$3\pi^+3\pi^-\pi^0$	< 2.9 %			1661

$\chi_{c2}(1P)$

$I^G(J^{PC}) = 0^+(2^{++})$

Mass $m = 3556.20 \pm 0.09$ MeV
Full width $\Gamma = 1.93 \pm 0.11$ MeV

$\chi_{c2}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
Hadronic decays			
$2(\pi^+\pi^-)$	(1.07±0.10) %		1751
$\pi^+\pi^-\pi^0\pi^0$	(1.91±0.25) %		1752
$\rho^+\pi^-\pi^0$ + c.c.	(2.3 ±0.4) %		1682
$4\pi^0$	(1.16±0.16) × 10^{-3}		1752
$K^+K^-\pi^0\pi^0$	(2.2 ±0.4) × 10^{-3}		1658
$K^+\pi^-\overline{K}^0\pi^0$ + c.c.	(1.44±0.21) %		1657
$\rho^- K^+\overline{K}^0$ + c.c.	(4.3 ±1.3) × 10^{-3}		1540
$K^*(892)^0 K^-\pi^+ \to K^-\pi^+ K^0\pi^0$ + c.c.	(3.1 ±0.8) × 10^{-3}		–
$K^*(892)^0\overline{K}^0\pi^0 \to K^+\pi^-\overline{K}^0\pi^0$ + c.c.	(4.0 ±0.9) × 10^{-3}		–
$K^*(892)^- K^+\pi^0 \to K^+\pi^-\overline{K}^0\pi^0$ + c.c.	(3.9 ±0.9) × 10^{-3}		–
$K^*(892)^+\overline{K}^0\pi^- \to K^+\pi^-\overline{K}^0\pi^0$ + c.c.	(3.1 ±0.8) × 10^{-3}		–
$K^+K^-\eta\pi^0$	(1.3 ±0.5) × 10^{-3}		1549
$K^+K^-\pi^+\pi^-$	(8.9 ±1.0) × 10^{-3}		1656
$K^+K^-\pi^+\pi^-\pi^0$	(1.17±0.13) %		1623
$K^0_S K^\pm\pi^\mp\pi^+\pi^-$	(7.3 ±0.8) × 10^{-3}		1621
$K^+\overline{K}^*(892)^0\pi^-$ + c.c.	(2.2 ±1.1) × 10^{-3}		1602
$K^*(892)^0\overline{K}^*(892)^0$	(2.4 ±0.5) × 10^{-3}		1538
$3(\pi^+\pi^-)$	(8.6 ±1.8) × 10^{-3}		1707
$\phi\phi$	(1.12±0.10) × 10^{-3}		1457
$\omega\omega$	(8.8 ±1.1) × 10^{-4}		1597
ωK^+K^-	(7.3 ±0.9) × 10^{-4}		1540
$\pi\pi$	(2.33±0.12) × 10^{-3}		1773
$\rho^0\pi^+\pi^-$	(3.8 ±1.6) × 10^{-3}		1682
$\pi^+\pi^-\eta$	(5.0 ±1.3) × 10^{-4}		1724
$\pi^+\pi^-\eta'$	(5.2 ±1.9) × 10^{-4}		1636
$\eta\eta$	(5.7 ±0.5) × 10^{-4}		1692
K^+K^-	(1.05±0.07) × 10^{-3}		1708
$K^0_S K^0_S$	(5.5 ±0.4) × 10^{-4}		1707
$\overline{K}^0 K^+\pi^-$ + c.c.	(1.34±0.19) × 10^{-3}		1685
$K^+K^-\pi^0$	(3.2 ±0.8) × 10^{-4}		1686
$K^+K^-\eta$	< 3.4 × 10^{-4}	90%	1592
$K^+K^-\eta'(958)$	(1.94±0.34) × 10^{-4}		1488
$\eta\eta'$	< 6 × 10^{-5}	90%	1600
$\eta'\eta'$	< 1.0 × 10^{-4}	90%	1498
$\pi^+\pi^- K^0_S K^0_S$	(2.3 ±0.6) × 10^{-3}		1655
$K^+K^- K^0_S K^0_S$	< 4 × 10^{-4}	90%	1418
$K^+K^-K^+K^-$	(1.73±0.21) × 10^{-3}		1421

$K^+K^-\phi$	(1.48±0.31)	$\times 10^{-3}$		1468
$\overline{K}^0K^+\pi^-\phi$+ c.c.	(4.8 ±0.7)	$\times 10^{-3}$		1416
$K^+K^-\pi^0\phi$	(2.7 ±0.5)	$\times 10^{-3}$		1419
$\phi\pi^+\pi^-\pi^0$	(9.3 ±1.2)	$\times 10^{-4}$		1603
$p\overline{p}$	(7.5 ±0.4)	$\times 10^{-5}$		1510
$p\overline{p}\pi^0$	(4.9 ±0.4)	$\times 10^{-4}$		1465
$p\overline{p}\eta$	(1.82±0.26)	$\times 10^{-4}$		1285
$p\overline{p}\omega$	(3.8 ±0.5)	$\times 10^{-4}$		1152
$p\overline{p}\phi$	(2.9 ±0.9)	$\times 10^{-5}$		1002
$p\overline{p}\pi^+\pi^-$	(1.32±0.34)	$\times 10^{-3}$		1410
$p\overline{p}\pi^0\pi^0$	(8.2 ±2.5)	$\times 10^{-4}$		1414
$p\overline{p}K^+K^-$(non-resonant)	(2.00±0.34)	$\times 10^{-4}$		1013
$p\overline{p}K^0_SK^0_S$	< 7.9	$\times 10^{-4}$	90%	1007
$p\overline{n}\pi^-$	(8.9 ±1.0)	$\times 10^{-4}$		1463
$\overline{p}n\pi^+$	(9.3 ±0.9)	$\times 10^{-4}$		1463
$p\overline{n}\pi^-\pi^0$	(2.27±0.19)	$\times 10^{-3}$		1411
$\overline{p}n\pi^+\pi^0$	(2.21±0.20)	$\times 10^{-3}$		1411
$\Lambda\overline{\Lambda}$	(1.92±0.16)	$\times 10^{-4}$		1385
$\Lambda\overline{\Lambda}\pi^+\pi^-$	(1.31±0.17)	$\times 10^{-3}$		1255
$\Lambda\overline{\Lambda}\pi^+\pi^-$(non-resonant)	(6.9 ±1.6)	$\times 10^{-4}$		1255
$\Sigma(1385)^+\overline{\Lambda}\pi^-$+ c.c.	< 4	$\times 10^{-4}$	90%	1192
$\Sigma(1385)^-\overline{\Lambda}\pi^+$+ c.c.	< 6	$\times 10^{-4}$	90%	1192
$K^+\overline{p}\Lambda$ + c.c.	(8.1 ±0.6)	$\times 10^{-4}$		1236
$K^+\overline{p}\Lambda(1520)$+ c.c.	(2.9 ±0.7)	$\times 10^{-4}$		992
$\Lambda(1520)\overline{\Lambda}(1520)$	(4.8 ±1.5)	$\times 10^{-4}$		923
$\Sigma^0\overline{\Sigma}^0$	< 6	$\times 10^{-5}$	90%	1319
$\Sigma^+\overline{\Sigma}^-$	< 7	$\times 10^{-5}$	90%	1322
$\Sigma(1385)^+\overline{\Sigma}(1385)^-$	< 1.6	$\times 10^{-4}$	90%	1118
$\Sigma(1385)^-\overline{\Sigma}(1385)^+$	< 8	$\times 10^{-5}$	90%	1118
$K^-\Lambda\overline{\Xi}^+$ + c.c.	(1.84±0.34)	$\times 10^{-4}$		1004
$\Xi^0\overline{\Xi}^0$	< 1.1	$\times 10^{-4}$	90%	1197
$\Xi^-\overline{\Xi}^+$	(1.48±0.33)	$\times 10^{-4}$		1189
$J/\psi(1S)\pi^+\pi^-\pi^0$	< 1.5	%	90%	185
$\pi^0\eta_c$	< 3.2	$\times 10^{-3}$	90%	512
$\eta_c(1S)\pi^+\pi^-$	< 5.4	$\times 10^{-3}$	90%	459

Radiative decays

$\gamma J/\psi(1S)$	(19.2 ±0.7)	%		430
$\gamma\rho^0$	< 2.0	$\times 10^{-5}$	90%	1694
$\gamma\omega$	< 6	$\times 10^{-6}$	90%	1692
$\gamma\phi$	< 8	$\times 10^{-6}$	90%	1632
$\gamma\gamma$	(2.74±0.14)	$\times 10^{-4}$		1778

$\eta_c(2S)$

$I^G(J^{PC}) = 0^+(0^{-+})$

Quantum numbers are quark model predictions.

Mass $m = 3639.2 \pm 1.2$ MeV
Full width $\Gamma = 11.3^{+3.2}_{-2.9}$ MeV

$\eta_c(2S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
hadrons	not seen		–
$K\overline{K}\pi$	(1.9±1.2) %		1730
$K\overline{K}\eta$	(5 ±4) $\times 10^{-3}$		1638
$2\pi^+2\pi^-$	not seen		1793
$\rho^0\rho^0$	not seen		1646
$3\pi^+3\pi^-$	not seen		1750
$K^+K^-\pi^+\pi^-$	not seen		1701
$K^{*0}\overline{K}^{*0}$	not seen		1586
$K^+K^-\pi^+\pi^-\pi^0$	(1.4±1.0) %		1668
$K^+K^-2\pi^+2\pi^-$	not seen		1628
$K^0_S K^-2\pi^+\pi^-$ + c.c.	seen		1667
$2K^+2K^-$	not seen		1471
$\phi\phi$	not seen		1507
$p\overline{p}$	< 2.0 $\times 10^{-3}$	90%	1559
$\gamma\gamma$	(1.9±1.3) $\times 10^{-4}$		1820
$\pi^+\pi^-\eta$	not seen		1767
$\pi^+\pi^-\eta'$	not seen		1681
$\pi^+\pi^-\eta_c(1S)$	< 25 %	90%	539

$\psi(2S)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 3686.097 \pm 0.025$ MeV (S = 2.6)
Full width $\Gamma = 296 \pm 8$ keV
$\Gamma_{ee} = 2.34 \pm 0.04$ keV

$\psi(2S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
hadrons	(97.85 ±0.13) %		–
virtual $\gamma \rightarrow$ hadrons	(1.73 ±0.14) %	S=1.5	–
ggg	(10.6 ±1.6) %		–
γgg	(1.03 ±0.29) %		–
light hadrons	(15.4 ±1.5) %		–
e^+e^-	(7.89 ±0.17) $\times 10^{-3}$		1843
$\mu^+\mu^-$	(7.9 ±0.9) $\times 10^{-3}$		1840
$\tau^+\tau^-$	(3.1 ±0.4) $\times 10^{-3}$		489

Decays into $J/\psi(1S)$ and anything

$J/\psi(1S)$ anything	$(61.0 \pm 0.6)\,\%$		–
$J/\psi(1S)$ neutrals	$(25.14 \pm 0.33)\,\%$		–
$J/\psi(1S)\pi^+\pi^-$	$(34.49 \pm 0.30)\,\%$		477
$J/\psi(1S)\pi^0\pi^0$	$(18.16 \pm 0.31)\,\%$		481
$J/\psi(1S)\eta$	$(3.36 \pm 0.05)\,\%$		199
$J/\psi(1S)\pi^0$	$(1.268 \pm 0.032) \times 10^{-3}$		528

Hadronic decays

$\pi^0 h_c(1P)$	$(8.6 \pm 1.3) \times 10^{-4}$		85
$3(\pi^+\pi^-)\pi^0$	$(3.5 \pm 1.6) \times 10^{-3}$		1746
$2(\pi^+\pi^-)\pi^0$	$(2.9 \pm 1.0) \times 10^{-3}$	S=4.7	1799
$\rho a_2(1320)$	$(2.6 \pm 0.9) \times 10^{-4}$		1500
$p\overline{p}$	$(2.88 \pm 0.09) \times 10^{-4}$		1586
$\Delta^{++}\overline{\Delta}^{--}$	$(1.28 \pm 0.35) \times 10^{-4}$		1371
$\Lambda\overline{\Lambda}\pi^0$	$< 2.9 \times 10^{-6}$	CL=90%	1412
$\Lambda\overline{\Lambda}\eta$	$(2.5 \pm 0.4) \times 10^{-5}$		1197
$\Lambda\overline{p}K^+$	$(1.00 \pm 0.14) \times 10^{-4}$		1327
$\Lambda\overline{p}K^+\pi^+\pi^-$	$(1.8 \pm 0.4) \times 10^{-4}$		1167
$\Lambda\overline{\Lambda}\pi^+\pi^-$	$(2.8 \pm 0.6) \times 10^{-4}$		1346
$\Lambda\overline{\Lambda}$	$(3.57 \pm 0.18) \times 10^{-4}$		1467
$\Lambda\overline{\Sigma}^+\pi^- +$ c.c.	$(1.40 \pm 0.13) \times 10^{-4}$		1376
$\Lambda\overline{\Sigma}^-\pi^+ +$ c.c.	$(1.54 \pm 0.14) \times 10^{-4}$		1379
$\Sigma^0\overline{p}K^+ +$ c.c.	$(1.67 \pm 0.18) \times 10^{-5}$		1291
$\Sigma^+\overline{\Sigma}^-$	$(2.51 \pm 0.21) \times 10^{-4}$		1408
$\Sigma^0\overline{\Sigma}^0$	$(2.32 \pm 0.16) \times 10^{-4}$		1405
$\Sigma(1385)^+\overline{\Sigma}(1385)^-$	$(1.1 \pm 0.4) \times 10^{-4}$		1218
$\Xi^-\overline{\Xi}^+$	$(2.64 \pm 0.18) \times 10^{-4}$		1284
$\Xi^0\overline{\Xi}^0$	$(2.07 \pm 0.23) \times 10^{-4}$		1291
$\Xi(1530)^0\overline{\Xi}(1530)^0$	$(5.2\ ^{+3.2}_{-1.2}) \times 10^{-5}$		1025
$K^-\Lambda\overline{\Xi}^+ +$ c.c.	$(3.9 \pm 0.4) \times 10^{-5}$		1114
$\Xi(1690)^-\overline{\Xi}^+ \to K^-\Lambda\overline{\Xi}^+ +$ c.c.	$(5.2 \pm 1.6) \times 10^{-6}$		–
$\Xi(1820)^-\overline{\Xi}^+ \to K^-\Lambda\overline{\Xi}^+ +$ c.c.	$(1.20 \pm 0.32) \times 10^{-5}$		–
$K^-\Sigma^0\overline{\Xi}^+ +$ c.c.	$(3.7 \pm 0.4) \times 10^{-5}$		1060
$\Omega^-\overline{\Omega}^+$	$(4.7 \pm 1.0) \times 10^{-5}$		774
$\pi^0 p\overline{p}$	$(1.53 \pm 0.07) \times 10^{-4}$		1543
$N(940)\overline{p} +$ c.c. $\to \pi^0 p\overline{p}$	$(6.4\ ^{+1.8}_{-1.3}) \times 10^{-5}$		–
$N(1440)\overline{p} +$ c.c. $\to \pi^0 p\overline{p}$	$(7.3\ ^{+1.7}_{-1.5}) \times 10^{-5}$	S=2.5	–
$N(1520)\overline{p} +$ c.c. $\to \pi^0 p\overline{p}$	$(6.4\ ^{+2.3}_{-1.8}) \times 10^{-6}$		–
$N(1535)\overline{p} +$ c.c. $\to \pi^0 p\overline{p}$	$(2.5 \pm 1.0) \times 10^{-5}$		–

$N(1650)\overline{p}+$ c.c. $\rightarrow$ $\pi^0 p\overline{p}$	(3.8	$^{+1.4}_{-1.7}$	) $\times 10^{-5}$		–
$N(1720)\overline{p}+$ c.c. $\rightarrow$ $\pi^0 p\overline{p}$	(1.79	$^{+0.26}_{-0.70}$	) $\times 10^{-5}$		–
$N(2300)\overline{p}+$ c.c. $\rightarrow$ $\pi^0 p\overline{p}$	(2.6	$^{+1.2}_{-0.7}$	) $\times 10^{-5}$		–
$N(2570)\overline{p}+$ c.c. $\rightarrow$ $\pi^0 p\overline{p}$	(2.13	$^{+0.40}_{-0.31}$	) $\times 10^{-5}$		–
$\pi^0 f_0(2100) \rightarrow \pi^0 p\overline{p}$	(1.1	± 0.4	) $\times 10^{-5}$		–
$\eta p\overline{p}$	(6.0	± 0.4	) $\times 10^{-5}$		1373
$\eta f_0(2100) \rightarrow \eta p\overline{p}$	(1.2	± 0.4	) $\times 10^{-5}$		–
$N(1535)\overline{p} \rightarrow \eta p\overline{p}$	(4.4	± 0.7	) $\times 10^{-5}$		–
$\omega p\overline{p}$	(6.9	± 2.1	) $\times 10^{-5}$		1247
$\phi p\overline{p}$	$<$ 2.4		$\times 10^{-5}$	CL=90%	1109
$\pi^+\pi^- p\overline{p}$	(6.0	± 0.4	) $\times 10^{-4}$		1491
$p\overline{n}\pi^-$ or c.c.	(2.48	± 0.17	) $\times 10^{-4}$		–
$p\overline{n}\pi^-\pi^0$	(3.2	± 0.7	) $\times 10^{-4}$		1492
$2(\pi^+\pi^-\pi^0)$	(4.8	± 1.5	) $\times 10^{-3}$		1776
$\eta\pi^+\pi^-$	$<$ 1.6		$\times 10^{-4}$	CL=90%	1791
$\eta\pi^+\pi^-\pi^0$	(9.5	± 1.7	) $\times 10^{-4}$		1778
$2(\pi^+\pi^-)\eta$	(1.2	± 0.6	) $\times 10^{-3}$		1758
$\eta'\pi^+\pi^-\pi^0$	(4.5	± 2.1	) $\times 10^{-4}$		1692
$\omega\pi^+\pi^-$	(7.3	± 1.2	) $\times 10^{-4}$	S=2.1	1748
$b_1^{\pm}\pi^{\mp}$	(4.0	± 0.6	) $\times 10^{-4}$	S=1.1	1635
$b_1^0\pi^0$	(2.4	± 0.6	) $\times 10^{-4}$		–
$\omega f_2(1270)$	(2.2	± 0.4	) $\times 10^{-4}$		1515
$\pi^+\pi^- K^+K^-$	(7.5	± 0.9	) $\times 10^{-4}$	S=1.9	1726
$\rho^0 K^+K^-$	(2.2	± 0.4	) $\times 10^{-4}$		1616
$K^*(892)^0\overline{K}_2^*(1430)^0$	(1.9	± 0.5	) $\times 10^{-4}$		1418
$K^+K^-\pi^+\pi^-\eta$	(1.3	± 0.7	) $\times 10^{-3}$		1574
$K^+K^-2(\pi^+\pi^-)\pi^0$	(1.00	± 0.31	) $\times 10^{-3}$		1611
$K^+K^-2(\pi^+\pi^-)$	(1.9	± 0.9	) $\times 10^{-3}$		1654
$K_1(1270)^{\pm}K^{\mp}$	(1.00	± 0.28	) $\times 10^{-3}$		1581
$K_S^0 K_S^0\pi^+\pi^-$	(2.2	± 0.4	) $\times 10^{-4}$		1724
$\rho^0 p\overline{p}$	(5.0	± 2.2	) $\times 10^{-5}$		1252
$K^+\overline{K}^*(892)^0\pi^-+$ c.c.	(6.7	± 2.5	) $\times 10^{-4}$		1674
$2(\pi^+\pi^-)$	(2.4	± 0.6	) $\times 10^{-4}$	S=2.2	1817
$\rho^0\pi^+\pi^-$	(2.2	± 0.6	) $\times 10^{-4}$	S=1.4	1750
$K^+K^-\pi^+\pi^-\pi^0$	(1.26	± 0.09	) $\times 10^{-3}$		1694
$\omega f_0(1710) \rightarrow \omega K^+K^-$	(5.9	± 2.2	) $\times 10^{-5}$		–
$K^*(892)^0 K^-\pi^+\pi^0+$ c.c.	(8.6	± 2.2	) $\times 10^{-4}$		–
$K^*(892)^+ K^-\pi^+\pi^-+$ c.c.	(9.6	± 2.8	) $\times 10^{-4}$		–
$K^*(892)^+ K^-\rho^0+$ c.c.	(7.3	± 2.6	) $\times 10^{-4}$		–
$K^*(892)^0 K^-\rho^++$ c.c.	(6.1	± 1.8	) $\times 10^{-4}$		–
ηK^+K^-, no $\eta\phi$	(3.1	± 0.4	) $\times 10^{-5}$		1664

$\omega K^+ K^-$	(1.62	± 0.11)	$\times 10^{-4}$	S=1.1	1614
$\omega K^*(892)^+ K^-$ + c.c.	(2.07	± 0.26)	$\times 10^{-4}$		1482
$\omega K_2^*(1430)^+ K^-$ + c.c.	(6.1	± 1.2)	$\times 10^{-5}$		1253
$\omega \overline{K}^*(892)^0 K^0$	(1.68	± 0.30)	$\times 10^{-4}$		1481
$\omega \overline{K}_2^*(1430)^0 K^0$	(5.8	± 2.2)	$\times 10^{-5}$		1251
$\omega X(1440) \rightarrow \omega K_S^0 K^- \pi^+$ + c.c.	(1.6	± 0.4)	$\times 10^{-5}$		–
$\omega X(1440) \rightarrow \omega K^+ K^- \pi^0$	(1.09	± 0.26)	$\times 10^{-5}$		–
$\omega f_1(1285) \rightarrow \omega K_S^0 K^- \pi^+$ + c.c.	(3.0	± 1.0)	$\times 10^{-6}$		–
$\omega f_1(1285) \rightarrow \omega K^+ K^- \pi^0$	(1.2	± 0.7)	$\times 10^{-6}$		–
$3(\pi^+ \pi^-)$	(3.5	± 2.0)	$\times 10^{-4}$	S=2.8	1774
$p\overline{p}\pi^+ \pi^- \pi^0$	(7.3	± 0.7)	$\times 10^{-4}$		1435
$K^+ K^-$	(7.5	± 0.5)	$\times 10^{-5}$		1776
$K_S^0 K_L^0$	(5.34	± 0.33)	$\times 10^{-5}$		1775
$\pi^+ \pi^- \pi^0$	(2.01	± 0.17)	$\times 10^{-4}$	S=1.7	1830
$\rho(2150)\pi \rightarrow \pi^+ \pi^- \pi^0$	(1.9	$^{+1.2}_{-0.4}$)	$\times 10^{-4}$		–
$\rho(770)\pi \rightarrow \pi^+ \pi^- \pi^0$	(3.2	± 1.2)	$\times 10^{-5}$	S=1.8	–
$\pi^+ \pi^-$	(7.8	± 2.6)	$\times 10^{-6}$		1838
$K_1(1400)^\pm K^\mp$	$<$ 3.1		$\times 10^{-4}$	CL=90%	1532
$K_2^*(1430)^\pm K^\mp$	(7.1	$^{+1.3}_{-0.9}$)	$\times 10^{-5}$		–
$K^+ K^- \pi^0$	(4.07	± 0.31)	$\times 10^{-5}$		1754
$K^+ K^*(892)^-$ + c.c.	(2.9	± 0.4)	$\times 10^{-5}$	S=1.2	1698
$K^*(892)^0 \overline{K}^0$ + c.c.	(1.09	± 0.20)	$\times 10^{-4}$		1697
$\phi \pi^+ \pi^-$	(1.17	± 0.29)	$\times 10^{-4}$	S=1.7	1690
$\phi f_0(980) \rightarrow \pi^+ \pi^-$	(6.8	± 2.5)	$\times 10^{-5}$	S=1.2	–
$2(K^+ K^-)$	(6.0	± 1.4)	$\times 10^{-5}$		1499
$\phi K^+ K^-$	(7.0	± 1.6)	$\times 10^{-5}$		1546
$2(K^+ K^-)\pi^0$	(1.10	± 0.28)	$\times 10^{-4}$		1440
$\phi\eta$	(3.10	± 0.31)	$\times 10^{-5}$		1654
$\phi\eta'$	(3.1	± 1.6)	$\times 10^{-5}$		1555
$\omega\eta'$	(3.2	$^{+2.5}_{-2.1}$)	$\times 10^{-5}$		1623
$\omega\pi^0$	(2.1	± 0.6)	$\times 10^{-5}$		1757
$\rho\eta'$	(1.9	$^{+1.7}_{-1.2}$)	$\times 10^{-5}$		1625
$\rho\eta$	(2.2	± 0.6)	$\times 10^{-5}$	S=1.1	1717
$\omega\eta$	$<$ 1.1		$\times 10^{-5}$	CL=90%	1715
$\phi\pi^0$	$<$ 4		$\times 10^{-7}$	CL=90%	1699
$\eta_c \pi^+ \pi^- \pi^0$	$<$ 1.0		$\times 10^{-3}$	CL=90%	513
$p\overline{p}K^+ K^-$	(2.7	± 0.7)	$\times 10^{-5}$		1118
$\overline{\Lambda} n K_S^0$ + c.c.	(8.1	± 1.8)	$\times 10^{-5}$		1324
$\phi f_2'(1525)$	(4.4	± 1.6)	$\times 10^{-5}$		1321

$\Theta(1540)\overline{\Theta}(1540) \to$ $K^0_S p K^- \overline{n}$ + c.c.	$<$	8.8	$\times 10^{-6}$	CL=90%	–
$\Theta(1540) K^- \overline{n} \to K^0_S p K^- \overline{n}$	$<$	1.0	$\times 10^{-5}$	CL=90%	–
$\Theta(1540) K^0_S \overline{p} \to K^0_S \overline{p} K^+ n$	$<$	7.0	$\times 10^{-6}$	CL=90%	–
$\overline{\Theta}(1540) K^+ n \to K^0_S \overline{p} K^+ n$	$<$	2.6	$\times 10^{-5}$	CL=90%	–
$\overline{\Theta}(1540) K^0_S p \to K^0_S p K^- \overline{n}$	$<$	6.0	$\times 10^{-6}$	CL=90%	–
$K^0_S K^0_S$	$<$	4.6	$\times 10^{-6}$		1775

Radiative decays

$\gamma \chi_{c0}(1P)$	(9.99	± 0.27) %			261
$\gamma \chi_{c1}(1P)$	(9.55	± 0.31) %			171
$\gamma \chi_{c2}(1P)$	(9.11	± 0.31) %			128
$\gamma \eta_c(1S)$	(3.4	± 0.5)	$\times 10^{-3}$	S=1.3	636
$\gamma \eta_c(2S)$	(7	± 5)	$\times 10^{-4}$		47
$\gamma \pi^0$	(1.6	± 0.4)	$\times 10^{-6}$		1841
$\gamma \eta'(958)$	(1.23	± 0.06)	$\times 10^{-4}$		1719
$\gamma f_2(1270)$	(2.73	$^{+0.29}_{-0.25}$)	$\times 10^{-4}$	S=1.8	1622
$\gamma f_0(1370) \to \gamma K \overline{K}$	(3.1	± 1.7)	$\times 10^{-5}$		1588
$\gamma f_0(1500)$	(9.2	± 1.9)	$\times 10^{-5}$		1536
$\gamma f'_2(1525)$	(3.3	± 0.8)	$\times 10^{-5}$		1528
$\gamma f_0(1710) \to \gamma \pi \pi$	(3.5	± 0.6)	$\times 10^{-5}$		–
$\gamma f_0(1710) \to \gamma K \overline{K}$	(6.6	± 0.7)	$\times 10^{-5}$		–
$\gamma f_0(2100) \to \gamma \pi \pi$	(4.8	± 1.0)	$\times 10^{-6}$		1244
$\gamma f_0(2200) \to \gamma K \overline{K}$	(3.2	± 1.0)	$\times 10^{-6}$		1193
$\gamma f_J(2220) \to \gamma \pi \pi$	$<$ 5.8		$\times 10^{-6}$	CL=90%	1168
$\gamma f_J(2220) \to \gamma K \overline{K}$	$<$ 9.5		$\times 10^{-6}$	CL=90%	1168
$\gamma \gamma$	$<$ 1.5		$\times 10^{-4}$	CL=90%	1843
$\gamma \eta$	(1.4	± 0.5)	$\times 10^{-6}$		1802
$\gamma \eta \pi^+ \pi^-$	(8.7	± 2.1)	$\times 10^{-4}$		1791
$\gamma \eta(1405) \to \gamma K \overline{K} \pi$	$<$ 9		$\times 10^{-5}$	CL=90%	1569
$\gamma \eta(1405) \to \eta \pi^+ \pi^-$	(3.6	± 2.5)	$\times 10^{-5}$		–
$\gamma \eta(1475) \to K \overline{K} \pi$	$<$ 1.4		$\times 10^{-4}$	CL=90%	–
$\gamma \eta(1475) \to \eta \pi^+ \pi^-$	$<$ 8.8		$\times 10^{-5}$	CL=90%	–
$\gamma 2(\pi^+ \pi^-)$	(4.0	± 0.6)	$\times 10^{-4}$		1817
$\gamma K^{*0} K^+ \pi^-$ + c.c.	(3.7	± 0.9)	$\times 10^{-4}$		1674
$\gamma K^{*0} \overline{K}^{*0}$	(2.4	± 0.7)	$\times 10^{-4}$		1613
$\gamma K^0_S K^+ \pi^-$ + c.c.	(2.6	± 0.5)	$\times 10^{-4}$		1753
$\gamma K^+ K^- \pi^+ \pi^-$	(1.9	± 0.5)	$\times 10^{-4}$		1726
$\gamma p \overline{p}$	(3.9	± 0.5)	$\times 10^{-5}$	S=2.0	1586
$\gamma f_2(1950) \to \gamma p \overline{p}$	(1.20	± 0.22)	$\times 10^{-5}$		–
$\gamma f_2(2150) \to \gamma p \overline{p}$	(7.2	± 1.8)	$\times 10^{-6}$		–
$\gamma X(1835) \to \gamma p \overline{p}$	(4.6	$^{+1.8}_{-4.0}$)	$\times 10^{-6}$		–

$\gamma X \rightarrow \gamma p\overline{p}$	[xxaa]	$<$	2	$\times 10^{-6}$	CL=90%	–
$\gamma\pi^+\pi^- p\overline{p}$		(2.8	± 1.4)	$\times 10^{-5}$		1491
$\gamma 2(\pi^+\pi^-)K^+K^-$		$<$	2.2	$\times 10^{-4}$	CL=90%	1654
$\gamma 3(\pi^+\pi^-)$		$<$	1.7	$\times 10^{-4}$	CL=90%	1774
$\gamma K^+K^-K^+K^-$		$<$	4	$\times 10^{-5}$	CL=90%	1499
$\gamma\gamma J/\psi$		(3.1	$^{+1.0}_{-1.2}$)	$\times 10^{-4}$		542

Other decays

invisible		$<$	1.6	%	CL=90%	–

$\psi(3770)$ $I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 3773.13 \pm 0.35$ MeV (S = 1.1)
Full width $\Gamma = 27.2 \pm 1.0$ MeV
$\Gamma_{ee} = 0.262 \pm 0.018$ keV (S = 1.4)

In addition to the dominant decay mode to $D\overline{D}$, $\psi(3770)$ was found to decay into the final states containing the J/ψ (BAI 05, ADAM 06). ADAMS 06 and HUANG 06A searched for various decay modes with light hadrons and found a statistically significant signal for the decay to $\phi\eta$ only (ADAMS 06).

$\psi(3770)$ DECAY MODES	Fraction (Γ_i/Γ)			Scale factor/ Confidence level	p (MeV/c)
$D\overline{D}$	(93	$^{+8}_{-9}$)	%	S=2.0	286
$D^0\overline{D}^0$	(52	$^{+4}_{-5}$)	%	S=2.0	286
D^+D^-	(41	± 4)	%	S=2.0	253
$J/\psi\pi^+\pi^-$	(1.93	± 0.28)	$\times 10^{-3}$		560
$J/\psi\pi^0\pi^0$	(8.0	± 3.0)	$\times 10^{-4}$		564
$J/\psi\eta$	(9	± 4)	$\times 10^{-4}$		360
$J/\psi\pi^0$	$<$	2.8	$\times 10^{-4}$	CL=90%	603
e^+e^-	(9.6	± 0.7)	$\times 10^{-6}$	S=1.3	1887

Decays to light hadrons

$b_1(1235)\pi$	$<$	1.4	$\times 10^{-5}$	CL=90%	1683
$\phi\eta'$	$<$	7	$\times 10^{-4}$	CL=90%	1607
$\omega\eta'$	$<$	4	$\times 10^{-4}$	CL=90%	1672
$\rho^0\eta'$	$<$	6	$\times 10^{-4}$	CL=90%	1674
$\phi\eta$	(3.1	± 0.7)	$\times 10^{-4}$		1703
$\omega\eta$	$<$	1.4	$\times 10^{-5}$	CL=90%	1762
$\rho^0\eta$	$<$	5	$\times 10^{-4}$	CL=90%	1764
$\phi\pi^0$	$<$	3	$\times 10^{-5}$	CL=90%	1746
$\omega\pi^0$	$<$	6	$\times 10^{-4}$	CL=90%	1803
$\pi^+\pi^-\pi^0$	$<$	5	$\times 10^{-6}$	CL=90%	1874

$\rho\pi$	$<$	5	$\times 10^{-6}$	CL=90%	1804
$K^*(892)^+K^-$ + c.c.	$<$	1.4	$\times 10^{-5}$	CL=90%	1745
$K^*(892)^0\overline{K}^0$ + c.c.	$<$	1.2	$\times 10^{-3}$	CL=90%	1744
$K^0_S K^0_L$	$<$	1.2	$\times 10^{-5}$	CL=90%	1820
$2(\pi^+\pi^-)$	$<$	1.12	$\times 10^{-3}$	CL=90%	1861
$2(\pi^+\pi^-)\pi^0$	$<$	1.06	$\times 10^{-3}$	CL=90%	1843
$2(\pi^+\pi^-\pi^0)$	$<$	5.85	%	CL=90%	1821
$\omega\pi^+\pi^-$	$<$	6.0	$\times 10^{-4}$	CL=90%	1794
$3(\pi^+\pi^-)$	$<$	9.1	$\times 10^{-3}$	CL=90%	1819
$3(\pi^+\pi^-)\pi^0$	$<$	1.37	%	CL=90%	1792
$3(\pi^+\pi^-)2\pi^0$	$<$	11.74	%	CL=90%	1760
$\eta\pi^+\pi^-$	$<$	1.24	$\times 10^{-3}$	CL=90%	1836
$\pi^+\pi^-2\pi^0$	$<$	8.9	$\times 10^{-3}$	CL=90%	1862
$\rho^0\pi^+\pi^-$	$<$	6.9	$\times 10^{-3}$	CL=90%	1796
$\eta 3\pi$	$<$	1.34	$\times 10^{-3}$	CL=90%	1824
$\eta 2(\pi^+\pi^-)$	$<$	2.43	%	CL=90%	1804
$\eta\rho^0\pi^+\pi^-$	$<$	1.45	%	CL=90%	1708
$\eta' 3\pi$	$<$	2.44	$\times 10^{-3}$	CL=90%	1740
$K^+K^-\pi^+\pi^-$	$<$	9.0	$\times 10^{-4}$	CL=90%	1772
$\phi\pi^+\pi^-$	$<$	4.1	$\times 10^{-4}$	CL=90%	1737
$K^+K^-2\pi^0$	$<$	4.2	$\times 10^{-3}$	CL=90%	1774
$4(\pi^+\pi^-)$	$<$	1.67	%	CL=90%	1757
$4(\pi^+\pi^-)\pi^0$	$<$	3.06	%	CL=90%	1720
$\phi f_0(980)$	$<$	4.5	$\times 10^{-4}$	CL=90%	1597
$K^+K^-\pi^+\pi^-\pi^0$	$<$	2.36	$\times 10^{-3}$	CL=90%	1741
$K^+K^-\rho^0\pi^0$	$<$	8	$\times 10^{-4}$	CL=90%	1624
$K^+K^-\rho^+\pi^-$	$<$	1.46	%	CL=90%	1622
ωK^+K^-	$<$	3.4	$\times 10^{-4}$	CL=90%	1664
$\phi\pi^+\pi^-\pi^0$	$<$	3.8	$\times 10^{-3}$	CL=90%	1722
$K^{*0}K^-\pi^+\pi^0$ + c.c.	$<$	1.62	%	CL=90%	1693
$K^{*+}K^-\pi^+\pi^-$ + c.c.	$<$	3.23	%	CL=90%	1692
$K^+K^-\pi^+\pi^-2\pi^0$	$<$	2.67	%	CL=90%	1705
$K^+K^-2(\pi^+\pi^-)$	$<$	1.03	%	CL=90%	1702
$K^+K^-2(\pi^+\pi^-)\pi^0$	$<$	3.60	%	CL=90%	1660
ηK^+K^-	$<$	4.1	$\times 10^{-4}$	CL=90%	1712
$\eta K^+K^-\pi^+\pi^-$	$<$	1.24	%	CL=90%	1624
$\rho^0 K^+K^-$	$<$	5.0	$\times 10^{-3}$	CL=90%	1665
$2(K^+K^-)$	$<$	6.0	$\times 10^{-4}$	CL=90%	1552
ϕK^+K^-	$<$	7.5	$\times 10^{-4}$	CL=90%	1598
$2(K^+K^-)\pi^0$	$<$	2.9	$\times 10^{-4}$	CL=90%	1493
$2(K^+K^-)\pi^+\pi^-$	$<$	3.2	$\times 10^{-3}$	CL=90%	1425
$K^0_S K^-\pi^+$	$<$	3.2	$\times 10^{-3}$	CL=90%	1799
$K^0_S K^-\pi^+\pi^0$	$<$	1.33	%	CL=90%	1773
$K^0_S K^-\rho^+$	$<$	6.6	$\times 10^{-3}$	CL=90%	1664

$K^0_S K^- 2\pi^+\pi^-$	$<$	8.7	$\times 10^{-3}$	CL=90%	1739
$K^0_S K^-\pi^+\rho^0$	$<$	1.6	%	CL=90%	1621
$K^0_S K^-\pi^+\eta$	$<$	1.3	%	CL=90%	1669
$K^0_S K^- 2\pi^+\pi^-\pi^0$	$<$	4.18	%	CL=90%	1703
$K^0_S K^- 2\pi^+\pi^-\eta$	$<$	4.8	%	CL=90%	1570
$K^0_S K^-\pi^+ 2(\pi^+\pi^-)$	$<$	1.22	%	CL=90%	1658
$K^0_S K^-\pi^+ 2\pi^0$	$<$	2.65	%	CL=90%	1742
$K^0_S K^- K^+ K^-\pi^+$	$<$	4.9	$\times 10^{-3}$	CL=90%	1490
$K^0_S K^- K^+ K^-\pi^+\pi^0$	$<$	3.0	%	CL=90%	1427
$K^0_S K^- K^+ K^-\pi^+\eta$	$<$	2.2	%	CL=90%	1214
$K^{*0} K^-\pi^+ +$ c.c.	$<$	9.7	$\times 10^{-3}$	CL=90%	1722
$p\overline{p}\pi^0$	$<$	4	$\times 10^{-5}$	CL=90%	1595
$p\overline{p}\pi^+\pi^-$	$<$	5.8	$\times 10^{-4}$	CL=90%	1544
$\Lambda\overline{\Lambda}$	$<$	1.2	$\times 10^{-4}$	CL=90%	1521
$p\overline{p}\pi^+\pi^-\pi^0$	$<$	1.85	$\times 10^{-3}$	CL=90%	1490
$\omega p\overline{p}$	$<$	2.9	$\times 10^{-4}$	CL=90%	1309
$\Lambda\overline{\Lambda}\pi^0$	$<$	7	$\times 10^{-5}$	CL=90%	1468
$p\overline{p} 2(\pi^+\pi^-)$	$<$	2.6	$\times 10^{-3}$	CL=90%	1425
$\eta p\overline{p}$	$<$	5.4	$\times 10^{-4}$	CL=90%	1430
$\eta p\overline{p}\pi^+\pi^-$	$<$	3.3	$\times 10^{-3}$	CL=90%	1284
$\rho^0 p\overline{p}$	$<$	1.7	$\times 10^{-3}$	CL=90%	1313
$p\overline{p} K^+ K^-$	$<$	3.2	$\times 10^{-4}$	CL=90%	1185
$\eta p\overline{p} K^+ K^-$	$<$	6.9	$\times 10^{-3}$	CL=90%	736
$\pi^0 p\overline{p} K^+ K^-$	$<$	1.2	$\times 10^{-3}$	CL=90%	1093
$\phi p\overline{p}$	$<$	1.3	$\times 10^{-4}$	CL=90%	1178
$\Lambda\overline{\Lambda}\pi^+\pi^-$	$<$	2.5	$\times 10^{-4}$	CL=90%	1404
$\Lambda\overline{p} K^+$	$<$	2.8	$\times 10^{-4}$	CL=90%	1387
$\Lambda\overline{p} K^+\pi^+\pi^-$	$<$	6.3	$\times 10^{-4}$	CL=90%	1234
$\Lambda\overline{\Lambda}\eta$	$<$	1.9	$\times 10^{-4}$	CL=90%	1262
$\Sigma^+\overline{\Sigma}^-$	$<$	1.0	$\times 10^{-4}$	CL=90%	1464
$\Sigma^0\overline{\Sigma}^0$	$<$	4	$\times 10^{-5}$	CL=90%	1462
$\Xi^+\overline{\Xi}^-$	$<$	1.5	$\times 10^{-4}$	CL=90%	1346
$\Xi^0\overline{\Xi}^0$	$<$	1.4	$\times 10^{-4}$	CL=90%	1353

Radiative decays

$\gamma\chi_{c2}$	$<$	6.4	$\times 10^{-4}$	CL=90%	211
$\gamma\chi_{c1}$	(	2.48$\pm$0.23)	$\times 10^{-3}$		253
$\gamma\chi_{c0}$	(	7.0 $\pm$0.6)	$\times 10^{-3}$		341
$\gamma\eta_c$	$<$	7	$\times 10^{-4}$	CL=90%	707
$\gamma\eta_c(2S)$	$<$	9	$\times 10^{-4}$	CL=90%	132
$\gamma\eta'$	$<$	1.8	$\times 10^{-4}$	CL=90%	1765
$\gamma\eta$	$<$	1.5	$\times 10^{-4}$	CL=90%	1847
$\gamma\pi^0$	$<$	2	$\times 10^{-4}$	CL=90%	1884

$\psi(3823)$ was $X(3823)$,

$I^G(J^{PC}) = ?^?(2^{--})$
J, P need confirmation.

Mass $m = 3822.2 \pm 1.2$ MeV
Full width $\Gamma < 16$ MeV, CL = 90%

$\psi(3823)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\chi_{c1}\gamma$	seen	299
$\chi_{c2}\gamma$	not seen	257

$X(3872)$

$I^G(J^{PC}) = 0^+(1^{++})$

Mass $m = 3871.69 \pm 0.17$ MeV
$m_{X(3872)} - m_{J/\psi} = 775 \pm 4$ MeV
$m_{X(3872)} - m_{\psi(2S)}$
Full width $\Gamma < 1.2$ MeV, CL = 90%

$X(3872)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi^+\pi^- J/\psi(1S)$	> 2.6 %	650
$\omega J/\psi(1S)$	> 1.9 %	†
$D^0\overline{D}^0\pi^0$	>32 %	117
$\overline{D}^{*0}D^0$	>24 %	3
$\gamma J/\psi$	$> 6 \times 10^{-3}$	697
$\gamma\psi(2S)$	> 3.0 %	181
$\pi^+\pi^-\eta_c(1S)$	not seen	746
$p\overline{p}$	not seen	1693

$X(3900)$

$I^G(J^{PC}) = 1^+(1^{+-})$

Mass $m = 3886.6 \pm 2.4$ MeV (S = 1.6)
Full width $\Gamma = 28.1 \pm 2.6$ MeV

$X(3900)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$J/\psi\pi$	seen	699
$h_c\pi^\pm$	not seen	318
$\eta_c\pi^+\pi^-$	not seen	759
$(D\overline{D}^*)^\pm$	seen	–
D^0D^{*-} + c.c.	seen	150
D^-D^{*0} + c.c.	seen	141
$\omega\pi^\pm$	not seen	1862

$J/\psi\eta$	not seen	509
D^+D^{*-} + c.c	seen	–
$D^0\overline{D}^{*0}$ + c.c	seen	–

$X(3915)$ was $\chi_{c0}(3915)$

$I^G(J^{PC}) = 0^+(0 \text{ or } 2^{++})$

Mass $m = 3918.4 \pm 1.9$ MeV
Full width $\Gamma = 20 \pm 5$ MeV (S = 1.1)

$X(3915)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\omega J/\psi$	seen	222
$\pi^+\pi^-\eta_c(1S)$	not seen	785
$\eta_c\eta$	not seen	665
$\eta_c\pi^0$	not seen	815
$K\overline{K}$	not seen	1896
$\gamma\gamma$	seen	1959

$\chi_{c2}(2P)$

$I^G(J^{PC}) = 0^+(2^{++})$

Mass $m = 3927.2 \pm 2.6$ MeV
Full width $\Gamma = 24 \pm 6$ MeV

$\chi_{c2}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\gamma\gamma$	seen	1964
$D\overline{D}$	seen	615
D^+D^-	seen	600
$D^0\overline{D}^0$	seen	615
$\pi^+\pi^-\eta_c(1S)$	not seen	793
$K\overline{K}$	not seen	1901

$X(4020)$

$I(J^P) = 1(?^?)$

Mass $m = 4024.1 \pm 1.9$ MeV
Full width $\Gamma = 13 \pm 5$ MeV (S = 1.7)

$X(4020)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$h_c(1P)\pi$	seen	450
$D^*\overline{D}^*$	seen	85
$D\overline{D}^*$ + c.c.	not seen	542
$\eta_c\pi^+\pi^-$	not seen	872

$\psi(4040)$ [yyaa]

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 4039 \pm 1$ MeV
Full width $\Gamma = 80 \pm 10$ MeV
$\Gamma_{ee} = 0.86 \pm 0.07$ keV

Due to the complexity of the $c\overline{c}$ threshold region, in this listing, "seen" ("not seen") means that a cross section for the mode in question has been measured at effective $\sqrt{s}$ near this particle's central mass value, more (less) than 2σ above zero, without regard to any peaking behavior in $\sqrt{s}$ or absence thereof. See mode listing(s) for details and references.

