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 $m_{B_s^0} = 5366.77 \pm 0.24$ MeV

$m_{B_s^0} - m_B = 87.35 \pm 0.23$ MeV

Mean life $\tau = (1.497 \pm 0.015) \times 10^{-12}$ s

$c\tau = 449\ \mu$m

$\Delta\Gamma_{B_s^0} = \Gamma_{B_{sL}^0} - \Gamma_{B_{sH}^0} = (0.100 \pm 0.013) \times 10^{12}$ s^{-1}

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

$\Delta m_{B_s^0} = m_{B_{sH}^0} - m_{B_{sL}^0} = (17.69 \pm 0.08) \times 10^{12}\ \hbar$ s^{-1}

$= (116.4 \pm 0.5) \times 10^{-10}$ MeV

$x_s = \Delta m_{B_s^0}/\Gamma_{B_s^0} = 26.49 \pm 0.29$

$\chi_s = 0.499292 \pm 0.000016$

CP violation parameters in B_s^0

$\mathrm{Re}(\epsilon_{B_s^0}) \,/\, (1 + |\epsilon_{B_s^0}|^2) = (-2.6 \pm 1.6) \times 10^{-3}$

CP Violation phase $\beta_s = 0.08^{+0.05}_{-0.07}$

$A_{CP}(B_s \to \pi^+ K^-) = 0.39 \pm 0.17$

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($\overline{b} \to B_s^0$) $\times$ 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)	Confidence level	p (MeV/c)
D_s^- anything		(93 $\pm$25) %		–
$\ell\,\nu_\ell X$		(9.5 $\pm$ 2.7) %		–
$D_s^-\,\ell^+\,\nu_\ell$ anything	[a]	(7.9 $\pm$ 2.4) %		–
$D_{s1}(2536)^-\,\mu^+\,\nu_\mu$, $D_{s1}^- \to D^{*-}\,K_S^0$		(2.5 $\pm$ 0.7) $\times 10^{-3}$		–
$D_{s1}(2536)^-\,X\,\mu^+\,\nu$, $D_{s1}^- \to \overline{D}^0\,K^+$		(4.3 $\pm$ 1.7) $\times 10^{-3}$		–
$D_{s2}(2573)^-\,X\,\mu^+\,\nu$, $D_{s2}^- \to \overline{D}^0\,K^+$		(2.6 $\pm$ 1.2) $\times 10^{-3}$		–
$D_s^-\,\pi^+$		(3.2 $\pm$ 0.4) $\times 10^{-3}$		2320
$D_s^-\,\rho^+$		(7.4 $\pm$ 1.7) $\times 10^{-3}$		2248
$D_s^-\,\pi^+\,\pi^+\,\pi^-$		(6.5 $\pm$ 1.2) $\times 10^{-3}$		2301
$D_s^\mp\,K^\pm$		(2.9 $\pm$ 0.6) $\times 10^{-4}$		2293
$D_s^+\,D_s^-$		(5.3 $\pm$ 0.9) $\times 10^{-3}$		1824
$D_s^{*-}\,\pi^+$		(2.1 $\pm$ 0.6) $\times 10^{-3}$		2265
$D_s^{*-}\,\rho^+$		(1.03 $\pm$ 0.26) %		2190
$D_s^{*+}\,D_s^- + D_s^{*-}\,D_s^+$		(1.24 $\pm$ 0.21) %		1742
$D_s^{*+}\,D_s^{*-}$		(1.88 $\pm$ 0.34) %		1655
$D_s^{(*)+}\,D_s^{(*)-}$		(4.5 $\pm$ 1.4) %		–
$\overline{D}^0\,\overline{K}^*(892)^0$		(4.7 $\pm$ 1.4) $\times 10^{-4}$		2264
$J/\psi(1S)\,\phi$		(1.09 $^{+\ 0.28}_{-\ 0.23}$) $\times 10^{-3}$		1588
$J/\psi(1S)\,\pi^0$		$<$ 1.2 $\times 10^{-3}$	90%	1786
$J/\psi(1S)\,\eta$		(5.1 $^{+\ 1.3}_{-\ 1.0}$) $\times 10^{-4}$		1733
$J/\psi(1S)\,K^0$		(3.6 $\pm$ 0.8) $\times 10^{-5}$		1743
$J/\psi(1S)\,K^{*0}$		(9 $\pm$ 4) $\times 10^{-5}$		–
$J/\psi(1S)\,\eta'$		(3.7 $^{+\ 1.0}_{-\ 0.9}$) $\times 10^{-4}$		1612
$J/\psi(1S)\,f_0(980)$, $f_0 \to \pi^+\,\pi^-$		(1.36 $^{+\ 0.35}_{-\ 0.28}$) $\times 10^{-4}$		–
$J/\psi(1S)\,f_0(1370)$, $f_0 \to \pi^+\,\pi^-$		(3.4 $\pm$ 1.4) $\times 10^{-5}$		–
$\psi(2S)\,\phi$		(5.7 $^{+\ 1.8}_{-\ 1.6}$) $\times 10^{-4}$		1120
$\pi^+\,\pi^-$		$<$ 1.2 $\times 10^{-6}$	90%	