$\psi(4040)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
e^+e^-	$(1.07\pm0.16)\times10^{-5}$		2019
$D\overline{D}$	seen		775
$D^0\overline{D}^0$	seen		775
D^+D^-	seen		764
$D^*\overline{D}$ + c.c.	seen		569
$D^*(2007)^0\overline{D}^0$ + c.c.	seen		575
$D^*(2010)^+D^-$ + c.c.	seen		561
$D^*\overline{D}^*$	seen		193
$D^*(2007)^0\overline{D}^*(2007)^0$	seen		226
$D^*(2010)^+D^*(2010)^-$	seen		193
$D^0D^-\pi^+$ +c.c. (excl. $D^*(2007)^0\overline{D}^0$ +c.c., $D^*(2010)^+D^-$ +c.c.)	not seen		–
$D\overline{D}^*\pi$ (excl. $D^*\overline{D}^*$)	not seen		–
$D^0\overline{D}^{*-}\pi^+$ +c.c. (excl. $D^*(2010)^+D^*(2010)^-$)	seen		–
$D_s^+D_s^-$	seen		452
$J/\psi\pi^+\pi^-$	$< 4 \times 10^{-3}$	90%	794
$J/\psi\pi^0\pi^0$	$< 2 \times 10^{-3}$	90%	797
$J/\psi\eta$	$(5.2\ \pm0.7\ )\times10^{-3}$		675
$J/\psi\pi^0$	$< 2.8 \times 10^{-4}$	90%	823
$J/\psi\pi^+\pi^-\pi^0$	$< 2 \times 10^{-3}$	90%	746
$\chi_{c1}\gamma$	$< 3.4 \times 10^{-3}$	90%	494
$\chi_{c2}\gamma$	$< 5 \times 10^{-3}$	90%	454
$\chi_{c1}\pi^+\pi^-\pi^0$	< 1.1 %	90%	306
$\chi_{c2}\pi^+\pi^-\pi^0$	< 3.2 %	90%	233
$h_c(1P)\pi^+\pi^-$	$< 3 \times 10^{-3}$	90%	403
$\phi\pi^+\pi^-$	$< 3 \times 10^{-3}$	90%	1880
$\Lambda\overline{\Lambda}\pi^+\pi^-$	$< 2.9 \times 10^{-4}$	90%	1578
$\Lambda\overline{\Lambda}\pi^0$	$< 9 \times 10^{-5}$	90%	1636

$\Lambda\overline{\Lambda}\eta$	< 3.0	$\times 10^{-4}$	90%	1452
$\Sigma^+\overline{\Sigma}^-$	< 1.3	$\times 10^{-4}$	90%	1632
$\Sigma^0\overline{\Sigma}^0$	< 7	$\times 10^{-5}$	90%	1630
$\Xi^+\overline{\Xi}^-$	< 1.6	$\times 10^{-4}$	90%	1527
$\Xi^0\overline{\Xi}^0$	< 1.8	$\times 10^{-4}$	90%	1533

$X(4140)$

$I^G(J^{PC}) = 0^+(?^{?+})$

Mass $m = 4146.9 \pm 3.1$ MeV (S = 1.3)
Full width $\Gamma = 15^{+6}_{-5}$ MeV

***X*(4140) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$J/\psi\phi$	seen	217
$\gamma\gamma$	not seen	2073

$\psi(4160)$ [yyaa]

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 4191 \pm 5$ MeV
Full width $\Gamma = 70 \pm 10$ MeV
$\Gamma_{ee} = 0.48 \pm 0.22$ keV

Due to the complexity of the $c\overline{c}$ threshold region, in this listing, "seen" ("not seen") means that a cross section for the mode in question has been measured at effective $\sqrt{s}$ near this particle's central mass value, more (less) than 2σ above zero, without regard to any peaking behavior in $\sqrt{s}$ or absence thereof. See mode listing(s) for details and references.

***ψ*(4160) DECAY MODES**	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
e^+e^-	$(6.9 \pm 3.3) \times 10^{-6}$		2096
$\mu^+\mu^-$	seen		2093
$D\overline{D}$	seen		956
$D^0\overline{D}^0$	seen		956
D^+D^-	seen		947
$D^*\overline{D}$ + c.c.	seen		798
$D^*(2007)^0\overline{D}^0$ + c.c.	seen		802
$D^*(2010)^+D^-$ + c.c.	seen		792
$D^*\overline{D}^*$	seen		592
$D^*(2007)^0\overline{D}^*(2007)^0$	seen		604
$D^*(2010)^+D^*(2010)^-$	seen		592
$D^0D^-\pi^+$ +c.c. (excl. $D^*(2007)^0\overline{D}^0$ +c.c., $D^*(2010)^+D^-$ +c.c.)	not seen		–
$D\overline{D}^*\pi$ +c.c. (excl. $D^*\overline{D}^*$)	seen		–

$D^0 D^{*-}\pi^+$ +c.c. (excl. $D^*(2010)^+ D^*(2010)^-$)	not seen			–
$D_s^+ D_s^-$	not seen			720
$D_s^{*+} D_s^-$ +c.c.	seen			385
$J/\psi\pi^+\pi^-$	< 3	$\times 10^{-3}$	90%	919
$J/\psi\pi^0\pi^0$	< 3	$\times 10^{-3}$	90%	922
$J/\psi K^+ K^-$	< 2	$\times 10^{-3}$	90%	407
$J/\psi\eta$	< 8	$\times 10^{-3}$	90%	822
$J/\psi\pi^0$	< 1	$\times 10^{-3}$	90%	944
$J/\psi\eta'$	< 5	$\times 10^{-3}$	90%	457
$J/\psi\pi^+\pi^-\pi^0$	< 1	$\times 10^{-3}$	90%	879
$\psi(2S)\pi^+\pi^-$	< 4	$\times 10^{-3}$	90%	396
$\chi_{c1}\gamma$	< 5	$\times 10^{-3}$	90%	625
$\chi_{c2}\gamma$	< 1.3	%	90%	587
$\chi_{c1}\pi^+\pi^-\pi^0$	< 2	$\times 10^{-3}$	90%	496
$\chi_{c2}\pi^+\pi^-\pi^0$	< 8	$\times 10^{-3}$	90%	445
$h_c(1P)\pi^+\pi^-$	< 5	$\times 10^{-3}$	90%	556
$h_c(1P)\pi^0\pi^0$	< 2	$\times 10^{-3}$	90%	560
$h_c(1P)\eta$	< 2	$\times 10^{-3}$	90%	348
$h_c(1P)\pi^0$	< 4	$\times 10^{-4}$	90%	600
$\phi\pi^+\pi^-$	< 2	$\times 10^{-3}$	90%	1961
$\gamma X(3872) \rightarrow \gamma J/\psi\pi^+\pi^-$	< 6.8	$\times 10^{-5}$	90%	–
$\gamma X(3915) \rightarrow \gamma J/\psi\pi^+\pi^-$	< 1.36	$\times 10^{-4}$	90%	–
$\gamma X(3930) \rightarrow \gamma J/\psi\pi^+\pi^-$	< 1.18	$\times 10^{-4}$	90%	–
$\gamma X(3940) \rightarrow \gamma J/\psi\pi^+\pi^-$	< 1.47	$\times 10^{-4}$	90%	–
$\gamma X(3872) \rightarrow \gamma\gamma J/\psi$	< 1.05	$\times 10^{-4}$	90%	–
$\gamma X(3915) \rightarrow \gamma\gamma J/\psi$	< 1.26	$\times 10^{-4}$	90%	–
$\gamma X(3930) \rightarrow \gamma\gamma J/\psi$	< 8.8	$\times 10^{-5}$	90%	–
$\gamma X(3940) \rightarrow \gamma\gamma J/\psi$	< 1.79	$\times 10^{-4}$	90%	–

$X(4260)$

$I^G(J^{PC}) = ?^?(1^{--})$

Mass $m = 4251 \pm 9$ MeV (S = 1.6)
Full width $\Gamma = 120 \pm 12$ MeV (S = 1.1)

***X*(4260) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$J/\psi\pi^+\pi^-$	seen	967
$J/\psi f_0(980)$, $f_0(980) \rightarrow \pi^+\pi^-$	seen	–
$X(3900)^\pm\pi^\mp$, $X^\pm \rightarrow J/\psi\pi^\pm$	seen	–
$J/\psi\pi^0\pi^0$	seen	969
$J/\psi K^+ K^-$	seen	512
$J/\psi K_S^0 K_S^0$	not seen	501

$X(3872)\gamma$	seen	363
$J/\psi\eta$	not seen	876
$J/\psi\pi^0$	not seen	991
$J/\psi\eta'$	not seen	552
$J/\psi\pi^+\pi^-\pi^0$	not seen	930
$J/\psi\eta\pi^0$	not seen	801
$J/\psi\eta\eta$	not seen	311
$\psi(2S)\pi^+\pi^-$	not seen	459
$\psi(2S)\eta$	not seen	129
$\chi_{c0}\omega$	not seen	265
$\chi_{c1}\gamma$	not seen	676
$\chi_{c2}\gamma$	not seen	638
$\chi_{c1}\pi^+\pi^-\pi^0$	not seen	560
$\chi_{c2}\pi^+\pi^-\pi^0$	not seen	512
$h_c(1P)\pi^+\pi^-$	not seen	613
$\phi\pi^+\pi^-$	not seen	1993
$\quad\phi f_0(980) \rightarrow\ \phi\pi^+\pi^-$	not seen	–
$D\overline{D}$	not seen	1020
$\quad D^0\overline{D}^0$	not seen	1020
$\quad D^+D^-$	not seen	1011
$D^*\overline{D}$ +c.c.	not seen	887
$\quad D^*(2007)^0\overline{D}^0$ +c.c.	not seen	–
$\quad D^*(2010)^+D^-$ +c.c.	not seen	–
$D^*\overline{D}^*$	not seen	691
$\quad D^*(2007)^0\overline{D}^*(2007)^0$	not seen	701
$\quad D^*(2010)^+D^*(2010)^-$	not seen	691
$\quad D^0D^-\pi^+$ +c.c. (excl. $D^*(2007)^0\overline{D}^{*0}$ +c.c., $D^*(2010)^+D^-$ +c.c.)	not seen	–
$D\overline{D}^*\pi$ +c.c. (excl. $D^*\overline{D}^*$)	not seen	723
$D^0D^{*-}\pi^+$ +c.c. (excl. $D^*(2010)^+D^*(2010)^-$)	not seen	–
$\quad D^0D^*(2010)^-\pi^+$ +c.c.	not seen	716
$D^*\overline{D}^*\pi$	not seen	449
$D_s^+D_s^-$	not seen	803
$D_s^{*+}D_s^-$ +c.c.	not seen	615
$D_s^{*+}D_s^{*-}$	not seen	239
$p\overline{p}$	not seen	1907
$K_S^0K^\pm\pi^\mp$	not seen	2048
$K^+K^-\pi^0$	not seen	2049

X(4360)

$I^G(J^{PC}) = ?^?(1^{--})$

$X(4360)$ MASS $= 4346 \pm 6$ MeV
$X(4360)$ WIDTH $= 102 \pm 10$ MeV

X(4360) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\psi(2S)\pi^+\pi^-$	seen	552
$\psi(3823)\pi^+\pi^-$	possibly seen	416

ψ(4415) [yyaa]

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 4421 \pm 4$ MeV
Full width $\Gamma = 62 \pm 20$ MeV
$\Gamma_{ee} = 0.58 \pm 0.07$ keV

Due to the complexity of the $c\overline{c}$ threshold region, in this listing, "seen" ("not seen") means that a cross section for the mode in question has been measured at effective $\sqrt{s}$ near this particle's central mass value, more (less) than 2σ above zero, without regard to any peaking behavior in $\sqrt{s}$ or absence thereof. See mode listing(s) for details and references.

ψ(4415) DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$D\overline{D}$	seen		1187
$D^0\overline{D}^0$	seen		1187
D^+D^-	seen		1179
$D^*\overline{D}$ + c.c.	seen		1063
$D^*(2007)^0\overline{D}^0$ + c.c.	seen		1067
$D^*(2010)^+D^-$ + c.c.	seen		1059
$D^*\overline{D}^*$	seen		919
$D^*(2007)^0\overline{D}^*(2007)^0$ + c.c.	seen		927
$D^*(2010)^+D^*(2010)^-$ + c.c.	seen		919
$D^0D^-\pi^+$ (excl. $D^*(2007)^0\overline{D}^0$ +c.c., $D^*(2010)^+D^-$ +c.c.	< 2.3 %	90%	–
$D\overline{D}_2^*(2460) \to D^0D^-\pi^+$+c.c.	(10 ±4) %		–
$D^0D^{*-}\pi^+$+c.c.	< 11 %	90%	926
$D_s^+D_s^-$	not seen		1006
$\omega\chi_{c2}$	possibly seen		330
$D_s^{*+}D_s^-$+c.c.	seen		–
$D_s^{*+}D_s^{*-}$	not seen		652
$\psi(3823)\pi^+\pi^-$	possibly seen		494
$J/\psi\eta$	$< 6 \times 10^{-3}$	90%	1022
$\chi_{c1}\gamma$	$< 8 \times 10^{-4}$	90%	817
$\chi_{c2}\gamma$	$< 4 \times 10^{-3}$	90%	780
e^+e^-	$(9.4\pm3.2) \times 10^{-6}$		2210

$X(4430)^{\pm}$

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

Quantum numbers not established.

Mass $m = 4478^{+15}_{-18}$ MeV
Full width $\Gamma = 181 \pm 31$ MeV

$X(4430)^{\pm}$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi^+\psi(2S)$	seen	711
$\pi^+ J/\psi$	seen	1162

$X(4660)$

$I^G(J^{PC}) = ?^?(1^{--})$

$X(4660)$ MASS $= 4643 \pm 9$ MeV (S = 1.2)
$X(4660)$ WIDTH $= 72 \pm 11$ MeV

$X(4660)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\psi(2S)\pi^+\pi^-$	seen	820

$\eta_b(1S)$

$I^G(J^{PC}) = 0^+(0^{-+})$

Mass $m = 9399.0 \pm 2.3$ MeV (S = 1.6)
Full width $\Gamma = 10^{+5}_{-4}$ MeV

$\eta_b(1S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
hadrons	seen		–
$3h^+3h^-$	not seen		4673
$2h^+2h^-$	not seen		4689
$\gamma\gamma$	not seen		4700
$\mu^+\mu^-$	$<9\times10^{-3}$	90%	4698
$\tau^+\tau^-$	<8 %	90%	4351

$\Upsilon(1S)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 9460.30 \pm 0.26$ MeV (S = 3.3)
Full width $\Gamma = 54.02 \pm 1.25$ keV
$\Gamma_{ee} = 1.340 \pm 0.018$ keV

$\Upsilon(1S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\tau^+\tau^-$	(2.60 ±0.10) %		4384
e^+e^-	(2.38 ±0.11) %		4730
$\mu^+\mu^-$	(2.48 ±0.05) %		4729
Hadronic decays			
ggg	(81.7 ±0.7) %		–
γgg	(2.2 ±0.6) %		–
$\eta'(958)$ anything	(2.94 ±0.24) %		–
$J/\psi(1S)$ anything	(6.5 ±0.7) $\times 10^{-4}$		4223
$J/\psi(1S)\eta_c$	$< 2.2 \times 10^{-6}$	90%	3624
$J/\psi(1S)\chi_{c0}$	$< 3.4 \times 10^{-6}$	90%	3429
$J/\psi(1S)\chi_{c1}$	(3.9 ±1.2) $\times 10^{-6}$		3382
$J/\psi(1S)\chi_{c2}$	$< 1.4 \times 10^{-6}$	90%	3359
$J/\psi(1S)\eta_c(2S)$	$< 2.2 \times 10^{-6}$	90%	3316
$J/\psi(1S)X(3940)$	$< 5.4 \times 10^{-6}$	90%	3148
$J/\psi(1S)X(4160)$	$< 5.4 \times 10^{-6}$	90%	3018
χ_{c0} anything	$< 5 \times 10^{-3}$	90%	–
χ_{c1} anything	(2.3 ±0.7) $\times 10^{-4}$		–
χ_{c2} anything	(3.4 ±1.0) $\times 10^{-4}$		–
$\psi(2S)$ anything	(2.7 ±0.9) $\times 10^{-4}$		–
$\psi(2S)\eta_c$	$< 3.6 \times 10^{-6}$	90%	3345
$\psi(2S)\chi_{c0}$	$< 6.5 \times 10^{-6}$	90%	3124
$\psi(2S)\chi_{c1}$	$< 4.5 \times 10^{-6}$	90%	3070
$\psi(2S)\chi_{c2}$	$< 2.1 \times 10^{-6}$	90%	3043
$\psi(2S)\eta_c(2S)$	$< 3.2 \times 10^{-6}$	90%	2993
$\psi(2S)X(3940)$	$< 2.9 \times 10^{-6}$	90%	2797
$\psi(2S)X(4160)$	$< 2.9 \times 10^{-6}$	90%	2642
$\rho\pi$	$< 3.68 \times 10^{-6}$	90%	4697
$\omega\pi^0$	$< 3.90 \times 10^{-6}$	90%	4697
$\pi^+\pi^-$	$< 5 \times 10^{-4}$	90%	4728
K^+K^-	$< 5 \times 10^{-4}$	90%	4704
$p\overline{p}$	$< 5 \times 10^{-4}$	90%	4636
$\pi^+\pi^-\pi^0$	(2.1 ±0.8) $\times 10^{-6}$		4725
ϕK^+K^-	(2.4 ±0.5) $\times 10^{-6}$		4622
$\omega\pi^+\pi^-$	(4.5 ±1.0) $\times 10^{-6}$		4694
$K^*(892)^0K^-\pi^+$ + c.c.	(4.4 ±0.8) $\times 10^{-6}$		4667
$\phi f_2'(1525)$	$< 1.63 \times 10^{-6}$	90%	4549
$\omega f_2(1270)$	$< 1.79 \times 10^{-6}$	90%	4611
$\rho(770)a_2(1320)$	$< 2.24 \times 10^{-6}$	90%	4605
$K^*(892)^0\overline{K}_2^*(1430)^0$ + c.c.	(3.0 ±0.8) $\times 10^{-6}$		4579
$K_1(1270)^\pm K^\mp$	$< 2.41 \times 10^{-6}$	90%	4631
$K_1(1400)^\pm K^\mp$	(1.0 ±0.4) $\times 10^{-6}$		4613

$b_1(1235)^{\pm}\pi^{\mp}$		< 1.25	$\times 10^{-6}$	90%	4649
$\pi^+\pi^-\pi^0\pi^0$		$(1.28 \pm 0.30) \times 10^{-5}$			4720
$K^0_S K^+\pi^-$ + c.c.		$(1.6 \pm 0.4) \times 10^{-6}$			4696
$K^*(892)^0\overline{K}^0$ + c.c.		$(2.9 \pm 0.9) \times 10^{-6}$			4675
$K^*(892)^- K^+$ + c.c.		< 1.11	$\times 10^{-6}$	90%	4675
$D^*(2010)^{\pm}$ anything		(2.52 ± 0.20) %			–
$\overline{^2H}$ anything		$(2.85 \pm 0.25) \times 10^{-5}$			–
Sum of 100 exclusive modes		(1.200 ± 0.017) %			–

Radiative decays

$\gamma\pi^+\pi^-$		$(6.3 \pm 1.8) \times 10^{-5}$			4728
$\gamma\pi^0\pi^0$		$(1.7 \pm 0.7) \times 10^{-5}$			4728
$\gamma\pi^0\eta$		< 2.4	$\times 10^{-6}$	90%	4713
$\gamma K^+ K^-$	[zzaa]	$(1.14 \pm 0.13) \times 10^{-5}$			4704
$\gamma p\overline{p}$	[aabb]	< 6	$\times 10^{-6}$	90%	4636
$\gamma 2h^+ 2h^-$		$(7.0 \pm 1.5) \times 10^{-4}$			4720
$\gamma 3h^+ 3h^-$		$(5.4 \pm 2.0) \times 10^{-4}$			4703
$\gamma 4h^+ 4h^-$		$(7.4 \pm 3.5) \times 10^{-4}$			4679
$\gamma\pi^+\pi^- K^+ K^-$		$(2.9 \pm 0.9) \times 10^{-4}$			4686
$\gamma 2\pi^+ 2\pi^-$		$(2.5 \pm 0.9) \times 10^{-4}$			4720
$\gamma 3\pi^+ 3\pi^-$		$(2.5 \pm 1.2) \times 10^{-4}$			4703
$\gamma 2\pi^+ 2\pi^- K^+ K^-$		$(2.4 \pm 1.2) \times 10^{-4}$			4658
$\gamma\pi^+\pi^- p\overline{p}$		$(1.5 \pm 0.6) \times 10^{-4}$			4604
$\gamma 2\pi^+ 2\pi^- p\overline{p}$		$(4 \pm 6) \times 10^{-5}$			4563
$\gamma 2K^+ 2K^-$		$(2.0 \pm 2.0) \times 10^{-5}$			4601
$\gamma\eta'(958)$		< 1.9	$\times 10^{-6}$	90%	4682
$\gamma\eta$		< 1.0	$\times 10^{-6}$	90%	4714
$\gamma f_0(980)$		< 3	$\times 10^{-5}$	90%	4678
$\gamma f'_2(1525)$		$(3.8 \pm 0.9) \times 10^{-5}$			4607
$\gamma f_2(1270)$		$(1.01 \pm 0.09) \times 10^{-4}$			4644
$\gamma\eta(1405)$		< 8.2	$\times 10^{-5}$	90%	4625
$\gamma f_0(1500)$		< 1.5	$\times 10^{-5}$	90%	4611
$\gamma f_0(1710)$		< 2.6	$\times 10^{-4}$	90%	4573
$\gamma f_0(1710) \to \gamma K^+ K^-$		< 7	$\times 10^{-6}$	90%	–
$\gamma f_0(1710) \to \gamma\pi^0\pi^0$		< 1.4	$\times 10^{-6}$	90%	–
$\gamma f_0(1710) \to \gamma\eta\eta$		< 1.8	$\times 10^{-6}$	90%	–
$\gamma f_4(2050)$		< 5.3	$\times 10^{-5}$	90%	4515
$\gamma f_0(2200) \to \gamma K^+ K^-$		< 2	$\times 10^{-4}$	90%	4475
$\gamma f_J(2220) \to \gamma K^+ K^-$		< 8	$\times 10^{-7}$	90%	4469
$\gamma f_J(2220) \to \gamma\pi^+\pi^-$		< 6	$\times 10^{-7}$	90%	–
$\gamma f_J(2220) \to \gamma p\overline{p}$		< 1.1	$\times 10^{-6}$	90%	–
$\gamma\eta(2225) \to \gamma\phi\phi$		< 3	$\times 10^{-3}$	90%	4469
$\gamma\eta_c(1S)$		< 5.7	$\times 10^{-5}$	90%	4260
$\gamma\chi_{c0}$		< 6.5	$\times 10^{-4}$	90%	4114

$\gamma\chi_{c1}$		<	2.3	$\times 10^{-5}$	90%	4079
$\gamma\chi_{c2}$		<	7.6	$\times 10^{-6}$	90%	4062
$\gamma X(3872) \rightarrow \pi^+\pi^- J/\psi$		<	1.6	$\times 10^{-6}$	90%	–
$\gamma X(3872) \rightarrow \pi^+\pi^-\pi^0 J/\psi$		<	2.8	$\times 10^{-6}$	90%	–
$\gamma X(3915) \rightarrow \omega J/\psi$		<	3.0	$\times 10^{-6}$	90%	–
$\gamma X(4140) \rightarrow \phi J/\psi$		<	2.2	$\times 10^{-6}$	90%	–
γX	[bbbb]	<	4.5	$\times 10^{-6}$	90%	–
$\gamma X\overline{X}(m_X < 3.1$ GeV)	[ccbb]	<	1	$\times 10^{-3}$	90%	–
$\gamma X\overline{X}(m_X < 4.5$ GeV)	[ddbb]	<	2.4	$\times 10^{-4}$	90%	–
$\gamma X \rightarrow \gamma +\geq 4$ prongs	[eebb]	<	1.78	$\times 10^{-4}$	95%	–
$\gamma a_1^0 \rightarrow \gamma\mu^+\mu^-$	[ffbb]	<	9	$\times 10^{-6}$	90%	–
$\gamma a_1^0 \rightarrow \gamma\tau^+\tau^-$	[zzaa]	<	1.30	$\times 10^{-4}$	90%	–
$\gamma a_1^0 \rightarrow \gamma g g$	[ggbb]	<	1	%	90%	–
$\gamma a_1^0 \rightarrow \gamma s\overline{s}$	[ggbb]	<	1	$\times 10^{-3}$	90%	–

Lepton Family number (*LF*) violating modes

$\mu^\pm\tau^\mp$	*LF*	<	6.0	$\times 10^{-6}$	95%	4563

Other decays

invisible		<	3.0	$\times 10^{-4}$	90%	–

$\chi_{b0}(1P)$ [hhbb]

$I^G(J^{PC}) = 0^+(0^{++})$
J needs confirmation.

Mass $m = 9859.44 \pm 0.42 \pm 0.31$ MeV

$\chi_{b0}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma\Upsilon(1S)$	(1.76±0.35) %		391
$D^0 X$	< 10.4 %	90%	–
$\pi^+\pi^- K^+ K^-\pi^0$	< 1.6 $\times 10^{-4}$	90%	4875
$2\pi^+\pi^- K^- K_S^0$	< 5 $\times 10^{-5}$	90%	4875
$2\pi^+\pi^- K^- K_S^0 2\pi^0$	< 5 $\times 10^{-4}$	90%	4846
$2\pi^+ 2\pi^- 2\pi^0$	< 2.1 $\times 10^{-4}$	90%	4905
$2\pi^+ 2\pi^- K^+ K^-$	(1.1 ±0.6) $\times 10^{-4}$		4861
$2\pi^+ 2\pi^- K^+ K^-\pi^0$	< 2.7 $\times 10^{-4}$	90%	4846
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	< 5 $\times 10^{-4}$	90%	4828
$3\pi^+ 2\pi^- K^- K_S^0\pi^0$	< 1.6 $\times 10^{-4}$	90%	4827
$3\pi^+ 3\pi^-$	< 8 $\times 10^{-5}$	90%	4904
$3\pi^+ 3\pi^- 2\pi^0$	< 6 $\times 10^{-4}$	90%	4881
$3\pi^+ 3\pi^- K^+ K^-$	(2.4 ±1.2) $\times 10^{-4}$		4827
$3\pi^+ 3\pi^- K^+ K^-\pi^0$	< 1.0 $\times 10^{-3}$	90%	4808
$4\pi^+ 4\pi^-$	< 8 $\times 10^{-5}$	90%	4880

$4\pi^+4\pi^-2\pi^0$	< 2.1	$\times 10^{-3}$	90%	4850
$J/\psi J/\psi$	< 7	$\times 10^{-5}$	90%	3836
$J/\psi\psi(2S)$	< 1.2	$\times 10^{-4}$	90%	3571
$\psi(2S)\psi(2S)$	< 3.1	$\times 10^{-5}$	90%	3273

$\chi_{b1}(1P)$ [hhbb]

$I^G(J^{PC}) = 0^+(1^{++})$
J needs confirmation.

Mass $m = 9892.78 \pm 0.26 \pm 0.31$ MeV

$\chi_{b1}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma\Upsilon(1S)$	(33.9±2.2) %		423
D^0X	(12.6±2.2) %		–
$\pi^+\pi^-K^+K^-\pi^0$	(2.0±0.6) $\times 10^{-4}$		4892
$2\pi^+\pi^-K^-K^0_S$	(1.3±0.5) $\times 10^{-4}$		4892
$2\pi^+\pi^-K^-K^0_S2\pi^0$	< 6 $\times 10^{-4}$	90%	4863
$2\pi^+2\pi^-2\pi^0$	(8.0±2.5) $\times 10^{-4}$		4921
$2\pi^+2\pi^-K^+K^-$	(1.5±0.5) $\times 10^{-4}$		4878
$2\pi^+2\pi^-K^+K^-\pi^0$	(3.5±1.2) $\times 10^{-4}$		4863
$2\pi^+2\pi^-K^+K^-2\pi^0$	(8.6±3.2) $\times 10^{-4}$		4845
$3\pi^+2\pi^-K^-K^0_S\pi^0$	(9.3±3.3) $\times 10^{-4}$		4844
$3\pi^+3\pi^-$	(1.9±0.6) $\times 10^{-4}$		4921
$3\pi^+3\pi^-2\pi^0$	(1.7±0.5) $\times 10^{-3}$		4898
$3\pi^+3\pi^-K^+K^-$	(2.6±0.8) $\times 10^{-4}$		4844
$3\pi^+3\pi^-K^+K^-\pi^0$	(7.5±2.6) $\times 10^{-4}$		4825
$4\pi^+4\pi^-$	(2.6±0.9) $\times 10^{-4}$		4897
$4\pi^+4\pi^-2\pi^0$	(1.4±0.6) $\times 10^{-3}$		4867
$J/\psi J/\psi$	< 2.7 $\times 10^{-5}$	90%	3857
$J/\psi\psi(2S)$	< 1.7 $\times 10^{-5}$	90%	3594
$\psi(2S)\psi(2S)$	< 6 $\times 10^{-5}$	90%	3298

$h_b(1P)$

$I^G(J^{PC}) = ?^?(1^{+-})$

Mass $m = 9899.3 \pm 0.8$ MeV

$h_b(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta_b(1S)\gamma$	(52^{+6}_{-5}) %	488

$\chi_{b2}(1P)$ [hhbb]

$I^G(J^{PC}) = 0^+(2^{++})$
J needs confirmation.

Mass $m = 9912.21 \pm 0.26 \pm 0.31$ MeV

$\chi_{b2}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma\,\Upsilon(1S)$	(19.1±1.2) %		442
$D^0 X$	< 7.9 %	90%	–
$\pi^+\pi^- K^+ K^- \pi^0$	(8 ±5) × 10^{-5}		4902
$2\pi^+\pi^- K^- K^0_S$	< 1.0 × 10^{-4}	90%	4901
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	(5.3±2.4) × 10^{-4}		4873
$2\pi^+ 2\pi^- 2\pi^0$	(3.5±1.4) × 10^{-4}		4931
$2\pi^+ 2\pi^- K^+ K^-$	(1.1±0.4) × 10^{-4}		4888
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	(2.1±0.9) × 10^{-4}		4872
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(3.9±1.8) × 10^{-4}		4855
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	< 5 × 10^{-4}	90%	4854
$3\pi^+ 3\pi^-$	(7.0±3.1) × 10^{-5}		4931
$3\pi^+ 3\pi^- 2\pi^0$	(1.0±0.4) × 10^{-3}		4908
$3\pi^+ 3\pi^- K^+ K^-$	< 8 × 10^{-5}	90%	4854
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	(3.6±1.5) × 10^{-4}		4835
$4\pi^+ 4\pi^-$	(8 ±4) × 10^{-5}		4907
$4\pi^+ 4\pi^- 2\pi^0$	(1.8±0.7) × 10^{-3}		4877
$J/\psi\,J/\psi$	< 4 × 10^{-5}	90%	3869
$J/\psi\,\psi(2S)$	< 5 × 10^{-5}	90%	3608
$\psi(2S)\psi(2S)$	< 1.6 × 10^{-5}	90%	3313

$\Upsilon(2S)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 10023.26 \pm 0.31$ MeV
$m_{\Upsilon(3S)} - m_{\Upsilon(2S)} = 331.50 \pm 0.13$ MeV
Full width $\Gamma = 31.98 \pm 2.63$ keV
$\Gamma_{ee} = 0.612 \pm 0.011$ keV

$\Upsilon(2S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\Upsilon(1S)\pi^+\pi^-$	(17.85± 0.26) %		475
$\Upsilon(1S)\pi^0\pi^0$	(8.6 ± 0.4) %		480
$\tau^+\tau^-$	(2.00± 0.21) %		4686
$\mu^+\mu^-$	(1.93± 0.17) %	S=2.2	5011
e^+e^-	(1.91± 0.16) %		5012
$\Upsilon(1S)\pi^0$	< 4 × 10^{-5}	CL=90%	531
$\Upsilon(1S)\eta$	(2.9 ± 0.4) × 10^{-4}	S=2.0	126
$J/\psi(1S)$ anything	< 6 × 10^{-3}	CL=90%	4533

$J/\psi(1S)\eta_c$	$<$ 5.4	$\times 10^{-6}$	CL=90%	3984
$J/\psi(1S)\chi_{c0}$	$<$ 3.4	$\times 10^{-6}$	CL=90%	3808
$J/\psi(1S)\chi_{c1}$	$<$ 1.2	$\times 10^{-6}$	CL=90%	3765
$J/\psi(1S)\chi_{c2}$	$<$ 2.0	$\times 10^{-6}$	CL=90%	3744
$J/\psi(1S)\eta_c(2S)$	$<$ 2.5	$\times 10^{-6}$	CL=90%	3706
$J/\psi(1S)X(3940)$	$<$ 2.0	$\times 10^{-6}$	CL=90%	3555
$J/\psi(1S)X(4160)$	$<$ 2.0	$\times 10^{-6}$	CL=90%	3440
$\psi(2S)\eta_c$	$<$ 5.1	$\times 10^{-6}$	CL=90%	3732
$\psi(2S)\chi_{c0}$	$<$ 4.7	$\times 10^{-6}$	CL=90%	3536
$\psi(2S)\chi_{c1}$	$<$ 2.5	$\times 10^{-6}$	CL=90%	3488
$\psi(2S)\chi_{c2}$	$<$ 1.9	$\times 10^{-6}$	CL=90%	3464
$\psi(2S)\eta_c(2S)$	$<$ 3.3	$\times 10^{-6}$	CL=90%	3421
$\psi(2S)X(3940)$	$<$ 3.9	$\times 10^{-6}$	CL=90%	3250
$\psi(2S)X(4160)$	$<$ 3.9	$\times 10^{-6}$	CL=90%	3118
$\overline{2H}$ anything	$(\ 2.78^{+\ 0.30}_{-\ 0.26}) \times 10^{-5}$		S=1.2	–
hadrons	(94 $\pm$11) %			–
$g\,g\,g$	(58.8 $\pm$ 1.2) %			–
$\gamma\,g\,g$	(1.87$\pm$ 0.28) %			–
$\phi K^+ K^-$	(1.6 $\pm$ 0.4) $\times 10^{-6}$			4910
$\omega\pi^+\pi^-$	$<$ 2.58	$\times 10^{-6}$	CL=90%	4977
$K^*(892)^0 K^-\pi^+$ + c.c.	(2.3 $\pm$ 0.7) $\times 10^{-6}$			4952
$\phi f_2'(1525)$	$<$ 1.33	$\times 10^{-6}$	CL=90%	4841
$\omega f_2(1270)$	$<$ 5.7	$\times 10^{-7}$	CL=90%	4899
$\rho(770)a_2(1320)$	$<$ 8.8	$\times 10^{-7}$	CL=90%	4894
$K^*(892)^0\overline{K}_2^*(1430)^0$ + c.c.	(1.5 $\pm$ 0.6) $\times 10^{-6}$			4869
$K_1(1270)^\pm K^\mp$	$<$ 3.22	$\times 10^{-6}$	CL=90%	4918
$K_1(1400)^\pm K^\mp$	$<$ 8.3	$\times 10^{-7}$	CL=90%	4901
$b_1(1235)^\pm\pi^\mp$	$<$ 4.0	$\times 10^{-7}$	CL=90%	4935
$\rho\pi$	$<$ 1.16	$\times 10^{-6}$	CL=90%	4981
$\pi^+\pi^-\pi^0$	$<$ 8.0	$\times 10^{-7}$	CL=90%	5007
$\omega\pi^0$	$<$ 1.63	$\times 10^{-6}$	CL=90%	4980
$\pi^+\pi^-\pi^0\pi^0$	(1.30$\pm$ 0.28) $\times 10^{-5}$			5002
$K_S^0 K^+\pi^-$ + c.c.	(1.14$\pm$ 0.33) $\times 10^{-6}$			4979
$K^*(892)^0\overline{K}^0$ + c.c.	$<$ 4.22	$\times 10^{-6}$	CL=90%	4959
$K^*(892)^- K^+$ + c.c.	$<$ 1.45	$\times 10^{-6}$	CL=90%	4960
Sum of 100 exclusive modes	(2.90$\pm$ 0.30) $\times 10^{-3}$			–

Radiative decays

$\gamma\chi_{b1}(1P)$	(6.9 $\pm$ 0.4) %			130
$\gamma\chi_{b2}(1P)$	(7.15$\pm$ 0.35) %			110
$\gamma\chi_{b0}(1P)$	(3.8 $\pm$ 0.4) %			162
$\gamma f_0(1710)$	$<$ 5.9	$\times 10^{-4}$	CL=90%	4864
$\gamma f_2'(1525)$	$<$ 5.3	$\times 10^{-4}$	CL=90%	4896
$\gamma f_2(1270)$	$<$ 2.41	$\times 10^{-4}$	CL=90%	4930

$\gamma\eta_c(1S)$		$<$	2.7	$\times 10^{-5}$	CL=90%	4568
$\gamma\chi_{c0}$		$<$	1.0	$\times 10^{-4}$	CL=90%	4430
$\gamma\chi_{c1}$		$<$	3.6	$\times 10^{-6}$	CL=90%	4397
$\gamma\chi_{c2}$		$<$	1.5	$\times 10^{-5}$	CL=90%	4381
$\gamma X(3872) \to \pi^+\pi^- J/\psi$		$<$	8	$\times 10^{-7}$	CL=90%	–
$\gamma X(3872) \to \pi^+\pi^-\pi^0 J/\psi$		$<$	2.4	$\times 10^{-6}$	CL=90%	–
$\gamma X(3915) \to \omega J/\psi$		$<$	2.8	$\times 10^{-6}$	CL=90%	–
$\gamma X(4140) \to \phi J/\psi$		$<$	1.2	$\times 10^{-6}$	CL=90%	–
$\gamma X(4350) \to \phi J/\psi$		$<$	1.3	$\times 10^{-6}$	CL=90%	–
$\gamma\eta_b(1S)$		(	3.9 ± 1.5)	$\times 10^{-4}$		605
$\gamma\eta_b(1S) \to \gamma$Sum of 26 exclusive modes		$<$	3.7	$\times 10^{-6}$	CL=90%	–
$\gamma X_{b\overline{b}} \to \gamma$Sum of 26 exclusive modes		$<$	4.9	$\times 10^{-6}$	CL=90%	–
$\gamma X \to \gamma +\geq 4$ prongs	[*iibb*]	$<$	1.95	$\times 10^{-4}$	CL=95%	–
$\gamma A^0 \to \gamma$hadrons		$<$	8	$\times 10^{-5}$	CL=90%	–
$\gamma a_1^0 \to \gamma\mu^+\mu^-$		$<$	8.3	$\times 10^{-6}$	CL=90%	–

Lepton Family number (*LF*) violating modes

$e^\pm\tau^\mp$	*LF*	$<$	3.2	$\times 10^{-6}$	CL=90%	4854
$\mu^\pm\tau^\mp$	*LF*	$<$	3.3	$\times 10^{-6}$	CL=90%	4854

$\Upsilon(1D)$

$I^G(J^{PC}) = 0^-(2^{--})$

Mass $m = 10163.7 \pm 1.4$ MeV (S = 1.7)

$\Upsilon(1D)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\gamma\gamma\,\Upsilon(1S)$	seen	679
$\gamma\chi_{bJ}(1P)$	seen	300
$\eta\,\Upsilon(1S)$	not seen	426
$\pi^+\pi^-\,\Upsilon(1S)$	$(6.6\pm1.6)\times10^{-3}$	623

$\chi_{b0}(2P)$ [*hhbb*]

$I^G(J^{PC}) = 0^+(0^{++})$
J needs confirmation.

Mass $m = 10232.5 \pm 0.4 \pm 0.5$ MeV

$\chi_{b0}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma\,\Upsilon(2S)$	(4.6 ± 2.1) %		207
$\gamma\,\Upsilon(1S)$	$(9\ \pm6\ )\times10^{-3}$		743
D^0X	< 8.2 %	90%	–
$\pi^+\pi^-K^+K^-\pi^0$	$< 3.4 \times 10^{-5}$	90%	5064
$2\pi^+\pi^-K^-K^0_S$	$< 5 \times 10^{-5}$	90%	5063

$2\pi^+\pi^- K^- K^0_S 2\pi^0$	< 2.2	$\times 10^{-4}$	90%	5036
$2\pi^+ 2\pi^- 2\pi^0$	< 2.4	$\times 10^{-4}$	90%	5092
$2\pi^+ 2\pi^- K^+ K^-$	< 1.5	$\times 10^{-4}$	90%	5050
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	< 2.2	$\times 10^{-4}$	90%	5035
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	< 1.1	$\times 10^{-3}$	90%	5019
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	< 7	$\times 10^{-4}$	90%	5018
$3\pi^+ 3\pi^-$	< 7	$\times 10^{-5}$	90%	5091
$3\pi^+ 3\pi^- 2\pi^0$	< 1.2	$\times 10^{-3}$	90%	5070
$3\pi^+ 3\pi^- K^+ K^-$	< 1.5	$\times 10^{-4}$	90%	5017
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	< 7	$\times 10^{-4}$	90%	4999
$4\pi^+ 4\pi^-$	< 1.7	$\times 10^{-4}$	90%	5069
$4\pi^+ 4\pi^- 2\pi^0$	< 6	$\times 10^{-4}$	90%	5039

$\chi_{b1}(2P)$ [hhbb]

$I^G(J^{PC}) = 0^+(1^{++})$
J needs confirmation.

Mass $m = 10255.46 \pm 0.22 \pm 0.50$ MeV
$m_{\chi_{b1}(2P)} - m_{\chi_{b0}(2P)} = 23.5 \pm 1.0$ MeV

$\chi_{b1}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor	p (MeV/c)
$\omega\,\Upsilon(1S)$	$(1.63^{+0.40}_{-0.34})$ %		135
$\gamma\,\Upsilon(2S)$	(19.9 ±1.9) %		230
$\gamma\,\Upsilon(1S)$	(9.2 ±0.8) %	1.1	764
$\pi\pi\,\chi_{b1}(1P)$	(9.1 ±1.3) $\times 10^{-3}$		238
$D^0 X$	(8.8 ±1.7) %		–
$\pi^+\pi^- K^+ K^- \pi^0$	(3.1 ±1.0) $\times 10^{-4}$		5075
$2\pi^+\pi^- K^- K^0_S$	(1.1 ±0.5) $\times 10^{-4}$		5075
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	(7.7 ±3.2) $\times 10^{-4}$		5047
$2\pi^+ 2\pi^- 2\pi^0$	(5.9 ±2.0) $\times 10^{-4}$		5104
$2\pi^+ 2\pi^- K^+ K^-$	(10 ±4) $\times 10^{-5}$		5062
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	(5.5 ±1.8) $\times 10^{-4}$		5047
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(10 ±4) $\times 10^{-4}$		5030
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	(6.7 ±2.6) $\times 10^{-4}$		5029
$3\pi^+ 3\pi^-$	(1.2 ±0.4) $\times 10^{-4}$		5103
$3\pi^+ 3\pi^- 2\pi^0$	(1.2 ±0.4) $\times 10^{-3}$		5081
$3\pi^+ 3\pi^- K^+ K^-$	(2.0 ±0.8) $\times 10^{-4}$		5029
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	(6.1 ±2.2) $\times 10^{-4}$		5011
$4\pi^+ 4\pi^-$	(1.7 ±0.6) $\times 10^{-4}$		5080
$4\pi^+ 4\pi^- 2\pi^0$	(1.9 ±0.7) $\times 10^{-3}$		5051

$\chi_{b2}(2P)$ [hhbb]

$I^G(J^{PC}) = 0^+(2^{++})$
J needs confirmation.

Mass $m = 10268.65 \pm 0.22 \pm 0.50$ MeV
$m_{\chi_{b2}(2P)} - m_{\chi_{b1}(2P)} = 13.4 \pm 0.6$ MeV

$\chi_{b2}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\omega\,\Upsilon(1S)$	$(\ 1.10^{+0.34}_{-0.30})$ %		194
$\gamma\,\Upsilon(2S)$	(10.6 ±2.6) %	S=2.0	242
$\gamma\,\Upsilon(1S)$	(7.0 ±0.7) %		777
$\pi\pi\,\chi_{b2}(1P)$	(5.1 ±0.9) $\times 10^{-3}$		229
$D^0 X$	< 2.4 %	CL=90%	–
$\pi^+\pi^- K^+ K^- \pi^0$	< 1.1 $\times 10^{-4}$	CL=90%	5082
$2\pi^+\pi^- K^- K^0_S$	< 9 $\times 10^{-5}$	CL=90%	5082
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	< 7 $\times 10^{-4}$	CL=90%	5054
$2\pi^+ 2\pi^- 2\pi^0$	(3.9 ±1.6) $\times 10^{-4}$		5110
$2\pi^+ 2\pi^- K^+ K^-$	(9 ±4) $\times 10^{-5}$		5068
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	(2.4 ±1.1) $\times 10^{-4}$		5054
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(4.7 ±2.3) $\times 10^{-4}$		5037
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	< 4 $\times 10^{-4}$	CL=90%	5036
$3\pi^+ 3\pi^-$	(9 ±4) $\times 10^{-5}$		5110
$3\pi^+ 3\pi^- 2\pi^0$	(1.2 ±0.4) $\times 10^{-3}$		5088
$3\pi^+ 3\pi^- K^+ K^-$	(1.4 ±0.7) $\times 10^{-4}$		5036
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	(4.2 ±1.7) $\times 10^{-4}$		5017
$4\pi^+ 4\pi^-$	(9 ±5) $\times 10^{-5}$		5087
$4\pi^+ 4\pi^- 2\pi^0$	(1.3 ±0.5) $\times 10^{-3}$		5058

$\Upsilon(3S)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 10355.2 \pm 0.5$ MeV
$m_{\Upsilon(3S)} - m_{\Upsilon(2S)} = 331.50 \pm 0.13$ MeV
Full width $\Gamma = 20.32 \pm 1.85$ keV
$\Gamma_{ee} = 0.443 \pm 0.008$ keV

$\Upsilon(3S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\Upsilon(2S)$ anything	(10.6 ±0.8) %		296
$\Upsilon(2S)\pi^+\pi^-$	(2.82±0.18) %	S=1.6	177
$\Upsilon(2S)\pi^0\pi^0$	(1.85±0.14) %		190
$\Upsilon(2S)\gamma\gamma$	(5.0 ±0.7) %		327
$\Upsilon(2S)\pi^0$	< 5.1 $\times 10^{-4}$	CL=90%	298
$\Upsilon(1S)\pi^+\pi^-$	(4.37±0.08) %		813
$\Upsilon(1S)\pi^0\pi^0$	(2.20±0.13) %		816

$\Upsilon(1S)\eta$		$<$ 1	$\times 10^{-4}$	CL=90%	677
$\Upsilon(1S)\pi^0$		$<$ 7	$\times 10^{-5}$	CL=90%	846
$h_b(1P)\pi^0$		$<$ 1.2	$\times 10^{-3}$	CL=90%	426
$h_b(1P)\pi^0 \rightarrow \gamma\eta_b(1S)\pi^0$		(4.3 $\pm$1.4)	$\times 10^{-4}$		–
$h_b(1P)\pi^+\pi^-$		$<$ 1.2	$\times 10^{-4}$	CL=90%	353
$\tau^+\tau^-$		(2.29$\pm$0.30)	%		4863
$\mu^+\mu^-$		(2.18$\pm$0.21)	%	S=2.1	5177
e^+e^-		seen			5178
ggg		(35.7 $\pm$2.6)	%		–
$\underline{\gamma g}g$		(9.7 $\pm$1.8)	$\times 10^{-3}$		–
^2H anything		(2.33$\pm$0.33)	$\times 10^{-5}$		–

Radiative decays

$\gamma\chi_{b2}(2P)$		(13.1 $\pm$1.6)	%	S=3.4	86
$\gamma\chi_{b1}(2P)$		(12.6 $\pm$1.2)	%	S=2.4	99
$\gamma\chi_{b0}(2P)$		(5.9 $\pm$0.6)	%	S=1.4	122
$\gamma\chi_{b2}(1P)$		(9.9 $\pm$1.3)	$\times 10^{-3}$	S=2.0	434
$\gamma A^0 \rightarrow \gamma$hadrons		$<$ 8	$\times 10^{-5}$	CL=90%	–
$\gamma\chi_{b1}(1P)$		(9 $\pm$5)	$\times 10^{-4}$	S=1.9	452
$\gamma\chi_{b0}(1P)$		(2.7 $\pm$0.4)	$\times 10^{-3}$		484
$\gamma\eta_b(2S)$		$<$ 6.2	$\times 10^{-4}$	CL=90%	350
$\gamma\eta_b(1S)$		(5.1 $\pm$0.7)	$\times 10^{-4}$		912
$\gamma X \rightarrow \gamma +\geq 4$ prongs	[*jjbb*]	$<$ 2.2	$\times 10^{-4}$	CL=95%	–
$\gamma a_1^0 \rightarrow \gamma\mu^+\mu^-$		$<$ 5.5	$\times 10^{-6}$	CL=90%	–
$\gamma a_1^0 \rightarrow \gamma\tau^+\tau^-$	[*kkbb*]	$<$ 1.6	$\times 10^{-4}$	CL=90%	–

Lepton Family number (*LF*) violating modes

$e^\pm\tau^\mp$	*LF*	$<$ 4.2	$\times 10^{-6}$	CL=90%	5025
$\mu^\pm\tau^\mp$	*LF*	$<$ 3.1	$\times 10^{-6}$	CL=90%	5025

$\chi_{b1}(3P)$

$I^G(J^{PC}) = 0^+(1^{++})$

Mass $m = 10512.1 \pm 2.3$ MeV

$\chi_{b1}(3P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Upsilon(1S)\gamma$	seen	999
$\Upsilon(2S)\gamma$	seen	477
$\Upsilon(3S)\gamma$	seen	156

$\Upsilon(4S)$ or $\Upsilon(10580)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 10579.4 \pm 1.2$ MeV
Full width $\Gamma = 20.5 \pm 2.5$ MeV
$\Gamma_{ee} = 0.272 \pm 0.029$ keV (S = 1.5)

$\Upsilon(4S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$B\overline{B}$	> 96 %	95%	326
B^+B^-	(51.4 ±0.6) %		331
D_s^+ anything + c.c.	(17.8 ±2.6) %		–
$B^0\overline{B}^0$	(48.6 ±0.6) %		326
$J/\psi K_S^0 + (J/\psi,\ \eta_c)K_S^0$	$< 4 \times 10^{-7}$	90%	–
non-$B\overline{B}$	< 4 %	95%	–
e^+e^-	$(1.57 \pm 0.08) \times 10^{-5}$		5290
$\rho^+\rho^-$	$< 5.7 \times 10^{-6}$	90%	5233
$K^*(892)^0\overline{K}^0$	$< 2.0 \times 10^{-6}$	90%	5240
$J/\psi(1S)$ anything	$< 1.9 \times 10^{-4}$	95%	–
D^{*+} anything + c.c.	< 7.4 %	90%	5099
ϕ anything	(7.1 ±0.6) %		5240
$\phi\eta$	$< 1.8 \times 10^{-6}$	90%	5226
$\phi\eta'$	$< 4.3 \times 10^{-6}$	90%	5196
$\rho\eta$	$< 1.3 \times 10^{-6}$	90%	5247
$\rho\eta'$	$< 2.5 \times 10^{-6}$	90%	5217
$\Upsilon(1S)$ anything	$< 4 \times 10^{-3}$	90%	1053
$\Upsilon(1S)\pi^+\pi^-$	$(8.1 \pm 0.6) \times 10^{-5}$		1026
$\Upsilon(1S)\eta$	$(1.96 \pm 0.28) \times 10^{-4}$		924
$\Upsilon(2S)\pi^+\pi^-$	$(8.6 \pm 1.3) \times 10^{-5}$		468
$h_b(1P)\pi^+\pi^-$	not seen		600
$h_b(1P)\eta$	$(2.18 \pm 0.21) \times 10^{-3}$		390
$\overline{^2H}$ anything	$< 1.3 \times 10^{-5}$	90%	–

$X(10610)^\pm$

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

Mass $m = 10607.2 \pm 2.0$ MeV
Full width $\Gamma = 18.4 \pm 2.4$ MeV

$X(10610)^-$ decay modes are charge conjugates of the modes below.

$X(10610)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Upsilon(1S)\pi^+$	seen	1077
$\Upsilon(2S)\pi^+$	seen	551

$\Upsilon(3S)\pi^+$	seen	207
$h_b(1P)\pi^+$	seen	671
$h_b(2P)\pi^+$	seen	313

$X(10610)^0$

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

Mass $m = 10609 \pm 6$ MeV

$X(10610)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Upsilon(1S)\pi^0$	not seen	1079
$\Upsilon(2S)\pi^0$	seen	554
$\Upsilon(3S)\pi^0$	seen	212

$\Upsilon(10860)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 10891 \pm 4$ MeV
Full width $\Gamma = 54 \pm 7$ MeV
$\Gamma_{ee} = 0.31 \pm 0.07$ keV (S = 1.3)

$\Upsilon(10860)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$B\overline{B}X$	$(76.2\ ^{+2.7}_{-4.0})$ %		–
$B\overline{B}$	(5.5 ±1.0) %		1334
$B\overline{B}^* +$ c.c.	(13.7 ±1.6) %		–
$B^*\overline{B}^*$	(38.1 ±3.4) %		1141
$B\overline{B}^{(*)}\pi$	< 19.7 %	90%	1031
$B\overline{B}\pi$	(0.0 ±1.2) %		1031
$B^*\overline{B}\pi + B\overline{B}^*\pi$	(7.3 ±2.3) %		–
$B^*\overline{B}^*\pi$	(1.0 ±1.4) %		761
$B\overline{B}\pi\pi$	< 8.9 %	90%	580
$B_s^{(*)}\overline{B}_s^{(*)}$	(20.1 ±3.1) %		923
$B_s\overline{B}_s$	(5 ±5) $\times 10^{-3}$		923
$B_s\overline{B}_s^* +$ c.c.	(1.35±0.32) %		–
$B_s^*\overline{B}_s^*$	(17.6 ±2.7) %		572
no open-bottom	$(3.8\ ^{+5.0}_{-0.5})$ %		–
e^+e^-	(5.7 ±1.5) $\times 10^{-6}$		5446
$K^*(892)^0\overline{K}^0$	< 1.0 $\times 10^{-5}$	90%	5398
$\Upsilon(1S)\pi^+\pi^-$	(5.3 ±0.6) $\times 10^{-3}$		1311
$\Upsilon(2S)\pi^+\pi^-$	(7.8 ±1.3) $\times 10^{-3}$		789
$\Upsilon(3S)\pi^+\pi^-$	$(4.8\ ^{+1.9}_{-1.7}) \times 10^{-3}$		446

$\Upsilon(1S)K^+K^-$	$(\ 6.1\ \pm 1.8\ )\times 10^{-4}$			966
$h_b(1P)\pi^+\pi^-$	$(\ 3.5\ ^{+1.0}_{-1.3}\ )\times 10^{-3}$			908
$h_b(2P)\pi^+\pi^-$	$(\ 6.0\ ^{+2.1}_{-1.8}\ )\times 10^{-3}$			550
$\chi_{b0}(1P)\pi^+\pi^-\pi^0$	$<\ 6.3\ \times 10^{-3}$		90%	900
$\chi_{b0}(1P)\omega$	$<\ 3.9\ \times 10^{-3}$		90%	640
$\chi_{b0}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$<\ 4.8\ \times 10^{-3}$		90%	–
$\chi_{b1}(1P)\pi^+\pi^-\pi^0$	$(\ 1.85\pm 0.33)\times 10^{-3}$			867
$\chi_{b1}(1P)\omega$	$(\ 1.57\pm 0.30)\times 10^{-3}$			591
$\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$(\ 5.2\ \pm 1.9\ )\times 10^{-4}$			–
$\chi_{b2}(1P)\pi^+\pi^-\pi^0$	$(\ 1.17\pm 0.30)\times 10^{-3}$			847
$\chi_{b2}(1P)\omega$	$(\ 6.0\ \pm 2.7\ )\times 10^{-4}$			561
$\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$(\ 6\ \ \pm 4\ \ )\times 10^{-4}$			–
$\gamma X_b \rightarrow\ \gamma\,\Upsilon(1S)\omega$	$<\ 3.8\ \times 10^{-5}$		90%	–

Inclusive Decays.

These decay modes are submodes of one or more of the decay modes above.

ϕ anything	$(\ 13.8\ ^{+2.4}_{-1.7}\ )$ %	–
D^0 anything + c.c.	$(108\ \ \pm 8\ \ )$ %	–
D_s anything + c.c.	$(\ 46\ \ \pm 6\ \ )$ %	–
J/ψ anything	$(\ 2.06\pm 0.21)$ %	–
B^0 anything + c.c.	$(\ 77\ \ \pm 8\ \ )$ %	–
B^+ anything + c.c.	$(\ 72\ \ \pm 6\ \ )$ %	–

$\Upsilon(11020)$

$I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 10987.5^{+11.0}_{-\ 3.4}$ MeV
Full width $\Gamma = 61^{+\ 9}_{-28}$ MeV
$\Gamma_{ee} = 0.130 \pm 0.030$ keV

$\Upsilon(11020)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
e^+e^-	$(2.1^{+1.1}_{-0.6})\times 10^{-6}$	5494

NOTES

[*a*] See the "Note on $\pi^{\pm} \to \ell^{\pm}\nu\gamma$ and $K^{\pm} \to \ell^{\pm}\nu\gamma$ Form Factors" in the $\pi^{\pm}$ Particle Listings for definitions and details.

[*b*] Measurements of $\Gamma(e^+\nu_e)/\Gamma(\mu^+\nu_\mu)$ always include decays with γ's, and measurements of $\Gamma(e^+\nu_e\gamma)$ and $\Gamma(\mu^+\nu_\mu\gamma)$ never include low-energy γ's. Therefore, since no clean separation is possible, we consider the modes with γ's to be subreactions of the modes without them, and let $[\Gamma(e^+\nu_e) + \Gamma(\mu^+\nu_\mu)]/\Gamma_{\text{total}} = 100\%$.

[*c*] See the $\pi^{\pm}$ Particle Listings for the energy limits used in this measurement; low-energy γ's are not included.

[*d*] Derived from an analysis of neutrino-oscillation experiments.

[*e*] Astrophysical and cosmological arguments give limits of order 10^{-13}; see the π^0 Particle Listings.

[*f*] *C* parity forbids this to occur as a single-photon process.

[*g*] See the "Note on scalar mesons" in the $f_0(500)$ Particle Listings . The interpretation of this entry as a particle is controversial.

[*h*] See the "Note on $\rho(770)$" in the $\rho(770)$ Particle Listings .

[*i*] The $\omega\rho$ interference is then due to $\omega\rho$ mixing only, and is expected to be small. If $e\mu$ universality holds, $\Gamma(\rho^0 \to \mu^+\mu^-) = \Gamma(\rho^0 \to e^+e^-) \times 0.99785$.

[*j*] See the "Note on scalar mesons" in the $f_0(500)$ Particle Listings .

[*k*] See the "Note on $a_1(1260)$" in the $a_1(1260)$ Particle Listings in PDG 06, Journal of Physics **G33** 1 (2006).

[*l*] This is only an educated guess; the error given is larger than the error on the average of the published values. See the Particle Listings for details.

[*n*] See the "Note on non-$q\overline{q}$ mesons" in the Particle Listings in PDG 06, Journal of Physics **G33** 1 (2006).

[*o*] See the "Note on the $\eta(1405)$" in the $\eta(1405)$ Particle Listings.

[*p*] See the "Note on the $f_1(1420)$" in the $\eta(1405)$ Particle Listings.

[*q*] See also the $\omega(1650)$ Particle Listings.

[*r*] See the "Note on the $\rho(1450)$ and the $\rho(1700)$" in the $\rho(1700)$ Particle Listings.

[*s*] See also the $\omega(1420)$ Particle Listings.

[*t*] See the "Note on $f_0(1710)$" in the $f_0(1710)$ Particle Listings in 2004 edition of *Review of Particle Physics*.

[*u*] See the note in the $K^{\pm}$ Particle Listings.

[*v*] Neglecting photon channels. See, *e.g.*, A. Pais and S.B. Treiman, Phys. Rev. **D12**, 2744 (1975).

[*x*] The definition of the slope parameters of the $K \to 3\pi$ Dalitz plot is as follows (see also "Note on Dalitz Plot Parameters for $K \to 3\pi$ Decays" in the $K^{\pm}$ Particle Listings):

$$|M|^2 = 1 + g(s_3 - s_0)/m^2_{\pi^+} + \cdots .$$

[*y*] For more details and definitions of parameters see the Particle Listings.

[*z*] See the $K^{\pm}$ Particle Listings for the energy limits used in this measurement.

[*aa*] Most of this radiative mode, the low-momentum γ part, is also included in the parent mode listed without γ's.

[*bb*] Structure-dependent part.

[*cc*] Direct-emission branching fraction.

[*dd*] Violates angular-momentum conservation.

[*ee*] Derived from measured values of ϕ_{+-}, ϕ_{00}, $|\eta|$, $|m_{K^0_L} - m_{K^0_S}|$, and $\tau_{K^0_S}$, as described in the introduction to "Tests of Conservation Laws."

[*ff*] The *CP*-violation parameters are defined as follows (see also "Note on *CP* Violation in $K_S \to 3\pi$" and "Note on *CP* Violation in K^0_L Decay" in the Particle Listings):

$$\eta_{+-} = |\eta_{+-}|e^{i\phi_{+-}} = \frac{A(K^0_L \to \pi^+\pi^-)}{A(K^0_S \to \pi^+\pi^-)} = \epsilon + \epsilon'$$

$$\eta_{00} = |\eta_{00}|e^{i\phi_{00}} = \frac{A(K^0_L \to \pi^0\pi^0)}{A(K^0_S \to \pi^0\pi^0)} = \epsilon - 2\epsilon'$$

$$\delta = \frac{\Gamma(K^0_L \to \pi^-\ell^+\nu) - \Gamma(K^0_L \to \pi^+\ell^-\nu)}{\Gamma(K^0_L \to \pi^-\ell^+\nu) + \Gamma(K^0_L \to \pi^+\ell^-\nu)} ,$$

$$\mathrm{Im}(\eta_{+-0})^2 = \frac{\Gamma(K^0_S \to \pi^+\pi^-\pi^0)^{CP \text{ viol.}}}{\Gamma(K^0_L \to \pi^+\pi^-\pi^0)} ,$$

$$\mathrm{Im}(\eta_{000})^2 = \frac{\Gamma(K^0_S \to \pi^0\pi^0\pi^0)}{\Gamma(K^0_L \to \pi^0\pi^0\pi^0)} .$$

where for the last two relations *CPT* is assumed valid, *i.e.*, $\mathrm{Re}(\eta_{+-0}) \simeq 0$ and $\mathrm{Re}(\eta_{000}) \simeq 0$.

[*gg*] See the K^0_S Particle Listings for the energy limits used in this measurement.

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

[*ii*] $\mathrm{Re}(\epsilon'/\epsilon) = \epsilon'/\epsilon$ to a very good approximation provided the phases satisfy *CPT* invariance.

[*jj*] This mode includes gammas from inner bremsstrahlung but not the direct emission mode $K_L^0 \to \pi^+\pi^-\gamma$(DE).

[*kk*] See the K_L^0 Particle Listings for the energy limits used in this measurement.

[*ll*] Allowed by higher-order electroweak interactions.

[*nn*] Violates *CP* in leading order. Test of direct *CP* violation since the indirect *CP*-violating and *CP*-conserving contributions are expected to be suppressed.

[*oo*] See the "Note on $f_0(1370)$" in the $f_0(1370)$ Particle Listings and in the 1994 edition.

[*pp*] See the note in the $L(1770)$ Particle Listings in Reviews of Modern Physics **56** S1 (1984), p. S200. See also the "Note on $K_2(1770)$ and the $K_2(1820)$" in the $K_2(1770)$ Particle Listings .

[*qq*] See the "Note on $K_2(1770)$ and the $K_2(1820)$" in the $K_2(1770)$ Particle Listings .

[*rr*] This result applies to $Z^0 \to c\overline{c}$ decays only. Here ℓ^+ is an average (not a sum) of e^+ and μ^+ decays.

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

[*tt*] 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.

[*uu*] These subfractions of the $K^-2\pi^+$ mode are uncertain: see the Particle Listings.

[*vv*] Submodes of the $D^+ \to K^-2\pi^+\pi^0$ and $K_S^0 2\pi^+\pi^-$ modes were studied by ANJOS 92C and COFFMAN 92B, but with at most 142 events for the first mode and 229 for the second – not enough for precise results. With nothing new for 18 years, we refer to our 2008 edition, Physics Letters **B667** 1 (2008), for those results.

[*xx*] The unseen decay modes of the resonances are included.

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

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

[*aaa*] In the 2010 *Review*, the values for these quantities were given using a measure of the asymmetry that was inconsistent with the usual definition.

[*bbb*] This value is obtained by subtracting the branching fractions for 2-, 4- and 6-prongs from unity.

[*ccc*] This is the sum of our $K^-2\pi^+\pi^-$, $K^-2\pi^+\pi^-\pi^0$, $\overline{K}^0 2\pi^+2\pi^-$, $K^+2K^-\pi^+$, $2\pi^+2\pi^-$, $2\pi^+2\pi^-\pi^0$, $K^+K^-\pi^+\pi^-$, and $K^+K^-\pi^+\pi^-\pi^0$, branching fractions.

[*ddd*] This is the sum of our $K^-3\pi^+2\pi^-$ and $3\pi^+3\pi^-$ branching fractions.

[*eee*] The branching fractions for the $K^-e^+\nu_e$, $K^*(892)^-e^+\nu_e$, $\pi^-e^+\nu_e$, and $\rho^-e^+\nu_e$ modes add up to 6.19 $\pm$ 0.17 %.

[*fff*] This is a doubly Cabibbo-suppressed mode.

[*ggg*] The two experiments measuring this fraction are in serious disagreement. See the Particle Listings.

[*hhh*] Submodes of the $D^0 \to K^0_S\pi^+\pi^-\pi^0$ mode with a K^* and/or ρ were studied by COFFMAN 92B, but with only 140 events. With nothing new for 18 years, we refer to our 2008 edition, Physics Letters **B667** 1 (2008), for those results.

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

[*jjj*] This limit is for either D^0 or $\overline{D}^0$ to pe^-.

[*kkk*] This limit is for either D^0 or $\overline{D}^0$ to $\overline{p}e^+$.

[*lll*] 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 7.0 $\pm$ 0.4 %

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

[*ooo*] Two times (to include μ decays) the $\eta' e^+\nu_e$ branching fraction, plus the $\eta'\pi^+$, $\eta'\rho^+$, and $\eta' K^+$ fractions, is (18.6 $\pm$ 2.3)%, which considerably exceeds the inclusive η' fraction of (11.7 $\pm$ 1.8)%. Our best guess is that the $\eta'\rho^+$ fraction, (12.5 $\pm$ 2.2)%, is too large.

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

[*qqq*] 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}.

[*rrr*] 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.

[*sss*] 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.

[*ttt*] An ℓ indicates an e or a μ mode, not a sum over these modes.

[*uuu*] An $CP(\pm1)$ indicates the CP=+1 and CP=−1 eigenstates of the D^0-$\overline{D}^0$ system.

[*vvv*] D denotes D^0 or $\overline{D}^0$.

[*xxx*] D^{*0}_{CP+} decays into $D^0\pi^0$ with the D^0 reconstructed in CP-even eigenstates K^+K^- and $\pi^+\pi^-$.

[*yyy*] $\overline{D}^{**}$ represents an excited state with mass $2.2 < \mathrm{M} < 2.8$ GeV/c^2.

[*zzz*] $X(3872)^+$ is a hypothetical charged partner of the $X(3872)$.

[*aaaa*] $\Theta(1710)^{++}$ is a possible narrow pentaquark state and $G(2220)$ is a possible glueball resonance.

[*bbaa*] $(\overline{\Lambda}_c^- p)_s$ denotes a low-mass enhancement near 3.35 GeV/c^2.

[*ccaa*] Stands for the possible candidates of $K^*(1410)$, $K_0^*(1430)$ and $K_2^*(1430)$.

[*ddaa*] B^0 and B_s^0 contributions not separated. Limit is on weighted average of the two decay rates.

[*eeaa*] This decay refers to the coherent sum of resonant and nonresonant $J^P = 0^+$ $K\pi$ components with $1.60 < m_{K\pi} < 2.15$ GeV/c^2.

[*ffaa*] $X(214)$ is a hypothetical particle of mass 214 MeV/c^2 reported by the HyperCP experiment, Physical Review Letters **94** 021801 (2005)

[*ggaa*] $\Theta(1540)^+$ denotes a possible narrow pentaquark state.

[*hhaa*] Here S and P are the hypothetical scalar and pseudoscalar particles with masses of 2.5 GeV/c^2 and 214.3 MeV/c^2, respectively.

[*iiaa*] These values are model dependent.

[*jjaa*] Here "anything" means at least one particle observed.

[*kkaa*] This is a B($B^0 \rightarrow$ $D^{*-}\ell^+\nu_\ell$) value.

[*llaa*] D^{**} stands for the sum of the $D(1\,^1P_1)$, $D(1\,^3P_0)$, $D(1\,^3P_1)$, $D(1\,^3P_2)$, $D(2\,^1S_0)$, and $D(2\,^1S_1)$ resonances.

[*nnaa*] $D^{(*)}\overline{D}^{(*)}$ stands for the sum of $D^*\overline{D}^*$, $D^*\overline{D}$, $D\overline{D}^*$, and $D\overline{D}$.

[*ooaa*] $X(3915)$ denotes a near-threshold enhancement in the $\omega J/\psi$ mass spectrum.

[*ppaa*] Inclusive branching fractions have a multiplicity definition and can be greater than 100%.

[*qqaa*] D_j represents an unresolved mixture of pseudoscalar and tensor D^{**} (P-wave) states.

[*rraa*] Not a pure measurement. See note at head of B_s^0 Decay Modes.

[*ssaa*] For $E_\gamma > 100$ MeV.

[*ttaa*] Includes $p\overline{p}\pi^+\pi^-\gamma$ and excludes $p\overline{p}\eta$, $p\overline{p}\omega$, $p\overline{p}\eta'$.

[*uuaa*] For a narrow state A with mass less than 960 MeV.

[*vvaa*] For a narrow scalar or pseudoscalar A^0 with mass 0.21–3.0 GeV.

[*xxaa*] For a narrow resonance in the range $2.2 < M(X) < 2.8$ GeV.

[*yyaa*] J^{PC} known by production in e^+e^- via single photon annihilation. I^G is not known; interpretation of this state as a single resonance is unclear because of the expectation of substantial threshold effects in this energy region.

[*zzaa*] $2m_\tau < \mathrm{M}(\tau^+\tau^-) < 9.2$ GeV

[*aabb*] 2 GeV $< m_{K^+K^-} <$ 3 GeV

[*bbbb*] X = scalar with $m < 8.0$ GeV

[*ccbb*] $X\overline{X}$ = vectors with $m < 3.1$ GeV

[*ddbb*] X and $\overline{X}$ = zero spin with $m < 4.5$ GeV

[*eebb*] 1.5 GeV $< m_X <$ 5.0 GeV

[*ffbb*] 201 MeV $< \mathrm{M}(\mu^+\mu^-) <$ 3565 MeV

[*ggbb*] 0.5 GeV $< m_X <$ 9.0 GeV, where m_X is the invariant mass of the hadronic final state.

[*hhbb*] Spectroscopic labeling for these states is theoretical, pending experimental information.

[*iibb*] 1.5 GeV $< m_X <$ 5.0 GeV

[*jjbb*] 1.5 GeV $< m_X <$ 5.0 GeV

[*kkbb*] For $m_{\tau^+\tau^-}$ in the ranges 4.03–9.52 and 9.61–10.10 GeV.

N BARYONS
($S = 0$, $I = 1/2$)

p, $N^+ = uud$; n, $N^0 = udd$

p

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

Mass $m = 1.00727646688 \pm 0.00000000009$ u
Mass $m = 938.272081 \pm 0.000006$ MeV [a]
$|m_p - m_{\overline{p}}|/m_p < 7 \times 10^{-10}$, CL = 90% [b]
$|\frac{q_{\overline{p}}}{m_{\overline{p}}}|/(\frac{q_p}{m_p}) = 0.99999999991 \pm 0.00000000009$
$|q_p + q_{\overline{p}}|/e < 7 \times 10^{-10}$, CL = 90% [b]
$|q_p + q_e|/e < 1 \times 10^{-21}$ [c]
Magnetic moment $\mu = 2.792847351 \pm 0.000000009\ \mu_N$
$(\mu_p + \mu_{\overline{p}}) / \mu_p = (0 \pm 5) \times 10^{-6}$
Electric dipole moment $d < 0.54 \times 10^{-23}\ e$ cm
Electric polarizability $\alpha = (11.2 \pm 0.4) \times 10^{-4}$ fm^3
Magnetic polarizability $\beta = (2.5 \pm 0.4) \times 10^{-4}$ fm^3 (S = 1.2)
Charge radius, μp Lamb shift = 0.84087 ± 0.00039 fm [d]
Charge radius, ep CODATA value = 0.8751 ± 0.0061 fm [d]
Magnetic radius = 0.78 ± 0.04 fm [e]
Mean life $\tau > 2.1 \times 10^{29}$ years, CL = 90% [f] ($p \rightarrow$ invisible mode)
Mean life $\tau > 10^{31}$ to 10^{33} years [f] (mode dependent)

See the "Note on Nucleon Decay" in our 1994 edition (Phys. Rev. **D50**, 1173) for a short review.

The "partial mean life" limits tabulated here are the limits on τ/B_i, where τ is the total mean life and B_i is the branching fraction for the mode in question. For N decays, p and n indicate proton and neutron partial lifetimes.

***p* DECAY MODES**	Partial mean life (10^{30} years)	Confidence level	p (MeV/c)
Antilepton + meson			
$N \rightarrow e^+\pi$	> 2000 (n), > 8200 (p)	90%	459
$N \rightarrow \mu^+\pi$	> 1000 (n), > 6600 (p)	90%	453
$N \rightarrow \nu\pi$	> 1100 (n), > 390 (p)	90%	459
$p \rightarrow e^+\eta$	> 4200	90%	309
$p \rightarrow \mu^+\eta$	> 1300	90%	297
$n \rightarrow \nu\eta$	> 158	90%	310
$N \rightarrow e^+\rho$	> 217 (n), > 710 (p)	90%	149
$N \rightarrow \mu^+\rho$	> 228 (n), > 160 (p)	90%	113

$N \to \nu\rho$	> 19 (n), > 162 (p)	90%	149
$p \to e^+\omega$	> 320	90%	143
$p \to \mu^+\omega$	> 780	90%	105
$n \to \nu\omega$	> 108	90%	144
$N \to e^+K$	> 17 (n), > 1000 (p)	90%	339
$N \to \mu^+K$	> 26 (n), > 1600 (p)	90%	329
$N \to \nu K$	> 86 (n), > 5900 (p)	90%	339
$n \to \nu K^0_S$	> 260	90%	338
$p \to e^+K^*(892)^0$	> 84	90%	45
$N \to \nu K^*(892)$	> 78 (n), > 51 (p)	90%	45

Antilepton + mesons

$p \to e^+\pi^+\pi^-$	> 82	90%	448
$p \to e^+\pi^0\pi^0$	> 147	90%	449
$n \to e^+\pi^-\pi^0$	> 52	90%	449
$p \to \mu^+\pi^+\pi^-$	> 133	90%	425
$p \to \mu^+\pi^0\pi^0$	> 101	90%	427
$n \to \mu^+\pi^-\pi^0$	> 74	90%	427
$n \to e^+K^0\pi^-$	> 18	90%	319

Lepton + meson

$n \to e^-\pi^+$	> 65	90%	459
$n \to \mu^-\pi^+$	> 49	90%	453
$n \to e^-\rho^+$	> 62	90%	150
$n \to \mu^-\rho^+$	> 7	90%	115
$n \to e^-K^+$	> 32	90%	340
$n \to \mu^-K^+$	> 57	90%	330

Lepton + mesons

$p \to e^-\pi^+\pi^+$	> 30	90%	448
$n \to e^-\pi^+\pi^0$	> 29	90%	449
$p \to \mu^-\pi^+\pi^+$	> 17	90%	425
$n \to \mu^-\pi^+\pi^0$	> 34	90%	427
$p \to e^-\pi^+K^+$	> 75	90%	320
$p \to \mu^-\pi^+K^+$	> 245	90%	279

Antilepton + photon(s)

$p \to e^+\gamma$	> 670	90%	469
$p \to \mu^+\gamma$	> 478	90%	463
$n \to \nu\gamma$	> 550	90%	470
$p \to e^+\gamma\gamma$	> 100	90%	469
$n \to \nu\gamma\gamma$	> 219	90%	470

Antilepton + single massless

$p \to e^+X$	> 790	90%	–
$p \to \mu^+X$	> 410	90%	–

Three (or more) leptons

$p \to e^+ e^+ e^-$	> 793	90%	469
$p \to e^+ \mu^+ \mu^-$	> 359	90%	457
$p \to e^+ \nu \nu$	> 170	90%	469
$n \to e^+ e^- \nu$	> 257	90%	470
$n \to \mu^+ e^- \nu$	> 83	90%	464
$n \to \mu^+ \mu^- \nu$	> 79	90%	458
$p \to \mu^+ e^+ e^-$	> 529	90%	463
$p \to \mu^+ \mu^+ \mu^-$	> 675	90%	439
$p \to \mu^+ \nu \nu$	> 220	90%	463
$p \to e^- \mu^+ \mu^+$	> 6	90%	457
$n \to 3\nu$	$> 5 \times 10^{-4}$	90%	470

Inclusive modes

$N \to e^+$ anything	> 0.6 (n, p)	90%	–
$N \to \mu^+$ anything	> 12 (n, p)	90%	–
$N \to e^+ \pi^0$ anything	> 0.6 (n, p)	90%	–

$\Delta B = 2$ dinucleon modes

The following are lifetime limits per iron nucleus.

$pp \to \pi^+ \pi^+$	> 72.2	90%	–
$pn \to \pi^+ \pi^0$	> 170	90%	–
$nn \to \pi^+ \pi^-$	> 0.7	90%	–
$nn \to \pi^0 \pi^0$	> 404	90%	–
$pp \to K^+ K^+$	> 170	90%	–
$pp \to e^+ e^+$	> 5.8	90%	–
$pp \to e^+ \mu^+$	> 3.6	90%	–
$pp \to \mu^+ \mu^+$	> 1.7	90%	–
$pn \to e^+ \overline{\nu}$	> 260	90%	–
$pn \to \mu^+ \overline{\nu}$	> 200	90%	–
$pn \to \tau^+ \overline{\nu}_\tau$	> 29	90%	–
$nn \to \nu_e \overline{\nu}_e$	> 1.4	90%	–
$nn \to \nu_\mu \overline{\nu}_\mu$	> 1.4	90%	–
$pn \to$ invisible	$> 2.1 \times 10^{-5}$	90%	–
$pp \to$ invisible	$> 5 \times 10^{-5}$	90%	–

$\overline{p}$ DECAY MODES

$\overline{p}$ DECAY MODES	Partial mean life (years)	Confidence level	p (MeV/c)
$\overline{p} \to e^- \gamma$	$> 7 \times 10^5$	90%	469
$\overline{p} \to \mu^- \gamma$	$> 5 \times 10^4$	90%	463
$\overline{p} \to e^- \pi^0$	$> 4 \times 10^5$	90%	459
$\overline{p} \to \mu^- \pi^0$	$> 5 \times 10^4$	90%	453
$\overline{p} \to e^- \eta$	$> 2 \times 10^4$	90%	309

$\overline{p} \to \mu^- \eta$	$> 8 \times 10^3$	90%	297
$\overline{p} \to e^- K_S^0$	> 900	90%	337
$\overline{p} \to \mu^- K_S^0$	$> 4 \times 10^3$	90%	326
$\overline{p} \to e^- K_L^0$	$> 9 \times 10^3$	90%	337
$\overline{p} \to \mu^- K_L^0$	$> 7 \times 10^3$	90%	326
$\overline{p} \to e^- \gamma\gamma$	$> 2 \times 10^4$	90%	469
$\overline{p} \to \mu^- \gamma\gamma$	$> 2 \times 10^4$	90%	463
$\overline{p} \to e^- \omega$	> 200	90%	143

n

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

Mass $m = 1.0086649159 \pm 0.0000000005$ u
Mass $m = 939.565413 \pm 0.000006$ MeV [a]
$(m_n - m_{\overline{n}})/\, m_n = (9 \pm 6) \times 10^{-5}$
$m_n - m_p = 1.2933321 \pm 0.0000005$ MeV
$= 0.00138844919(45)$ u
Mean life $\tau = 880.2 \pm 1.0$ s (S = 1.9)
$c\tau = 2.6387 \times 10^8$ km
Magnetic moment $\mu = -1.9130427 \pm 0.0000005\ \mu_N$
Electric dipole moment $d < 0.30 \times 10^{-25}\ e$cm, CL = 90%
Mean-square charge radius $\langle r_n^2 \rangle = -0.1161 \pm 0.0022$ fm^2 (S = 1.3)
Magnetic radius $\sqrt{\langle r_M^2 \rangle} = 0.864^{+0.009}_{-0.008}$ fm
Electric polarizability $\alpha = (11.8 \pm 1.1) \times 10^{-4}$ fm^3
Magnetic polarizability $\beta = (3.7 \pm 1.2) \times 10^{-4}$ fm^3
Charge $q = (-0.2 \pm 0.8) \times 10^{-21}\ e$
Mean $n\overline{n}$-oscillation time $> 2.7 \times 10^8$ s, CL = 90% (free n)
Mean $n\overline{n}$-oscillation time $> 1.3 \times 10^8$ s, CL = 90% [g] (bound n)
Mean nn'-oscillation time > 414 s, CL = 90% [h]

$pe^-\overline{\nu}_e$ decay parameters [i]

$\lambda \equiv g_A / g_V = -1.2723 \pm 0.0023$ (S = 2.2)
$A = -0.1184 \pm 0.0010$ (S = 2.4)
$B = 0.9807 \pm 0.0030$
$C = -0.2377 \pm 0.0026$
$a = -0.103 \pm 0.004$
$\phi_{AV} = (180.017 \pm 0.026)^\circ$ [j]
$D = (-1.2 \pm 2.0) \times 10^{-4}$ [k]
$R = 0.004 \pm 0.013$ [k]

***n* DECAY MODES**	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$pe^-\overline{\nu}_e$	100 %		1
$pe^-\overline{\nu}_e\gamma$	[*l*] (3.09±0.32) × 10^{-3}		1
Charge conservation (Q) violating mode			
$p\nu_e\overline{\nu}_e$	Q < 8 × 10^{-27}	68%	1

N(1440) 1/2$^+$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

Breit-Wigner mass = 1410 to 1450 (≈ 1430) MeV
Breit-Wigner full width = 250 to 450 (≈ 350) MeV

***N*(1440) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	55–75 %	391
$N\eta$	<1 %	†
$N\pi\pi$	25–50 %	338
$\Delta(1232)\pi$	20–30 %	135
$\Delta(1232)\pi$, P-wave	13–27 %	135
$N\sigma$	11–23 %	–
$p\gamma$, helicity=1/2	0.035–0.048 %	407
$n\gamma$, helicity=1/2	0.02–0.04 %	406

N(1520) 3/2$^-$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$

Re(pole position) = 1505 to 1515 (≈ 1510) MeV
−2Im(pole position) = 105 to 120 (≈ 110) MeV
Breit-Wigner mass = 1510 to 1520 (≈ 1515) MeV
Breit-Wigner full width = 100 to 125 (≈ 115) MeV

***N*(1520) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	55–65 %	453
$N\eta$	< 1 %	142
$N\pi\pi$	25–35 %	410
$\Delta(1232)\pi$	22–34 %	225
$\Delta(1232)\pi$, S-wave	15–23 %	225
$\Delta(1232)\pi$, D-wave	7–11 %	225
$N\sigma$	< 2 %	–
$p\gamma$	0.31–0.52 %	467
$p\gamma$, helicity=1/2	0.01–0.02 %	467
$p\gamma$, helicity=3/2	0.30–0.50 %	467

$n\gamma$	0.30–0.53 %	466
$n\gamma$, helicity=1/2	0.04–0.10 %	466
$n\gamma$, helicity=3/2	0.25–0.45 %	466

$N(1535)\ 1/2^-$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^-)$

Re(pole position) = 1490 to 1530 ($\approx$ 1510) MeV
-2Im(pole position) = 90 to 250 ($\approx$ 170) MeV
Breit-Wigner mass = 1525 to 1545 ($\approx$ 1535) MeV
Breit-Wigner full width = 125 to 175 ($\approx$ 150) MeV

$N(1535)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	35–55 %	468
$N\eta$	32–52 %	186
$N\pi\pi$	3–14 %	426
$\Delta(1232)\pi$, D-wave	1–4 %	244
$N\sigma$	2–10 %	–
$N(1440)\pi$	5–12 %	†
$p\gamma$, helicity=1/2	0.15–0.30 %	481
$n\gamma$, helicity=1/2	0.01–0.25 %	480

$N(1650)\ 1/2^-$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^-)$

Re(pole position) = 1640 to 1670 ($\approx$ 1655) MeV
-2Im(pole position) = 100 to 170 ($\approx$ 135) MeV
Breit-Wigner mass = 1645 to 1670 ($\approx$ 1655) MeV
Breit-Wigner full width = 110 to 170 ($\approx$ 140) MeV

$N(1650)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	50–70 %	551
$N\eta$	14–22 %	354
ΛK	5–15 %	179
$N\pi\pi$	8–36 %	517
$\Delta(1232)\pi$, D-wave	6–18 %	349
$N\sigma$	2–18 %	–
$N(1440)\pi$	6–26 %	168
$p\gamma$, helicity=1/2	0.04–0.20 %	562
$n\gamma$, helicity=1/2	0.003–0.17 %	561

$N(1675)\ 5/2^-$

$I(J^P) = \frac{1}{2}(\frac{5}{2}^-)$

Re(pole position) = 1655 to 1665 (≈ 1660) MeV
−2Im(pole position) = 125 to 150 (≈ 135) MeV
Breit-Wigner mass = 1670 to 1680 (≈ 1675) MeV
Breit-Wigner full width = 130 to 165 (≈ 150) MeV

***N*(1675) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	35–45 %	564
$N\eta$	< 1 %	376
$N\pi\pi$	25–45 %	532
$\Delta(1232)\pi$, D-wave	23–37 %	366
$N\sigma$	3–7 %	–
$p\gamma$	0–0.02 %	575
$p\gamma$, helicity=1/2	0–0.01 %	575
$p\gamma$, helicity=3/2	0–0.01 %	575
$n\gamma$	0–0.15 %	574
$n\gamma$, helicity=1/2	0–0.05 %	574
$n\gamma$, helicity=3/2	0–0.10 %	574

$N(1680)\ 5/2^+$

$I(J^P) = \frac{1}{2}(\frac{5}{2}^+)$

Re(pole position) = 1665 to 1680 (≈ 1675) MeV
−2Im(pole position) = 110 to 135 (≈ 120) MeV
Breit-Wigner mass = 1680 to 1690 (≈ 1685) MeV
Breit-Wigner full width = 120 to 140 (≈ 130) MeV

***N*(1680) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	65–70 %	571
$N\eta$	<1 %	386
$N\pi\pi$	20–40 %	539
$\Delta(1232)\pi$	11–23 %	374
$\Delta(1232)\pi$, P-wave	4–10 %	374
$\Delta(1232)\pi$, F-wave	7–13 %	374
$N\sigma$	9–19 %	–
$p\gamma$	0.21–0.32 %	581
$p\gamma$, helicity=1/2	0.001–0.011 %	581
$p\gamma$, helicity=3/2	0.20–0.32 %	581
$n\gamma$	0.021–0.046 %	581
$n\gamma$, helicity=1/2	0.004–0.029 %	581
$n\gamma$, helicity=3/2	0.01–0.024 %	581

$N(1700)\ 3/2^-$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$

Re(pole position) = 1650 to 1750 (≈ 1700) MeV
-2Im(pole position) = 100 to 300 MeV
Breit-Wigner mass = 1650 to 1750 (≈ 1700) MeV
Breit-Wigner full width = 100 to 250 (≈ 150) MeV

***N*(1700) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	7–17 %	581
$N\eta$	seen	402
$N\pi\pi$	60–90 %	550
$\Delta(1232)\pi$	55–85 %	386
$\Delta(1232)\pi$, S-wave	50–80 %	386
$\Delta(1232)\pi$, D-wave	4–14 %	386
$N(1440)\pi$	3–11 %	215
$N(1520)\pi$	<4 %	120
$N\rho$, S=3/2, S-wave	seen	†
$N\sigma$	2–14 %	–
$p\gamma$	0.01–0.05 %	591
$p\gamma$, helicity=1/2	0.0–0.024 %	591
$p\gamma$, helicity=3/2	0.002–0.026 %	591
$n\gamma$	0.01–0.13 %	590
$n\gamma$, helicity=1/2	0.0–0.09 %	590
$n\gamma$, helicity=3/2	0.01–0.05 %	590

$N(1710)\ 1/2^+$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

Re(pole position) = 1670 to 1770 (≈ 1720) MeV
-2Im(pole position) = 80 to 380 (≈ 230) MeV
Breit-Wigner mass = 1680 to 1740 (≈ 1710) MeV
Breit-Wigner full width = 50 to 250 (≈ 100) MeV

***N*(1710) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	5–20 %	588
$N\eta$	10–50 %	412
$N\omega$	1–5 %	†
ΛK	5–25 %	269
ΣK	seen	138
$N\pi\pi$	seen	557
$\Delta(1232)\pi$, P-wave	seen	394
$N(1535)\pi$	9–21 %	106

$N\rho$, S=1/2, P-wave	seen	†
$p\gamma$, helicity=1/2	0.002–0.08 %	598
$n\gamma$, helicity=1/2	0.0–0.02%	597

$N(1720)\ 3/2^+$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^+)$

Re(pole position) = 1660 to 1690 ($\approx$ 1675) MeV
-2Im(pole position) = 150 to 400 ($\approx$ 250) MeV
Breit-Wigner mass = 1700 to 1750 ($\approx$ 1720) MeV
Breit-Wigner full width = 150 to 400 ($\approx$ 250) MeV

$N(1720)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	8–14 %	594
$N\eta$	1–5 %	422
ΛK	4–5 %	283
$N\pi\pi$	50–90 %	564
$\Delta(1232)\pi$, P-wave	47–77 %	402
$\Delta(1232)\pi$, F-wave	<12 %	402
$N\rho$	70–85 %	74
$N\rho$, S=1/2, P-wave	seen	74
$N\sigma$	2–14 %	–
$N(1440)\pi$	<2 %	235
$N(1520)\pi$, S-wave	1–5 %	145
$p\gamma$	0.05–0.25 %	604
$p\gamma$, helicity=1/2	0.05–0.15 %	604
$p\gamma$, helicity=3/2	0.002–0.16 %	604
$n\gamma$	0.0–0.016 %	603
$n\gamma$, helicity=1/2	0.0–0.01 %	603
$n\gamma$, helicity=3/2	0.0–0.015 %	603

$N(1875)\ 3/2^-$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$

Re(pole position) = 1800 to 1950 MeV
-2Im(pole position) = 150 to 250 MeV
Breit-Wigner mass = 1820 to 1920 ($\approx$ 1875) MeV
Breit-Wigner full width = 250 $\pm$ 70 MeV

$N(1875)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	2–14 %	695
$N\eta$	<1 %	559
$N\omega$	15–25 %	371

ΛK	seen	454
ΣK	seen	384
$N\pi\pi$		670
$\Delta(1232)\pi$	10–35 %	520
$\Delta(1232)\pi$, S-wave	7–21 %	520
$\Delta(1232)\pi$, D-wave	2–12 %	520
$N\rho$, S=3/2, S-wave	seen	379
$N\sigma$	30–60 %	–
$N(1440)\pi$	2–8 %	373
$N(1520)\pi$	<2 %	301
$p\gamma$	0.001–0.025 %	703
$p\gamma$, helicity=1/2	0.001–0.021 %	703
$p\gamma$, helicity=3/2	<0.003 %	703
$n\gamma$	<0.040 %	702
$n\gamma$, helicity=1/2	<0.007 %	702
$n\gamma$, helicity=3/2	<0.033 %	702

$N(1900)\ 3/2^+$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^+)$

Re(pole position) = 1900 to 1940 ($\approx$ 1920) MeV
-2Im(pole position) = 130 to 300 MeV
Breit-Wigner mass = 1900 $\pm$ 30 MeV
Breit-Wigner full width = 200 $\pm$ 50 MeV

***N*(1900) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	<10 %	710
$N\eta$	2–14 %	579
$N\omega$	7–13 %	401
ΛK	2–20 %	477
ΣK	3–7 %	410
$N\pi\pi$	40–80 %	686
$\Delta(1232)\pi$	30–70 %	539
$\Delta(1232)\pi$, P-wave	9–25 %	539
$\Delta(1232)\pi$, F-wave	21–45 %	539
$N\sigma$	1–7 %	–
$N(1520)\pi$	7–23 %	324
$N(1535)\pi$	4–10 %	306
$p\gamma$	0.001–0.025 %	718
$p\gamma$, helicity=1/2	0.001–0.021 %	718
$p\gamma$, helicity=3/2	<0.003 %	718
$n\gamma$	<0.040 %	718
$n\gamma$, helicity=1/2	<0.007 %	718
$n\gamma$, helicity=3/2	<0.033 %	718

$N(2190)\ 7/2^-$

$I(J^P) = \frac{1}{2}(\frac{7}{2}^-)$

Re(pole position) = 2050 to 2100 (≈ 2075) MeV
-2Im(pole position) = 400 to 520 (≈ 450) MeV
Breit-Wigner mass = 2100 to 2200 (≈ 2190) MeV
Breit-Wigner full width = 300 to 700 (≈ 500) MeV

$N(2190)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	10–20 %	888
$N\eta$	seen	791
ΛK	0.2–0.8;%	712
$N\pi\pi$	22–80;%	870
$\Delta(1232)\pi$, D-wave	19–31 %	740
$N\rho$, S=3/2, D-wave	seen	680
$N\sigma$	3–9 %	–
$p\gamma$	0.014–0.077 %	894
$p\gamma$, helicity=1/2	0.013–0.062;%	894
$p\gamma$, helicity=3/2	0.001–0.014;%	894
$n\gamma$	<0.04 %	893
$n\gamma$, helicity=1/2	<0.01;%	893
$n\gamma$, helicity=3/2	<0.03 %	893

$N(2220)\ 9/2^+$

$I(J^P) = \frac{1}{2}(\frac{9}{2}^+)$

Re(pole position) = 2130 to 2200 (≈ 2170) MeV
-2Im(pole position) = 400 to 560 (≈ 480) MeV
Breit-Wigner mass = 2200 to 2300 (≈ 2250) MeV
Breit-Wigner full width = 350 to 500 (≈ 400) MeV

$N(2220)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	15–25 %	924

$N(2250)\ 9/2^-$

$I(J^P) = \frac{1}{2}(\frac{9}{2}^-)$

Re(pole position) = 2150 to 2250 (≈ 2200) MeV
-2Im(pole position) = 350 to 550 (≈ 450) MeV
Breit-Wigner mass = 2250 to 2320 (≈ 2280) MeV
Breit-Wigner full width = 300 to 600 (≈ 500) MeV

***N*(2250) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	5–15 %	941

$N(2600)\ 11/2^-$

$I(J^P) = \frac{1}{2}(\frac{11}{2}^-)$

Breit-Wigner mass = 2550 to 2750 ($\approx$ 2600) MeV
Breit-Wigner full width = 500 to 800 ($\approx$ 650) MeV

***N*(2600) DECAY MODES**	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	5–10 %	1126

Δ BARYONS ($S=0, I=3/2$)

$\Delta^{++} = uuu, \quad \Delta^{+} = uud, \quad \Delta^{0} = udd, \quad \Delta^{-} = ddd$

$\Delta(1232)\ 3/2^+$

$I(J^P) = \frac{3}{2}(\frac{3}{2}^+)$

Re(pole position) = 1209 to 1211 ($\approx$ 1210) MeV
-2Im(pole position) = 98 to 102 ($\approx$ 100) MeV
Breit-Wigner mass (mixed charges) = 1230 to 1234 ($\approx$ 1232) MeV
Breit-Wigner full width (mixed charges) = 114 to 120 ($\approx$ 117) MeV

Δ(1232) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	99.4 %	229
$N\gamma$	0.55–0.65 %	259
$N\gamma$, helicity=1/2	0.11–0.13 %	259
$N\gamma$, helicity=3/2	0.44–0.52 %	259

$\Delta(1600)\ 3/2^+$

$I(J^P) = \frac{3}{2}(\frac{3}{2}^+)$

Re(pole position) = 1460 to 1560 ($\approx$ 1510) MeV
-2Im(pole position) = 200 to 350 ($\approx$ 275) MeV
Breit-Wigner mass = 1500 to 1700 ($\approx$ 1600) MeV
Breit-Wigner full width = 220 to 420 ($\approx$ 320) MeV

Δ(1600) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	10–25 %	513
$N\pi\pi$	75–90 %	477
$\Delta(1232)\pi$	73–83 %	303
$\Delta(1232)\pi$, P-wave	72–82 %	303
$\Delta(1232)\pi$, F-wave	<2 %	303
$N(1440)\pi$, P-wave	seen	98
$N\gamma$	0.001–0.035 %	525
$N\gamma$, helicity=1/2	0.0–0.02 %	525
$N\gamma$, helicity=3/2	0.001–0.015 %	525

Δ(1620) 1/2⁻

$I(J^P) = \frac{3}{2}(\frac{1}{2}^-)$

Re(pole position) = 1590 to 1610 (≈ 1600) MeV
−2Im(pole position) = 120 to 140 (≈ 130) MeV
Breit-Wigner mass = 1600 to 1660 (≈ 1630) MeV
Breit-Wigner full width = 130 to 150 (≈ 140) MeV

Δ(1620) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	20–30 %	534
$N\pi\pi$	55–80 %	499
$\Delta(1232)\pi$, D-wave	52–72 %	328
$N\rho$, S=1/2, S-wave	seen	†
$N\rho$, S=3/2, D-wave	seen	†
$N(1440)\pi$	3–9 %	138
$N\gamma$, helicity=1/2	0.03–0.10 %	545

Δ(1700) 3/2⁻

$I(J^P) = \frac{3}{2}(\frac{3}{2}^-)$

Re(pole position) = 1620 to 1680 (≈ 1650) MeV
−2Im(pole position) = 160 to 300 (≈ 230) MeV
Breit-Wigner mass = 1670 to 1750 (≈ 1700) MeV
Breit-Wigner full width = 200 to 400 (≈ 300) MeV

Δ(1700) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	10–20 %	581
$N\pi\pi$	10–55 %	550
$\Delta(1232)\pi$	10–50 %	386
$\Delta(1232)\pi$, S-wave	5–35 %	386
$\Delta(1232)\pi$, D-wave	4–16 %	386

$N\rho$, S=3/2, S-wave	seen	†
$N(1520)\pi$, P-wave	1–5 %	120
$N(1535)\pi$	0.5–1.5 %	90
$\Delta(1232)\eta$	3–7 %	†
$N\gamma$	0.22–0.60 %	591
$N\gamma$, helicity=1/2	0.12–0.30 %	591
$N\gamma$, helicity=3/2	0.10–0.30 %	591

$\Delta(1905)\ 5/2^+$

$I(J^P) = \frac{3}{2}(\frac{5}{2}^+)$

Re(pole position) = 1805 to 1835 ($\approx$ 1820) MeV
-2Im(pole position) = 265 to 300 ($\approx$ 280) MeV
Breit-Wigner mass = 1855 to 1910 ($\approx$ 1880) MeV
Breit-Wigner full width = 270 to 400 ($\approx$ 330) MeV

$\Delta(1905)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	9–15 %	698
$N\pi\pi$		673
$\Delta(1232)\pi$, P-wave	23–43 %	524
$\Delta(1232)\pi$, F-wave	seen	524
$N\rho$, S=3/2, P-wave	seen	385
$N(1535)\pi$	$<$ 1 %	288
$N(1680)\pi$, P-wave	5–15 %	133
$\Delta(1232)\eta$	2–6 %	282
$N\gamma$	0.012–0.036 %	706
$N\gamma$, helicity=1/2	0.002–0.006 %	706
$N\gamma$, helicity=3/2	0.01–0.03 %	706

$\Delta(1910)\ 1/2^+$

$I(J^P) = \frac{3}{2}(\frac{1}{2}^+)$

Re(pole position) = 1830 to 1880 ($\approx$ 1855) MeV
-2Im(pole position) = 200 to 500 ($\approx$ 350) MeV
Breit-Wigner mass = 1860 to 1910 ($\approx$ 1890) MeV
Breit-Wigner full width = 220 to 340 ($\approx$ 280) MeV

$\Delta(1910)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	15–30 %	704
ΣK	4–14 %	400
$N\pi\pi$		680
$\Delta(1232)\pi$	34–66 %	531
$N(1440)\pi$	3–9 %	386

$\Delta(1232)\eta$	5–13 %	296
$N\gamma$, helicity=1/2	0.0–0.02 %	712

$\Delta(1920)\ 3/2^+$

$I(J^P) = \frac{3}{2}(\frac{3}{2}^+)$

Re(pole position) = 1850 to 1950 (≈ 1900) MeV
−2Im(pole position) = 200 to 400 (≈ 300) MeV
Breit-Wigner mass = 1900 to 1970 (≈ 1920) MeV
Breit-Wigner full width = 180 to 300 (≈ 260) MeV

$\Delta(1920)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	5–20 %	723
ΣK	2–6 %	431
$N\pi\pi$		699
$\Delta(1232)\pi$	50–90 %	553
$\Delta(1232)\pi$, P-wave	8–28 %	553
$\Delta(1232)\pi$, F-wave	44–72 %	553
$N(1440)\pi$, P-wave	<4 %	411
$N(1520)\pi$, S-wave	<5 %	341
$N(1535)\pi$	<2 %	324
$N a_0(980)$	seen	41
$\Delta(1232)\eta$	5–17 %	336

$\Delta(1930)\ 5/2^-$

$I(J^P) = \frac{3}{2}(\frac{5}{2}^-)$

Re(pole position) = 1840 to 1960 (≈ 1900) MeV
−2Im(pole position) = 175 to 360 (≈ 270) MeV
Breit-Wigner mass = 1900 to 2000 (≈ 1950) MeV
Breit-Wigner full width = 220 to 500 (≈ 360) MeV

$\Delta(1930)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	5–15 %	742
$N\gamma$	0.0–0.01 %	749
$N\gamma$, helicity=1/2	0.0–0.005 %	749
$N\gamma$, helicity=3/2	0.0–0.004 %	749

$\Delta(1950)\ 7/2^+$

$I(J^P) = \frac{3}{2}(\frac{7}{2}^+)$

Re(pole position) = 1870 to 1890 (≈ 1880) MeV
−2Im(pole position) = 220 to 260 (≈ 240) MeV
Breit-Wigner mass = 1915 to 1950 (≈ 1930) MeV
Breit-Wigner full width = 235 to 335 (≈ 285) MeV

Δ(1950) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	35–45 %	729
ΣK	0.3–0.5 %	441
$N\pi\pi$		706
$\Delta(1232)\pi$, F-wave	1–9 %	560
$N(1680)\pi$, P-wave	3–9 %	191
$\Delta(1232)\eta$	< 1 %	349

Δ(2420) 11/2+

$I(J^P) = \frac{3}{2}(\frac{11}{2}^+)$

Re(pole position) = 2260 to 2400 (≈ 2330) MeV
−2Im(pole position) = 350 to 750 (≈ 550) MeV
Breit-Wigner mass = 2300 to 2500 (≈ 2420) MeV
Breit-Wigner full width = 300 to 500 (≈ 400) MeV

Δ(2420) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\pi$	5–15 %	1023

Λ BARYONS ($S = -1$, $I = 0$)

$\Lambda^0 = uds$

Λ

$I(J^P) = 0(\frac{1}{2}^+)$

Mass $m = 1115.683 \pm 0.006$ MeV
$(m_\Lambda - m_{\overline{\Lambda}}) \,/\, m_\Lambda = (-0.1 \pm 1.1) \times 10^{-5}$ (S = 1.6)
Mean life $\tau = (2.632 \pm 0.020) \times 10^{-10}$ s (S = 1.6)
$(\tau_\Lambda - \tau_{\overline{\Lambda}}) \,/\, \tau_\Lambda = -0.001 \pm 0.009$
$c\tau = 7.89$ cm
Magnetic moment $\mu = -0.613 \pm 0.004\ \mu_N$
Electric dipole moment $d < 1.5 \times 10^{-16}\ e$cm, CL = 95%

Decay parameters

$p\pi^-$	$\alpha_- = 0.642 \pm 0.013$
$\overline{p}\pi^+$	$\alpha_+ = -0.71 \pm 0.08$
$p\pi^-$	$\phi_- = (-6.5 \pm 3.5)^\circ$
"	$\gamma_- = 0.76$ [n]
"	$\Delta_- = (8 \pm 4)^\circ$ [n]
$n\pi^0$	$\alpha_0 = 0.65 \pm 0.04$
$pe^-\overline{\nu}_e$	$g_A/g_V = -0.718 \pm 0.015$ [i]

Λ DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$p\pi^-$		(63.9 ±0.5) %		101
$n\pi^0$		(35.8 ±0.5) %		104
$n\gamma$		(1.75±0.15) × 10^{-3}		162
$p\pi^-\gamma$	[o]	(8.4 ±1.4) × 10^{-4}		101
$pe^-\overline{\nu}_e$		(8.32±0.14) × 10^{-4}		163
$p\mu^-\overline{\nu}_\mu$		(1.57±0.35) × 10^{-4}		131
Lepton (L) and/or Baryon (B) number violating decay modes				
π^+e^-	L,B	< 6 × 10^{-7}	90%	549
$\pi^+\mu^-$	L,B	< 6 × 10^{-7}	90%	544
π^-e^+	L,B	< 4 × 10^{-7}	90%	549
$\pi^-\mu^+$	L,B	< 6 × 10^{-7}	90%	544
K^+e^-	L,B	< 2 × 10^{-6}	90%	449
$K^+\mu^-$	L,B	< 3 × 10^{-6}	90%	441
K^-e^+	L,B	< 2 × 10^{-6}	90%	449
$K^-\mu^+$	L,B	< 3 × 10^{-6}	90%	441
$K^0_S\nu$	L,B	< 2 × 10^{-5}	90%	447
$\overline{p}\pi^+$	B	< 9 × 10^{-7}	90%	101

Λ(1405) 1/2⁻

$I(J^P) = 0(\frac{1}{2}^-)$

Mass $m = 1405.1^{+1.3}_{-1.0}$ MeV
Full width $\Gamma = 50.5 \pm 2.0$ MeV
Below $\overline{K}N$ threshold

Λ(1405) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Sigma\pi$	100 %	155

Λ(1520) 3/2⁻

$I(J^P) = 0(\frac{3}{2}^-)$

Mass $m = 1519.5 \pm 1.0$ MeV [p]
Full width $\Gamma = 15.6 \pm 1.0$ MeV [p]

Λ(1520) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	(45 ±1) %	243
$\Sigma\pi$	(42 ±1) %	268
$\Lambda\pi\pi$	(10 ±1) %	259
$\Sigma\pi\pi$	(0.9 ±0.1) %	169
$\Lambda\gamma$	(0.85±0.15) %	350

$\Lambda(1600)\ 1/2^+$

$I(J^P) = 0(\frac{1}{2}^+)$

Mass $m = 1560$ to 1700 (≈ 1600) MeV
Full width $\Gamma = 50$ to 250 (≈ 150) MeV

$\Lambda(1600)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	15–30 %	343
$\Sigma\pi$	10–60 %	338

$\Lambda(1670)\ 1/2^-$

$I(J^P) = 0(\frac{1}{2}^-)$

Mass $m = 1660$ to 1680 (≈ 1670) MeV
Full width $\Gamma = 25$ to 50 (≈ 35) MeV

$\Lambda(1670)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	20–30 %	414
$\Sigma\pi$	25–55 %	394
$\Lambda\eta$	10–25 %	69
$N\overline{K}^*(892)$, S=3/2, D-wave	(5±4) %	†

$\Lambda(1690)\ 3/2^-$

$I(J^P) = 0(\frac{3}{2}^-)$

Mass $m = 1685$ to 1695 (≈ 1690) MeV
Full width $\Gamma = 50$ to 70 (≈ 60) MeV

$\Lambda(1690)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	20–30 %	433
$\Sigma\pi$	20–40 %	410
$\Lambda\pi\pi$	$\sim$ 25 %	419
$\Sigma\pi\pi$	$\sim$ 20 %	358

$\Lambda(1800)\ 1/2^-$

$I(J^P) = 0(\frac{1}{2}^-)$

Mass $m = 1720$ to 1850 (≈ 1800) MeV
Full width $\Gamma = 200$ to 400 (≈ 300) MeV

Λ(1800) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	25–40 %	528
$\Sigma\pi$	seen	494
$\Sigma(1385)\pi$	seen	349
$\Lambda\eta$	(6±5) %	326
$N\overline{K}^*(892)$	seen	†

Λ(1810) 1/2$^+$

$I(J^P) = 0(\frac{1}{2}^+)$

Mass m = 1750 to 1850 (≈ 1810) MeV
Full width Γ = 50 to 250 (≈ 150) MeV

Λ(1810) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	20–50 %	537
$\Sigma\pi$	10–40 %	501
$\Sigma(1385)\pi$	seen	357
$N\overline{K}^*(892)$	30–60 %	†

Λ(1820) 5/2$^+$

$I(J^P) = 0(\frac{5}{2}^+)$

Mass m = 1815 to 1825 (≈ 1820) MeV
Full width Γ = 70 to 90 (≈ 80) MeV

Λ(1820) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	55–65 %	545
$\Sigma\pi$	8–14 %	509
$\Sigma(1385)\pi$	5–10 %	366
$N\overline{K}^*(892)$, S=3/2, P-wave	(3.0±1.0) %	†

Λ(1830) 5/2$^-$

$I(J^P) = 0(\frac{5}{2}^-)$

Mass m = 1810 to 1830 (≈ 1830) MeV
Full width Γ = 60 to 110 (≈ 95) MeV

Λ(1830) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	3–10 %	553
$\Sigma\pi$	35–75 %	516
$\Sigma(1385)\pi$	>15 %	374
$\Sigma(1385)\pi$, D-wave	(52±6) %	374

Λ(1890) 3/2$^+$

$I(J^P) = 0(\frac{3}{2}^+)$

Mass m = 1850 to 1910 (≈ 1890) MeV
Full width Γ = 60 to 200 (≈ 100) MeV

Λ(1890) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	20–35 %	599
$\Sigma\pi$	3–10 %	560
$\Sigma(1385)\pi$	seen	423
$N\overline{K}^*(892)$	seen	236

Λ(2100) 7/2$^-$

$I(J^P) = 0(\frac{7}{2}^-)$

Mass m = 2090 to 2110 (≈ 2100) MeV
Full width Γ = 100 to 250 (≈ 200) MeV

Λ(2100) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	25–35 %	751
$\Sigma\pi$	∼ 5 %	705
$\Lambda\eta$	<3 %	617
ΞK	<3 %	491
$\Lambda\omega$	<8 %	443
$N\overline{K}^*(892)$	10–20 %	515

Λ(2110) 5/2$^+$

$I(J^P) = 0(\frac{5}{2}^+)$

Mass m = 2090 to 2140 (≈ 2110) MeV
Full width Γ = 150 to 250 (≈ 200) MeV

Λ(2110) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	5–25 %	757
$\Sigma\pi$	10–40 %	711
$\Lambda\omega$	seen	455
$\Sigma(1385)\pi$	seen	591
$N\overline{K}^*(892)$	10–60 %	525

Λ(2350) 9/2$^+$

$I(J^P) = 0(\frac{9}{2}^+)$

Mass m = 2340 to 2370 ($\approx$ 2350) MeV
Full width Γ = 100 to 250 ($\approx$ 150) MeV

Λ(2350) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	$\sim$ 12 %	915
$\Sigma\pi$	$\sim$ 10 %	867

Σ BARYONS ($S=-1, I=1$)

$\Sigma^+ = uus, \quad \Sigma^0 = uds, \quad \Sigma^- = dds$

Σ$^+$

$I(J^P) = 1(\frac{1}{2}^+)$

Mass $m = 1189.37 \pm 0.07$ MeV (S = 2.2)
Mean life $\tau = (0.8018 \pm 0.0026) \times 10^{-10}$ s
$c\tau$ = 2.404 cm
$(\tau_{\Sigma^+} - \tau_{\overline{\Sigma}^-}) / \tau_{\Sigma^+} = -0.0006 \pm 0.0012$
Magnetic moment $\mu = 2.458 \pm 0.010\ \mu_N$ (S = 2.1)
$(\mu_{\Sigma^+} + \mu_{\overline{\Sigma}^-}) / \mu_{\Sigma^+} = 0.014 \pm 0.015$
$\Gamma(\Sigma^+ \to n\ell^+\nu)/\Gamma(\Sigma^- \to n\ell^-\overline{\nu}) < 0.043$

Decay parameters

$p\pi^0$	$\alpha_0 = -0.980^{+0.017}_{-0.015}$
"	$\phi_0 = (36 \pm 34)^\circ$
"	$\gamma_0 = 0.16$ [n]
"	$\Delta_0 = (187 \pm 6)^\circ$ [n]
$n\pi^+$	$\alpha_+ = 0.068 \pm 0.013$
"	$\phi_+ = (167 \pm 20)^\circ$ (S = 1.1)
"	$\gamma_+ = -0.97$ [n]
"	$\Delta_+ = (-73^{+133}_{-10})^\circ$ [n]
$p\gamma$	$\alpha_\gamma = -0.76 \pm 0.08$

Σ^+ DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$p\pi^0$		(51.57±0.30) %		189
$n\pi^+$		(48.31±0.30) %		185
$p\gamma$		(1.23±0.05) $\times 10^{-3}$		225
$n\pi^+\gamma$	[o]	(4.5 ±0.5) $\times 10^{-4}$		185
$\Lambda e^+\nu_e$		(2.0 ±0.5) $\times 10^{-5}$		71
$\Delta S = \Delta Q$ (SQ) violating modes or $\Delta S = 1$ weak neutral current ($S1$) modes				
$ne^+\nu_e$	SQ	$< 5 \times 10^{-6}$	90%	224
$n\mu^+\nu_\mu$	SQ	$< 3.0 \times 10^{-5}$	90%	202
pe^+e^-	$S1$	$< 7 \times 10^{-6}$		225
$p\mu^+\mu^-$	$S1$	$(9 \ {}^{+9}_{-8}) \times 10^{-8}$		121

Σ^0

$I(J^P) = 1(\frac{1}{2}^+)$

Mass $m = 1192.642 \pm 0.024$ MeV
$m_{\Sigma^-} - m_{\Sigma^0} = 4.807 \pm 0.035$ MeV (S = 1.1)
$m_{\Sigma^0} - m_\Lambda = 76.959 \pm 0.023$ MeV
Mean life $\tau = (7.4 \pm 0.7) \times 10^{-20}$ s
$c\tau = 2.22 \times 10^{-11}$ m
Transition magnetic moment $|\mu_{\Sigma\Lambda}| = 1.61 \pm 0.08\ \mu_N$

Σ^0 DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\Lambda\gamma$		100 %		74
$\Lambda\gamma\gamma$		< 3 %	90%	74
Λe^+e^-	[q]	5×10^{-3}		74

Σ^-

$I(J^P) = 1(\frac{1}{2}^+)$

Mass $m = 1197.449 \pm 0.030$ MeV (S = 1.2)
$m_{\Sigma^-} - m_{\Sigma^+} = 8.08 \pm 0.08$ MeV (S = 1.9)
$m_{\Sigma^-} - m_\Lambda = 81.766 \pm 0.030$ MeV (S = 1.2)
Mean life $\tau = (1.479 \pm 0.011) \times 10^{-10}$ s (S = 1.3)
$c\tau = 4.434$ cm
Magnetic moment $\mu = -1.160 \pm 0.025\ \mu_N$ (S = 1.7)
Σ^- charge radius = 0.78 ± 0.10 fm

Decay parameters

$n\pi^-$	$\alpha_- = -0.068 \pm 0.008$
"	$\phi_- = (10 \pm 15)^\circ$
"	$\gamma_- = 0.98$ [n]
"	$\Delta_- = (249^{+12}_{-120})^\circ$ [n]
$ne^-\overline{\nu}_e$	$g_A/g_V = 0.340 \pm 0.017$ [i]
"	$f_2(0)/f_1(0) = 0.97 \pm 0.14$
"	$D = 0.11 \pm 0.10$
$\Lambda e^-\overline{\nu}_e$	$g_V/g_A = 0.01 \pm 0.10$ [i] (S = 1.5)
"	$g_{WM}/g_A = 2.4 \pm 1.7$ [i]

Σ^- DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$n\pi^-$	(99.848±0.005) %	193
$n\pi^-\gamma$	[o] (4.6 ±0.6) × 10^{-4}	193
$ne^-\overline{\nu}_e$	(1.017±0.034) × 10^{-3}	230
$n\mu^-\overline{\nu}_\mu$	(4.5 ±0.4) × 10^{-4}	210
$\Lambda e^-\overline{\nu}_e$	(5.73 ±0.27) × 10^{-5}	79

$\Sigma(1385)\ 3/2^+$

$I(J^P) = 1(\frac{3}{2}^+)$

$\Sigma(1385)^+$ mass $m = 1382.80 \pm 0.35$ MeV (S = 1.9)
$\Sigma(1385)^0$ mass $m = 1383.7 \pm 1.0$ MeV (S = 1.4)
$\Sigma(1385)^-$ mass $m = 1387.2 \pm 0.5$ MeV (S = 2.2)
$\Sigma(1385)^+$ full width $\Gamma = 36.0 \pm 0.7$ MeV
$\Sigma(1385)^0$ full width $\Gamma = 36 \pm 5$ MeV
$\Sigma(1385)^-$ full width $\Gamma = 39.4 \pm 2.1$ MeV (S = 1.7)
Below $\overline{K}N$ threshold

$\Sigma(1385)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\Lambda\pi$	(87.0 ±1.5) %		208
$\Sigma\pi$	(11.7 ±1.5) %		129
$\Lambda\gamma$	($1.25^{+0.13}_{-0.12}$) %		241
$\Sigma^+\gamma$	(7.0 ±1.7) × 10^{-3}		180
$\Sigma^-\gamma$	< 2.4 × 10^{-4}	90%	173

$\Sigma(1660)\ 1/2^+$

$I(J^P) = 1(\frac{1}{2}^+)$

Mass $m = 1630$ to 1690 (≈ 1660) MeV
Full width $\Gamma = 40$ to 200 (≈ 100) MeV

Σ(1660) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	10–30 %	405
$\Lambda\pi$	seen	440
$\Sigma\pi$	seen	387

Σ(1670) 3/2⁻

$I(J^P) = 1(\frac{3}{2}^-)$

Mass m = 1665 to 1685 ($\approx$ 1670) MeV
Full width Γ = 40 to 80 ($\approx$ 60) MeV

Σ(1670) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	7–13 %	414
$\Lambda\pi$	5–15 %	448
$\Sigma\pi$	30–60 %	394

Σ(1750) 1/2⁻

$I(J^P) = 1(\frac{1}{2}^-)$

Mass m = 1730 to 1800 ($\approx$ 1750) MeV
Full width Γ = 60 to 160 ($\approx$ 90) MeV

Σ(1750) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	10–40 %	486
$\Lambda\pi$	seen	507
$\Sigma\pi$	<8 %	456
$\Sigma\eta$	15–55 %	98
$N\overline{K}^*(892)$, S=1/2	(8±4) %	†

Σ(1775) 5/2⁻

$I(J^P) = 1(\frac{5}{2}^-)$

Mass m = 1770 to 1780 ($\approx$ 1775) MeV
Full width Γ = 105 to 135 ($\approx$ 120) MeV

Σ(1775) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	37–43%	508
$\Lambda\pi$	14–20%	525
$\Sigma\pi$	2–5%	475
$\Sigma(1385)\pi$	8–12%	327
$\Lambda(1520)\pi$, P-wave	17–23%	201

$\Sigma(1915)\ 5/2^+$

$I(J^P) = 1(\frac{5}{2}^+)$

Mass $m = 1900$ to 1935 (≈ 1915) MeV
Full width $\Gamma = 80$ to 160 (≈ 120) MeV

$\Sigma(1915)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	5–15 %	618
$\Lambda\pi$	seen	623
$\Sigma\pi$	seen	577
$\Sigma(1385)\pi$	<5 %	443

$\Sigma(1940)\ 3/2^-$

$I(J^P) = 1(\frac{3}{2}^-)$

Mass $m = 1900$ to 1950 (≈ 1940) MeV
Full width $\Gamma = 150$ to 300 (≈ 220) MeV

$\Sigma(1940)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	<20 %	637
$\Lambda\pi$	seen	640
$\Sigma\pi$	seen	595
$\Sigma(1385)\pi$	seen	463
$\Lambda(1520)\pi$	seen	355
$\Delta(1232)\overline{K}$	seen	410
$N\overline{K}^*(892)$	seen	322

$\Sigma(2030)\ 7/2^+$

$I(J^P) = 1(\frac{7}{2}^+)$

Mass $m = 2025$ to 2040 (≈ 2030) MeV
Full width $\Gamma = 150$ to 200 (≈ 180) MeV

$\Sigma(2030)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	17–23 %	702
$\Lambda\pi$	17–23 %	700
$\Sigma\pi$	5–10 %	657
ΞK	<2 %	422
$\Sigma(1385)\pi$	5–15 %	532
$\Lambda(1520)\pi$	10–20 %	430
$\Delta(1232)\overline{K}$	10–20 %	498
$N\overline{K}^*(892)$	<5 %	439

$\Sigma(2250)$

$I(J^P) = 1(?^?)$

Mass $m = 2210$ to 2280 (≈ 2250) MeV
Full width $\Gamma = 60$ to 150 (≈ 100) MeV

$\Sigma(2250)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	<10 %	851
$\Lambda\pi$	seen	842
$\Sigma\pi$	seen	803

Ξ BARYONS ($S=-2, I=1/2$)

$\Xi^0 = uss, \quad \Xi^- = dss$

Ξ^0

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

P is not yet measured; $+$ is the quark model prediction.

Mass $m = 1314.86 \pm 0.20$ MeV
$m_{\Xi^-} - m_{\Xi^0} = 6.85 \pm 0.21$ MeV
Mean life $\tau = (2.90 \pm 0.09) \times 10^{-10}$ s
$c\tau = 8.71$ cm
Magnetic moment $\mu = -1.250 \pm 0.014\ \mu_N$

Decay parameters

$\Lambda\pi^0$	$\alpha = -0.406 \pm 0.013$
"	$\phi = (21 \pm 12)^\circ$
"	$\gamma = 0.85$ [n]
"	$\Delta = (218^{+12}_{-19})^\circ$ [n]
$\Lambda\gamma$	$\alpha = -0.70 \pm 0.07$
$\Lambda e^+ e^-$	$\alpha = -0.8 \pm 0.2$
$\Sigma^0\gamma$	$\alpha = -0.69 \pm 0.06$
$\Sigma^+ e^- \overline{\nu}_e$	$g_1(0)/f_1(0) = 1.22 \pm 0.05$
$\Sigma^+ e^- \overline{\nu}_e$	$f_2(0)/f_1(0) = 2.0 \pm 0.9$

Ξ^0 DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\Lambda\pi^0$	(99.524±0.012) %		135
$\Lambda\gamma$	(1.17 ±0.07) × 10^{-3}		184
$\Lambda e^+ e^-$	(7.6 ±0.6) × 10^{-6}		184
$\Sigma^0\gamma$	(3.33 ±0.10) × 10^{-3}		117
$\Sigma^+ e^- \overline{\nu}_e$	(2.52 ±0.08) × 10^{-4}		120
$\Sigma^+ \mu^- \overline{\nu}_\mu$	(2.33 ±0.35) × 10^{-6}		64
$\Delta S = \Delta Q$ (SQ) violating modes or $\Delta S = 2$ forbidden ($S2$) modes			
$\Sigma^- e^+ \nu_e$	SQ < 9 × 10^{-4}	90%	112
$\Sigma^- \mu^+ \nu_\mu$	SQ < 9 × 10^{-4}	90%	49
$p\pi^-$	$S2$ < 8 × 10^{-6}	90%	299
$p e^- \overline{\nu}_e$	$S2$ < 1.3 × 10^{-3}		323
$p\mu^- \overline{\nu}_\mu$	$S2$ < 1.3 × 10^{-3}		309

Ξ^-

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

P is not yet measured; + is the quark model prediction.

Mass $m = 1321.71 \pm 0.07$ MeV
$(m_{\Xi^-} - m_{\overline{\Xi}^+}) / m_{\Xi^-} = (-3 \pm 9) \times 10^{-5}$
Mean life $\tau = (1.639 \pm 0.015) \times 10^{-10}$ s
$c\tau = 4.91$ cm
$(\tau_{\Xi^-} - \tau_{\overline{\Xi}^+}) / \tau_{\Xi^-} = -0.01 \pm 0.07$
Magnetic moment $\mu = -0.6507 \pm 0.0025\ \mu_N$
$(\mu_{\Xi^-} + \mu_{\overline{\Xi}^+}) / |\mu_{\Xi^-}| = +0.01 \pm 0.05$

Decay parameters

$\Lambda\pi^-$ $\alpha = -0.458 \pm 0.012$ (S = 1.8)
$[\alpha(\Xi^-)\alpha_-(\Lambda) - \alpha(\overline{\Xi}^+)\alpha_+(\overline{\Lambda})] / [\text{ sum }] = (0 \pm 7) \times 10^{-4}$
" $\phi = (-2.1 \pm 0.8)^\circ$
" $\gamma = 0.89$ [n]
" $\Delta = (175.9 \pm 1.5)^\circ$ [n]
$\Lambda e^- \overline{\nu}_e$ $g_A/g_V = -0.25 \pm 0.05$ [i]

Ξ^- DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\Lambda\pi^-$	(99.887±0.035) %		140
$\Sigma^-\gamma$	(1.27 ±0.23) × 10^{-4}		118
$\Lambda e^- \overline{\nu}_e$	(5.63 ±0.31) × 10^{-4}		190
$\Lambda\mu^- \overline{\nu}_\mu$	(3.5 $^{+3.5}_{-2.2}$) × 10^{-4}		163

$\Sigma^0 e^- \overline{\nu}_e$		(8.7 ±1.7)	$\times 10^{-5}$		123
$\Sigma^0 \mu^- \overline{\nu}_\mu$		< 8	$\times 10^{-4}$	90%	70
$\Xi^0 e^- \overline{\nu}_e$		< 2.3	$\times 10^{-3}$	90%	7
$\Delta S = 2$ forbidden ($S2$) modes					
$n\pi^-$	$S2$	< 1.9	$\times 10^{-5}$	90%	304
$ne^- \overline{\nu}_e$	$S2$	< 3.2	$\times 10^{-3}$	90%	327
$n\mu^- \overline{\nu}_\mu$	$S2$	< 1.5	%	90%	314
$p\pi^-\pi^-$	$S2$	< 4	$\times 10^{-4}$	90%	223
$p\pi^- e^- \overline{\nu}_e$	$S2$	< 4	$\times 10^{-4}$	90%	305
$p\pi^- \mu^- \overline{\nu}_\mu$	$S2$	< 4	$\times 10^{-4}$	90%	251
$p\mu^-\mu^-$	L	< 4	$\times 10^{-8}$	90%	272

$\Xi(1530)\ 3/2^+$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^+)$

$\Xi(1530)^0$ mass $m = 1531.80 \pm 0.32$ MeV (S = 1.3)
$\Xi(1530)^-$ mass $m = 1535.0 \pm 0.6$ MeV
$\Xi(1530)^0$ full width $\Gamma = 9.1 \pm 0.5$ MeV
$\Xi(1530)^-$ full width $\Gamma = 9.9^{+1.7}_{-1.9}$ MeV

$\Xi(1530)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\Xi\pi$	100 %		158
$\Xi\gamma$	<4 %	90%	202

$\Xi(1690)$

$I(J^P) = \frac{1}{2}(?^?)$

Mass $m = 1690 \pm 10$ MeV [p]
Full width $\Gamma < 30$ MeV

$\Xi(1690)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda\overline{K}$	seen	240
$\Sigma\overline{K}$	seen	70
$\Xi\pi$	seen	311
$\Xi^-\pi^+\pi^-$	possibly seen	213

$\Xi(1820)\ 3/2^-$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$

Mass $m = 1823 \pm 5$ MeV [p]
Full width $\Gamma = 24^{+15}_{-10}$ MeV [p]

Ξ(1820) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda\overline{K}$	large	402
$\Sigma\overline{K}$	small	324
$\Xi\pi$	small	421
$\Xi(1530)\pi$	small	237

Ξ(1950)

$I(J^P) = \frac{1}{2}(?^?)$

Mass $m = 1950 \pm 15$ MeV [p]
Full width $\Gamma = 60 \pm 20$ MeV [p]

Ξ(1950) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda\overline{K}$	seen	522
$\Sigma\overline{K}$	possibly seen	460
$\Xi\pi$	seen	519

Ξ(2030)

$I(J^P) = \frac{1}{2}(\geq \frac{5}{2}?)$

Mass $m = 2025 \pm 5$ MeV [p]
Full width $\Gamma = 20^{+15}_{-5}$ MeV [p]

Ξ(2030) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda\overline{K}$	~ 20 %	585
$\Sigma\overline{K}$	~ 80 %	529
$\Xi\pi$	small	574
$\Xi(1530)\pi$	small	416
$\Lambda\overline{K}\pi$	small	499
$\Sigma\overline{K}\pi$	small	428

Ω BARYONS ($S = -3, I = 0$)

$\Omega^- = sss$

Ω^-

$I(J^P) = 0(\frac{3}{2}^+)$

$J^P = \frac{3}{2}^+$ is the quark-model prediction; and $J = 3/2$ is fairly well established.

Mass $m = 1672.45 \pm 0.29$ MeV
$(m_{\Omega^-} - m_{\overline{\Omega}^+}) / m_{\Omega^-} = (-1 \pm 8) \times 10^{-5}$
Mean life $\tau = (0.821 \pm 0.011) \times 10^{-10}$ s
$c\tau = 2.461$ cm
$(\tau_{\Omega^-} - \tau_{\overline{\Omega}^+}) / \tau_{\Omega^-} = 0.00 \pm 0.05$
Magnetic moment $\mu = -2.02 \pm 0.05\ \mu_N$

Decay parameters

ΛK^-	$\alpha = 0.0180 \pm 0.0024$
ΛK^-, $\overline{\Lambda} K^+$	$(\alpha + \overline{\alpha})/(\alpha - \overline{\alpha}) = -0.02 \pm 0.13$
$\Xi^0 \pi^-$	$\alpha = 0.09 \pm 0.14$
$\Xi^- \pi^0$	$\alpha = 0.05 \pm 0.21$

Ω^- DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
ΛK^-		(67.8±0.7) %		211
$\Xi^0 \pi^-$		(23.6±0.7) %		294
$\Xi^- \pi^0$		(8.6±0.4) %		289
$\Xi^- \pi^+ \pi^-$		$(3.7^{+0.7}_{-0.6}) \times 10^{-4}$		189
$\Xi(1530)^0 \pi^-$		$< 7 \times 10^{-5}$	90%	17
$\Xi^0 e^- \overline{\nu}_e$		$(5.6 \pm 2.8) \times 10^{-3}$		319
$\Xi^- \gamma$		$< 4.6 \times 10^{-4}$	90%	314
$\Delta S = 2$ forbidden ($S2$) modes				
$\Lambda \pi^-$	$S2$	$< 2.9 \times 10^{-6}$	90%	449

$\Omega(2250)^-$

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

Mass $m = 2252 \pm 9$ MeV
Full width $\Gamma = 55 \pm 18$ MeV

$\Omega(2250)^-$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi^-\pi^+K^-$	seen	532
$\Xi(1530)^0K^-$	seen	437

CHARMED BARYONS ($C=+1$)

$\Lambda_c^+ = udc$, $\Sigma_c^{++} = uuc$, $\Sigma_c^+ = udc$, $\Sigma_c^0 = ddc$,
$\Xi_c^+ = usc$, $\Xi_c^0 = dsc$, $\Omega_c^0 = ssc$

Λ_c^+

$I(J^P) = 0(\frac{1}{2}^+)$

J is not well measured; $\frac{1}{2}$ is the quark-model prediction.

Mass $m = 2286.46 \pm 0.14$ MeV
Mean life $\tau = (200 \pm 6) \times 10^{-15}$ s (S = 1.6)
$c\tau = 59.9$ μm

Decay asymmetry parameters

$\Lambda\pi^+$ $\alpha = -0.91 \pm 0.15$
$\Sigma^+\pi^0$ $\alpha = -0.45 \pm 0.32$
$\Lambda\ell^+\nu_\ell$ $\alpha = -0.86 \pm 0.04$
$(\alpha + \overline{\alpha})/(\alpha - \overline{\alpha})$ in $\Lambda_c^+ \to \Lambda\pi^+$, $\overline{\Lambda}_c^- \to \overline{\Lambda}\pi^- = -0.07 \pm 0.31$
$(\alpha + \overline{\alpha})/(\alpha - \overline{\alpha})$ in $\Lambda_c^+ \to \Lambda e^+\nu_e$, $\overline{\Lambda}_c^- \to \overline{\Lambda}e^-\overline{\nu}_e = 0.00 \pm 0.04$

Λ_c^+ DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Hadronic modes with a p: $S = -1$ final states				
pK_S^0		(1.58 ± 0.08) %	S=1.2	873
$pK^-\pi^+$		(6.35 ± 0.33) %	S=1.4	823
$p\overline{K}^*(892)^0$	[r]	(1.98 ± 0.28) %		685
$\Delta(1232)^{++}K^-$		(1.09 ± 0.25) %		710
$\Lambda(1520)\pi^+$	[r]	(2.2 ± 0.5) %		627
$pK^-\pi^+$ nonresonant		(3.5 ± 0.4) %		823
$pK_S^0\pi^0$		(1.99 ± 0.13) %	S=1.1	823
$p\overline{K}^0\eta$		(1.6 ± 0.4) %		568
$pK_S^0\pi^+\pi^-$		(1.66 ± 0.12) %	S=1.1	754
$pK^-\pi^+\pi^0$		(4.9 ± 0.4) %	S=1.3	759
$pK^*(892)^-\pi^+$	[r]	(1.5 ± 0.5) %		580

$p(K^-\pi^+)_{\text{nonresonant}}\pi^0$		(4.6 ± 0.9) %		759
$\Delta(1232)\overline{K}^*(892)$		seen		419
$pK^-2\pi^+\pi^-$		(1.4 ± 1.0) $\times 10^{-3}$		671
$pK^-\pi^+2\pi^0$		(1.0 ± 0.5) %		678

Hadronic modes with a p: $S = 0$ final states

$p\pi^+\pi^-$		(4.4 ± 2.3) $\times 10^{-3}$		927
$pf_0(980)$	[r]	(3.5 ± 2.3) $\times 10^{-3}$		614
$p2\pi^+2\pi^-$		(2.3 ± 1.5) $\times 10^{-3}$		852
pK^+K^-		(10 ± 4) $\times 10^{-4}$		616
$p\phi$	[r]	(1.04± 0.21) $\times 10^{-3}$		590
pK^+K^- non-ϕ		(4.4 ± 1.8) $\times 10^{-4}$		616

Hadronic modes with a hyperon: $S = -1$ final states

$\Lambda\pi^+$		(1.30± 0.07) %	S=1.2	864
$\Lambda\pi^+\pi^0$		(7.1 ± 0.4) %	S=1.2	844
$\Lambda\rho^+$		< 6 %	CL=95%	636
$\Lambda\pi^-2\pi^+$		(3.7 ± 0.4) %	S=1.9	807
$\Sigma(1385)^+\pi^+\pi^-$, $\Sigma^{*+}\to\Lambda\pi^+$		(1.0 ± 0.5) %		688
$\Sigma(1385)^-2\pi^+$, $\Sigma^{*-}\to\Lambda\pi^-$		(7.8 ± 1.6) $\times 10^{-3}$		688
$\Lambda\pi^+\rho^0$		(1.5 ± 0.6) %		524
$\Sigma(1385)^+\rho^0$, $\Sigma^{*+}\to\Lambda\pi^+$		(5 ± 4) $\times 10^{-3}$		363
$\Lambda\pi^-2\pi^+$ nonresonant		< 1.1 %	CL=90%	807
$\Lambda\pi^-\pi^02\pi^+$ total		(2.3 ± 0.8) %		757
$\Lambda\pi^+\eta$	[r]	(2.3 ± 0.5) %		691
$\Sigma(1385)^+\eta$	[r]	(1.08± 0.32) %		570
$\Lambda\pi^+\omega$	[r]	(1.5 ± 0.5) %		517
$\Lambda\pi^-\pi^02\pi^+$, no η or ω		< 8 $\times 10^{-3}$	CL=90%	757
$\Lambda K^+\overline{K}^0$		(5.7 ± 1.1) $\times 10^{-3}$	S=2.0	443
$\Xi(1690)^0K^+$, $\Xi^{*0}\to\Lambda\overline{K}^0$		(1.6 ± 0.5) $\times 10^{-3}$		286
$\Sigma^0\pi^+$		(1.29± 0.07) %	S=1.1	825
$\Sigma^+\pi^0$		(1.24± 0.10) %		827
$\Sigma^+\eta$		(7.0 ± 2.3) $\times 10^{-3}$		713
$\Sigma^+\pi^+\pi^-$		(4.57± 0.29) %	S=1.2	804
$\Sigma^+\rho^0$		< 1.7 %	CL=95%	575
$\Sigma^-2\pi^+$		(2.1 ± 0.4) %		799
$\Sigma^0\pi^+\pi^0$		(2.3 ± 0.9) %		803
$\Sigma^0\pi^-2\pi^+$		(1.13± 0.29) %		763
$\Sigma^+\pi^+\pi^-\pi^0$		—		767
$\Sigma^+\omega$	[r]	(1.74± 0.21) %		569
$\Sigma^+K^+K^-$		(3.6 ± 0.4) $\times 10^{-3}$		349
$\Sigma^+\phi$	[r]	(4.0 ± 0.6) $\times 10^{-3}$	S=1.1	295
$\Xi(1690)^0K^+$, $\Xi^{*0}\to\Sigma^+K^-$		(1.03± 0.26) $\times 10^{-3}$		286

$\Sigma^+ K^+ K^-$ nonresonant		< 8	$\times 10^{-4}$	CL=90%	349
$\Xi^0 K^+$		$(5.0 \pm 1.2) \times 10^{-3}$			653
$\Xi^- K^+ \pi^+$		$(6.2 \pm 0.6) \times 10^{-3}$		S=1.1	565
$\Xi(1530)^0 K^+$	[r]	$(3.3 \pm 0.9) \times 10^{-3}$			473

Hadronic modes with a hyperon: $S = 0$ final states

ΛK^+		$(6.1 \pm 1.2) \times 10^{-4}$			781
$\Lambda K^+ \pi^+ \pi^-$		< 5	$\times 10^{-4}$	CL=90%	637
$\Sigma^0 K^+$		$(5.2 \pm 0.8) \times 10^{-4}$			735
$\Sigma^0 K^+ \pi^+ \pi^-$		< 2.6	$\times 10^{-4}$	CL=90%	574
$\Sigma^+ K^+ \pi^-$		$(2.1 \pm 0.6) \times 10^{-3}$			670
$\Sigma^+ K^*(892)^0$	[r]	$(3.6 \pm 1.0) \times 10^{-3}$			470
$\Sigma^- K^+ \pi^+$		< 1.2	$\times 10^{-3}$	CL=90%	664

Doubly Cabibbo-suppressed modes

$p K^+ \pi^-$		< 2.9	$\times 10^{-4}$	CL=90%	823

Semileptonic modes

$\Lambda e^+ \nu_e$		(3.6 ± 0.4) %			871

Inclusive modes

e^+ anything		(4.5 ± 1.7) %			–
$p e^+$ anything		(1.8 ± 0.9) %			–
p anything		(50 ± 16) %			–
p anything (no Λ)		(12 ± 19) %			–
n anything		(50 ± 16) %			–
n anything (no Λ)		(29 ± 17) %			–
Λ anything		(35 ± 11) %		S=1.4	–
$\Sigma^\pm$ anything	[s]	(10 ± 5) %			–
3prongs		(24 ± 8) %			–

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

$p e^+ e^-$	$C1$	< 5.5	$\times 10^{-6}$	CL=90%	951
$p \mu^+ \mu^-$	$C1$	< 4.4	$\times 10^{-5}$	CL=90%	937
$p e^+ \mu^-$	LF	< 9.9	$\times 10^{-6}$	CL=90%	947
$p e^- \mu^+$	LF	< 1.9	$\times 10^{-5}$	CL=90%	947
$\overline{p} 2e^+$	L,B	< 2.7	$\times 10^{-6}$	CL=90%	951
$\overline{p} 2\mu^+$	L,B	< 9.4	$\times 10^{-6}$	CL=90%	937
$\overline{p} e^+ \mu^+$	L,B	< 1.6	$\times 10^{-5}$	CL=90%	947
$\Sigma^- \mu^+ \mu^+$	L	< 7.0	$\times 10^{-4}$	CL=90%	812

$\Lambda_c(2595)^+$ $I(J^P) = 0(\frac{1}{2}^-)$

The spin-parity follows from the fact that $\Sigma_c(2455)\pi$ decays, with little available phase space, are dominant. This assumes that $J^P = 1/2^+$ for the $\Sigma_c(2455)$.

Mass $m = 2592.25 \pm 0.28$ MeV
$m - m_{\Lambda_c^+} = 305.79 \pm 0.24$ MeV
Full width $\Gamma = 2.6 \pm 0.6$ MeV

$\Lambda_c^+\pi\pi$ and its submode $\Sigma_c(2455)\pi$ — the latter just barely — are the only strong decays allowed to an excited Λ_c^+ having this mass; and the submode seems to dominate.

$\Lambda_c(2595)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+\pi^+\pi^-$	[t] —	117
$\Sigma_c(2455)^{++}\pi^-$	24 ± 7 %	†
$\Sigma_c(2455)^0\pi^+$	24 ± 7 %	†
$\Lambda_c^+\pi^+\pi^-$ 3-body	18 ± 10 %	117
$\Lambda_c^+\pi^0$	[u] not seen	258
$\Lambda_c^+\gamma$	not seen	288

$\Lambda_c(2625)^+$ $I(J^P) = 0(\frac{3}{2}^-)$

J^P has not been measured; $\frac{3}{2}^-$ is the quark-model prediction.

Mass $m = 2628.11 \pm 0.19$ MeV (S = 1.1)
$m - m_{\Lambda_c^+} = 341.65 \pm 0.13$ MeV (S = 1.1)
Full width $\Gamma < 0.97$ MeV, CL = 90%

$\Lambda_c^+\pi\pi$ and its submode $\Sigma(2455)\pi$ are the only strong decays allowed to an excited Λ_c^+ having this mass.

$\Lambda_c(2625)^+$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\Lambda_c^+\pi^+\pi^-$	[t] ≈ 67%		184
$\Sigma_c(2455)^{++}\pi^-$	<5	90%	102
$\Sigma_c(2455)^0\pi^+$	<5	90%	102
$\Lambda_c^+\pi^+\pi^-$ 3-body	large		184
$\Lambda_c^+\pi^0$	[u] not seen		293
$\Lambda_c^+\gamma$	not seen		319

$\Lambda_c(2880)^+$

$I(J^P) = 0(\frac{5}{2}^+)$

There is some good evidence that indeed $J^P = 5/2^+$

Mass $m = 2881.53 \pm 0.35$ MeV
$m - m_{\Lambda_c^+} = 595.1 \pm 0.4$ MeV
Full width $\Gamma = 5.8 \pm 1.1$ MeV

$\Lambda_c(2880)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+ \pi^+ \pi^-$	seen	471
$\Sigma_c(2455)^{0,++} \pi^\pm$	seen	376
$\Sigma_c(2520)^{0,++} \pi^\pm$	seen	317
$p D^0$	seen	316

$\Lambda_c(2940)^+$

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

Mass $m = 2939.3^{+1.4}_{-1.5}$ MeV
Full width $\Gamma = 17^{+8}_{-6}$ MeV

$\Lambda_c(2940)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$p D^0$	seen	420
$\Sigma_c(2455)^{0,++} \pi^\pm$	seen	–

$\Sigma_c(2455)$

$I(J^P) = 1(\frac{1}{2}^+)$

$\Sigma_c(2455)^{++}$ mass $m = 2453.97 \pm 0.14$ MeV
$\Sigma_c(2455)^+$ mass $m = 2452.9 \pm 0.4$ MeV
$\Sigma_c(2455)^0$ mass $m = 2453.75 \pm 0.14$ MeV
$m_{\Sigma_c^{++}} - m_{\Lambda_c^+} = 167.510 \pm 0.017$ MeV
$m_{\Sigma_c^+} - m_{\Lambda_c^+} = 166.4 \pm 0.4$ MeV
$m_{\Sigma_c^0} - m_{\Lambda_c^+} = 167.290 \pm 0.017$ MeV
$m_{\Sigma_c^{++}} - m_{\Sigma_c^0} = 0.220 \pm 0.013$ MeV
$m_{\Sigma_c^+} - m_{\Sigma_c^0} = -0.9 \pm 0.4$ MeV
$\Sigma_c(2455)^{++}$ full width $\Gamma = 1.89^{+0.09}_{-0.18}$ MeV (S = 1.1)
$\Sigma_c(2455)^+$ full width $\Gamma < 4.6$ MeV, CL = 90%
$\Sigma_c(2455)^0$ full width $\Gamma = 1.83^{+0.11}_{-0.19}$ MeV (S = 1.2)

$\Lambda_c^+\pi$ is the only strong decay allowed to a Σ_c having this mass.

$\Sigma_c(2455)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+\pi$	≈ 100 %	94

$\Sigma_c(2520)$ $I(J^P) = 1(\frac{3}{2}^+)$

J^P has not been measured; $\frac{3}{2}^+$ is the quark-model prediction.

$\Sigma_c(2520)^{++}$ mass $m = 2518.41^{+0.21}_{-0.19}$ MeV (S = 1.1)
$\Sigma_c(2520)^{+}$ mass $m = 2517.5 \pm 2.3$ MeV
$\Sigma_c(2520)^{0}$ mass $m = 2518.48 \pm 0.20$ MeV (S = 1.1)
$m_{\Sigma_c(2520)^{++}} - m_{\Lambda_c^+} = 231.95^{+0.17}_{-0.12}$ MeV (S = 1.3)
$m_{\Sigma_c(2520)^{+}} - m_{\Lambda_c^+} = 231.0 \pm 2.3$ MeV
$m_{\Sigma_c(2520)^{0}} - m_{\Lambda_c^+} = 232.02^{+0.15}_{-0.14}$ MeV (S = 1.3)
$m_{\Sigma_c(2520)^{++}} - m_{\Sigma_c(2520)^{0}} = 0.01 \pm 0.15$ MeV
$\Sigma_c(2520)^{++}$ full width $\Gamma = 14.78^{+0.30}_{-0.40}$ MeV
$\Sigma_c(2520)^{+}$ full width $\Gamma < 17$ MeV, CL = 90%
$\Sigma_c(2520)^{0}$ full width $\Gamma = 15.3^{+0.4}_{-0.5}$ MeV

$\Lambda_c^+\pi$ is the only strong decay allowed to a Σ_c having this mass.

$\Sigma_c(2520)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+\pi$	≈ 100 %	179

$\Sigma_c(2800)$ $I(J^P) = 1(?^?)$

$\Sigma_c(2800)^{++}$ mass $m = 2801^{+4}_{-6}$ MeV
$\Sigma_c(2800)^{+}$ mass $m = 2792^{+14}_{-5}$ MeV
$\Sigma_c(2800)^{0}$ mass $m = 2806^{+5}_{-7}$ MeV (S = 1.3)
$m_{\Sigma_c(2800)^{++}} - m_{\Lambda_c^+} = 514^{+4}_{-6}$ MeV
$m_{\Sigma_c(2800)^{+}} - m_{\Lambda_c^+} = 505^{+14}_{-5}$ MeV
$m_{\Sigma_c(2800)^{0}} - m_{\Lambda_c^+} = 519^{+5}_{-7}$ MeV (S = 1.3)
$\Sigma_c(2800)^{++}$ full width $\Gamma = 75^{+22}_{-17}$ MeV
$\Sigma_c(2800)^{+}$ full width $\Gamma = 62^{+60}_{-40}$ MeV
$\Sigma_c(2800)^{0}$ full width $\Gamma = 72^{+22}_{-15}$ MeV

$\Sigma_c(2800)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+\pi$	seen	443

Ξ_c^+

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2467.93^{+0.28}_{-0.40}$ MeV

Mean life $\tau = (442 \pm 26) \times 10^{-15}$ s (S = 1.3)

$c\tau = 132$ μm

Ξ_c^+ DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)

No absolute branching fractions have been measured.
The following are branching *ratios* relative to $\Xi^-2\pi^+$.

Cabibbo-favored ($S = -2$) decays — relative to $\Xi^-2\pi^+$

$p2K_S^0$		0.087 ± 0.021		767
$\Lambda\overline{K}^0\pi^+$		—		852
$\Sigma(1385)^+\overline{K}^0$	[r]	1.0 ± 0.5		746
$\Lambda K^-2\pi^+$		0.323 ± 0.033		787
$\Lambda\overline{K}^*(892)^0\pi^+$	[r]	<0.16	90%	608
$\Sigma(1385)^+K^-\pi^+$	[r]	<0.23	90%	678
$\Sigma^+K^-\pi^+$		0.94 ± 0.10		811
$\Sigma^+\overline{K}^*(892)^0$	[r]	0.81 ± 0.15		658
$\Sigma^0K^-2\pi^+$		0.27 ± 0.12		735
$\Xi^0\pi^+$		0.55 ± 0.16		877
$\Xi^-2\pi^+$		**DEFINED AS 1**		851
$\Xi(1530)^0\pi^+$	[r]	<0.10	90%	750
$\Xi^0\pi^+\pi^0$		2.3 ± 0.7		856
$\Xi^0\pi^-2\pi^+$		1.7 ± 0.5		818
$\Xi^0e^+\nu_e$		$2.3\ ^{+0.7}_{-0.8}$		884
$\Omega^-K^+\pi^+$		0.07 ± 0.04		399

Cabibbo-suppressed decays — relative to $\Xi^-2\pi^+$

$pK^-\pi^+$		0.21 ± 0.04		944
$p\overline{K}^*(892)^0$	[r]	0.116 ± 0.030		828
$\Sigma^+\pi^+\pi^-$		0.48 ± 0.20		922
$\Sigma^-2\pi^+$		0.18 ± 0.09		918
$\Sigma^+K^+K^-$		0.15 ± 0.06		580
$\Sigma^+\phi$	[r]	<0.11	90%	549

$\Xi(1690)^0 K^+$, $\Xi^0 \to \Sigma^+ K^-$	<0.05	90%	501

Ξ_c^0

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2470.85^{+0.28}_{-0.40}$ MeV
$m_{\Xi_c^0} - m_{\Xi_c^+} = 2.93 \pm 0.24$ MeV
Mean life $\tau = (112^{+13}_{-10}) \times 10^{-15}$ s
$c\tau = 33.6$ μm

Decay asymmetry parameters

$\Xi^-\pi^+$ $\alpha = -0.6 \pm 0.4$

No absolute branching fractions have been measured. Several measurements of ratios of fractions may be found in the Listings that follow.

Ξ_c^0 DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
No absolute branching fractions have been measured. The following are branching *ratios* relative to $\Xi^-\pi^+$.		
Cabibbo-favored (S = −2) decays — relative to $\Xi^-\pi^+$		
$pK^-K^-\pi^+$	0.34 ±0.04	676
$pK^-\overline{K}^*(892)^0$	0.21 ±0.05	413
$pK^-K^-\pi^+$ (no $\overline{K}^{*0}$)	0.21 ±0.04	676
ΛK_S^0	0.210±0.028	906
$\Lambda K^-\pi^+$	1.07 ±0.14	856
$\Lambda\overline{K}^0\pi^+\pi^-$	seen	787
$\Lambda K^-\pi^+\pi^+\pi^-$	seen	703
$\Xi^-\pi^+$	**DEFINED AS 1**	875
$\Xi^-\pi^+\pi^+\pi^-$	3.3 ±1.4	816
$\Omega^- K^+$	0.297±0.024	522
$\Xi^- e^+\nu_e$	3.1 ±1.1	882
$\Xi^-\ell^+$ anything	1.0 ±0.5	–
Cabibbo-suppressed decays — relative to $\Xi^-\pi^+$		
$\Xi^- K^+$	0.028±0.006	790
ΛK^+K^- (no ϕ)	0.029±0.007	648
$\Lambda\phi$	0.034±0.007	621

$\Xi_c'^+$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2575.7 \pm 3.0$ MeV
$m_{\Xi_c'^+} - m_{\Xi_c^+} = 107.8 \pm 3.0$ MeV

The $\Xi_c'^+$–Ξ_c^+ mass difference is too small for any strong decay to occur.

$\Xi_c'^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_c^+\gamma$	seen	106

$\Xi_c'^0$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2577.9 \pm 2.9$ MeV
$m_{\Xi_c'^0} - m_{\Xi_c^0} = 107.0 \pm 2.9$ MeV

The $\Xi_c'^0 - \Xi_c^0$ mass difference is too small for any strong decay to occur.

$\Xi_c'^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_c^0\gamma$	seen	105

$\Xi_c(2645)$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^+)$

J^P has not been measured; $\frac{3}{2}^+$ is the quark-model prediction.

$\Xi_c(2645)^+$ mass $m = 2645.9 \pm 0.5$ MeV (S = 1.1)
$\Xi_c(2645)^0$ mass $m = 2645.9 \pm 0.5$ MeV
$m_{\Xi_c(2645)^+} - m_{\Xi_c^0} = 175.0 \pm 0.6$ MeV (S = 1.1)
$m_{\Xi_c(2645)^0} - m_{\Xi_c^+} = 178.0 \pm 0.6$ MeV
$m_{\Xi_c(2645)^+} - m_{\Xi_c(2645)^0} = 0.0 \pm 0.5$ MeV
$\Xi_c(2645)^+$ full width $\Gamma = 2.6 \pm 0.4$ MeV
$\Xi_c(2645)^0$ full width $\Gamma < 5.5$ MeV, CL = 90%

$\Xi_c\pi$ is the only strong decay allowed to a Ξ_c resonance having this mass.

$\Xi_c(2645)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_c^0\pi^+$	seen	102
$\Xi_c^+\pi^-$	seen	107

$\Xi_c(2790)$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^-)$

J^P has not been measured; $\frac{1}{2}^-$ is the quark-model prediction.

$\Xi_c(2790)^+$ mass = 2789.1 ± 3.2 MeV
$\Xi_c(2790)^0$ mass = 2791.9 ± 3.3 MeV
$m_{\Xi_c(2790)^+} - m_{\Xi_c^0} = 318.2 \pm 3.2$ MeV
$m_{\Xi_c(2790)^0} - m_{\Xi_c^+} = 324.0 \pm 3.3$ MeV
$\Xi_c(2790)^+$ width < 15 MeV, CL = 90%
$\Xi_c(2790)^0$ width < 12 MeV, CL = 90%

$\Xi_c(2790)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_c'\pi$	seen	159

$\Xi_c(2815)$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$

J^P has not been measured; $\frac{3}{2}^-$ is the quark-model prediction.

$\Xi_c(2815)^+$ mass m = 2816.6 ± 0.9 MeV
$\Xi_c(2815)^0$ mass m = 2819.6 ± 1.2 MeV
$m_{\Xi_c(2815)^+} - m_{\Xi_c^+} = 348.7 \pm 0.9$ MeV
$m_{\Xi_c(2815)^0} - m_{\Xi_c^0} = 348.8 \pm 1.2$ MeV
$m_{\Xi_c(2815)^+} - m_{\Xi_c(2815)^0} = -3.0 \pm 1.3$ MeV
$\Xi_c(2815)^+$ full width Γ < 3.5 MeV, CL = 90%
$\Xi_c(2815)^0$ full width Γ < 6.5 MeV, CL = 90%

The $\Xi_c\pi\pi$ modes are consistent with being entirely via $\Xi_c(2645)\pi$.

$\Xi_c(2815)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_c^+\pi^+\pi^-$	seen	196
$\Xi_c^0\pi^+\pi^-$	seen	191

$\Xi_c(2970)$
was $\Xi_c(2980)$

$I(J^P) = \frac{1}{2}(?^?)$

$\Xi_c(2970)^+$ $m = 2970.7 \pm 2.2$ MeV (S = 1.5)
$\Xi_c(2970)^0$ $m = 2968.0 \pm 2.6$ MeV (S = 1.2)
$\Xi_c(2970)^+$ width $\Gamma = 17.9 \pm 3.5$ MeV
$\Xi_c(2970)^0$ width $\Gamma = 20 \pm 7$ MeV (S = 1.3)

$\Xi_c(2970)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+ \overline{K}\pi$	seen	231
$\Sigma_c(2455)\overline{K}$	seen	134
$\Lambda_c^+ \overline{K}$	not seen	414
$\Xi_c 2\pi$	seen	385
$\Xi_c(2645)\pi$	seen	277

$\Xi_c(3055)$

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

Mass $m = 3055.1 \pm 1.7$ MeV (S = 1.5)
Full width $\Gamma = 11 \pm 4$ MeV

$\Xi_c(3080)$

$I(J^P) = \frac{1}{2}(?^?)$

$\Xi_c(3080)^+$ $m = 3076.94 \pm 0.28$ MeV
$\Xi_c(3080)^0$ $m = 3079.9 \pm 1.4$ MeV (S = 1.3)
$\Xi_c(3080)^+$ width $\Gamma = 4.3 \pm 1.5$ MeV (S = 1.3)
$\Xi_c(3080)^0$ width $\Gamma = 5.6 \pm 2.2$ MeV

$\Xi_c(3080)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+ \overline{K}\pi$	seen	415
$\Sigma_c(2455)\overline{K}$	seen	342
$\Sigma_c(2455)\overline{K} + \Sigma_c(2520)\overline{K}$	seen	–
$\Lambda_c^+ \overline{K}$	not seen	536
$\Lambda_c^+ \overline{K}\pi^+\pi^-$	not seen	143

Ω_c^0

$I(J^P) = 0(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2695.2 \pm 1.7$ MeV (S = 1.3)
Mean life $\tau = (69 \pm 12) \times 10^{-15}$ s
$c\tau = 21$ μm

No absolute branching fractions have been measured.

Ω_c^0 DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Sigma^+ K^- K^- \pi^+$	seen	689
$\Xi^0 K^- \pi^+$	seen	901
$\Xi^- K^- \pi^+ \pi^+$	seen	830
$\Omega^- e^+ \nu_e$	seen	829
$\Omega^- \pi^+$	seen	821
$\Omega^- \pi^+ \pi^0$	seen	797
$\Omega^- \pi^- \pi^+ \pi^+$	seen	753

$\Omega_c(2770)^0$

$I(J^P) = 0(\frac{3}{2}^+)$

J^P has not been measured; $\frac{3}{2}^+$ is the quark-model prediction.

Mass $m = 2765.9 \pm 2.0$ MeV (S = 1.2)

$m_{\Omega_c(2770)^0} - m_{\Omega_c^0} = 70.7^{+0.8}_{-0.9}$ MeV

The $\Omega_c(2770)^0$–Ω_c^0 mass difference is too small for any strong decay to occur.

$\Omega_c(2770)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Omega_c^0 \gamma$	presumably 100%	70

BOTTOM BARYONS ($B = -1$)

$\Lambda_b^0 = udb$, $\Xi_b^0 = usb$, $\Xi_b^- = dsb$, $\Omega_b^- = ssb$

Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$

$I(J^P)$ not yet measured; $0(\frac{1}{2}^+)$ is the quark model prediction.

Mass $m = 5619.51 \pm 0.23$ MeV

$m_{\Lambda_b^0} - m_{B^0} = 339.2 \pm 1.4$ MeV

$m_{\Lambda_b^0} - m_{B^+} = 339.72 \pm 0.28$ MeV

Mean life $\tau = (1.466 \pm 0.010) \times 10^{-12}$ s

$c\tau = 439.5$ μm

$A_{CP}(\Lambda_b \to p\pi^-) = 0.06 \pm 0.07$

$A_{CP}(\Lambda_b \to\ p K^-) = 0.00 \pm 0.19$ (S = 2.4)
$A_{CP}(\Lambda_b \to\ p \overline{K}^0 \pi^-) = 0.22 \pm 0.13$
$\Delta A_{CP}(J/\psi p\pi^-/K^-) \equiv A_{CP}(J/\psi p\pi^-) - A_{CP}(J/\psi p K^-)$
$= (5.7 \pm 2.7) \times 10^{-2}$
α decay parameter for $\Lambda_b \to\ J/\psi\Lambda = 0.18 \pm 0.13$
$A_{FB}^{\ell}(\mu\mu)$ in $\Lambda_b \to\ \Lambda\mu^+\mu^- = -0.05 \pm 0.09$
$A_{FB}^{h}(p\pi)$ in $\Lambda_b \to\ \Lambda(p\pi)\mu^+\mu^- = -0.29 \pm 0.08$
$f_L(\mu\mu)$ longitudinal polarization fraction in $\Lambda_b \to\ \Lambda\mu^+\mu^- = 0.61^{+0.11}_{-0.14}$

The branching fractions B(*b*-baryon $\to\ \Lambda\ell^-\overline{\nu}_\ell$anything) and B($\Lambda_b^0 \to\ \Lambda_c^+\ell^-\overline{\nu}_\ell$anything) are not pure measurements because the underlying measured products of these with B($b \to\ b$-baryon) were used to determine B($b \to\ b$-baryon), as described in the note "Production and Decay of *b*-Flavored Hadrons."

For inclusive branching fractions, *e.g.*, $\Lambda_b \to\ \overline{\Lambda}_c$anything, the values usually are multiplicities, not branching fractions. They can be greater than one.

Λ_b^0 DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$J/\psi(1S)\Lambda \times$ B($b \to\ \Lambda_b^0$)		$(\ 5.8\ \pm 0.8\ ) \times 10^{-5}$		1740
$p D^0 \pi^-$		$(\ 6.4\ \pm 0.7\ ) \times 10^{-4}$		2370
$p D^0 K^-$		$(\ 4.7\ \pm 0.8\ ) \times 10^{-5}$		2269
$p J/\psi \pi^-$		$(\ 2.6\ ^{+0.5}_{-0.4}\ ) \times 10^{-5}$		1755
$p J/\psi K^-$		$(\ 3.2\ ^{+0.6}_{-0.5}\ ) \times 10^{-4}$		1589
$P_c(4380)^+ K^-$, $P_c \to\ p J/\psi$	[*v*]	$(\ 2.7\ \pm 1.4\ ) \times 10^{-5}$		–
$P_c(4450)^+ K^-$, $P_c \to\ p J/\psi$	[*v*]	$(\ 1.3\ \pm 0.4\ ) \times 10^{-5}$		–
$p \overline{K}^0 \pi^-$		$(\ 1.3\ \pm 0.4\ ) \times 10^{-5}$		2693
$p K^0 K^-$		$< 3.5 \times 10^{-6}$	CL=90%	2639
$\Lambda_c^+ \pi^-$		$(\ 4.9\ \pm 0.4\ ) \times 10^{-3}$	S=1.2	2342
$\Lambda_c^+ K^-$		$(\ 3.59 \pm 0.30) \times 10^{-4}$	S=1.2	2314
$\Lambda_c^+ a_1(1260)^-$		seen		2153
$\Lambda_c^+ D^-$		$(\ 4.6\ \pm 0.6\ ) \times 10^{-4}$		1886
$\Lambda_c^+ D_s^-$		$(\ 1.10 \pm 0.10)$ %		1833
$\Lambda_c^+ \pi^+ \pi^- \pi^-$		$(\ 7.7\ \pm 1.1\ ) \times 10^{-3}$	S=1.1	2323
$\Lambda_c(2595)^+ \pi^-$, $\Lambda_c(2595)^+ \to\ \Lambda_c^+ \pi^+ \pi^-$		$(\ 3.4\ \pm 1.5\ ) \times 10^{-4}$		2210
$\Lambda_c(2625)^+ \pi^-$, $\Lambda_c(2625)^+ \to\ \Lambda_c^+ \pi^+ \pi^-$		$(\ 3.3\ \pm 1.3\ ) \times 10^{-4}$		2193

$\Sigma_c(2455)^0\pi^+\pi^-$, $\Sigma_c^0 \to \Lambda_c^+\pi^-$		(5.7 ±2.2) × 10^{-4}		2265
$\Sigma_c(2455)^{++}\pi^-\pi^-$, $\Sigma_c^{++} \to \Lambda_c^+\pi^+$		(3.2 ±1.6) × 10^{-4}		2265
$\Lambda_c^+\ell^-\overline{\nu}_\ell$ anything	[x]	(10.3 ±2.2) %		–
$\Lambda_c^+\ell^-\overline{\nu}_\ell$		(6.2 $^{+1.4}_{-1.3}$) %		2345
$\Lambda_c^+\pi^+\pi^-\ell^-\overline{\nu}_\ell$		(5.6 ±3.1) %		2335
$\Lambda_c(2595)^+\ell^-\overline{\nu}_\ell$		(7.9 $^{+4.0}_{-3.5}$) × 10^{-3}		2212
$\Lambda_c(2625)^+\ell^-\overline{\nu}_\ell$		(1.3 $^{+0.6}_{-0.5}$) %		2195
ph^-	[y]	< 2.3 × 10^{-5}	CL=90%	2730
$p\pi^-$		(4.2 ±0.8) × 10^{-6}		2730
pK^-		(5.1 ±1.0) × 10^{-6}		2708
pD_s^-		< 4.8 × 10^{-4}	CL=90%	2364
$p\mu^-\overline{\nu}_\mu$		(4.1 ±1.0) × 10^{-4}		2730
$\Lambda\mu^+\mu^-$		(1.08±0.28) × 10^{-6}		2695
$\Lambda\gamma$		< 1.3 × 10^{-3}	CL=90%	2699
$\Lambda^0\eta$		(9 $^{+7}_{-5}$) × 10^{-6}		–
$\Lambda^0\eta'(958)$		< 3.1 × 10^{-6}	CL=90%	–

$\Lambda_b(5912)^0$

$J^P = \frac{1}{2}^-$

Mass m = 5912.11 ± 0.26 MeV
Full width Γ < 0.66 MeV, CL = 90%

$\Lambda_b(5912)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_b^0\pi^+\pi^-$	seen	86

$\Lambda_b(5920)^0$

$J^P = \frac{3}{2}^-$

Mass m = 5919.81 ± 0.23 MeV
Full width Γ < 0.63 MeV, CL = 90%

$\Lambda_b(5920)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_b^0\pi^+\pi^-$	seen	108

Σ_b

$I(J^P) = 1(\frac{1}{2}^+)$
I, J, P need confirmation.

Mass $m(\Sigma_b^+) = 5811.3 \pm 1.9$ MeV
Mass $m(\Sigma_b^-) = 5815.5 \pm 1.8$ MeV
$m_{\Sigma_b^+} - m_{\Sigma_b^-} = -4.2 \pm 1.1$ MeV
$\Gamma(\Sigma_b^+) = 9.7^{+4.0}_{-3.0}$ MeV
$\Gamma(\Sigma_b^-) = 4.9^{+3.3}_{-2.4}$ MeV

Σ_b DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_b^0\pi$	dominant	134

Σ_b^*

$I(J^P) = 1(\frac{3}{2}^+)$
I, J, P need confirmation.

Mass $m(\Sigma_b^{*+}) = 5832.1 \pm 1.9$ MeV
Mass $m(\Sigma_b^{*-}) = 5835.1 \pm 1.9$ MeV
$m_{\Sigma_b^{*+}} - m_{\Sigma_b^{*-}} = -3.0^{+1.0}_{-0.9}$ MeV
$\Gamma(\Sigma_b^{*+}) = 11.5 \pm 2.8$ MeV
$\Gamma(\Sigma_b^{*-}) = 7.5 \pm 2.3$ MeV
$m_{\Sigma_b^*} - m_{\Sigma_b} = 21.2 \pm 2.0$ MeV

Σ_b^* DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_b^0\pi$	dominant	161

Ξ_b^0, Ξ_b^-

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$
I, J, P need confirmation.

$m(\Xi_b^-) = 5794.5 \pm 1.4$ MeV (S = 4.0)
$m(\Xi_b^0) = 5791.9 \pm 0.5$ MeV
$m_{\Xi_b^-} - m_{\Lambda_b^0} = 177.9 \pm 0.9$ MeV (S = 2.1)
$m_{\Xi_b^0} - m_{\Lambda_b^0} = 172.5 \pm 0.4$ MeV
$m_{\Xi_b^-} - m_{\Xi_b^0} = 5.9 \pm 0.6$ MeV
Mean life $\tau_{\Xi_b^-} = (1.560 \pm 0.040) \times 10^{-12}$ s
Mean life $\tau_{\Xi_b^0} = (1.464 \pm 0.031) \times 10^{-12}$ s

Ξ_b DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\Xi_b \to \Xi^-\ell^-\overline{\nu}_\ell X \times$ B($\overline{b} \to \Xi_b$)	$(3.9 \pm 1.2) \times 10^{-4}$	S=1.4	–
$\Xi_b^- \to J/\psi\Xi^- \times$ B($b \to \Xi_b^-$)	$(1.02^{+0.26}_{-0.21}) \times 10^{-5}$		1782
$\Xi_b^0 \to pD^0K^- \times$ B($\overline{b} \to \Xi_b$)	$(1.8 \pm 0.6) \times 10^{-6}$		2374

$\Xi_b^0 \to p\overline{K}^0\pi^- \times$ B($\overline{b} \to \Xi_b$)/B($\overline{b} \to B^0$)	< 1.6	$\times 10^{-6}$	CL=90%	2783
$\Xi_b^0 \to pK^0K^- \times$ B($\overline{b} \to \Xi_b$)/B($\overline{b} \to B^0$)	< 1.1	$\times 10^{-6}$	CL=90%	2730
$\Xi_b^0 \to \Lambda_c^+ K^- \times$ B($\overline{b} \to \Xi_b$)	(6 ± 4)	$\times 10^{-7}$		2416
$\Xi_b^- \to \Lambda_b^0\pi^- \times$ B($b \to \Xi_b^-$)/B($b \to \Lambda_b^0$)	(5.7 ± 2.0)	$\times 10^{-4}$		100

$\Xi_b'(5935)^-$

$J^P = \frac{1}{2}^+$

Mass $m = 5935.02 \pm 0.05$ MeV
$m_{\Xi_b'(5935)^-} - m_{\Xi_b^0} - m_{\pi^-} = 3.653 \pm 0.019$ MeV
Full width $\Gamma < 0.08$ MeV, CL = 95%

$\Xi_b'(5935)^-$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_b^0\pi^- \times$ B($\overline{b} \to \Xi_b'(5935)^-$)/B($\overline{b} \to \Xi_b^0$)	(11.8$\pm$1.8) %	31

$\Xi_b(5945)^0$

$J^P = \frac{3}{2}^+$

Mass $m = 5948.9 \pm 1.6$ MeV
Full width $\Gamma = 2.1 \pm 1.7$ MeV

$\Xi_b(5945)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_b^-\pi^+$	seen	71

$\Xi_b^*(5955)^-$

$J^P = \frac{3}{2}^+$

Mass $m = 5955.33 \pm 0.13$ MeV
$m_{\Xi_b^*(5955)^-} - m_{\Xi_b^0} - m_{\pi^-} = 23.96 \pm 0.13$ MeV
Full width $\Gamma = 1.65 \pm 0.33$ MeV

$\Xi_b^*(5955)^-$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_b^0\pi^- \times$ B($\overline{b} \to \Xi_b^*(5955)^-$)/B($\overline{b} \to \Xi_b^0$)	(20.7$\pm$3.5) %	84

Ω_b^-

$I(J^P) = 0(\frac{1}{2}^+)$
I, J, P need confirmation.

Mass $m = 6046.4 \pm 1.9$ MeV
$m_{\Omega_b^-} - m_{\Lambda_b^0} = 426.4 \pm 2.2$ MeV
Mean life $\tau = (1.57^{+0.23}_{-0.20}) \times 10^{-12}$ s

Ω_b^- DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$J/\psi\,\Omega^- \times$B($b \rightarrow\ \Omega_b$)	$(2.9^{+1.1}_{-0.8}) \times 10^{-6}$	1806

b-baryon ADMIXTURE (Λ_b, Ξ_b, Σ_b, Ω_b)

Mean life τ

These branching fractions are actually an average over weakly decaying b-baryons weighted by their production rates at the LHC, LEP, and Tevatron, branching ratios, and detection efficiencies. They scale with the b-baryon production fraction B($b \rightarrow\ b$-baryon).

The branching fractions B(b-baryon $\rightarrow\ \Lambda\ell^-\overline{\nu}_\ell$anything) and B($\Lambda_b^0 \rightarrow \Lambda_c^+\,\ell^-\overline{\nu}_\ell$anything) are not pure measurements because the underlying measured products of these with B($b \rightarrow\ b$-baryon) were used to determine B($b \rightarrow\ b$-baryon), as described in the note "Production and Decay of b-Flavored Hadrons."

For inclusive branching fractions, *e.g.*, $B \rightarrow\ D^\pm$anything, the values usually are multiplicities, not branching fractions. They can be greater than one.

b-baryon ADMIXTURE DECAY MODES (Λ_b,Ξ_b,Σ_b,Ω_b)	Fraction (Γ_i/Γ)	p (MeV/c)
$p\mu^-\overline{\nu}$anything	($5.5^{+\ 2.2}_{-\ 1.9}$) %	–
$p\ell\overline{\nu}_\ell$anything	(5.3± 1.2) %	–
$p$anything	(66 ±21) %	–
$\Lambda\ell^-\overline{\nu}_\ell$anything	(3.6± 0.6) %	–
$\Lambda\ell^+\nu_\ell$anything	(3.0± 0.8) %	–
Λanything	(37 ± 7) %	–
$\Xi^-\ell^-\overline{\nu}_\ell$anything	(6.2± 1.6) $\times 10^{-3}$	–

EXOTIC BARYONS

$P_c(4380)^+$

Mass $m = 4380 \pm 30$ MeV
Full width $\Gamma = 205 \pm 90$ MeV

Mode Mode	Fraction (Γ_i/Γ)	p (MeV/c)
$J/\psi\, p$	seen	741

$P_c(4450)^+$

Mass $m = 4449.8 \pm 3.0$ MeV
Full width $\Gamma = 39 \pm 20$ MeV

Mode Mode	Fraction (Γ_i/Γ)	p (MeV/c)
$J/\psi\, p$	seen	820

NOTES

[a] The masses of the p and n are most precisely known in u (unified atomic mass units). The conversion factor to MeV, 1 u = 931.494061(21) MeV, is less well known than are the masses in u.

[b] The $\left|m_p - m_{\overline{p}}\right|/m_p$ and $\left|q_p + q_{\overline{p}}\right|/e$ are not independent, and both use the more precise measurement of $\left|q_{\overline{p}}/m_{\overline{p}}\right|/(q_p/m_p)$.

[c] The limit is from neutrality-of-matter experiments; it assumes $q_n = q_p + q_e$. See also the charge of the neutron.

[d] The $\mu\, p$ and $e\, p$ values for the charge radius are much too different to average them. The disagreement is not yet understood.

[e] There is a lot of disagreement about the value of the proton magnetic charge radius. See the Listings.

[f] The first limit is for $p \rightarrow$ anything or "disappearance" modes of a bound proton. The second entry, a rough range of limits, assumes the dominant decay modes are among those investigated. For antiprotons the best limit, inferred from the observation of cosmic ray $\overline{p}$'s is $\tau_{\overline{p}} > 10^7$ yr, the cosmic-ray storage time, but this limit depends on a number of assumptions. The best direct observation of stored antiprotons gives $\tau_{\overline{p}}/\mathrm{B}(\overline{p} \rightarrow e^- \gamma) > 7 \times 10^5$ yr.

[g] There is some controversy about whether nuclear physics and model dependence complicate the analysis for bound neutrons (from which the best limit comes). The first limit here is from reactor experiments with free neutrons.

[h] Lee and Yang in 1956 proposed the existence of a mirror world in an attempt to restore global parity symmetry—thus a search for oscillations

between the two worlds. Oscillations between the worlds would be maximal when the magnetic fields B and B' were equal. The limit for any B' in the range 0 to 12.5 μT is >12 s (95% CL).

[*i*] The parameters g_A, g_V, and g_{WM} for semileptonic modes are defined by $\overline{B}_f[\gamma_\lambda(g_V + g_A\gamma_5) + i(g_{WM}/m_{B_i})\ \sigma_{\lambda\nu}\ q^\nu]B_i$, and ϕ_{AV} is defined by $g_A/g_V = \left|g_A/g_V\right|e^{i\phi_{AV}}$. See the "Note on Baryon Decay Parameters" in the neutron Particle Listings.

[*j*] Time-reversal invariance requires this to be 0° or 180°.

[*k*] This coefficient is zero if time invariance is not violated.

[*l*] This limit is for γ energies between 15 and 340 keV.

[*n*] The decay parameters γ and Δ are calculated from α and ϕ using

$$\gamma = \sqrt{1-\alpha^2}\ \cos\phi\,, \qquad \tan\Delta = -\frac{1}{\alpha}\ \sqrt{1-\alpha^2}\ \sin\phi\,.$$

See the "Note on Baryon Decay Parameters" in the neutron Particle Listings.

[*o*] See the Listings for the pion momentum range used in this measurement.

[*p*] The error given here is only an educated guess. It is larger than the error on the weighted average of the published values.

[*q*] A theoretical value using QED.

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

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

[*t*] See AALTONEN 11H, Fig. 8, for the calculated ratio of $\Lambda_c^+\pi^0\pi^0$ and $\Lambda_c^+\pi^+\pi^-$ partial widths as a function of the $\Lambda_c(2595)^+ - \Lambda_c^+$ mass difference. At our value of the mass difference, the ratio is about 4.

[*u*] A test that the isospin is indeed 0, so that the particle is indeed a Λ_c^+.

[*v*] P_c^+ is a pentaquark-charmonium state.

[*x*] Not a pure measurement. See note at head of Λ_b^0 Decay Modes.

[*y*] Here h^- means π^- or K^-.

SEARCHES FOR MONOPOLES, SUPERSYMMETRY, TECHNICOLOR, COMPOSITENESS, EXTRA DIMENSIONS, etc.

Magnetic Monopole Searches

Isolated supermassive monopole candidate events have not been confirmed. The most sensitive experiments obtain negative results.

Best cosmic-ray supermassive monopole flux limit:

$< 1.4 \times 10^{-16}$ cm^{-2}sr^{-1}s^{-1} for $1.1 \times 10^{-4} < \beta < 1$

Supersymmetric Particle Searches

Presently all supersymmetric mass bounds are model dependent. This table contains a selection of bounds indicating the range of possibilities. For a more extensive set of cases consult the detailed listings.

The limits are based on the Minimal Supersymmetric Standard Model (MSSM) with additional assumptions as follows:

1) $\widetilde{\chi}_1^0$ is lightest supersymmetric particle; 2) R-parity is conserved;

See the Particle Listings for a Note giving details of supersymmetry.

$\widetilde{\chi}_i^0$ — neutralinos (mixtures of $\widetilde{\gamma}$, $\widetilde{Z}^0$, and $\widetilde{H}_i^0$)

Mass $m_{\widetilde{\chi}_1^0} > 0$ GeV, CL = 95%

[general MSSM, non-universal gaugino masses]

Mass $m_{\widetilde{\chi}_1^0} > 46$ GeV, CL = 95%

[all tanβ, all m_0, all $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$]

Mass $m_{\widetilde{\chi}_2^0} > 62.4$ GeV, CL = 95%

[1<tanβ <40, all m_0, all $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$]

Mass $m_{\widetilde{\chi}_2^0} > 345$ GeV, CL = 95%

[$\widetilde{\chi}_1^\pm \widetilde{\chi}_2^0 \rightarrow W \widetilde{\chi}_1^0 Z \widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^\pm} = m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0} = 0$ GeV]

Mass $m_{\widetilde{\chi}^0_3} > 99.9$ GeV, CL = 95%
[1<tanβ <40, all m_0, all $m_{\widetilde{\chi}^0_2} - m_{\widetilde{\chi}^0_1}$]
Mass $m_{\widetilde{\chi}^0_4} > 116$ GeV, CL = 95%
[1<tanβ <40, all m_0, all $m_{\widetilde{\chi}^0_2} - m_{\widetilde{\chi}^0_1}$]

$\widetilde{\chi}^\pm_i$ — charginos (mixtures of $\widetilde{W}^\pm$ and $\widetilde{H}^\pm_i$)
Mass $m_{\widetilde{\chi}^\pm_1} > 94$ GeV, CL = 95%
[tan$\beta < 40$, $m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1} > 3$ GeV, all m_0]
Mass $m_{\widetilde{\chi}^\pm_1} > 345$ GeV, CL = 95%
[simplified model, $m_{\widetilde{\chi}^\pm_1} = m_{\widetilde{\chi}^0_2}$, $m_{\widetilde{\chi}^0_1} = 0$ GeV]

$\widetilde{\nu}$ — sneutrino
Mass $m > 94$ GeV, CL = 95%
[CMSSM, $1 \leq$ tan$\beta \leq 40$, $m_{\widetilde{e}_R} - m_{\widetilde{\chi}^0_1} >$10 GeV]

$\widetilde{e}$ — scalar electron (selectron)
Mass $m(\widetilde{e}_L) > 107$ GeV, CL = 95% [all $m_{\widetilde{e}_R} - m_{\widetilde{\chi}^0_1}$]
Mass $m(\widetilde{e}_R) > 97.5$ GeV, CL = 95%
[$\Delta m > 11$ GeV, $|\mu| >$100 GeV, tanβ=1.5]

$\widetilde{\mu}$ — scalar muon (smuon)
Mass $m > 94$ GeV, CL = 95%
[CMSSM, $1 \leq$ tan$\beta \leq 40$, $m_{\widetilde{\mu}_R} - m_{\widetilde{\chi}^0_1} >$ 10 GeV]

$\widetilde{\tau}$ — scalar tau (stau)
Mass $m > 81.9$ GeV, CL = 95%
[$m_{\widetilde{\tau}_R} - m_{\widetilde{\chi}^0_1} >$15 GeV, all θ_τ, B($\widetilde{\tau} \rightarrow \tau \widetilde{\chi}^0_1$) = 100%]

$\widetilde{q}$ – squarks of the first two quark generations

The first of these limits is within CMSSM with cascade decays, evaluated assuming a fixed value of the parameters μ and tanβ. The first two limits assume two-generations of mass degenerate squarks ($\widetilde{q}_L$ and $\widetilde{q}_R$) and gaugino mass parameters that are constrained by the unification condition at the grand unification scale. The third limit assumes a simplified model with a 100% branching ratio for the prompt decay $\widetilde{q} \rightarrow q \widetilde{\chi}^0_1$.

Mass $m > 1450$ GeV, CL = 95%
[CMSSM, tan$\beta = 30$, $A_0 = -2$max(m_0, $m_{1/2}$), $\mu > 0$]
Mass $m > 850$ GeV, CL = 95%
[jets + $\not{E}_T$, $\widetilde{q} \rightarrow q \widetilde{\chi}^0_1$ simplified model, $m_{\widetilde{\chi}^0_1}$= 0 GeV]
Mass $m > 520$ GeV, CL = 95%
[$\widetilde{q} \rightarrow q \widetilde{\chi}^0_1$, simplified model, single light squark, $m_{\widetilde{\chi}^0_1} = 0$]

$\widetilde{b}$ — scalar bottom (sbottom)

Mass $m >$ 650 GeV, CL = 95% $[\widetilde{b} \rightarrow b\widetilde{\chi}_1^0,\ m_{\widetilde{\chi}_1^0} = 0]$

Mass $m >$ 600 GeV, CL = 95% $[\widetilde{b} \rightarrow b\widetilde{\chi}_1^0,\ m_{\widetilde{\chi}_1^0} < 250$ GeV$]$

$\widetilde{t}$ — scalar top (stop)

Mass $m >$ 730 GeV, CL = 95%
$[\widetilde{t} \rightarrow t\widetilde{\chi}_1^0,\ m_{\widetilde{\chi}_1^0} = 100$ GeV, $m_{\widetilde{t}} > m_t + m_{\widetilde{\chi}_1^0}]$

Mass $m >$ 500 GeV, CL = 95%
$[\ell^{\pm}$ + jets + $\not{E}_T$, $\widetilde{t}_1 \rightarrow b\widetilde{\chi}_1^{\pm}$, $m_{\widetilde{\chi}_1^{\pm}} = 2\ m_{\widetilde{\chi}_1^0}$, 100 GeV $< m_{\widetilde{\chi}_1^0} <$ 150 GeV$]$

Mass $m >$ 240 GeV, CL = 95%
$[\widetilde{t}_1 \rightarrow c\widetilde{\chi}_1^0, m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} <$85 GeV$]$

$\widetilde{g}$ — gluino

The first limit assumes a simplified model with a 100% branching ratio for the prompt 3 body decay, independent of the squark mass. The second of these limits is within the CMSSM (for $m_{\widetilde{g}} \gtrsim 5$ GeV), and includes the effects of cascade decays, evaluated assuming a fixed value of the parameters μ and tanβ. The limit assumes GUT relations between gaugino masses and the gauge couplings. The third limit is based on a combination of searches.

Mass $m >$ 1225 GeV, CL = 95% $[\widetilde{g} \rightarrow q\overline{q}\widetilde{\chi}_1^0,\ m_{\widetilde{\chi}_1^0} = 0]$

Mass $m >$ 1150 GeV, CL = 95%
[CMSSM, tanβ=30, A_0=$-$2max(m_0,$m_{1/2}$), $\mu >$0]

Mass $m >$ 1150 GeV, CL = 95%
[general RPC $\widetilde{g}$ decays, $m_{\widetilde{\chi}_1^0} <$ 100 GeV]

Technicolor

The limits for technicolor (and top-color) particles are quite varied depending on assumptions. See the Technicolor section of the full *Review* (the data listings).

Quark and Lepton Compositeness, Searches for

Scale Limits Λ for Contact Interactions (the lowest dimensional interactions with four fermions)

If the Lagrangian has the form

$$\pm \frac{g^2}{2\Lambda^2}\, \overline{\psi}_L \gamma_\mu \psi_L \overline{\psi}_L \gamma^\mu \psi_L$$

(with $g^2/4\pi$ set equal to 1), then we define $\Lambda \equiv \Lambda^{\pm}_{LL}$. For the full definitions and for other forms, see the Note in the Listings on Searches for Quark and Lepton Compositeness in the full *Review* and the original literature.

$\Lambda^{+}_{LL}(eeee)$	$>$	8.3 TeV, CL = 95%
$\Lambda^{-}_{LL}(eeee)$	$>$	10.3 TeV, CL = 95%
$\Lambda^{+}_{LL}(ee\mu\mu)$	$>$	8.5 TeV, CL = 95%
$\Lambda^{-}_{LL}(ee\mu\mu)$	$>$	9.5 TeV, CL = 95%
$\Lambda^{+}_{LL}(ee\tau\tau)$	$>$	7.9 TeV, CL = 95%
$\Lambda^{-}_{LL}(ee\tau\tau)$	$>$	7.2 TeV, CL = 95%
$\Lambda^{+}_{LL}(\ell\ell\ell\ell)$	$>$	9.1 TeV, CL = 95%
$\Lambda^{-}_{LL}(\ell\ell\ell\ell)$	$>$	10.3 TeV, CL = 95%
$\Lambda^{+}_{LL}(eeuu)$	$>$	23.3 TeV, CL = 95%
$\Lambda^{-}_{LL}(eeuu)$	$>$	12.5 TeV, CL = 95%
$\Lambda^{+}_{LL}(eedd)$	$>$	11.1 TeV, CL = 95%
$\Lambda^{-}_{LL}(eedd)$	$>$	26.4 TeV, CL = 95%
$\Lambda^{+}_{LL}(eecc)$	$>$	9.4 TeV, CL = 95%
$\Lambda^{-}_{LL}(eecc)$	$>$	5.6 TeV, CL = 95%
$\Lambda^{+}_{LL}(eebb)$	$>$	9.4 TeV, CL = 95%
$\Lambda^{-}_{LL}(eebb)$	$>$	10.2 TeV, CL = 95%
$\Lambda^{+}_{LL}(\mu\mu qq)$	$>$	12.5 TeV, CL = 95%
$\Lambda^{-}_{LL}(\mu\mu qq)$	$>$	16.7 TeV, CL = 95%
$\Lambda(\ell\nu\ell\nu)$	$>$	3.10 TeV, CL = 90%
$\Lambda(e\nu qq)$	$>$	2.81 TeV, CL = 95%
$\Lambda^{+}_{LL}(qqqq)$	$>$	9.0 TeV, CL = 95%
$\Lambda^{-}_{LL}(qqqq)$	$>$	12.0 TeV, CL = 95%
$\Lambda^{+}_{LL}(\nu\nu qq)$	$>$	5.0 TeV, CL = 95%
$\Lambda^{-}_{LL}(\nu\nu qq)$	$>$	5.4 TeV, CL = 95%

Excited Leptons

The limits from $\ell^{*+}\ell^{*-}$ do not depend on λ (where λ is the $\ell\ell^*$ transition coupling). The λ-dependent limits assume chiral coupling.

$e^{*\pm}$ — excited electron

Mass $m >$ 103.2 GeV, CL = 95% (from e^*e^*)
Mass $m >$ 3.000×10^3 GeV, CL = 95% (from ee^*)
Mass $m >$ 356 GeV, CL = 95% (if $\lambda_\gamma = 1$)

$\mu^{*\pm}$ — excited muon

Mass $m >$ 103.2 GeV, CL = 95% (from $\mu^*\mu^*$)
Mass $m >$ 3.000×10^3 GeV, CL = 95% (from $\mu\mu^*$)

$\tau^{*\pm}$ — excited tau

Mass $m >$ 103.2 GeV, CL = 95% (from $\tau^*\tau^*$)
Mass $m >$ 2.500×10^3 GeV, CL = 95% (from $\tau\tau^*$)

ν^* — excited neutrino

Mass $m >$ 1.600×10^3 GeV, CL = 95% (from $\nu^*\nu^*$)
Mass $m >$ 213 GeV, CL = 95% (from ν^*X)

q^* — excited quark

Mass $m >$ 338 GeV, CL = 95% (from q^*q^*)
Mass $m >$ 4.060×10^3 GeV, CL = 95% (from q^*X)

Color Sextet and Octet Particles

Color Sextet Quarks (q_6)

Mass $m >$ 84 GeV, CL = 95% (Stable q_6)

Color Octet Charged Leptons (ℓ_8)

Mass $m >$ 86 GeV, CL = 95% (Stable ℓ_8)

Color Octet Neutrinos (ν_8)

Mass $m >$ 110 GeV, CL = 90% ($\nu_8 \rightarrow \nu g$)

Extra Dimensions

Please refer to the Extra Dimensions section of the full *Review* for a discussion of the model-dependence of these bounds, and further constraints.

Constraints on the radius of the extra dimensions, for the case of two-flat dimensions of equal radii

$R <$ 30 μm, CL = 95% (direct tests of Newton's law)
$R <$ 15 μm, CL = 95% ($pp \rightarrow jG$)
$R <$ 0.16–916 nm (astrophysics; limits depend on technique and assumptions)

Constraints on the fundamental gravity scale

$M_{TT} > 6.3$ TeV, CL = 95% ($pp \to$ dijet, angular distribution)
$M_c > 4.16$ TeV, CL = 95% ($pp \to \ell\overline{\ell}$)

Constraints on the Kaluza-Klein graviton in warped extra dimensions

$M_G > 2.73$ TeV, CL = 95% ($pp \to e^+e^-,\ \mu^+\mu^-$)

Constraints on the Kaluza-Klein gluon in warped extra dimensions

$M_{g_{KK}} > 2.5$ TeV, CL = 95% ($g_{KK} \to t\overline{t}$)

TESTS OF DISCRETE SPACE-TIME SYMMETRIES

CHARGE CONJUGATION (*C*) INVARIANCE

$\Gamma(\pi^0 \to\ 3\gamma)/\Gamma_{\text{total}}$		$<3.1 \times 10^{-8}$, CL = 90%
η *C*-nonconserving decay parameters		
$\pi^+\pi^-\pi^0$ left-right asymmetry		$(0.09^{+0.11}_{-0.12}) \times 10^{-2}$
$\pi^+\pi^-\pi^0$ sextant asymmetry		$(0.12^{+0.10}_{-0.11}) \times 10^{-2}$
$\pi^+\pi^-\pi^0$ quadrant asymmetry		$(-0.09 \pm 0.09) \times 10^{-2}$
$\pi^+\pi^-\gamma$ left-right asymmetry		$(0.9 \pm 0.4) \times 10^{-2}$
$\pi^+\pi^-\gamma$ parameter β (*D*-wave)		-0.02 ± 0.07 (S = 1.3)
$\Gamma(\eta \to\ \pi^0\gamma)/\Gamma_{\text{total}}$		$<9 \times 10^{-5}$, CL = 90%
$\Gamma(\eta \to\ 2\pi^0\gamma)/\Gamma_{\text{total}}$		$<5 \times 10^{-4}$, CL = 90%
$\Gamma(\eta \to\ 3\pi^0\gamma)/\Gamma_{\text{total}}$		$<6 \times 10^{-5}$, CL = 90%
$\Gamma(\eta \to\ 3\gamma)/\Gamma_{\text{total}}$		$<1.6 \times 10^{-5}$, CL = 90%
$\Gamma(\eta \to\ \pi^0 e^+ e^-)/\Gamma_{\text{total}}$	[a]	$<4 \times 10^{-5}$, CL = 90%
$\Gamma(\eta \to\ \pi^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$	[a]	$<5 \times 10^{-6}$, CL = 90%
$\Gamma(\omega(782) \to\ \eta\pi^0)/\Gamma_{\text{total}}$		$<2.1 \times 10^{-4}$, CL = 90%
$\Gamma(\omega(782) \to\ 2\pi^0)/\Gamma_{\text{total}}$		$<2.1 \times 10^{-4}$, CL = 90%
$\Gamma(\omega(782) \to\ 3\pi^0)/\Gamma_{\text{total}}$		$<2.3 \times 10^{-4}$, CL = 90%
asymmetry parameter for $\eta'(958) \to\ \pi^+\pi^-\gamma$ decay		-0.03 ± 0.04
$\Gamma(\eta'(958) \to\ \pi^0 e^+ e^-)/\Gamma_{\text{total}}$	[a]	$<1.4 \times 10^{-3}$, CL = 90%
$\Gamma(\eta'(958) \to\ \eta e^+ e^-)/\Gamma_{\text{total}}$	[a]	$<2.4 \times 10^{-3}$, CL = 90%
$\Gamma(\eta'(958) \to\ 3\gamma)/\Gamma_{\text{total}}$		$<1.0 \times 10^{-4}$, CL = 90%
$\Gamma(\eta'(958) \to\ \mu^+ \mu^- \pi^0)/\Gamma_{\text{total}}$	[a]	$<6.0 \times 10^{-5}$, CL = 90%
$\Gamma(\eta'(958) \to\ \mu^+ \mu^- \eta)/\Gamma_{\text{total}}$	[a]	$<1.5 \times 10^{-5}$, CL = 90%
$\Gamma(J/\psi(1S) \to\ \gamma\gamma)/\Gamma_{\text{total}}$		$<2.7 \times 10^{-7}$, CL = 90%
$\Gamma(J/\psi(1S) \to\ \gamma\phi)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-6}$, CL = 90%

PARITY (*P*) INVARIANCE

e electric dipole moment	$<0.87 \times 10^{-28}$ *e* cm, CL = 90%
μ electric dipole moment	$(-0.1 \pm 0.9) \times 10^{-19}$ *e* cm
Re($d_\tau = \tau$ electric dipole moment)	-0.220 to 0.45×10^{-16} *e* cm, CL = 95%
$\Gamma(\eta \to\ \pi^+\pi^-)/\Gamma_{\text{total}}$	$<1.3 \times 10^{-5}$, CL = 90%
$\Gamma(\eta \to\ 2\pi^0)/\Gamma_{\text{total}}$	$<3.5 \times 10^{-4}$, CL = 90%
$\Gamma(\eta \to\ 4\pi^0)/\Gamma_{\text{total}}$	$<6.9 \times 10^{-7}$, CL = 90%
$\Gamma(\eta'(958) \to\ \pi^+\pi^-)/\Gamma_{\text{total}}$	$<6 \times 10^{-5}$, CL = 90%
$\Gamma(\eta'(958) \to\ \pi^0\pi^0)/\Gamma_{\text{total}}$	$<4 \times 10^{-4}$, CL = 90%

$\Gamma(\eta_c(1S) \to \pi^+\pi^-)/\Gamma_{\text{total}}$		$<1.1 \times 10^{-4}$, CL = 90%
$\Gamma(\eta_c(1S) \to \pi^0\pi^0)/\Gamma_{\text{total}}$		$<4 \times 10^{-5}$, CL = 90%
$\Gamma(\eta_c(1S) \to K^+K^-)/\Gamma_{\text{total}}$		$<6 \times 10^{-4}$, CL = 90%
$\Gamma(\eta_c(1S) \to K^0_S K^0_S)/\Gamma_{\text{total}}$		$<3.1 \times 10^{-4}$, CL = 90%
p electric dipole moment		$<0.54 \times 10^{-23}$ e cm
n electric dipole moment		$<0.30 \times 10^{-25}$ e cm, CL = 90%
Λ electric dipole moment		$<1.5 \times 10^{-16}$ e cm, CL = 95%

TIME REVERSAL (T) INVARIANCE

e electric dipole moment		$<0.87 \times 10^{-28}$ e cm, CL = 90%
μ electric dipole moment		$(-0.1 \pm 0.9) \times 10^{-19}$ e cm
μ decay parameters		
transverse e^+ polarization normal to plane of μ spin, e^+ momentum		$(-2 \pm 8) \times 10^{-3}$
α'/A		$(-10 \pm 20) \times 10^{-3}$
β'/A		$(2 \pm 7) \times 10^{-3}$
Re($d_\tau = \tau$ electric dipole moment)		-0.220 to 0.45×10^{-16} e cm, CL = 95%
P_T in $K^+ \to \pi^0\mu^+\nu_\mu$		$(-1.7 \pm 2.5) \times 10^{-3}$
P_T in $K^+ \to \mu^+\nu_\mu\gamma$		$(-0.6 \pm 1.9) \times 10^{-2}$
Im(ξ) in $K^+ \to \pi^0\mu^+\nu_\mu$ decay (from transverse μ pol.)		-0.006 ± 0.008
asymmetry A_T in K^0-$\overline{K}^0$ mixing		$(6.6 \pm 1.6) \times 10^{-3}$
Im(ξ) in $K^0_{\mu 3}$ decay (from transverse μ pol.)		-0.007 ± 0.026
$A_T(D^\pm \to K^0_S K^\pm\pi^+\pi^-)$	[b]	$(-12 \pm 11) \times 10^{-3}$
$A_T(D^0 \to K^+K^-\pi^+\pi^-)$	[b]	$(1.7 \pm 2.7) \times 10^{-3}$
$A_T(D_s^\pm \to K^0_S K^\pm\pi^+\pi^-)$	[b]	$(-14 \pm 8) \times 10^{-3}$
ΔS_T^+ ($S^-_{\ell^-,K^0_S} - S^+_{\ell^+,K^0_S}$)		-1.37 ± 0.15
ΔS_T^- ($S^+_{\ell^-,K^0_S} - S^-_{\ell^+,K^0_S}$)		1.17 ± 0.21
ΔC_T^+ ($C^-_{\ell^-,K^0_S} - C^+_{\ell^+,K^0_S}$)		0.10 ± 0.16
ΔC_T^- ($C^+_{\ell^-,K^0_S} - C^-_{\ell^+,K^0_S}$)		0.04 ± 0.16
p electric dipole moment		$<0.54 \times 10^{-23}$ e cm
n electric dipole moment		$<0.30 \times 10^{-25}$ e cm, CL = 90%
$n \to pe^-\overline{\nu}_e$ decay parameters		
ϕ_{AV}, phase of g_A relative to g_V	[c]	$(180.017 \pm 0.026)^\circ$
triple correlation coefficient D	[d]	$(-1.2 \pm 2.0) \times 10^{-4}$
triple correlation coefficient R	[d]	0.004 ± 0.013
Λ electric dipole moment		$<1.5 \times 10^{-16}$ e cm, CL = 95%
triple correlation coefficient D for $\Sigma^- \to ne^-\overline{\nu}_e$		0.11 ± 0.10

CP INVARIANCE

$\mathrm{Re}(d_\tau^W)$		$<0.50\times10^{-17}$ e cm, CL = 95%
$\mathrm{Im}(d_\tau^W)$		$<1.1\times10^{-17}$ e cm, CL = 95%
$\eta\to\ \pi^+\pi^-e^+e^-$ decay-plane asymmetry		$(-0.6\pm3.1)\times10^{-2}$
$\Gamma(\eta\to\ \pi^+\pi^-)/\Gamma_{\rm total}$		$<1.3\times10^{-5}$, CL = 90%
$\Gamma(\eta\to\ 2\pi^0)/\Gamma_{\rm total}$		$<3.5\times10^{-4}$, CL = 90%
$\Gamma(\eta\to\ 4\pi^0)/\Gamma_{\rm total}$		$<6.9\times10^{-7}$, CL = 90%
$\Gamma(\eta'(958)\to\ \pi^+\pi^-)/\Gamma_{\rm total}$		$<6\times10^{-5}$, CL = 90%
$\Gamma(\eta'(958)\to\ \pi^0\pi^0)/\Gamma_{\rm total}$		$<4\times10^{-4}$, CL = 90%
$K^\pm\to\ \pi^\pm e^+e^-$ rate difference/sum		$(-2.2\pm1.6)\times10^{-2}$
$K^\pm\to\ \pi^\pm\mu^+\mu^-$ rate difference/sum		0.010 ± 0.023
$K^\pm\to\ \pi^\pm\pi^0\gamma$ rate difference/sum		$(0.0\pm1.2)\times10^{-3}$
$K^\pm\to\ \pi^\pm\pi^+\pi^-$ rate difference/sum		(0.04 ± 0.06)%
$K^\pm\to\ \pi^\pm\pi^0\pi^0$ rate difference/sum		(-0.02 ± 0.28)%
$K^\pm\to\ \pi^\pm\pi^+\pi^-\ (g_+-g_-)\ /\ (g_++g_-)$		$(-1.5\pm2.2)\times10^{-4}$
$K^\pm\to\ \pi^\pm\pi^0\pi^0\ (g_+-g_-)\ /\ (g_++g_-)$		$(1.8\pm1.8)\times10^{-4}$
$A_S=[\ \Gamma(K_S^0\to\ \pi^-e^+\nu_e)$ - $\Gamma(K_S^0\to\ \pi^+e^-\overline{\nu}_e)\ ]$ / SUM		$(2\pm10)\times10^{-3}$
$\mathrm{Im}(\eta_{+-0})=\mathrm{Im}(\mathrm{A}(K_S^0\to\ \pi^+\pi^-\pi^0$, *CP*-violating) / $\mathrm{A}(K_L^0\to\ \pi^+\pi^-\pi^0))$		-0.002 ± 0.009
$\mathrm{Im}(\eta_{000})=\mathrm{Im}(A(K_S^0\to\ \pi^0\pi^0\pi^0)/A(K_L^0\to\ \pi^0\pi^0\pi^0))$		-0.001 ± 0.016
$\lvert\eta_{000}\rvert=\lvert A(K_S^0\to\ 3\pi^0)/A(K_L^0\to\ 3\pi^0)\rvert$		<0.0088, CL = 90%
CP asymmetry A in $K_S^0\to\ \pi^+\pi^-e^+e^-$		(-0.4 ± 0.8)%
$\Gamma(K_S^0\to\ 3\pi^0)/\Gamma_{\rm total}$		$<2.6\times10^{-8}$, CL = 90%
linear coefficient j for $K_L^0\to\ \pi^+\pi^-\pi^0$		0.0012 ± 0.0008
quadratic coefficient f for $K_L^0\to\ \pi^+\pi^-\pi^0$		0.004 ± 0.006
$\lvert\epsilon'_{+-\gamma}\rvert/\epsilon$ for $K_L^0\to\ \pi^+\pi^-\gamma$		<0.3, CL = 90%
$\lvert g_{E1}\rvert$ for $K_L^0\to\ \pi^+\pi^-\gamma$		<0.21, CL = 90%
$\Gamma(K_L^0\to\ \pi^0\mu^+\mu^-)/\Gamma_{\rm total}$	[e]	$<3.8\times10^{-10}$, CL = 90%
$\Gamma(K_L^0\to\ \pi^0e^+e^-)/\Gamma_{\rm total}$	[e]	$<2.8\times10^{-10}$, CL = 90%
$\Gamma(K_L^0\to\ \pi^0\nu\overline{\nu})/\Gamma_{\rm total}$	[f]	$<2.6\times10^{-8}$, CL = 90%
$A_{CP}(D^\pm\to\ \mu^\pm\nu)$		(8 ± 8)%
$A_{CP}(D^\pm\to\ K_L^0e^\pm\nu)$		(-0.6 ± 1.6)%
$A_{CP}(D^\pm\to\ K_S^0\pi^\pm)$		(-0.41 ± 0.09)%
$A_{CP}(D^\pm\to\ K^\mp2\pi^\pm)$		(-0.18 ± 0.16)%
$A_{CP}(D^\pm\to\ K^\mp\pi^\pm\pi^\pm\pi^0)$		(-0.3 ± 0.7)%
$A_{CP}(D^\pm\to\ K_S^0\pi^\pm\pi^0)$		(-0.1 ± 0.7)%
$A_{CP}(D^\pm\to\ K_S^0\pi^\pm\pi^+\pi^-)$		(0.0 ± 1.2)%
$A_{CP}(D^\pm\to\ \pi^\pm\pi^0)$		(2.9 ± 2.9)%

$A_{CP}(D^\pm \to \pi^\pm \eta)$		$(1.0 \pm 1.5)\%$ (S = 1.4)
$A_{CP}(D^\pm \to \pi^\pm \eta'(958))$		$(-0.5 \pm 1.2)\%$ (S = 1.1)
$A_{CP}(\overline{K}^0 / K^0 K^\pm)$		$(0.11 \pm 0.17)\%$
$A_{CP}(D^\pm \to K^0_S K^\pm)$		$(-0.11 \pm 0.25)\%$
$A_{CP}(D^\pm \to K^+ K^- \pi^\pm)$		$(0.37 \pm 0.29)\%$
$A_{CP}(D^\pm \to K^\pm K^{*0})$		$(-0.3 \pm 0.4)\%$
$A_{CP}(D^\pm \to \phi\pi^\pm)$		$(0.09 \pm 0.19)\%$ (S = 1.2)
$A_{CP}(D^\pm \to K^\pm K^*_0(1430)^0)$		$(8^{+7}_{-6})\%$
$A_{CP}(D^\pm \to K^\pm K^*_2(1430)^0)$		$(43^{+20}_{-26})\%$
$A_{CP}(D^\pm \to K^\pm K^*_0(800))$		$(-12^{+18}_{-13})\%$
$A_{CP}(D^\pm \to a_0(1450)^0 \pi^\pm)$		$(-19^{+14}_{-16})\%$
$A_{CP}(D^\pm \to \phi(1680)\pi^\pm)$		$(-9 \pm 26)\%$
$A_{CP}(D^\pm \to \pi^+\pi^-\pi^\pm)$		$(-2 \pm 4)\%$
$A_{CP}(D^\pm \to K^0_S K^\pm \pi^+\pi^-)$		$(-4 \pm 7)\%$
$A_{CP}(D^\pm \to K^\pm \pi^0)$		$(-4 \pm 11)\%$
Local *CPV* in $D^\pm \to \pi^+\pi^-\pi^\pm$		78.1%
Local *CPV* in $D^\pm \to K^+K^-\pi^\pm$		31%
$\lvert q/p \rvert$ of D^0–$\overline{D}^0$ mixing		$0.92^{+0.12}_{-0.09}$
A_Γ of D^0–$\overline{D}^0$ mixing		$(-0.125 \pm 0.526) \times 10^{-3}$

Where there is ambiguity, the *CP* test is labelled by the D^0 decay mode.

$A_{CP}(D^0 \to K^+K^-)$		$(-0.14 \pm 0.12)\%$
$A_{CP}(D^0 \to K^0_S K^0_S)$		$(-5 \pm 5)\%$
$A_{CP}(D^0 \to \pi^+\pi^-)$		$(0.01 \pm 0.15)\%$
$A_{CP}(D^0 \to \pi^0\pi^0)$		$(0.0 \pm 0.6)\%$
$A_{CP}(D^0 \to \pi^+\pi^-\pi^0)$		$(0.3 \pm 0.4)\%$
$A_{CP}(D^0 \to \rho(770)^+\pi^- \to \pi^+\pi^-\pi^0)$	[g]	$(1.2 \pm 0.9)\%$
$A_{CP}(D^0 \to \rho(770)^0\pi^0 \to \pi^+\pi^-\pi^0)$	[g]	$(-3.1 \pm 3.0)\%$
$A_{CP}(D^0 \to \rho(770)^-\pi^+ \to \pi^+\pi^-\pi^0)$	[g]	$(-1.0 \pm 1.7)\%$
$A_{CP}(D^0 \to \rho(1450)^+\pi^- \to \pi^+\pi^-\pi^0)$	[g]	$(0 \pm 70)\%$
$A_{CP}(D^0 \to \rho(1450)^0\pi^0 \to \pi^+\pi^-\pi^0)$	[g]	$(-20 \pm 40)\%$
$A_{CP}(D^0 \to \rho(1450)^-\pi^+ \to \pi^+\pi^-\pi^0)$	[g]	$(6 \pm 9)\%$
$A_{CP}(D^0 \to \rho(1700)^+\pi^- \to \pi^+\pi^-\pi^0)$	[g]	$(-5 \pm 14)\%$
$A_{CP}(D^0 \to \rho(1700)^0\pi^0 \to \pi^+\pi^-\pi^0)$	[g]	$(13 \pm 9)\%$
$A_{CP}(D^0 \to \rho(1700)^-\pi^+ \to \pi^+\pi^-\pi^0)$	[g]	$(8 \pm 11)\%$
$A_{CP}(D^0 \to f_0(980)\pi^0 \to \pi^+\pi^-\pi^0)$	[g]	$(0 \pm 35)\%$
$A_{CP}(D^0 \to f_0(1370)\pi^0 \to \pi^+\pi^-\pi^0)$	[g]	$(25 \pm 18)\%$
$A_{CP}(D^0 \to f_0(1500)\pi^0 \to \pi^+\pi^-\pi^0)$	[g]	$(0 \pm 18)\%$
$A_{CP}(D^0 \to f_0(1710)\pi^0 \to \pi^+\pi^-\pi^0)$	[g]	$(0 \pm 24)\%$
$A_{CP}(D^0 \to f_2(1270)\pi^0 \to \pi^+\pi^-\pi^0)$	[g]	$(-4 \pm 6)\%$
$A_{CP}(D^0 \to \sigma(400)\pi^0 \to \pi^+\pi^-\pi^0)$	[g]	$(6 \pm 8)\%$
$A_{CP}(\text{nonresonant } D^0 \to \pi^+\pi^-\pi^0)$	[g]	$(-13 \pm 23)\%$

$A_{CP}(D^0 \to K^+K^-\pi^0)$		$(-1.0 \pm 1.7)\%$
$A_{CP}(D^0 \to K^*(892)^+K^- \to K^+K^-\pi^0)$	[g]	$(-0.9 \pm 1.3)\%$
$A_{CP}(D^0 \to K^*(1410)^+K^- \to K^+K^-\pi^0)$	[g]	$(-21 \pm 24)\%$
$A_{CP}(D^0 \to (K^+\pi^0)_S K^- \to K^+K^-\pi^0)$	[g]	$(7 \pm 15)\%$
$A_{CP}(D^0 \to \phi(1020)\pi^0 \to K^+K^-\pi^0)$	[g]	$(1.1 \pm 2.2)\%$
$A_{CP}(D^0 \to f_0(980)\pi^0 \to K^+K^-\pi^0)$	[g]	$(-3 \pm 19)\%$
$A_{CP}(D^0 \to a_0(980)^0\pi^0 \to K^+K^-\pi^0)$	[g]	$(-5 \pm 16)\%$
$A_{CP}(D^0 \to f_2'(1525)\pi^0 \to K^+K^-\pi^0)$	[g]	$(0 \pm 160)\%$
$A_{CP}(D^0 \to K^*(892)^-K^+ \to K^+K^-\pi^0)$	[g]	$(-5 \pm 4)\%$
$A_{CP}(D^0 \to K^*(1410)^-K^+ \to K^+K^-\pi^0)$	[g]	$(-17 \pm 29)\%$
$A_{CP}(D^0 \to (K^-\pi^0)_{S-wave}K^+ \to K^+K^-\pi^0)$	[g]	$(-10 \pm 40)\%$
$A_{CP}(D^0 \to K^0_S\pi^0)$		$(-0.20 \pm 0.17)\%$
$A_{CP}(D^0 \to K^0_S\eta)$		$(0.5 \pm 0.5)\%$
$A_{CP}(D^0 \to K^0_S\eta')$		$(1.0 \pm 0.7)\%$
$A_{CP}(D^0 \to K^0_S\phi)$		$(-3 \pm 9)\%$
$A_{CP}(D^0 \to K^-\pi^+)$		$(0.3 \pm 0.7)\%$
$A_{CP}(D^0 \to K^+\pi^-)$		$(0.0 \pm 1.6)\%$
$A_{CP}(D^0 \to K^-\pi^+\pi^0)$		$(0.1 \pm 0.5)\%$
$A_{CP}(D^0 \to K^+\pi^-\pi^0)$		$(0 \pm 5)\%$
$A_{CP}(D^0 \to K^0_S\pi^+\pi^-)$		$(-0.1 \pm 0.8)\%$
$A_{CP}(D^0 \to K^*(892)^-\pi^+ \to K^0_S\pi^+\pi^-)$		$(0.4 \pm 0.5)\%$
$A_{CP}(D^0 \to K^*(892)^+\pi^- \to K^0_S\pi^+\pi^-)$		$(1 \pm 6)\%$
$A_{CP}(D^0 \to K^0_S\rho^0 \to K^0_S\pi^+\pi^-)$		$(-0.1 \pm 0.5)\%$
$A_{CP}(D^0 \to K^0_S\omega \to K^0_S\pi^+\pi^-)$		$(-13 \pm 7)\%$
$A_{CP}(D^0 \to K^0_S f_0(980) \to K^0_S\pi^+\pi^-)$		$(-0.4 \pm 2.7)\%$
$A_{CP}(D^0 \to K^0_S f_2(1270) \to K^0_S\pi^+\pi^-)$		$(-4 \pm 5)\%$
$A_{CP}(D^0 \to K^0_S f_0(1370) \to K^0_S\pi^+\pi^-)$		$(-1 \pm 9)\%$
$A_{CP}(D^0 \to \overline{K}^0\rho^0(1450) \to K^0_S\pi^+\pi^-)$		$(-4 \pm 10)\%$
$A_{CP}(D^0 \to \overline{K}^0 f_0(600) \to K^0_S\pi^+\pi^-)$		$(-3 \pm 5)\%$
$A_{CP}(D^0 \to K^*(1410)^-\pi^+ \to K^0_S\pi^+\pi^-)$		$(-2 \pm 9)\%$
$A_{CP}(D^0 \to K^*_0(1430)^-\pi^+ \to K^0_S\pi^+\pi^-)$		$(4 \pm 4)\%$
$A_{CP}(D^0 \to K^*_0(1430)^-\pi^+ \to K^0_S\pi^+\pi^-)$		$(12 \pm 15)\%$
$A_{CP}(D^0 \to K^*_2(1430)^-\pi^+ \to K^0_S\pi^+\pi^-)$		$(3 \pm 6)\%$
$A_{CP}(D^0 \to K^*_2(1430)^+\pi^- \to K^0_S\pi^+\pi^-)$		$(-10 \pm 32)\%$
$A_{CP}(D^0 \to K^*(1680)^-\pi^+ \to K^0_S\pi^+\pi^-)$		—
$A_{CP}(D^0 \to K^-\pi^+\pi^+\pi^-)$		$(0.2 \pm 0.5)\%$
$A_{CP}(D^0 \to K^+\pi^-\pi^+\pi^-)$		$(-2 \pm 4)\%$
$A_{CP}(D^0 \to K^+K^-\pi^+\pi^-)$		$(-8 \pm 7)\%$
$A_{CP}(D^0 \to K^*_1(1270)^+K^- \to K^{*0}\pi^+K^-)$		$(-1 \pm 10)\%$

$A_{CP}(D^0 \to K_1^*(1270)^- K^+ \to \overline{K}^{*0}\pi^- K^+)$	$(-10 \pm 32)\%$
$A_{CP}(D^0 \to K_1^*(1270)^+ K^- \to \rho^0 K^+ K^-)$	$(-7 \pm 17)\%$
$A_{CP}(D^0 \to K_1^*(1270)^- K^+ \to \rho^0 K^- K^+)$	$(10 \pm 13)\%$
$A_{CP}(D^0 \to K^*(1410)^+ K^- \to K^{*0}\pi^+ K^-)$	$(-20 \pm 17)\%$
$A_{CP}(D^0 \to K^*(1410)^- K^+ \to \overline{K}^{*0}\pi^- K^+)$	$(-1 \pm 14)\%$
$A_{CP}(D^0 \to K^{*0}\overline{K}^{*0}$ S-wave)	$(10 \pm 14)\%$
$A_{CP}(D^0 \to \phi\rho^0$ S-wave)	$(-3 \pm 5)\%$
$A_{CP}(D^0 \to \phi\rho^0$ D-wave)	$(-37 \pm 19)\%$
$A_{CP}(D^0 \to \phi(\pi^+\pi^-)_{S-wave})$	$(-9 \pm 10)\%$
$A_{CP}((K^-\pi^+)_{P-wave}\,(K^+\pi^-)_{S-wave})$	$(3 \pm 11)\%$
CP-even fraction in $D^0 \to \pi^+\pi^-\pi^0$ decays	$(97.3 \pm 1.7)\%$
CP-even fraction in $D^0 \to K^+K^-\pi^0$ decays	$(73 \pm 6)\%$
CP-even fraction in $D^0 \to \pi^+\pi^-\pi^+\pi^-$ decays	$(73.7 \pm 2.8)\%$
$\Delta A_{CP}^{D^0} = A_{CP}(K^+K^-) - A_{CP}(\pi^+\pi^-)$	$(-0.32 \pm 0.22)\%$ (S = 1.9)
Local CPV in D^0, $\overline{D}^0 \to \pi^+\pi^-\pi^0$	4.9%
Local CPV in D^0, $\overline{D}^0 \to \pi^+\pi^-\pi^+\pi^-$	41%
Local CPV in D^0, $\overline{D}^0 \to K_S^0\pi^+\pi^-$	96%
Local CPV in D^0, $\overline{D}^0 \to K^+K^-\pi^0$	16.6%
Local CPV in D^0, $\overline{D}^0 \to K^+K^-\pi^+\pi^-$	9.1%
$A_{CP}(D_s^\pm \to \mu^\pm\nu)$	$(5 \pm 6)\%$
$A_{CP}(D_s^\pm \to K^\pm K_S^0)$	$(0.08 \pm 0.26)\%$
$A_{CP}(D_s^\pm \to K^+K^-\pi^\pm)$	$(-0.5 \pm 0.9)\%$
$A_{CP}(D_s^\pm \to \phi\pi^\pm)$	$(-0.38 \pm 0.27)\%$
$A_{CP}(D_s^\pm \to K^\pm K_S^0\pi^0)$	$(-2 \pm 6)\%$
$A_{CP}(D_s^\pm \to 2K_S^0\pi^\pm)$	$(3 \pm 5)\%$
$A_{CP}(D_s^\pm \to K^+K^-\pi^\pm\pi^0)$	$(0.0 \pm 3.0)\%$
$A_{CP}(D_s^\pm \to K^\pm K_S^0\pi^+\pi^-)$	$(-6 \pm 5)\%$
$A_{CP}(D_s^\pm \to K_S^0 K^\mp 2\pi^\pm)$	$(4.1 \pm 2.8)\%$
$A_{CP}(D_s^\pm \to \pi^+\pi^-\pi^\pm)$	$(-0.7 \pm 3.1)\%$
$A_{CP}(D_s^\pm \to \pi^\pm\eta)$	$(1.1 \pm 3.1)\%$
$A_{CP}(D_s^\pm \to \pi^\pm\eta')$	$(-2.2 \pm 2.3)\%$
$A_{CP}(D_s^\pm \to \eta\pi^\pm\pi^0)$	$(-1 \pm 4)\%$
$A_{CP}(D_s^\pm \to \eta'\pi^\pm\pi^0)$	$(0 \pm 8)\%$
$A_{CP}(D_s^\pm \to K^\pm\pi^0)$	$(-27 \pm 24)\%$
$A_{CP}(\overline{K}^0/K^0\pi^\pm)$	$(0.4 \pm 0.5)\%$
$A_{CP}(D_s^\pm \to K_S^0\pi^\pm)$	$(3.1 \pm 2.6)\%$ (S = 1.7)
$A_{CP}(D_s^\pm \to K^\pm\pi^+\pi^-)$	$(4 \pm 5)\%$
$A_{CP}(D_s^\pm \to K^\pm\eta)$	$(9 \pm 15)\%$
$A_{CP}(D_s^\pm \to K^\pm\eta'(958))$	$(6 \pm 19)\%$

$A_{CP}(B^+ \to J/\psi(1S)K^+)$	0.003 ± 0.006 (S = 1.8)
$A_{CP}(B^+ \to J/\psi(1S)\pi^+)$	$(0.1 \pm 2.8) \times 10^{-2}$ (S = 1.2)
$A_{CP}(B^+ \to J/\psi\rho^+)$	-0.11 ± 0.14
$A_{CP}(B^+ \to J/\psi K^*(892)^+)$	-0.048 ± 0.033
$A_{CP}(B^+ \to \eta_c K^+)$	0.01 ± 0.07 (S = 2.2)
$A_{CP}(B^+ \to \psi(2S)\pi^+)$	0.03 ± 0.06
$A_{CP}(B^+ \to \psi(2S)K^+)$	0.012 ± 0.020 (S = 1.5)
$A_{CP}(B^+ \to \psi(2S)K^*(892)^+)$	0.08 ± 0.21
$A_{CP}(B^+ \to \chi_{c1}(1P)\pi^+)$	0.07 ± 0.18
$A_{CP}(B^+ \to \chi_{c0}K^+)$	-0.20 ± 0.18 (S = 1.5)
$A_{CP}(B^+ \to \chi_{c1}K^+)$	-0.009 ± 0.033
$A_{CP}(B^+ \to \chi_{c1}K^*(892)^+)$	0.5 ± 0.5
$A_{CP}(B^+ \to \overline{D}^0\pi^+)$	-0.007 ± 0.007
$A_{CP}(B^+ \to D_{CP(+1)}\pi^+)$	0.035 ± 0.024
$A_{CP}(B^+ \to D_{CP(-1)}\pi^+)$	0.017 ± 0.026
$A_{CP}(B^+ \to \overline{D}^0 K^+)$	0.007 ± 0.025 (S = 1.5)
$r_B(B^+ \to D^0 K^+)$	0.095 ± 0.008
$\delta_B(B^+ \to D^0 K^+)$	$(123 \pm 10)^\circ$
$r_B(B^+ \to \overline{D}^0 K^{*+})$	0.17 ± 0.11 (S = 2.3)
$\delta_B(B^+ \to D^0 K^{*+})$	$(155 \pm 70)^\circ$ (S = 2.0)
$A_{CP}(B^+ \to [K^-\pi^+]_D K^+)$	-0.58 ± 0.21
$A_{CP}(B^+ \to [K^-\pi^+\pi^0]_D K^+)$	0.07 ± 0.30 (S = 1.5)
$A_{CP}(B^+ \to [K^+K^-\pi^0]_D K^+)$	0.30 ± 0.20
$A_{CP}(B^+ \to [\pi^+\pi^-\pi^0]_D K^+)$	0.05 ± 0.09
$A_{CP}(B^+ \to [K^-\pi^+]_{\overline{D}} K^*(892)^+)$	-0.3 ± 0.5
$A_{CP}(B^+ \to [K^-\pi^+]_D \pi^+)$	0.00 ± 0.09
$A_{CP}(B^+ \to [K^-\pi^+\pi^0]_D \pi^+)$	0.35 ± 0.16
$A_{CP}(B^+ \to [K^+K^-\pi^0]_D \pi^+)$	-0.03 ± 0.04
$A_{CP}(B^+ \to [\pi^+\pi^-\pi^0]_D \pi^+)$	-0.016 ± 0.020
$A_{CP}(B^+ \to [K^-\pi^+]_{(D\pi)}\pi^+)$	-0.09 ± 0.27
$A_{CP}(B^+ \to [K^-\pi^+]_{(D\gamma)}\pi^+)$	-0.7 ± 0.6
$A_{CP}(B^+ \to [K^-\pi^+]_{(D\pi)}K^+)$	0.8 ± 0.4
$A_{CP}(B^+ \to [K^-\pi^+]_{(D\gamma)}K^+)$	0.4 ± 1.0
$A_{CP}(B^+ \to [\pi^+\pi^-\pi^0]_D K^+)$	-0.02 ± 0.15
$A_{CP}(B^+ \to [K^0_S K^+\pi^-]_D K^+)$	0.04 ± 0.09
$A_{CP}(B^+ \to [K^0_S K^-\pi^+]_D K^+)$	0.23 ± 0.13
$A_{CP}(B^+ \to [K^0_S K^-\pi^+]_D \pi^+)$	-0.052 ± 0.034
$A_{CP}(B^+ \to [K^0_S K^+\pi^-]_D \pi^+)$	-0.025 ± 0.026
$A_{CP}(B^+ \to [K^*(892)^- K^+]_D K^+)$	0.03 ± 0.11
$A_{CP}(B^+ \to [K^*(892)^+ K^-]_D K^+)$	0.34 ± 0.21

$A_{CP}(B^+ \to [K^*(892)^+ K^-]_D \pi^+)$	-0.05 ± 0.05
$A_{CP}(B^+ \to [K^*(892)^- K^+]_D \pi^+)$	-0.012 ± 0.030
$A_{CP}(B^+ \to D_{CP(+1)} K^+)$	0.170 ± 0.033 (S = 1.2)
$A_{ADS}(B^+ \to D K^+)$	-0.52 ± 0.15
$A_{ADS}(B^+ \to D \pi^+)$	0.14 ± 0.06
$A_{ADS}(B^+ \to [K^- \pi^+]_D K^+ \pi^- \pi^+)$	-0.33 ± 0.35
$A_{ADS}(B^+ \to [K^- \pi^+]_D \pi^+ \pi^- \pi^+)$	-0.01 ± 0.09
$A_{CP}(B^+ \to D_{CP(-1)} K^+)$	-0.10 ± 0.07
$A_{CP}(B^+ \to [K^+ K^-]_D K^+ \pi^- \pi^+)$	-0.04 ± 0.06
$A_{CP}(B^+ \to [\pi^+ \pi^-]_D K^+ \pi^- \pi^+)$	-0.05 ± 0.10
$A_{CP}(B^+ \to [K^- \pi^+]_D K^+ \pi^- \pi^+)$	0.013 ± 0.023
$A_{CP}(B^+ \to [K^+ K^-]_D \pi^+ \pi^- \pi^+)$	-0.019 ± 0.015
$A_{CP}(B^+ \to [\pi^+ \pi^-]_D \pi^+ \pi^- \pi^+)$	-0.013 ± 0.019
$A_{CP}(B^+ \to [K^- \pi^+]_D \pi^+ \pi^- \pi^+)$	-0.002 ± 0.011
$A_{CP}(B^+ \to \overline{D}^{*0} \pi^+)$	-0.014 ± 0.015
$A_{CP}(B^+ \to (D^*_{CP(+1)})^0 \pi^+)$	-0.02 ± 0.05
$A_{CP}(B^+ \to (D^*_{CP(-1)})^0 \pi^+)$	-0.09 ± 0.05
$A_{CP}(B^+ \to D^{*0} K^+)$	-0.07 ± 0.04
$r^*_B(B^+ \to D^{*0} K^+)$	$0.114^{+0.023}_{-0.040}$ (S = 1.2)
$\delta^*_B(B^+ \to D^{*0} K^+)$	$(310^{+22}_{-28})^\circ$ (S = 1.3)
$A_{CP}(B^+ \to D^{*0}_{CP(+1)} K^+)$	-0.12 ± 0.08
$A_{CP}(B^+ \to D^*_{CP(-1)} K^+)$	0.07 ± 0.10
$A_{CP}(B^+ \to D_{CP(+1)} K^*(892)^+)$	0.09 ± 0.14
$A_{CP}(B^+ \to D_{CP(-1)} K^*(892)^+)$	-0.23 ± 0.22
$A_{CP}(B^+ \to D_s^+ \phi)$	0.0 ± 0.4
$A_{CP}(B^+ \to D^{*+} \overline{D}^{*0})$	-0.15 ± 0.11
$A_{CP}(B^+ \to D^{*+} \overline{D}^0)$	-0.06 ± 0.13
$A_{CP}(B^+ \to D^+ \overline{D}^{*0})$	0.13 ± 0.18
$A_{CP}(B^+ \to D^+ \overline{D}^0)$	-0.03 ± 0.07
$A_{CP}(B^+ \to K^0_S \pi^+)$	-0.017 ± 0.016
$A_{CP}(B^+ \to K^+ \pi^0)$	0.037 ± 0.021
$A_{CP}(B^+ \to \eta' K^+)$	0.004 ± 0.011
$A_{CP}(B^+ \to \eta' K^*(892)^+)$	-0.26 ± 0.27
$A_{CP}(B^+ \to \eta' K^*_0(1430)^+)$	0.06 ± 0.20
$A_{CP}(B^+ \to \eta' K^*_2(1430)^+)$	0.15 ± 0.13
$A_{CP}(B^+ \to \eta K^*(892)^+)$	0.02 ± 0.06
$A_{CP}(B^+ \to \eta K^*_0(1430)^+)$	0.05 ± 0.13
$A_{CP}(B^+ \to \eta K^*_2(1430)^+)$	-0.45 ± 0.30
$A_{CP}(B^+ \to \omega K^+)$	-0.02 ± 0.04

$A_{CP}(B^+ \to \omega K^{*+})$	0.29 ± 0.35
$A_{CP}(B^+ \to \omega (K\pi)_0^{*+})$	-0.10 ± 0.09
$A_{CP}(B^+ \to \omega K_2^*(1430)^+)$	0.14 ± 0.15
$A_{CP}(B^+ \to K^{*0}\pi^+)$	-0.04 ± 0.09 (S = 2.1)
$A_{CP}(B^+ \to K^*(892)^+\pi^0)$	-0.06 ± 0.24
$A_{CP}(B^+ \to K^+\pi^-\pi^+)$	0.027 ± 0.008
$A_{CP}(B^+ \to K^+K^-K^+$ nonresonant)	0.06 ± 0.05
$A_{CP}(B^+ \to f(980)^0 K^+)$	-0.08 ± 0.09
$A_{CP}(B^+ \to f_0(1500)\,K^+)$	0.28 ± 0.30
$A_{CP}(B^+ \to f_2'(1525)^0 K^+)$	$-0.08^{+0.05}_{-0.04}$
$A_{CP}(B^+ \to K_0^*(1430)^0\pi^+)$	0.055 ± 0.033
$A_{CP}(B^+ \to K_2^*(1430)^0\pi^+)$	$0.05^{+0.29}_{-0.24}$
$A_{CP}(B^+ \to K^+\pi^0\pi^0)$	-0.06 ± 0.07
$A_{CP}(B^+ \to K^0\rho^+)$	-0.12 ± 0.17
$A_{CP}(B^+ \to K^{*+}\pi^+\pi^-)$	0.07 ± 0.08
$A_{CP}(B^+ \to \rho^0 K^*(892)^+)$	0.31 ± 0.13
$A_{CP}(B^+ \to K^*(892)^+ f_0(980))$	-0.15 ± 0.12
$A_{CP}(B^+ \to a_1^+ K^0)$	0.12 ± 0.11
$A_{CP}(B^+ \to b_1^+ K^0)$	-0.03 ± 0.15
$A_{CP}(B^+ \to K^*(892)^0\rho^+)$	-0.01 ± 0.16
$A_{CP}(B^+ \to b_1^0 K^+)$	-0.46 ± 0.20
$A_{CP}(B^+ \to K^0 K^+)$	0.04 ± 0.14
$A_{CP}(B^+ \to K^+ K_S^0 K_S^0)$	$0.04^{+0.04}_{-0.05}$
$A_{CP}(B^+ \to K^+K^-\pi^+)$	-0.118 ± 0.022
$A_{CP}(B^+ \to K^+K^-K^+)$	-0.033 ± 0.008
$A_{CP}(B^+ \to \phi K^+)$	0.024 ± 0.028 (S = 2.3)
$A_{CP}(B^+ \to X_0(1550)\,K^+)$	-0.04 ± 0.07
$A_{CP}(B^+ \to K^{*+}K^+K^-)$	0.11 ± 0.09
$A_{CP}(B^+ \to \phi K^*(892)^+)$	-0.01 ± 0.08
$A_{CP}(B^+ \to \phi (K\pi)_0^{*+})$	0.04 ± 0.16
$A_{CP}(B^+ \to \phi K_1(1270)^+)$	0.15 ± 0.20
$A_{CP}(B^+ \to \phi K_2^*(1430)^+)$	-0.23 ± 0.20
$A_{CP}(B^+ \to K^+\phi\phi)$	-0.10 ± 0.08
$A_{CP}(B^+ \to K^+[\phi\phi]_{\eta_c})$	0.09 ± 0.10
$A_{CP}(B^+ \to K^*(892)^+\gamma)$	0.018 ± 0.029
$A_{CP}(B^+ \to \eta K^+\gamma)$	-0.12 ± 0.07
$A_{CP}(B^+ \to \phi K^+\gamma)$	-0.13 ± 0.11 (S = 1.1)
$A_{CP}(B^+ \to \rho^+\gamma)$	-0.11 ± 0.33
$A_{CP}(B^+ \to \pi^+\pi^0)$	0.03 ± 0.04
$A_{CP}(B^+ \to \pi^+\pi^-\pi^+)$	0.057 ± 0.013

$A_{CP}(B^+ \to \rho^0\pi^+)$	$0.18^{+0.09}_{-0.17}$
$A_{CP}(B^+ \to f_2(1270)\pi^+)$	0.41 ± 0.30
$A_{CP}(B^+ \to \rho^0(1450)\pi^+)$	$-0.1^{+0.4}_{-0.5}$
$A_{CP}(B^+ \to \pi^+\pi^-\pi^+$ nonresonant)	$-0.14^{+0.23}_{-0.16}$
$A_{CP}(B^+ \to \rho^+\pi^0)$	0.02 ± 0.11
$A_{CP}(B^+ \to \rho^+\rho^0)$	-0.05 ± 0.05
$A_{CP}(B^+ \to \omega\pi^+)$	-0.04 ± 0.06
$A_{CP}(B^+ \to \omega\rho^+)$	-0.20 ± 0.09
$A_{CP}(B^+ \to \eta\pi^+)$	-0.14 ± 0.07 (S = 1.4)
$A_{CP}(B^+ \to \eta\rho^+)$	0.11 ± 0.11
$A_{CP}(B^+ \to \eta'\pi^+)$	0.06 ± 0.16
$A_{CP}(B^+ \to \eta'\rho^+)$	0.26 ± 0.17
$A_{CP}(B^+ \to b_1^0\pi^+)$	0.05 ± 0.16
$A_{CP}(B^+ \to p\overline{p}\pi^+)$	0.00 ± 0.04
$A_{CP}(B^+ \to p\overline{p}K^+)$	0.00 ± 0.04 (S = 2.2)
$A_{CP}(B^+ \to p\overline{p}K^*(892)^+)$	0.21 ± 0.16 (S = 1.4)
$A_{CP}(B^+ \to p\overline{\Lambda}\gamma)$	0.17 ± 0.17
$A_{CP}(B^+ \to p\overline{\Lambda}\pi^0)$	0.01 ± 0.17
$A_{CP}(B^+ \to K^+\ell^+\ell^-)$	-0.02 ± 0.08
$A_{CP}(B^+ \to K^+e^+e^-)$	0.14 ± 0.14
$A_{CP}(B^+ \to K^+\mu^+\mu^-)$	0.011 ± 0.017
$A_{CP}(B^+ \to K^{*+}\ell^+\ell^-)$	-0.09 ± 0.14
$A_{CP}(B^+ \to K^*e^+e^-)$	-0.14 ± 0.23
$A_{CP}(B^+ \to K^*\mu^+\mu^-)$	-0.12 ± 0.24
$\mathrm{Re}(\epsilon_{B^0})/(1+\lvert\epsilon_{B^0}\rvert^2)$	$(-0.4 \pm 0.4) \times 10^{-3}$
$A_{T/CP}$	0.005 ± 0.018
$A_{CP}(B^0 \to D^*(2010)^+D^-)$	0.037 ± 0.034
$A_{CP}(B^0 \to [K^+K^-]_D K^*(892)^0)$	-0.20 ± 0.15
$A_{CP}(B^0 \to [K^+\pi^-]_D K^*(892)^0)$	-0.03 ± 0.04
$A_{CP}(B^0 \to [\pi^+\pi^-]_D K^*(892)^0)$	-0.09 ± 0.22
$A_{CP}(B^0 \to \eta' K^*(892)^0)$	-0.07 ± 0.18
$A_{CP}(B^0 \to \eta' K_0^*(1430)^0)$	-0.19 ± 0.17
$A_{CP}(B^0 \to \eta' K_2^*(1430)^0)$	0.14 ± 0.18
$A_{CP}(B^0 \to \eta K_0^*(1430)^0)$	0.06 ± 0.13
$A_{CP}(B^0 \to \eta K_2^*(1430)^0)$	-0.07 ± 0.19
$A_{CP}(B^0 \to b_1 K^+)$	-0.07 ± 0.12
$A_{CP}(B^0 \to \omega K^{*0})$	0.45 ± 0.25
$A_{CP}(B^0 \to \omega(K\pi)_0^{*0})$	-0.07 ± 0.09
$A_{CP}(B^0 \to \omega K_2^*(1430)^0)$	-0.37 ± 0.17
$A_{CP}(B^0 \to K^+\pi^-\pi^0)$	$(0 \pm 6) \times 10^{-2}$

$A_{CP}(B^0 \to \rho^- K^+)$	0.20 ± 0.11
$A_{CP}(B^0 \to \rho(1450)^- K^+)$	-0.10 ± 0.33
$A_{CP}(B^0 \to \rho(1700)^- K^+)$	-0.4 ± 0.6
$A_{CP}(B^0 \to K^+ \pi^- \pi^0$ nonresonant)	0.10 ± 0.18
$A_{CP}(B^0 \to K^0 \pi^+ \pi^-)$	-0.01 ± 0.05
$A_{CP}(B^0 \to K^*(892)^+ \pi^-)$	-0.22 ± 0.06
$A_{CP}(B^0 \to (K\pi)_0^{*+} \pi^-)$	0.09 ± 0.07
$A_{CP}(B^0 \to (K\pi)_0^{*0} \pi^0)$	-0.15 ± 0.11
$A_{CP}(B^0 \to K^{*0} \pi^0)$	-0.15 ± 0.13
$A_{CP}(B^0 \to K^*(892)^0 \pi^+ \pi^-)$	0.07 ± 0.05
$A_{CP}(B^0 \to K^*(892)^0 \rho^0)$	-0.06 ± 0.09
$A_{CP}(B^0 \to K^{*0} f_0(980))$	0.07 ± 0.10
$A_{CP}(B^0 \to K^{*+} \rho^-)$	0.21 ± 0.15
$A_{CP}(B^0 \to K^*(892)^0 K^+ K^-)$	0.01 ± 0.05
$A_{CP}(B^0 \to a_1^- K^+)$	-0.16 ± 0.12
$A_{CP}(B^0 \to K^0 K^0)$	-0.6 ± 0.7
$A_{CP}(B^0 \to K^*(892)^0 \phi)$	0.00 ± 0.04
$A_{CP}(B^0 \to K^*(892)^0 K^- \pi^+)$	0.2 ± 0.4
$A_{CP}(B^0 \to \phi(K\pi)_0^{*0})$	0.12 ± 0.08
$A_{CP}(B^0 \to \phi K_2^*(1430)^0)$	-0.11 ± 0.10
$A_{CP}(B^0 \to K^*(892)^0 \gamma)$	-0.002 ± 0.015
$A_{CP}(B^0 \to K_2^*(1430)^0 \gamma)$	-0.08 ± 0.15
$A_{CP}(B^0 \to \rho^+ \pi^-)$	0.13 ± 0.06 (S = 1.1)
$A_{CP}(B^0 \to \rho^- \pi^+)$	-0.08 ± 0.08
$A_{CP}(B^0 \to a_1(1260)^\pm \pi^\mp)$	-0.07 ± 0.06
$A_{CP}(B^0 \to b_1^- \pi^+)$	-0.05 ± 0.10
$A_{CP}(B^0 \to p\overline{p} K^*(892)^0)$	0.05 ± 0.12
$A_{CP}(B^0 \to p\overline{\Lambda}\pi^-)$	0.04 ± 0.07
$A_{CP}(B^0 \to K^{*0} \ell^+ \ell^-)$	-0.05 ± 0.10
$A_{CP}(B^0 \to K^{*0} e^+ e^-)$	-0.21 ± 0.19
$A_{CP}(B^0 \to K^{*0} \mu^+ \mu^-)$	-0.034 ± 0.024
$C_{D^*(2010)^- D^+}$ $(B^0 \to D^*(2010)^- D^+)$	-0.01 ± 0.11
$C_{D^*(2010)^+ D^-}$ $(B^0 \to D^*(2010)^+ D^-)$	0.00 ± 0.13 (S = 1.3)
$C_{D^{*+} D^{*-}}$ $(B^0 \to D^{*+} D^{*-})$	0.01 ± 0.09 (S = 1.6)
C_+ $(B^0 \to D^{*+} D^{*-})$	0.00 ± 0.10 (S = 1.6)
C_- $(B^0 \to D^{*+} D^{*-})$	0.19 ± 0.31
S_- $(B^0 \to D^{*+} D^{*-})$	0.1 ± 1.6 (S = 3.5)
C $(B^0 \to D^*(2010)^+ D^*(2010)^- K_S^0)$	0.01 ± 0.29
S $(B^0 \to D^*(2010)^+ D^*(2010)^- K_S^0)$	0.1 ± 0.4
$C_{D^+ D^-}$ $(B^0 \to D^+ D^-)$	-0.46 ± 0.21 (S = 1.8)

$C_{J/\psi(1S)\pi^0}$ ($B^0 \to J/\psi(1S)\pi^0$)	-0.13 ± 0.13
$C(B^0 \to J/\psi(1S)\rho^0)$	-0.06 ± 0.06
$C_{D^{(*)}_{CP}h^0}$ ($B^0 \to D^{(*)}_{CP}h^0$)	-0.02 ± 0.08
$S_{D^{(*)}_{CP}h^0}$ ($B^0 \to D^{(*)}_{CP}h^0$)	-0.66 ± 0.12
$C_{K^0\pi^0}$ ($B^0 \to K^0\pi^0$)	0.00 ± 0.13 (S = 1.4)
$C_{\eta'(958)K^0_S}$ ($B^0 \to \eta'(958)K^0_S$)	-0.04 ± 0.20 (S = 2.5)
$S_{\eta'(958)K^0_S}$ ($B^0 \to \eta'(958)K^0_S$)	0.43 ± 0.17 (S = 1.5)
$C_{\eta' K^0}$ ($B^0 \to \eta' K^0$)	-0.06 ± 0.04
$C_{\omega K^0_S}$ ($B^0 \to \omega K^0_S$)	0.0 ± 0.4 (S = 3.0)
$S_{\omega K^0_S}$ ($B^0 \to \omega K^0_S$)	0.70 ± 0.21
C ($B^0 \to K^0_S\pi^0\pi^0$)	0.2 ± 0.5
S ($B^0 \to K^0_S\pi^0\pi^0$)	0.7 ± 0.7
$C_{\rho^0 K^0_S}$ ($B^0 \to \rho^0 K^0_S$)	-0.04 ± 0.20
$S_{\rho^0 K^0_S}$ ($B^0 \to \rho^0 K^0_S$)	$0.50^{+0.17}_{-0.21}$
$C_{f_0(980)K^0_S}$ ($B^0 \to f_0(980)K^0_S$)	0.29 ± 0.20
$S_{f_0(980)K^0_S}$ ($B^0 \to f_0(980)K^0_S$)	-0.50 ± 0.16
$S_{f_2(1270)K^0_S}$ ($B^0 \to f_2(1270)K^0_S$)	-0.5 ± 0.5
$C_{f_2(1270)K^0_S}$ ($B^0 \to f_2(1270)K^0_S$)	0.3 ± 0.4
$S_{f_x(1300)K^0_S}$ ($B^0 \to f_x(1300)K^0_S$)	-0.2 ± 0.5
$C_{f_x(1300)K^0_S}$ ($B^0 \to f_x(1300)K^0_S$)	0.13 ± 0.35
$S_{K^0\pi^+\pi^-}$ ($B^0 \to K^0\pi^+\pi^-$ nonresonant)	-0.01 ± 0.33
$C_{K^0\pi^+\pi^-}$ ($B^0 \to K^0\pi^+\pi^-$ nonresonant)	0.01 ± 0.26
$C_{K^0_S K^0_S}$ ($B^0 \to K^0_S K^0_S$)	0.0 ± 0.4 (S = 1.4)
$S_{K^0_S K^0_S}$ ($B^0 \to K^0_S K^0_S$)	-0.8 ± 0.5
$C_{K^+K^-K^0_S}$ ($B^0 \to K^+K^-K^0_S$ nonresonant)	0.06 ± 0.08
$C_{K^+K^-K^0_S}$ ($B^0 \to K^+K^-K^0_S$ inclusive)	0.01 ± 0.09
$C_{\phi K^0_S}$ ($B^0 \to \phi K^0_S$)	0.01 ± 0.14
$S_{\phi K^0_S}$ ($B^0 \to \phi K^0_S$)	0.59 ± 0.14
$C_{K_S K_S K_S}$($B^0 \to K_S K_S K_S$)	-0.23 ± 0.14
$S_{K_S K_S K_S}$($B^0 \to K_S K_S K_S$)	-0.5 ± 0.6 (S = 3.0)
$C_{K^0_S\pi^0\gamma}$($B^0 \to K^0_S\pi^0\gamma$)	0.36 ± 0.33

$S_{K^0_S\pi^0\gamma}(B^0 \to K^0_S\pi^0\gamma)$	-0.8 ± 0.6
$C_{K^*(892)^0\gamma}$ $(B^0 \to K^*(892)^0\gamma)$	-0.04 ± 0.16 (S = 1.2)
$S_{K^*(892)^0\gamma}$ $(B^0 \to K^*(892)^0\gamma)$	-0.15 ± 0.22
$C_{\eta K^0\gamma}$ $(B^0 \to \eta K^0\gamma)$	-0.3 ± 0.4
$S_{\eta K^0\gamma}$ $(B^0 \to \eta K^0\gamma)$	-0.2 ± 0.5
$C_{K^0\phi\gamma}$ $(B^0 \to K^0\phi\gamma)$	-0.3 ± 0.6
$S_{K^0\phi\gamma}$ $(B^0 \to K^0\phi\gamma)$	$0.7^{+0.7}_{-1.1}$
$C(B^0 \to K^0_S\rho^0\gamma)$	-0.05 ± 0.19
$S(B^0 \to K^0_S\rho^0\gamma)$	0.11 ± 0.34
C $(B^0 \to \rho^0\gamma)$	0.4 ± 0.5
S $(B^0 \to \rho^0\gamma)$	-0.8 ± 0.7
$C_{\pi\pi}$ $(B^0 \to \pi^+\pi^-)$	-0.31 ± 0.05
$C_{\pi^0\pi^0}(B^0 \to \pi^0\pi^0)$	-0.43 ± 0.24
$C_{\rho\pi}$ $(B^0 \to \rho^+\pi^-)$	-0.03 ± 0.07 (S = 1.2)
$S_{\rho\pi}$ $(B^0 \to \rho^+\pi^-)$	0.05 ± 0.07
$\Delta S_{\rho\pi}$ $(B^0 \to \rho^+\pi^-)$	0.01 ± 0.08
$C_{\rho^0\pi^0}$ $(B^0 \to \rho^0\pi^0)$	0.27 ± 0.24
$S_{\rho^0\pi^0}$ $(B^0 \to \rho^0\pi^0)$	-0.23 ± 0.34
$C_{a_1\pi}$ $(B^0 \to a_1(1260)^+\pi^-)$	-0.05 ± 0.11
$S_{a_1\pi}$ $(B^0 \to a_1(1260)^+\pi^-)$	-0.2 ± 0.4 (S = 3.2)
$\Delta C_{a_1\pi}$ $(B^0 \to a_1(1260)^+\pi^-)$	0.43 ± 0.14 (S = 1.3)
$\Delta S_{a_1\pi}$ $(B^0 \to a_1(1260)^+\pi^-)$	-0.11 ± 0.12
C $(B^0 \to b_1^- K^+)$	-0.22 ± 0.24
ΔC $(B^0 \to b_1^- \pi^+)$	-1.04 ± 0.24
$C_{\rho^0\rho^0}$ $(B^0 \to \rho^0\rho^0)$	0.2 ± 0.9
$S_{\rho^0\rho^0}$ $(B^0 \to \rho^0\rho^0)$	0.3 ± 0.7
$C_{\rho\rho}$ $(B^0 \to \rho^+\rho^-)$	0.00 ± 0.09
$S_{\rho\rho}$ $(B^0 \to \rho^+\rho^-)$	-0.14 ± 0.13
$\lvert\lambda\rvert$ $(B^0 \to J/\psi K^*(892)^0)$	<0.25, CL = 95%
cos 2β $(B^0 \to J/\psi K^*(892)^0)$	$1.7^{+0.7}_{-0.9}$ (S = 1.6)
cos 2β $(B^0 \to [K^0_S\pi^+\pi^-]_{D^{(*)}}\, h^0)$	$1.0^{+0.6}_{-0.7}$ (S = 1.8)
$(S_+ + S_-)/2$ $(B^0 \to D^{*-}\pi^+)$	-0.039 ± 0.011
$(S_- - S_+)/2$ $(B^0 \to D^{*-}\pi^+)$	-0.009 ± 0.015
$(S_+ + S_-)/2$ $(B^0 \to D^-\pi^+)$	-0.046 ± 0.023
$(S_- - S_+)/2$ $(B^0 \to D^-\pi^+)$	-0.022 ± 0.021
$(S_+ + S_-)/2$ $(B^0 \to D^-\rho^+)$	-0.024 ± 0.032

$(S_- - S_+)/2$ ($B^0 \to D^- \rho^+$)	-0.10 ± 0.06
$C_{\eta_c K^0_S}$ ($B^0 \to \eta_c K^0_S$)	0.08 ± 0.13
$C_{c\overline{c}K^{(*)0}}$ ($B^0 \to c\overline{c}K^{(*)0}$)	$(0.5 \pm 1.7) \times 10^{-2}$
$C_{J/\psi(\mathrm{nS})K^0}$ ($B^0 \to J/\psi(\mathrm{nS})K^0$)	$(0.5 \pm 2.0) \times 10^{-2}$
$C_{J/\psi K^{*0}}$ ($B^0 \to J/\psi K^{*0}$)	0.03 ± 0.10
$S_{J/\psi K^{*0}}$ ($B^0 \to J/\psi K^{*0}$)	0.60 ± 0.25
$C_{\chi_{c0} K^0_S}$ ($B^0 \to \chi_{c0} K^0_S$)	$-0.3^{+0.5}_{-0.4}$
$S_{\chi_{c0} K^0_S}$ ($B^0 \to \chi_{c0} K^0_S$)	-0.7 ± 0.5
$C_{\chi_{c1} K^0_S}$ ($B^0 \to \chi_{c1} K^0_S$)	0.06 ± 0.07
$\sin(2\beta_{\mathrm{eff}})(B^0 \to \phi K^0)$	0.22 ± 0.30
$\sin(2\beta_{\mathrm{eff}})(B^0 \to \phi K^*_0(1430)^0)$	$0.97^{+0.03}_{-0.52}$
$\sin(2\beta_{\mathrm{eff}})(B^0 \to [K^0_S\pi^+\pi^-]_{D^{(*)}} h^0)$	0.45 ± 0.28
$\lvert\lambda\rvert$ ($B^0 \to [K^0_S\pi^+\pi^-]_{D^{(*)}} h^0$)	1.01 ± 0.08
$\lvert\sin(2\beta+\gamma)\rvert$	>0.40, CL = 90%
$2\beta+\gamma$	$(83 \pm 60)^\circ$
$\gamma(B^0 \to D^0 K^{*0})$	$(162 \pm 60)^\circ$
$A_{CP}(B \to K^*(892)\gamma)$	-0.003 ± 0.017
$A_{CP}(b \to s\gamma)$	0.015 ± 0.020
$A_{CP}(b \to (s+d)\gamma)$	0.010 ± 0.031
$A_{CP}(B \to X_s \ell^+\ell^-)$	0.04 ± 0.11
$A_{CP}(B \to K^* e^+ e^-)$	-0.18 ± 0.15
$A_{CP}(B \to K^* \mu^+ \mu^-)$	-0.03 ± 0.13
$A_{CP}(B \to K^* \ell^+ \ell^-)$	-0.04 ± 0.07
$A_{CP}(B \to \eta\,\mathrm{anything})$	$-0.13^{+0.04}_{-0.05}$
$\mathrm{Re}(\epsilon_{B^0_s})$ / $(1 + \lvert\epsilon_{B^0_s}\rvert^2)$	$(-1.9 \pm 1.0) \times 10^{-3}$
CP Violation phase β_s	$(0.6 \pm 1.9) \times 10^{-2}$ rad
$A_{CP}(B_s \to \pi^+ K^-)$	0.263 ± 0.035
$A_{CP}(B^0_s \to [K^+K^-]_D \overline{K}^*(892)^0)$	-0.04 ± 0.07
$\Gamma(\eta_c(1S) \to \pi^+\pi^-)/\Gamma_{\mathrm{total}}$	$<1.1 \times 10^{-4}$, CL = 90%
$\Gamma(\eta_c(1S) \to \pi^0\pi^0)/\Gamma_{\mathrm{total}}$	$<4 \times 10^{-5}$, CL = 90%
$\Gamma(\eta_c(1S) \to K^+K^-)/\Gamma_{\mathrm{total}}$	$<6 \times 10^{-4}$, CL = 90%
$\Gamma(\eta_c(1S) \to K^0_S K^0_S)/\Gamma_{\mathrm{total}}$	$<3.1 \times 10^{-4}$, CL = 90%
$(\alpha+\overline{\alpha})/(\alpha-\overline{\alpha})$ in $\Lambda \to p\pi^-$, $\overline{\Lambda} \to \overline{p}\pi^+$	0.006 ± 0.021
$\frac{[\alpha(\Xi^-)\alpha_-(\Lambda)-\alpha(\overline{\Xi}^+)\alpha_+(\overline{\Lambda})]}{[\alpha(\Xi^-)\alpha_-(\Lambda)+\alpha(\overline{\Xi}^+)\alpha_+(\overline{\Lambda})]}$	$(0 \pm 7) \times 10^{-4}$
$(\alpha+\overline{\alpha})/(\alpha-\overline{\alpha})$ in $\Omega^- \to \Lambda K^-$, $\overline{\Omega}^+ \to \overline{\Lambda}K^+$	-0.02 ± 0.13
$(\alpha+\overline{\alpha})/(\alpha-\overline{\alpha})$ in $\Lambda_c^+ \to \Lambda\pi^+$, $\overline{\Lambda}_c^- \to \overline{\Lambda}\pi^-$	-0.07 ± 0.31
$(\alpha+\overline{\alpha})/(\alpha-\overline{\alpha})$ in $\Lambda_c^+ \to \Lambda e^+\nu_e$, $\overline{\Lambda}_c^- \to \overline{\Lambda}e^-\overline{\nu}_e$	0.00 ± 0.04

$A_{CP}(\Lambda_b \to\ p\pi^-)$		0.06 ± 0.07
$A_{CP}(\Lambda_b \to\ pK^-)$		0.00 ± 0.19 (S = 2.4)

CP VIOLATION OBSERVED

Re(ϵ)		$(1.596 \pm 0.013) \times 10^{-3}$
charge asymmetry in $K^0_{\ell 3}$ decays		
A_L = weighted average of $A_L(\mu)$ and $A_L(e)$		$(0.332 \pm 0.006)\%$
$A_L(\mu) = [\Gamma(\pi^-\mu^+\nu_\mu) - \Gamma(\pi^+\mu^-\overline{\nu}_\mu)]$/sum		$(0.304 \pm 0.025)\%$
$A_L(e) = [\Gamma(\pi^- e^+\nu_e) - \Gamma(\pi^+ e^-\overline{\nu}_e)]$/sum		$(0.334 \pm 0.007)\%$
parameters for $K^0_L \to\ 2\pi$ decay		
$\lvert\eta_{00}\rvert = \lvert$A($K^0_L \to\ 2\pi^0$) / A($K^0_S \to\ 2\pi^0$)$\rvert$		$(2.220 \pm 0.011) \times 10^{-3}$ (S = 1.8)
$\lvert\eta_{+-}\rvert = \lvert$A($K^0_L \to\ \pi^+\pi^-$) / A($K^0_S \to\ \pi^+\pi^-$)$\rvert$		$(2.232 \pm 0.011) \times 10^{-3}$ (S = 1.8)
$\lvert\epsilon\rvert = (2\lvert\eta_{+-}\rvert + \lvert\eta_{00}\rvert)/3$		$(2.228 \pm 0.011) \times 10^{-3}$ (S = 1.8)
$\lvert\eta_{00}/\eta_{+-}\rvert$	[h]	0.9950 ± 0.0007 (S = 1.6)
Re(ϵ'/ϵ) = $(1-\lvert\eta_{00}/\eta_{+-}\rvert)/3$	[h]	$(1.66 \pm 0.23) \times 10^{-3}$ (S = 1.6)
Assuming *CPT*		
ϕ_{+-}, phase of η_{+-}		$(43.51 \pm 0.05)^\circ$ (S = 1.2)
ϕ_{00}, phase of η_{00}		$(43.52 \pm 0.05)^\circ$ (S = 1.3)
$\phi_\epsilon = (2\phi_{+-} + \phi_{00})/3$		$(43.52 \pm 0.05)^\circ$ (S = 1.2)
Not assuming *CPT*		
ϕ_{+-}, phase of η_{+-}		$(43.4 \pm 0.5)^\circ$ (S = 1.2)
ϕ_{00}, phase of η_{00}		$(43.7 \pm 0.6)^\circ$ (S = 1.2)
$\phi_\epsilon = (2\phi_{+-} + \phi_{00})/3$		$(43.5 \pm 0.5)^\circ$ (S = 1.3)
CP asymmetry *A* in $K^0_L \to\ \pi^+\pi^- e^+ e^-$		$(13.7 \pm 1.5)\%$
β_{CP} from $K^0_L \to\ e^+e^-e^+e^-$		-0.19 ± 0.07
γ_{CP} from $K^0_L \to\ e^+e^-e^+e^-$		0.01 ± 0.11 (S = 1.6)
parameters for $K^0_L \to\ \pi^+\pi^-\gamma$ decay		
$\lvert\eta_{+-\gamma}\rvert = \lvert$A($K^0_L \to\ \pi^+\pi^-\gamma$, *CP* violating)/A($K^0_S \to\ \pi^+\pi^-\gamma$)$\rvert$		$(2.35 \pm 0.07) \times 10^{-3}$
$\phi_{+-\gamma}$ = phase of $\eta_{+-\gamma}$		$(44 \pm 4)^\circ$
$\Gamma(K^0_L \to\ \pi^+\pi^-)/\Gamma_{\text{total}}$	[i]	$(1.967 \pm 0.010) \times 10^{-3}$ (S = 1.5)
$\Gamma(K^0_L \to\ \pi^0\pi^0)/\Gamma_{\text{total}}$		$(8.64 \pm 0.06) \times 10^{-4}$ (S = 1.8)
$A_{CP}(B^+ \to\ D_{CP(+1)}K^+)$		0.170 ± 0.033 (S = 1.2)
$A_{ADS}(B^+ \to\ DK^+)$		-0.52 ± 0.15
$A_{CP}(B^+ \to\ \eta K^+)$		-0.37 ± 0.08
$A_{CP}(B^+ \to\ f_2(1270)K^+)$		$-0.68^{+0.19}_{-0.17}$

$A_{CP}(B^+ \to \rho^0 K^+)$	0.37 ± 0.10
$A_{CP}(B^+ \to f_0(1370)\pi^+)$	0.72 ± 0.22
$\gamma(B^+ \to D^{(*)0} K^{(*)+})$	$(70 \pm 9)^\circ$
$A_{CP}\ (B^0 \to K^+\pi^-)$	-0.082 ± 0.006
$A_{CP}(B^0 \to \eta K^*(892)^0)$	0.19 ± 0.05
$S_{D^*(2010)^- D^+}\ (B^0 \to D^*(2010)^- D^+)$	-0.72 ± 0.15
$S_{D^*(2010)^+ D^-}\ (B^0 \to D^*(2010)^+ D^-)$	-0.73 ± 0.14
$S_{D^{*+}D^{*-}}\ (B^0 \to D^{*+} D^{*-})$	-0.59 ± 0.14 (S = 1.8)
$S_+\ (B^0 \to D^{*+} D^{*-})$	-0.73 ± 0.09
$S_{D^+D^-}\ (B^0 \to D^+ D^-)$	$-0.99^{+0.17}_{-0.14}$
$S_{J/\psi(1S)\pi^0}\ (B^0 \to J/\psi(1S)\pi^0)$	-0.94 ± 0.29 (S = 1.9)
$S(B^0 \to J/\psi(1S)\rho^0)$	$-0.66^{+0.16}_{-0.12}$
$S_{K^0\pi^0}\ (B^0 \to K^0\pi^0)$	0.58 ± 0.17
$S_{\eta' K^0}\ (B^0 \to \eta' K^0)$	0.63 ± 0.06
$S_{K^+K^-K^0_S}\ (B^0 \to K^+K^-K^0_S$ nonresonant)	-0.66 ± 0.11
$S_{K^+K^-K^0_S}\ (B^0 \to K^+K^-K^0_S$ inclusive)	-0.65 ± 0.12
$S_{\pi\pi}\ (B^0 \to \pi^+\pi^-)$	-0.67 ± 0.06
$\Delta C_{\rho\pi}\ (B^0 \to \rho^+\pi^-)$	0.27 ± 0.06
$S_{\eta_c K^0_S}\ (B^0 \to \eta_c K^0_S)$	0.93 ± 0.17
$\sin(2\beta)\ (B^0 \to J/\psi K^0_S)$	0.679 ± 0.020
$S_{J/\psi(\mathrm{nS})K^0}\ (B^0 \to J/\psi(\mathrm{nS})K^0)$	0.676 ± 0.021
$S_{\chi_{c1}K^0_S}\ (B^0 \to \chi_{c1} K^0_S)$	0.63 ± 0.10
$\sin(2\beta_{\mathrm{eff}})(B^0 \to K^+K^-K^0_S)$	$0.77^{+0.13}_{-0.12}$
α	$(93 \pm 5)^\circ$
$\mathrm{Re}(\epsilon_b)\ /\ (1 + \lvert\epsilon_b\rvert^2)$	$(1.2 \pm 0.4) \times 10^{-3}$

CPT INVARIANCE

$(m_{W^+} - m_{W^-})\ /\ m_{\mathrm{average}}$	-0.002 ± 0.007
$(m_{e^+} - m_{e^-})\ /\ m_{\mathrm{average}}$	$<8 \times 10^{-9}$, CL = 90%
$\lvert q_{e^+} + q_{e^-}\rvert/e$	$<4 \times 10^{-8}$
$(g_{e^+} - g_{e^-})\ /\ g_{\mathrm{average}}$	$(-0.5 \pm 2.1) \times 10^{-12}$
$(\tau_{\mu^+} - \tau_{\mu^-})\ /\ \tau_{\mathrm{average}}$	$(2 \pm 8) \times 10^{-5}$
$(g_{\mu^+} - g_{\mu^-})\ /\ g_{\mathrm{average}}$	$(-0.11 \pm 0.12) \times 10^{-8}$
$(m_{\tau^+} - m_{\tau^-})/m_{\mathrm{average}}$	$<2.8 \times 10^{-4}$, CL = 90%
$m_t - m_{\overline{t}}$	-0.2 ± 0.5 GeV (S = 1.1)

$(m_{\pi^+} - m_{\pi^-}) / m_{\text{average}}$		$(2 \pm 5) \times 10^{-4}$
$(\tau_{\pi^+} - \tau_{\pi^-}) / \tau_{\text{average}}$		$(6 \pm 7) \times 10^{-4}$
$(m_{K^+} - m_{K^-}) / m_{\text{average}}$		$(-0.6 \pm 1.8) \times 10^{-4}$
$(\tau_{K^+} - \tau_{K^-}) / \tau_{\text{average}}$		$(0.10 \pm 0.09)\%$ (S = 1.2)
$K^\pm \to \mu^\pm \nu_\mu$ rate difference/sum		$(-0.27 \pm 0.21)\%$
$K^\pm \to \pi^\pm \pi^0$ rate difference/sum	[j]	$(0.4 \pm 0.6)\%$
δ in $K^0 - \overline{K}^0$ mixing		
real part of δ		$(2.5 \pm 2.3) \times 10^{-4}$
imaginary part of δ		$(-1.5 \pm 1.6) \times 10^{-5}$
Re(y), K_{e3} parameter		$(0.4 \pm 2.5) \times 10^{-3}$
Re(x_), K_{e3} parameter		$(-2.9 \pm 2.0) \times 10^{-3}$
$\lvert m_{K^0} - m_{\overline{K}^0} \rvert / m_{\text{average}}$	[k]	$<6 \times 10^{-19}$, CL = 90%
$(\Gamma_{K^0} - \Gamma_{\overline{K}^0})/m_{\text{average}}$		$(8 \pm 8) \times 10^{-18}$
phase difference $\phi_{00} - \phi_{+-}$		$(0.34 \pm 0.32)^\circ$
$\text{Re}(\frac{2}{3}\eta_{+-} + \frac{1}{3}\eta_{00}) - \frac{A_L}{2}$		$(-3 \pm 35) \times 10^{-6}$
$A_{CPT}(D^0 \to K^-\pi^+)$		0.008 ± 0.008
ΔS^+_{CPT} $(S^-_{\ell^+,K^0_S} - S^+_{\ell^+,K^0_S})$		0.16 ± 0.23
ΔS^-_{CPT} $(S^+_{\ell^+,K^0_S} - S^-_{\ell^+,K^0_S})$		-0.03 ± 0.14
ΔC^+_{CPT} $(C^-_{\ell^+,K^0_S} - C^+_{\ell^+,K^0_S})$		0.14 ± 0.17
ΔC^-_{CPT} $(C^+_{\ell^+,K^0_S} - C^-_{\ell^+,K^0_S})$		0.03 ± 0.14
$\lvert m_p - m_{\overline{p}} \rvert / m_p$	[l]	$<7 \times 10^{-10}$, CL = 90%
$(\lvert \frac{q_{\overline{p}}}{m_{\overline{p}}} \rvert - \frac{q_p}{m_p}) / \frac{q_p}{m_p}$		$(-9 \pm 9) \times 10^{-11}$
$\lvert q_p + q_{\overline{p}} \rvert / e$	[l]	$<7 \times 10^{-10}$, CL = 90%
$(\mu_p + \mu_{\overline{p}}) / \mu_p$		$(0 \pm 5) \times 10^{-6}$
$(m_n - m_{\overline{n}}) / m_n$		$(9 \pm 6) \times 10^{-5}$
$(m_\Lambda - m_{\overline{\Lambda}}) / m_\Lambda$		$(-0.1 \pm 1.1) \times 10^{-5}$ (S = 1.6)
$(\tau_\Lambda - \tau_{\overline{\Lambda}}) / \tau_\Lambda$		-0.001 ± 0.009
$(\tau_{\Sigma^+} - \tau_{\overline{\Sigma}^-}) / \tau_{\Sigma^+}$		-0.0006 ± 0.0012
$(\mu_{\Sigma^+} + \mu_{\overline{\Sigma}^-}) / \mu_{\Sigma^+}$		0.014 ± 0.015
$(m_{\Xi^-} - m_{\overline{\Xi}^+}) / m_{\Xi^-}$		$(-3 \pm 9) \times 10^{-5}$
$(\tau_{\Xi^-} - \tau_{\overline{\Xi}^+}) / \tau_{\Xi^-}$		-0.01 ± 0.07
$(\mu_{\Xi^-} + \mu_{\overline{\Xi}^+}) / \lvert \mu_{\Xi^-} \rvert$		$+0.01 \pm 0.05$
$(m_{\Omega^-} - m_{\overline{\Omega}^+}) / m_{\Omega^-}$		$(-1 \pm 8) \times 10^{-5}$
$(\tau_{\Omega^-} - \tau_{\overline{\Omega}^+}) / \tau_{\Omega^-}$		0.00 ± 0.05

TESTS OF NUMBER CONSERVATION LAWS

LEPTON FAMILY NUMBER

Lepton family number conservation means separate conservation of each of L_e, L_μ, L_τ.

$\Gamma(Z \to\ e^\pm\mu^\mp)/\Gamma_{\text{total}}$	[n]	$<7.5\times10^{-7}$, CL = 95%
$\Gamma(Z \to\ e^\pm\tau^\mp)/\Gamma_{\text{total}}$	[n]	$<9.8\times10^{-6}$, CL = 95%
$\Gamma(Z \to\ \mu^\pm\tau^\mp)/\Gamma_{\text{total}}$	[n]	$<1.2\times10^{-5}$, CL = 95%
$\sigma(e^+e^- \to\ e^\pm\tau^\mp)\ /\ \sigma(e^+e^- \to\ \mu^+\mu^-)$		$<8.9\times10^{-6}$, CL = 95%
$\sigma(e^+e^- \to\ \mu^\pm\tau^\mp)\ /\ \sigma(e^+e^- \to\ \mu^+\mu^-)$		$<4.0\times10^{-6}$, CL = 95%
limit on $\mu^- \to\ e^-$ conversion		
$\sigma(\mu^-\,{}^{32}\text{S} \to\ e^-\,{}^{32}\text{S})\ /$ $\sigma(\mu^-\,{}^{32}\text{S} \to\ \nu_\mu\,{}^{32}\text{P}^*)$		$<7\times10^{-11}$, CL = 90%
$\sigma(\mu^-\,\text{Ti} \to\ e^-\,\text{Ti})\ /$ $\sigma(\mu^-\,\text{Ti} \to\ \text{capture})$		$<4.3\times10^{-12}$, CL = 90%
$\sigma(\mu^-\,\text{Pb} \to\ e^-\,\text{Pb})\ /$ $\sigma(\mu^-\,\text{Pb} \to\ \text{capture})$		$<4.6\times10^{-11}$, CL = 90%
limit on muonium $\to$ antimuonium conversion $R_g = G_C\ /\ G_F$		<0.0030, CL = 90%
$\Gamma(\mu^- \to\ e^-\nu_e\overline{\nu}_\mu)/\Gamma_{\text{total}}$	[o]	$<1.2\times10^{-2}$, CL = 90%
$\Gamma(\mu^- \to\ e^-\gamma)/\Gamma_{\text{total}}$		$<5.7\times10^{-13}$, CL = 90%
$\Gamma(\mu^- \to\ e^-e^+e^-)/\Gamma_{\text{total}}$		$<1.0\times10^{-12}$, CL = 90%
$\Gamma(\mu^- \to\ e^-2\gamma)/\Gamma_{\text{total}}$		$<7.2\times10^{-11}$, CL = 90%
$\Gamma(\tau^- \to\ e^-\gamma)/\Gamma_{\text{total}}$		$<3.3\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^-\gamma)/\Gamma_{\text{total}}$		$<4.4\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ e^-\pi^0)/\Gamma_{\text{total}}$		$<8.0\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^-\pi^0)/\Gamma_{\text{total}}$		$<1.1\times10^{-7}$, CL = 90%
$\Gamma(\tau^- \to\ e^-K^0_S)/\Gamma_{\text{total}}$		$<2.6\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^-K^0_S)/\Gamma_{\text{total}}$		$<2.3\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ e^-\eta)/\Gamma_{\text{total}}$		$<9.2\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^-\eta)/\Gamma_{\text{total}}$		$<6.5\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ e^-\rho^0)/\Gamma_{\text{total}}$		$<1.8\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^-\rho^0)/\Gamma_{\text{total}}$		$<1.2\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ e^-\omega)/\Gamma_{\text{total}}$		$<4.8\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^-\omega)/\Gamma_{\text{total}}$		$<4.7\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ e^-K^*(892)^0)/\Gamma_{\text{total}}$		$<3.2\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^-K^*(892)^0)/\Gamma_{\text{total}}$		$<5.9\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ e^-\overline{K}^*(892)^0)/\Gamma_{\text{total}}$		$<3.4\times10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^-\overline{K}^*(892)^0)/\Gamma_{\text{total}}$		$<7.0\times10^{-8}$, CL = 90%

$\Gamma(\tau^- \to e^- \eta'(958))/\Gamma_{\text{total}}$		$<1.6 \times 10^{-7}$, CL = 90%
$\Gamma(\tau^- \to \mu^- \eta'(958))/\Gamma_{\text{total}}$		$<1.3 \times 10^{-7}$, CL = 90%
$\Gamma(\tau^- \to e^- f_0(980) \to e^- \pi^+ \pi^-)/\Gamma_{\text{total}}$		$<3.2 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^- f_0(980) \to \mu^- \pi^+ \pi^-)/\Gamma_{\text{total}}$		$<3.4 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^- \phi)/\Gamma_{\text{total}}$		$<3.1 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^- \phi)/\Gamma_{\text{total}}$		$<8.4 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^- e^+ e^-)/\Gamma_{\text{total}}$		$<2.7 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^- \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<2.7 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^+ \mu^- \mu^-)/\Gamma_{\text{total}}$		$<1.7 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^- e^+ e^-)/\Gamma_{\text{total}}$		$<1.8 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^+ e^- e^-)/\Gamma_{\text{total}}$		$<1.5 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^- \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<2.1 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^- \pi^+ \pi^-)/\Gamma_{\text{total}}$		$<2.3 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^- \pi^+ \pi^-)/\Gamma_{\text{total}}$		$<2.1 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^- \pi^+ K^-)/\Gamma_{\text{total}}$		$<3.7 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^- \pi^- K^+)/\Gamma_{\text{total}}$		$<3.1 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^- K^0_S K^0_S)/\Gamma_{\text{total}}$		$<7.1 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^- K^+ K^-)/\Gamma_{\text{total}}$		$<3.4 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^- \pi^+ K^-)/\Gamma_{\text{total}}$		$<8.6 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^- \pi^- K^+)/\Gamma_{\text{total}}$		$<4.5 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^- K^0_S K^0_S)/\Gamma_{\text{total}}$		$<8.0 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \mu^- K^+ K^-)/\Gamma_{\text{total}}$		$<4.4 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to e^- \pi^0 \pi^0)/\Gamma_{\text{total}}$		$<6.5 \times 10^{-6}$, CL = 90%
$\Gamma(\tau^- \to \mu^- \pi^0 \pi^0)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to e^- \eta\eta)/\Gamma_{\text{total}}$		$<3.5 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to \mu^- \eta\eta)/\Gamma_{\text{total}}$		$<6.0 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to e^- \pi^0 \eta)/\Gamma_{\text{total}}$		$<2.4 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to \mu^- \pi^0 \eta)/\Gamma_{\text{total}}$		$<2.2 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to e^-$ light boson$)/\Gamma_{\text{total}}$		$<2.7 \times 10^{-3}$, CL = 95%
$\Gamma(\tau^- \to \mu^-$ light boson$)/\Gamma_{\text{total}}$		$<5 \times 10^{-3}$, CL = 95%

LEPTON FAMILY NUMBER VIOLATION IN NEUTRINOS

$\sin^2(\theta_{12})$		0.304 ± 0.014
Δm^2_{21}		$(7.53 \pm 0.18) \times 10^{-5}$ eV^2
$\sin^2(\theta_{23})$ (normal mass hierarchy)		0.51 ± 0.05
$\sin^2(\theta_{23})$ (inverted mass hierarchy)		0.50 ± 0.05
Δm^2_{32} (normal mass hierarchy)	[p]	$(2.44 \pm 0.06) \times 10^{-3}$ eV^2
Δm^2_{32} (inverted mass hierarchy)	[p]	$(2.51 \pm 0.06) \times 10^{-3}$ eV^2
$\sin^2(\theta_{13})$		$(2.19 \pm 0.12) \times 10^{-2}$
$\Gamma(\pi^+ \to \mu^+ \nu_e)/\Gamma_{\text{total}}$	[q]	$<8.0 \times 10^{-3}$, CL = 90%
$\Gamma(\pi^+ \to \mu^- e^+ e^+ \nu)/\Gamma_{\text{total}}$		$<1.6 \times 10^{-6}$, CL = 90%

$\Gamma(\pi^0 \to \mu^+ e^-)/\Gamma_{\text{total}}$		$<3.8 \times 10^{-10}$, CL = 90%
$\Gamma(\pi^0 \to \mu^- e^+)/\Gamma_{\text{total}}$		$<3.4 \times 10^{-9}$, CL = 90%
$\Gamma(\pi^0 \to \mu^+ e^- + \mu^- e^+)/\Gamma_{\text{total}}$		$<3.6 \times 10^{-10}$, CL = 90%
$\Gamma(\eta \to \mu^+ e^- + \mu^- e^+)/\Gamma_{\text{total}}$		$<6 \times 10^{-6}$, CL = 90%
$\Gamma(\eta'(958) \to e\mu)/\Gamma_{\text{total}}$		$<4.7 \times 10^{-4}$, CL = 90%
$\Gamma(\phi(1020) \to e^{\pm}\mu^{\mp})/\Gamma_{\text{total}}$		$<2 \times 10^{-6}$, CL = 90%
$\Gamma(K^+ \to \mu^- \nu e^+ e^+)/\Gamma_{\text{total}}$		$<2.1 \times 10^{-8}$, CL = 90%
$\Gamma(K^+ \to \mu^+ \nu_e)/\Gamma_{\text{total}}$	[q]	$<4 \times 10^{-3}$, CL = 90%
$\Gamma(K^+ \to \pi^+ \mu^+ e^-)/\Gamma_{\text{total}}$		$<1.3 \times 10^{-11}$, CL = 90%
$\Gamma(K^+ \to \pi^+ \mu^- e^+)/\Gamma_{\text{total}}$		$<5.2 \times 10^{-10}$, CL = 90%
$\Gamma(K_L^0 \to e^{\pm}\mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<4.7 \times 10^{-12}$, CL = 90%
$\Gamma(K_L^0 \to e^{\pm}e^{\pm}\mu^{\mp}\mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<4.12 \times 10^{-11}$, CL = 90%
$\Gamma(K_L^0 \to \pi^0 \mu^{\pm} e^{\mp})/\Gamma_{\text{total}}$	[n]	$<7.6 \times 10^{-11}$, CL = 90%
$\Gamma(K_L^0 \to \pi^0\pi^0 \mu^{\pm} e^{\mp})/\Gamma_{\text{total}}$		$<1.7 \times 10^{-10}$, CL = 90%
$\Gamma(D^+ \to \pi^+ e^+ \mu^-)/\Gamma_{\text{total}}$		$<2.9 \times 10^{-6}$, CL = 90%
$\Gamma(D^+ \to \pi^+ e^- \mu^+)/\Gamma_{\text{total}}$		$<3.6 \times 10^{-6}$, CL = 90%
$\Gamma(D^+ \to K^+ e^+ \mu^-)/\Gamma_{\text{total}}$		$<1.2 \times 10^{-6}$, CL = 90%
$\Gamma(D^+ \to K^+ e^- \mu^+)/\Gamma_{\text{total}}$		$<2.8 \times 10^{-6}$, CL = 90%
$\Gamma(D^0 \to \mu^{\pm} e^{\mp})/\Gamma_{\text{total}}$	[n]	$<2.6 \times 10^{-7}$, CL = 90%
$\Gamma(D^0 \to \pi^0 e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<8.6 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \eta e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<1.0 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \pi^+\pi^- e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<1.5 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \rho^0 e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<4.9 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \omega e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<1.2 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to K^- K^+ e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<1.8 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \phi e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<3.4 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \overline{K}^0 e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<1.0 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to K^- \pi^+ e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<5.53 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \overline{K}^*(892)^0 e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$	[n]	$<8.3 \times 10^{-5}$, CL = 90%
$\Gamma(D_s^+ \to \pi^+ e^+ \mu^-)/\Gamma_{\text{total}}$		$<1.2 \times 10^{-5}$, CL = 90%
$\Gamma(D_s^+ \to \pi^+ e^- \mu^+)/\Gamma_{\text{total}}$		$<2.0 \times 10^{-5}$, CL = 90%
$\Gamma(D_s^+ \to K^+ e^+ \mu^-)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-5}$, CL = 90%
$\Gamma(D_s^+ \to K^+ e^- \mu^+)/\Gamma_{\text{total}}$		$<9.7 \times 10^{-6}$, CL = 90%
$\Gamma(B^+ \to \pi^+ e^+ \mu^-)/\Gamma_{\text{total}}$		$<6.4 \times 10^{-3}$, CL = 90%
$\Gamma(B^+ \to \pi^+ e^- \mu^+)/\Gamma_{\text{total}}$		$<6.4 \times 10^{-3}$, CL = 90%
$\Gamma(B^+ \to \pi^+ e^{\pm} \mu^{\mp})/\Gamma_{\text{total}}$		$<1.7 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to \pi^+ e^+ \tau^-)/\Gamma_{\text{total}}$		$<7.4 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to \pi^+ e^- \tau^+)/\Gamma_{\text{total}}$		$<2.0 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to \pi^+ e^{\pm} \tau^{\mp})/\Gamma_{\text{total}}$		$<7.5 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to \pi^+ \mu^+ \tau^-)/\Gamma_{\text{total}}$		$<6.2 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to \pi^+ \mu^- \tau^+)/\Gamma_{\text{total}}$		$<4.5 \times 10^{-5}$, CL = 90%

$\Gamma(B^+ \to \pi^+ \mu^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<7.2 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to K^+ e^+ \mu^-)/\Gamma_{\text{total}}$		$<9.1 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to K^+ e^- \mu^+)/\Gamma_{\text{total}}$		$<1.3 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to K^+ e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<9.1 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to K^+ e^+ \tau^-)/\Gamma_{\text{total}}$		$<4.3 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to K^+ e^- \tau^+)/\Gamma_{\text{total}}$		$<1.5 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to K^+ e^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<3.0 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to K^+ \mu^+ \tau^-)/\Gamma_{\text{total}}$		$<4.5 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to K^+ \mu^- \tau^+)/\Gamma_{\text{total}}$		$<2.8 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to K^+ \mu^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<4.8 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to K^*(892)^+ e^+ \mu^-)/\Gamma_{\text{total}}$		$<1.3 \times 10^{-6}$, CL = 90%
$\Gamma(B^+ \to K^*(892)^+ e^- \mu^+)/\Gamma_{\text{total}}$		$<9.9 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to K^*(892)^+ e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-6}$, CL = 90%
$\Gamma(B^0 \to e^\pm \mu^\mp)/\Gamma_{\text{total}}$	[n]	$<2.8 \times 10^{-9}$, CL = 90%
$\Gamma(B^0 \to \pi^0 e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to K^0 e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<2.7 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to K^*(892)^0 e^+ \mu^-)/\Gamma_{\text{total}}$		$<5.3 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to K^*(892)^0 e^- \mu^+)/\Gamma_{\text{total}}$		$<3.4 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to K^*(892)^0 e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<5.8 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to e^\pm \tau^\mp)/\Gamma_{\text{total}}$	[n]	$<2.8 \times 10^{-5}$, CL = 90%
$\Gamma(B^0 \to \mu^\pm \tau^\mp)/\Gamma_{\text{total}}$	[n]	$<2.2 \times 10^{-5}$, CL = 90%
$\Gamma(B \to s e^\pm \mu^\mp)/\Gamma_{\text{total}}$	[n]	$<2.2 \times 10^{-5}$, CL = 90%
$\Gamma(B \to \pi e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<9.2 \times 10^{-8}$, CL = 90%
$\Gamma(B \to \rho e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<3.2 \times 10^{-6}$, CL = 90%
$\Gamma(B \to K e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<3.8 \times 10^{-8}$, CL = 90%
$\Gamma(B \to K^*(892) e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<5.1 \times 10^{-7}$, CL = 90%
$\Gamma(B_s^0 \to e^\pm \mu^\mp)/\Gamma_{\text{total}}$	[n]	$<1.1 \times 10^{-8}$, CL = 90%
$\Gamma(J/\psi(1S) \to e^\pm \mu^\mp)/\Gamma_{\text{total}}$		$<1.6 \times 10^{-7}$, CL = 90%
$\Gamma(J/\psi(1S) \to e^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<8.3 \times 10^{-6}$, CL = 90%
$\Gamma(J/\psi(1S) \to \mu^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<2.0 \times 10^{-6}$, CL = 90%
$\Gamma(\Upsilon(1S) \to \mu^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<6.0 \times 10^{-6}$, CL = 95%
$\Gamma(\Upsilon(2S) \to e^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<3.2 \times 10^{-6}$, CL = 90%
$\Gamma(\Upsilon(2S) \to \mu^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<3.3 \times 10^{-6}$, CL = 90%
$\Gamma(\Upsilon(3S) \to e^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<4.2 \times 10^{-6}$, CL = 90%
$\Gamma(\Upsilon(3S) \to \mu^\pm \tau^\mp)/\Gamma_{\text{total}}$		$<3.1 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda_c^+ \to p e^+ \mu^-)/\Gamma_{\text{total}}$		$<9.9 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda_c^+ \to p e^- \mu^+)/\Gamma_{\text{total}}$		$<1.9 \times 10^{-5}$, CL = 90%

TOTAL LEPTON NUMBER

Violation of total lepton number conservation also implies violation of lepton family number conservation.

$\Gamma(Z \to\ p e)/\Gamma_{\text{total}}$		$<1.8 \times 10^{-6}$, CL = 95%
$\Gamma(Z \to\ p \mu)/\Gamma_{\text{total}}$		$<1.8 \times 10^{-6}$, CL = 95%
limit on $\mu^- \to\ e^+$ conversion		
$\sigma(\mu^- {}^{32}\text{S} \to\ e^+ {}^{32}\text{Si}^*)$ / $\sigma(\mu^- {}^{32}\text{S} \to\ \nu_\mu {}^{32}\text{P}^*)$		$<9 \times 10^{-10}$, CL = 90%
$\sigma(\mu^- {}^{127}\text{I} \to\ e^+ {}^{127}\text{Sb}^*)$ / $\sigma(\mu^- {}^{127}\text{I} \to\ \text{anything})$		$<3 \times 10^{-10}$, CL = 90%
$\sigma(\mu^- \text{Ti} \to\ e^+ \text{Ca})$ / $\sigma(\mu^- \text{Ti} \to\ \text{capture})$		$<3.6 \times 10^{-11}$, CL = 90%
$\Gamma(\tau^- \to\ e^+ \pi^- \pi^-)/\Gamma_{\text{total}}$		$<2.0 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^+ \pi^- \pi^-)/\Gamma_{\text{total}}$		$<3.9 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ e^+ \pi^- K^-)/\Gamma_{\text{total}}$		$<3.2 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ e^+ K^- K^-)/\Gamma_{\text{total}}$		$<3.3 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^+ \pi^- K^-)/\Gamma_{\text{total}}$		$<4.8 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \mu^+ K^- K^-)/\Gamma_{\text{total}}$		$<4.7 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ p \mu^- \mu^-)/\Gamma_{\text{total}}$		$<4.4 \times 10^{-7}$, CL = 90%
$\Gamma(\tau^- \to\ \overline{p} \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<3.3 \times 10^{-7}$, CL = 90%
$\Gamma(\tau^- \to\ \overline{p} \gamma)/\Gamma_{\text{total}}$		$<3.5 \times 10^{-6}$, CL = 90%
$\Gamma(\tau^- \to\ \overline{p} \pi^0)/\Gamma_{\text{total}}$		$<1.5 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to\ \overline{p} 2\pi^0)/\Gamma_{\text{total}}$		$<3.3 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to\ \overline{p} \eta)/\Gamma_{\text{total}}$		$<8.9 \times 10^{-6}$, CL = 90%
$\Gamma(\tau^- \to\ \overline{p} \pi^0 \eta)/\Gamma_{\text{total}}$		$<2.7 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to\ \Lambda \pi^-)/\Gamma_{\text{total}}$		$<7.2 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to\ \overline{\Lambda} \pi^-)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-7}$, CL = 90%
$t_{1/2}(\ {}^{76}\text{Ge} \to\ {}^{76}\text{Se} + 2\ e^-\ )$		$>1.9 \times 10^{25}$ yr, CL = 90%
$\Gamma(\pi^+ \to\ \mu^+ \overline{\nu}_e)/\Gamma_{\text{total}}$	[q]	$<1.5 \times 10^{-3}$, CL = 90%
$\Gamma(K^+ \to\ \pi^- \mu^+ e^+)/\Gamma_{\text{total}}$		$<5.0 \times 10^{-10}$, CL = 90%
$\Gamma(K^+ \to\ \pi^- e^+ e^+)/\Gamma_{\text{total}}$		$<6.4 \times 10^{-10}$, CL = 90%
$\Gamma(K^+ \to\ \pi^- \mu^+ \mu^+)/\Gamma_{\text{total}}$	[q]	$<1.1 \times 10^{-9}$, CL = 90%
$\Gamma(K^+ \to\ \mu^+ \overline{\nu}_e)/\Gamma_{\text{total}}$	[q]	$<3.3 \times 10^{-3}$, CL = 90%
$\Gamma(K^+ \to\ \pi^0 e^+ \overline{\nu}_e)/\Gamma_{\text{total}}$		$<3 \times 10^{-3}$, CL = 90%
$\Gamma(D^+ \to\ \pi^- 2e^+)/\Gamma_{\text{total}}$		$<1.1 \times 10^{-6}$, CL = 90%
$\Gamma(D^+ \to\ \pi^- 2\mu^+)/\Gamma_{\text{total}}$		$<2.2 \times 10^{-8}$, CL = 90%
$\Gamma(D^+ \to\ \pi^- e^+ \mu^+)/\Gamma_{\text{total}}$		$<2.0 \times 10^{-6}$, CL = 90%
$\Gamma(D^+ \to\ \rho^- 2\mu^+)/\Gamma_{\text{total}}$		$<5.6 \times 10^{-4}$, CL = 90%
$\Gamma(D^+ \to\ K^- 2e^+)/\Gamma_{\text{total}}$		$<9 \times 10^{-7}$, CL = 90%
$\Gamma(D^+ \to\ K^- 2\mu^+)/\Gamma_{\text{total}}$		$<1.0 \times 10^{-5}$, CL = 90%
$\Gamma(D^+ \to\ K^- e^+ \mu^+)/\Gamma_{\text{total}}$		$<1.9 \times 10^{-6}$, CL = 90%

$\Gamma(D^+ \to K^*(892)^- 2\mu^+)/\Gamma_{\text{total}}$		$<8.5 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to 2\pi^- 2e^+ + \text{c.c.})/\Gamma_{\text{total}}$		$<1.12 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to 2\pi^- 2\mu^+ + \text{c.c.})/\Gamma_{\text{total}}$		$<2.9 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to K^-\pi^- 2e^+ + \text{c.c.})/\Gamma_{\text{total}}$		$<2.06 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to K^-\pi^- 2\mu^+ + \text{c.c.})/\Gamma_{\text{total}}$		$<3.9 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to 2K^- 2e^+ + \text{c.c.})/\Gamma_{\text{total}}$		$<1.52 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to 2K^- 2\mu^+ + \text{c.c.})/\Gamma_{\text{total}}$		$<9.4 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \pi^-\pi^- e^+\mu^+ + \text{c.c.})/\Gamma_{\text{total}}$		$<7.9 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to K^-\pi^- e^+\mu^+ + \text{c.c.})/\Gamma_{\text{total}}$		$<2.18 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to 2K^- e^+\mu^+ + \text{c.c.})/\Gamma_{\text{total}}$		$<5.7 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to p e^-)/\Gamma_{\text{total}}$	[r]	$<1.0 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \overline{p} e^+)/\Gamma_{\text{total}}$	[s]	$<1.1 \times 10^{-5}$, CL = 90%
$\Gamma(D_s^+ \to \pi^- 2e^+)/\Gamma_{\text{total}}$		$<4.1 \times 10^{-6}$, CL = 90%
$\Gamma(D_s^+ \to \pi^- 2\mu^+)/\Gamma_{\text{total}}$		$<1.2 \times 10^{-7}$, CL = 90%
$\Gamma(D_s^+ \to \pi^- e^+\mu^+)/\Gamma_{\text{total}}$		$<8.4 \times 10^{-6}$, CL = 90%
$\Gamma(D_s^+ \to K^- 2e^+)/\Gamma_{\text{total}}$		$<5.2 \times 10^{-6}$, CL = 90%
$\Gamma(D_s^+ \to K^- 2\mu^+)/\Gamma_{\text{total}}$		$<1.3 \times 10^{-5}$, CL = 90%
$\Gamma(D_s^+ \to K^- e^+\mu^+)/\Gamma_{\text{total}}$		$<6.1 \times 10^{-6}$, CL = 90%
$\Gamma(D_s^+ \to K^*(892)^- 2\mu^+)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-3}$, CL = 90%
$\Gamma(B^+ \to \pi^- e^+ e^+)/\Gamma_{\text{total}}$		$<2.3 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to \pi^- \mu^+ \mu^+)/\Gamma_{\text{total}}$		$<4.0 \times 10^{-9}$, CL = 95%
$\Gamma(B^+ \to \pi^- e^+ \mu^+)/\Gamma_{\text{total}}$		$<1.5 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to \rho^- e^+ e^+)/\Gamma_{\text{total}}$		$<1.7 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to \rho^- \mu^+ \mu^+)/\Gamma_{\text{total}}$		$<4.2 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to \rho^- e^+ \mu^+)/\Gamma_{\text{total}}$		$<4.7 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to K^- e^+ e^+)/\Gamma_{\text{total}}$		$<3.0 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to K^- \mu^+ \mu^+)/\Gamma_{\text{total}}$		$<4.1 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to K^- e^+ \mu^+)/\Gamma_{\text{total}}$		$<1.6 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to K^*(892)^- e^+ e^+)/\Gamma_{\text{total}}$		$<4.0 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to K^*(892)^- \mu^+ \mu^+)/\Gamma_{\text{total}}$		$<5.9 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to K^*(892)^- e^+ \mu^+)/\Gamma_{\text{total}}$		$<3.0 \times 10^{-7}$, CL = 90%
$\Gamma(B^+ \to D^- e^+ e^+)/\Gamma_{\text{total}}$		$<2.6 \times 10^{-6}$, CL = 90%
$\Gamma(B^+ \to D^- e^+ \mu^+)/\Gamma_{\text{total}}$		$<1.8 \times 10^{-6}$, CL = 90%
$\Gamma(B^+ \to D^- \mu^+ \mu^+)/\Gamma_{\text{total}}$		$<6.9 \times 10^{-7}$, CL = 95%
$\Gamma(B^+ \to D^{*-} \mu^+ \mu^+)/\Gamma_{\text{total}}$		$<2.4 \times 10^{-6}$, CL = 95%
$\Gamma(B^+ \to D_s^- \mu^+ \mu^+)/\Gamma_{\text{total}}$		$<5.8 \times 10^{-7}$, CL = 95%
$\Gamma(B^+ \to \overline{D}^0 \pi^- \mu^+ \mu^+)/\Gamma_{\text{total}}$		$<1.5 \times 10^{-6}$, CL = 95%
$\Gamma(B^+ \to \Lambda^0 \mu^+)/\Gamma_{\text{total}}$		$<6 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to \Lambda^0 e^+)/\Gamma_{\text{total}}$		$<3.2 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to \overline{\Lambda}^0 \mu^+)/\Gamma_{\text{total}}$		$<6 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to \overline{\Lambda}^0 e^+)/\Gamma_{\text{total}}$		$<8 \times 10^{-8}$, CL = 90%

$\Gamma(B^0 \to \Lambda_c^+ \mu^-)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-6}$, CL = 90%
$\Gamma(B^0 \to \Lambda_c^+ e^-)/\Gamma_{\text{total}}$		$<4 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda \to \pi^+ e^-)/\Gamma_{\text{total}}$		$<6 \times 10^{-7}$, CL = 90%
$\Gamma(\Lambda \to \pi^+ \mu^-)/\Gamma_{\text{total}}$		$<6 \times 10^{-7}$, CL = 90%
$\Gamma(\Lambda \to \pi^- e^+)/\Gamma_{\text{total}}$		$<4 \times 10^{-7}$, CL = 90%
$\Gamma(\Lambda \to \pi^- \mu^+)/\Gamma_{\text{total}}$		$<6 \times 10^{-7}$, CL = 90%
$\Gamma(\Lambda \to K^+ e^-)/\Gamma_{\text{total}}$		$<2 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda \to K^+ \mu^-)/\Gamma_{\text{total}}$		$<3 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda \to K^- e^+)/\Gamma_{\text{total}}$		$<2 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda \to K^- \mu^+)/\Gamma_{\text{total}}$		$<3 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda \to K_S^0 \nu)/\Gamma_{\text{total}}$		$<2 \times 10^{-5}$, CL = 90%
$\Gamma(\Xi^- \to p \mu^- \mu^-)/\Gamma_{\text{total}}$		$<4 \times 10^{-8}$, CL = 90%
$\Gamma(\Lambda_c^+ \to \overline{p} 2e^+)/\Gamma_{\text{total}}$		$<2.7 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda_c^+ \to \overline{p} 2\mu^+)/\Gamma_{\text{total}}$		$<9.4 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda_c^+ \to \overline{p} e^+ \mu^+)/\Gamma_{\text{total}}$		$<1.6 \times 10^{-5}$, CL = 90%
$\Gamma(\Lambda_c^+ \to \Sigma^- \mu^+ \mu^+)/\Gamma_{\text{total}}$		$<7.0 \times 10^{-4}$, CL = 90%

BARYON NUMBER

$\Gamma(Z \to p e)/\Gamma_{\text{total}}$		$<1.8 \times 10^{-6}$, CL = 95%
$\Gamma(Z \to p \mu)/\Gamma_{\text{total}}$		$<1.8 \times 10^{-6}$, CL = 95%
$\Gamma(\tau^- \to p \mu^- \mu^-)/\Gamma_{\text{total}}$		$<4.4 \times 10^{-7}$, CL = 90%
$\Gamma(\tau^- \to \overline{p} \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<3.3 \times 10^{-7}$, CL = 90%
$\Gamma(\tau^- \to \overline{p} \gamma)/\Gamma_{\text{total}}$		$<3.5 \times 10^{-6}$, CL = 90%
$\Gamma(\tau^- \to \overline{p} \pi^0)/\Gamma_{\text{total}}$		$<1.5 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to \overline{p} 2\pi^0)/\Gamma_{\text{total}}$		$<3.3 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to \overline{p} \eta)/\Gamma_{\text{total}}$		$<8.9 \times 10^{-6}$, CL = 90%
$\Gamma(\tau^- \to \overline{p} \pi^0 \eta)/\Gamma_{\text{total}}$		$<2.7 \times 10^{-5}$, CL = 90%
$\Gamma(\tau^- \to \Lambda \pi^-)/\Gamma_{\text{total}}$		$<7.2 \times 10^{-8}$, CL = 90%
$\Gamma(\tau^- \to \overline{\Lambda} \pi^-)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-7}$, CL = 90%
$\Gamma(D^0 \to p e^-)/\Gamma_{\text{total}}$	[r]	$<1.0 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \overline{p} e^+)/\Gamma_{\text{total}}$	[s]	$<1.1 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to \Lambda^0 \mu^+)/\Gamma_{\text{total}}$		$<6 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to \Lambda^0 e^+)/\Gamma_{\text{total}}$		$<3.2 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to \overline{\Lambda}^0 \mu^+)/\Gamma_{\text{total}}$		$<6 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to \overline{\Lambda}^0 e^+)/\Gamma_{\text{total}}$		$<8 \times 10^{-8}$, CL = 90%
$\Gamma(B^0 \to \Lambda_c^+ \mu^-)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-6}$, CL = 90%
$\Gamma(B^0 \to \Lambda_c^+ e^-)/\Gamma_{\text{total}}$		$<4 \times 10^{-6}$, CL = 90%
p mean life	[t]	$>2.1 \times 10^{29}$ years, CL = 90%

A few examples of proton or bound neutron decay follow. For limits on many other nucleon decay channels, see the Baryon Summary Table.

$\tau(N \to e^+\pi)$		> 2000 (n), > 8200 (p) $\times 10^{30}$ years, CL = 90%
$\tau(N \to \mu^+\pi)$		> 1000 (n), > 6600 (p) $\times 10^{30}$ years, CL = 90%
$\tau(N \to e^+K)$		> 17 (n), > 1000 (p) $\times 10^{30}$ years, CL = 90%
$\tau(N \to \mu^+K)$		> 26 (n), > 1600 (p) $\times 10^{30}$ years, CL = 90%
limit on $n\overline{n}$ oscillations (free n)		$>0.86 \times 10^8$ s, CL = 90%
limit on $n\overline{n}$ oscillations (bound n)	[u]	$>1.3 \times 10^8$ s, CL = 90%
$\Gamma(\Lambda \to \pi^+e^-)/\Gamma_{\text{total}}$		$<6 \times 10^{-7}$, CL = 90%
$\Gamma(\Lambda \to \pi^+\mu^-)/\Gamma_{\text{total}}$		$<6 \times 10^{-7}$, CL = 90%
$\Gamma(\Lambda \to \pi^-e^+)/\Gamma_{\text{total}}$		$<4 \times 10^{-7}$, CL = 90%
$\Gamma(\Lambda \to \pi^-\mu^+)/\Gamma_{\text{total}}$		$<6 \times 10^{-7}$, CL = 90%
$\Gamma(\Lambda \to K^+e^-)/\Gamma_{\text{total}}$		$<2 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda \to K^+\mu^-)/\Gamma_{\text{total}}$		$<3 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda \to K^-e^+)/\Gamma_{\text{total}}$		$<2 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda \to K^-\mu^+)/\Gamma_{\text{total}}$		$<3 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda \to K^0_S\nu)/\Gamma_{\text{total}}$		$<2 \times 10^{-5}$, CL = 90%
$\Gamma(\Lambda \to \overline{p}\pi^+)/\Gamma_{\text{total}}$		$<9 \times 10^{-7}$, CL = 90%
$\Gamma(\Lambda_c^+ \to \overline{p}2e^+)/\Gamma_{\text{total}}$		$<2.7 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda_c^+ \to \overline{p}2\mu^+)/\Gamma_{\text{total}}$		$<9.4 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda_c^+ \to \overline{p}e^+\mu^+)/\Gamma_{\text{total}}$		$<1.6 \times 10^{-5}$, CL = 90%

ELECTRIC CHARGE (Q)

$e \to \nu_e\gamma$ and astrophysical limits	[v]	$>6.6 \times 10^{28}$ yr, CL = 90%
$\Gamma(n \to p\nu_e\overline{\nu}_e)/\Gamma_{\text{total}}$		$<8 \times 10^{-27}$, CL = 68%

$\Delta S = \Delta Q$ RULE

Violations allowed in second-order weak interactions.

$\Gamma(K^+ \to \pi^+\pi^+e^-\overline{\nu}_e)/\Gamma_{\text{total}}$	$<1.3 \times 10^{-8}$, CL = 90%
$\Gamma(K^+ \to \pi^+\pi^+\mu^-\overline{\nu}_\mu)/\Gamma_{\text{total}}$	$<3.0 \times 10^{-6}$, CL = 95%
Re(x_+), K_{e3} parameter	$(-0.9 \pm 3.0) \times 10^{-3}$
$x = A(\overline{K}^0 \to \pi^-\ell^+\nu)/A(K^0 \to \pi^-\ell^+\nu) = A(\Delta S{=}-\Delta Q)/A(\Delta S{=}\Delta Q)$	
real part of x	-0.002 ± 0.006
imaginary part of x	0.0012 ± 0.0021
$\Gamma(\Sigma^+ \to n\ell^+\nu)/\Gamma(\Sigma^- \to n\ell^-\overline{\nu})$	<0.043
$\Gamma(\Sigma^+ \to ne^+\nu_e)/\Gamma_{\text{total}}$	$<5 \times 10^{-6}$, CL = 90%
$\Gamma(\Sigma^+ \to n\mu^+\nu_\mu)/\Gamma_{\text{total}}$	$<3.0 \times 10^{-5}$, CL = 90%

$\Gamma(\Xi^0 \to \Sigma^- e^+ \nu_e)/\Gamma_{\text{total}}$	$<9 \times 10^{-4}$, CL = 90%
$\Gamma(\Xi^0 \to \Sigma^- \mu^+ \nu_\mu)/\Gamma_{\text{total}}$	$<9 \times 10^{-4}$, CL = 90%

$\Delta S = 2$ FORBIDDEN

Allowed in second-order weak interactions.

$\Gamma(\Xi^0 \to p\pi^-)/\Gamma_{\text{total}}$	$<8 \times 10^{-6}$, CL = 90%
$\Gamma(\Xi^0 \to p e^- \overline{\nu}_e)/\Gamma_{\text{total}}$	$<1.3 \times 10^{-3}$
$\Gamma(\Xi^0 \to p \mu^- \overline{\nu}_\mu)/\Gamma_{\text{total}}$	$<1.3 \times 10^{-3}$
$\Gamma(\Xi^- \to n\pi^-)/\Gamma_{\text{total}}$	$<1.9 \times 10^{-5}$, CL = 90%
$\Gamma(\Xi^- \to n e^- \overline{\nu}_e)/\Gamma_{\text{total}}$	$<3.2 \times 10^{-3}$, CL = 90%
$\Gamma(\Xi^- \to n \mu^- \overline{\nu}_\mu)/\Gamma_{\text{total}}$	$<1.5 \times 10^{-2}$, CL = 90%
$\Gamma(\Xi^- \to p\pi^-\pi^-)/\Gamma_{\text{total}}$	$<4 \times 10^{-4}$, CL = 90%
$\Gamma(\Xi^- \to p\pi^- e^- \overline{\nu}_e)/\Gamma_{\text{total}}$	$<4 \times 10^{-4}$, CL = 90%
$\Gamma(\Xi^- \to p\pi^- \mu^- \overline{\nu}_\mu)/\Gamma_{\text{total}}$	$<4 \times 10^{-4}$, CL = 90%
$\Gamma(\Omega^- \to \Lambda\pi^-)/\Gamma_{\text{total}}$	$<2.9 \times 10^{-6}$, CL = 90%

$\Delta S = 2$ VIA MIXING

Allowed in second-order weak interactions, e.g. mixing.

$m_{K_L^0} - m_{K_S^0}$	$(0.5293 \pm 0.0009) \times 10^{10}\ \hbar\ \text{s}^{-1}$ (S = 1.3)
$m_{K_L^0} - m_{K_S^0}$	$(3.484 \pm 0.006) \times 10^{-12}$ MeV

$\Delta C = 2$ VIA MIXING

Allowed in second-order weak interactions, e.g. mixing.

$\lvert m_{D_1^0} - m_{D_2^0} \rvert = x\Gamma$	$(0.95^{+0.41}_{-0.44}) \times 10^{10}\ \hbar\ \text{s}^{-1}$
$(\Gamma_{D_1^0} - \Gamma_{D_2^0})/\Gamma = 2y$	$(1.29^{+0.14}_{-0.18}) \times 10^{-2}$

$\Delta B = 2$ VIA MIXING

Allowed in second-order weak interactions, e.g. mixing.

χ_d	0.1875 ± 0.0017
$\Delta m_{B^0} = m_{B_H^0} - m_{B_L^0}$	$(0.5096 \pm 0.0034) \times 10^{12}\ \hbar\ \text{s}^{-1}$

$x_d = \Delta m_{B^0}/\Gamma_{B^0}$	0.775 ± 0.006
$\Delta m_{B_s^0} = m_{B_{sH}^0} - m_{B_{sL}^0}$	$(17.757 \pm 0.021) \times 10^{12}\ \hbar\ \mathrm{s}^{-1}$
$x_s = \Delta m_{B_s^0}/\Gamma_{B_s^0}$	26.81 ± 0.10
χ_s	0.499308 ± 0.000005

$\Delta S = 1$ WEAK NEUTRAL CURRENT FORBIDDEN

Allowed by higher-order electroweak interactions.

$\Gamma(K^+ \to \pi^+ e^+ e^-)/\Gamma_{\text{total}}$		$(3.00 \pm 0.09) \times 10^{-7}$
$\Gamma(K^+ \to \pi^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(9.4 \pm 0.6) \times 10^{-8}$ (S = 2.6)
$\Gamma(K^+ \to \pi^+ \nu\overline{\nu})/\Gamma_{\text{total}}$		$(1.7 \pm 1.1) \times 10^{-10}$
$\Gamma(K^+ \to \pi^+ \pi^0 \nu\overline{\nu})/\Gamma_{\text{total}}$		$<4.3 \times 10^{-5}$, CL = 90%
$\Gamma(K_S^0 \to \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<9 \times 10^{-9}$, CL = 90%
$\Gamma(K_S^0 \to e^+ e^-)/\Gamma_{\text{total}}$		$<9 \times 10^{-9}$, CL = 90%
$\Gamma(K_S^0 \to \pi^0 e^+ e^-)/\Gamma_{\text{total}}$	[x]	$(3.0^{+1.5}_{-1.2}) \times 10^{-9}$
$\Gamma(K_S^0 \to \pi^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(2.9^{+1.5}_{-1.2}) \times 10^{-9}$
$\Gamma(K_L^0 \to \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(6.84 \pm 0.11) \times 10^{-9}$
$\Gamma(K_L^0 \to e^+ e^-)/\Gamma_{\text{total}}$		$(9^{+6}_{-4}) \times 10^{-12}$
$\Gamma(K_L^0 \to \pi^+ \pi^- e^+ e^-)/\Gamma_{\text{total}}$	[y]	$(3.11 \pm 0.19) \times 10^{-7}$
$\Gamma(K_L^0 \to \pi^0 \pi^0 e^+ e^-)/\Gamma_{\text{total}}$		$<6.6 \times 10^{-9}$, CL = 90%
$\Gamma(K_L^0 \to \pi^0 \pi^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<9.2 \times 10^{-11}$, CL = 90%
$\Gamma(K_L^0 \to \mu^+ \mu^- e^+ e^-)/\Gamma_{\text{total}}$		$(2.69 \pm 0.27) \times 10^{-9}$
$\Gamma(K_L^0 \to e^+ e^- e^+ e^-)/\Gamma_{\text{total}}$		$(3.56 \pm 0.21) \times 10^{-8}$
$\Gamma(K_L^0 \to \pi^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<3.8 \times 10^{-10}$, CL = 90%
$\Gamma(K_L^0 \to \pi^0 e^+ e^-)/\Gamma_{\text{total}}$		$<2.8 \times 10^{-10}$, CL = 90%
$\Gamma(K_L^0 \to \pi^0 \nu\overline{\nu})/\Gamma_{\text{total}}$		$<2.6 \times 10^{-8}$, CL = 90%
$\Gamma(K_L^0 \to \pi^0 \pi^0 \nu\overline{\nu})/\Gamma_{\text{total}}$		$<8.1 \times 10^{-7}$, CL = 90%
$\Gamma(\Sigma^+ \to p e^+ e^-)/\Gamma_{\text{total}}$		$<7 \times 10^{-6}$
$\Gamma(\Sigma^+ \to p \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(9^{+9}_{-8}) \times 10^{-8}$

$\Delta C = 1$ WEAK NEUTRAL CURRENT FORBIDDEN

Allowed by higher-order electroweak interactions.

$\Gamma(D^+ \to \pi^+ e^+ e^-)/\Gamma_{\text{total}}$	$<1.1 \times 10^{-6}$, CL = 90%
$\Gamma(D^+ \to \pi^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$	$<7.3 \times 10^{-8}$, CL = 90%
$\Gamma(D^+ \to \rho^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$	$<5.6 \times 10^{-4}$, CL = 90%

$\Gamma(D^0 \to \gamma\gamma)/\Gamma_{\text{total}}$		$<2.2 \times 10^{-6}$, CL = 90%
$\Gamma(D^0 \to e^+ e^-)/\Gamma_{\text{total}}$		$<7.9 \times 10^{-8}$, CL = 90%
$\Gamma(D^0 \to \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<6.2 \times 10^{-9}$, CL = 90%
$\Gamma(D^0 \to \pi^0 e^+ e^-)/\Gamma_{\text{total}}$		$<4.5 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \pi^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<1.8 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \eta e^+ e^-)/\Gamma_{\text{total}}$		$<1.1 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \eta \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<5.3 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \pi^+ \pi^- e^+ e^-)/\Gamma_{\text{total}}$		$<3.73 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \rho^0 e^+ e^-)/\Gamma_{\text{total}}$		$<1.0 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \pi^+ \pi^- \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<5.5 \times 10^{-7}$, CL = 90%
$\Gamma(D^0 \to \rho^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<2.2 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \omega e^+ e^-)/\Gamma_{\text{total}}$		$<1.8 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \omega \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<8.3 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to K^- K^+ e^+ e^-)/\Gamma_{\text{total}}$		$<3.15 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \phi e^+ e^-)/\Gamma_{\text{total}}$		$<5.2 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to K^- K^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<3.3 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to \phi \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<3.1 \times 10^{-5}$, CL = 90%
$\Gamma(D^0 \to K^- \pi^+ e^+ e^-)/\Gamma_{\text{total}}$		$<3.85 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to K^- \pi^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<3.59 \times 10^{-4}$, CL = 90%
$\Gamma(D^0 \to \pi^+ \pi^- \pi^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<8.1 \times 10^{-4}$, CL = 90%
$\Gamma(D_s^+ \to K^+ e^+ e^-)/\Gamma_{\text{total}}$		$<3.7 \times 10^{-6}$, CL = 90%
$\Gamma(D_s^+ \to K^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<2.1 \times 10^{-5}$, CL = 90%
$\Gamma(D_s^+ \to K^*(892)^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<1.4 \times 10^{-3}$, CL = 90%
$\Gamma(\Lambda_c^+ \to p e^+ e^-)/\Gamma_{\text{total}}$		$<5.5 \times 10^{-6}$, CL = 90%
$\Gamma(\Lambda_c^+ \to p \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<4.4 \times 10^{-5}$, CL = 90%

$\Delta B = 1$ WEAK NEUTRAL CURRENT FORBIDDEN

Allowed by higher-order electroweak interactions.

$\Gamma(B^+ \to \pi^+ \ell^+ \ell^-)/\Gamma_{\text{total}}$		$<4.9 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to \pi^+ e^+ e^-)/\Gamma_{\text{total}}$		$<8.0 \times 10^{-8}$, CL = 90%
$\Gamma(B^+ \to \pi^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(1.79 \pm 0.23) \times 10^{-8}$
$\Gamma(B^+ \to \pi^+ \nu\overline{\nu})/\Gamma_{\text{total}}$		$<9.8 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to K^+ \ell^+ \ell^-)/\Gamma_{\text{total}}$	[z]	$(4.51 \pm 0.23) \times 10^{-7}$ (S = 1.1)
$\Gamma(B^+ \to K^+ e^+ e^-)/\Gamma_{\text{total}}$		$(5.5 \pm 0.7) \times 10^{-7}$
$\Gamma(B^+ \to K^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(4.43 \pm 0.24) \times 10^{-7}$ (S = 1.2)
$\Gamma(B^+ \to K^+ \overline{\nu}\nu)/\Gamma_{\text{total}}$		$<1.6 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to \rho^+ \nu\overline{\nu})/\Gamma_{\text{total}}$		$<2.13 \times 10^{-4}$, CL = 90%
$\Gamma(B^+ \to K^*(892)^+ \ell^+ \ell^-)/\Gamma_{\text{total}}$	[z]	$(1.01 \pm 0.11) \times 10^{-6}$ (S = 1.1)
$\Gamma(B^+ \to K^*(892)^+ e^+ e^-)/\Gamma_{\text{total}}$		$(1.55^{+0.40}_{-0.31}) \times 10^{-6}$

$\Gamma(B^+ \to K^*(892)^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(9.6 \pm 1.0) \times 10^{-7}$
$\Gamma(B^+ \to K^*(892)^+ \nu\overline{\nu})/\Gamma_{\text{total}}$		$<4.0 \times 10^{-5}$, CL = 90%
$\Gamma(B^+ \to K^+ \pi^+ \pi^- \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(4.4 \pm 0.4) \times 10^{-7}$
$\Gamma(B^+ \to \phi K^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(7.9^{+2.1}_{-1.7}) \times 10^{-8}$
$\Gamma(B^0 \to \gamma\gamma)/\Gamma_{\text{total}}$		$<3.2 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to e^+ e^-)/\Gamma_{\text{total}}$		$<8.3 \times 10^{-8}$, CL = 90%
$\Gamma(B^0 \to e^+ e^- \gamma)/\Gamma_{\text{total}}$		$<1.2 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(3.9^{+1.6}_{-1.4}) \times 10^{-10}$
$\Gamma(B^0 \to \mu^+ \mu^- \gamma)/\Gamma_{\text{total}}$		$<1.6 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to \mu^+ \mu^- \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<5.3 \times 10^{-9}$, CL = 90%
$\Gamma(B^0 \to SP,\ S \to \mu^+ \mu^-,\ P \to \mu^+ \mu^-)/\Gamma_{\text{total}}$	[aa]	$<5.1 \times 10^{-9}$, CL = 90%
$\Gamma(B^0 \to \tau^+ \tau^-)/\Gamma_{\text{total}}$		$<4.1 \times 10^{-3}$, CL = 90%
$\Gamma(B^0 \to \pi^0 \ell^+ \ell^-)/\Gamma_{\text{total}}$		$<5.3 \times 10^{-8}$, CL = 90%
$\Gamma(B^0 \to \pi^0 e^+ e^-)/\Gamma_{\text{total}}$		$<8.4 \times 10^{-8}$, CL = 90%
$\Gamma(B^0 \to \pi^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<6.9 \times 10^{-8}$, CL = 90%
$\Gamma(B^0 \to \eta \ell^+ \ell^-)/\Gamma_{\text{total}}$		$<6.4 \times 10^{-8}$, CL = 90%
$\Gamma(B^0 \to \eta e^+ e^-)/\Gamma_{\text{total}}$		$<1.08 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to \eta \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<1.12 \times 10^{-7}$, CL = 90%
$\Gamma(B^0 \to \pi^0 \nu\overline{\nu})/\Gamma_{\text{total}}$		$<6.9 \times 10^{-5}$, CL = 90%
$\Gamma(B^0 \to K^0 \ell^+ \ell^-)/\Gamma_{\text{total}}$	[z]	$(3.1^{+0.8}_{-0.7}) \times 10^{-7}$
$\Gamma(B^0 \to K^0 e^+ e^-)/\Gamma_{\text{total}}$		$(1.6^{+1.0}_{-0.8}) \times 10^{-7}$
$\Gamma(B^0 \to K^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(3.39 \pm 0.34) \times 10^{-7}$
$\Gamma(B^0 \to K^0 \nu\overline{\nu})/\Gamma_{\text{total}}$		$<4.9 \times 10^{-5}$, CL = 90%
$\Gamma(B^0 \to \rho^0 \nu\overline{\nu})/\Gamma_{\text{total}}$		$<2.08 \times 10^{-4}$, CL = 90%
$\Gamma(B^0 \to K^*(892)^0 \ell^+ \ell^-)/\Gamma_{\text{total}}$	[z]	$(9.9^{+1.2}_{-1.1}) \times 10^{-7}$
$\Gamma(B^0 \to K^*(892)^0 e^+ e^-)/\Gamma_{\text{total}}$		$(1.03^{+0.19}_{-0.17}) \times 10^{-6}$
$\Gamma(B^0 \to K^*(892)^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(1.02 \pm 0.09) \times 10^{-6}$
$\Gamma(B^0 \to K^*(892)^0 \nu\overline{\nu})/\Gamma_{\text{total}}$		$<5.5 \times 10^{-5}$, CL = 90%
$\Gamma(B^0 \to \phi \nu\overline{\nu})/\Gamma_{\text{total}}$		$<1.27 \times 10^{-4}$, CL = 90%
$\Gamma(B^0 \to \text{invisible})/\Gamma_{\text{total}}$		$<2.4 \times 10^{-5}$, CL = 90%
$\Gamma(B^0 \to \nu\overline{\nu}\gamma)/\Gamma_{\text{total}}$		$<1.7 \times 10^{-5}$, CL = 90%
$\Gamma(B \to s e^+ e^-)/\Gamma_{\text{total}}$		$(6.7 \pm 1.7) \times 10^{-6}$ (S = 2.0)
$\Gamma(B \to s \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(4.3 \pm 1.0) \times 10^{-6}$
$\Gamma(B \to s \ell^+ \ell^-)/\Gamma_{\text{total}}$	[z]	$(5.8 \pm 1.3) \times 10^{-6}$ (S = 1.8)
$\Gamma(B \to \pi \ell^+ \ell^-)/\Gamma_{\text{total}}$		$<5.9 \times 10^{-8}$, CL = 90%
$\Gamma(B \to \pi e^+ e^-)/\Gamma_{\text{total}}$		$<1.10 \times 10^{-7}$, CL = 90%
$\Gamma(B \to \pi \mu^+ \mu^-)/\Gamma_{\text{total}}$		$<5.0 \times 10^{-8}$, CL = 90%
$\Gamma(B \to K e^+ e^-)/\Gamma_{\text{total}}$		$(4.4 \pm 0.6) \times 10^{-7}$
$\Gamma(B \to K^*(892) e^+ e^-)/\Gamma_{\text{total}}$		$(1.19 \pm 0.20) \times 10^{-6}$ (S = 1.2)
$\Gamma(B \to K \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(4.4 \pm 0.4) \times 10^{-7}$
$\Gamma(B \to K^*(892) \mu^+ \mu^-)/\Gamma_{\text{total}}$		$(1.06 \pm 0.09) \times 10^{-6}$

$\Gamma(B \to K\ell^+\ell^-)/\Gamma_{\text{total}}$		$(4.8 \pm 0.4) \times 10^{-7}$
$\Gamma(B \to K^*(892)\ell^+\ell^-)/\Gamma_{\text{total}}$		$(1.05 \pm 0.10) \times 10^{-6}$
$\Gamma(B \to K\nu\overline{\nu})/\Gamma_{\text{total}}$		$<1.7 \times 10^{-5}$, CL = 90%
$\Gamma(B \to K^*\nu\overline{\nu})/\Gamma_{\text{total}}$		$<7.6 \times 10^{-5}$, CL = 90%
$\Gamma(\overline{b} \to \overline{s}\overline{\nu}\nu)/\Gamma_{\text{total}}$		$<6.4 \times 10^{-4}$, CL = 90%
$\Gamma(\overline{b} \to e^+e^-\text{anything})/\Gamma_{\text{total}}$		—
$\Gamma(\overline{b} \to \mu^+\mu^-\text{anything})/\Gamma_{\text{total}}$		$<3.2 \times 10^{-4}$, CL = 90%
$\Gamma(\overline{b} \to \nu\overline{\nu}\text{anything})/\Gamma_{\text{total}}$		—
$\Gamma(B_s^0 \to \gamma\gamma)/\Gamma_{\text{total}}$		$<3.1 \times 10^{-6}$, CL = 90%
$\Gamma(B_s^0 \to \mu^+\mu^-)/\Gamma_{\text{total}}$		$(2.9^{+0.7}_{-0.6}) \times 10^{-9}$
$\Gamma(B_s^0 \to e^+e^-)/\Gamma_{\text{total}}$		$<2.8 \times 10^{-7}$, CL = 90%
$\Gamma(B_s^0 \to \mu^+\mu^-\mu^+\mu^-)/\Gamma_{\text{total}}$		$<1.2 \times 10^{-8}$, CL = 90%
$\Gamma(B_s^0 \to SP,\ S \to \mu^+\mu^-,\ P \to \mu^+\mu^-)/\Gamma_{\text{total}}$	[aa]	$<1.2 \times 10^{-8}$, CL = 90%
$\Gamma(B_s^0 \to \phi(1020)\mu^+\mu^-)/\Gamma_{\text{total}}$		$(8.2 \pm 1.2) \times 10^{-7}$
$\Gamma(B_s^0 \to \pi^+\pi^-\mu^+\mu^-)/\Gamma_{\text{total}}$		$(8.4 \pm 1.7) \times 10^{-8}$
$\Gamma(B_s^0 \to \phi\nu\overline{\nu})/\Gamma_{\text{total}}$		$<5.4 \times 10^{-3}$, CL = 90%

$\Delta T = 1$ WEAK NEUTRAL CURRENT FORBIDDEN

Allowed by higher-order electroweak interactions.

$\Gamma(t \to Zq(q{=}u,c))/\Gamma_{\text{total}}$	[bb]	$<5 \times 10^{-4}$, CL = 95%

NOTES

[a] C parity forbids this to occur as a single-photon process.

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

[c] Time-reversal invariance requires this to be 0° or 180°.

[d] This coefficient is zero if time invariance is not violated.

[e] Allowed by higher-order electroweak interactions.

[f] Violates CP in leading order. Test of direct CP violation since the indirect CP-violating and CP-conserving contributions are expected to be suppressed.

[g] In the 2010 *Review*, the values for these quantities were given using a measure of the asymmetry that was inconsistent with the usual definition.

[h] $\text{Re}(\epsilon'/\epsilon) = \epsilon'/\epsilon$ to a very good approximation provided the phases satisfy CPT invariance.

[*i*] This mode includes gammas from inner bremsstrahlung but not the direct emission mode $K_L^0 \to \pi^+\pi^-\gamma$(DE).

[*j*] Neglecting photon channels. See, *e.g.*, A. Pais and S.B. Treiman, Phys. Rev. **D12**, 2744 (1975).

[*k*] Derived from measured values of ϕ_{+-}, ϕ_{00}, $|\eta|$, $|m_{K_L^0} - m_{K_S^0}|$, and $\tau_{K_S^0}$, as described in the introduction to "Tests of Conservation Laws."

[*l*] The $|m_p - m_{\overline{p}}|/m_p$ and $|q_p + q_{\overline{p}}|/e$ are not independent, and both use the more precise measurement of $|q_{\overline{p}}/m_{\overline{p}}|/(q_p/m_p)$.

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

[*o*] A test of additive vs. multiplicative lepton family number conservation.

[*p*] The sign of Δm^2_{32} is not known at this time. The range quoted is for the absolute value.

[*q*] Derived from an analysis of neutrino-oscillation experiments.

[*r*] This limit is for either D^0 or $\overline{D}^0$ to pe^-.

[*s*] This limit is for either D^0 or $\overline{D}^0$ to $\overline{p}e^+$.

[*t*] The first limit is for $p \to$ anything or "disappearance" modes of a bound proton. The second entry, a rough range of limits, assumes the dominant decay modes are among those investigated. For antiprotons the best limit, inferred from the observation of cosmic ray $\overline{p}$'s is $\tau_{\overline{p}} > 10^7$ yr, the cosmic-ray storage time, but this limit depends on a number of assumptions. The best direct observation of stored antiprotons gives $\tau_{\overline{p}}/\mathrm{B}(\overline{p} \to e^-\gamma) > 7 \times 10^5$ yr.

[*u*] There is some controversy about whether nuclear physics and model dependence complicate the analysis for bound neutrons (from which the best limit comes). The first limit here is from reactor experiments with free neutrons.

[*v*] This is the best limit for the mode $e^- \to \nu\gamma$. The best limit for "electron disappearance" is 6.4×10^{24} yr.

[*x*] See the K_S^0 Particle Listings for the energy limits used in this measurement.

[*y*] See the K_L^0 Particle Listings for the energy limits used in this measurement.

[*z*] An ℓ indicates an e or a μ mode, not a sum over these modes.

[*aa*] Here S and P are the hypothetical scalar and pseudoscalar particles with masses of 2.5 GeV/c^2 and 214.3 MeV/c^2, respectively.

[*bb*] This limit is for $\Gamma(t \to Zq)/\Gamma(t \to Wb)$.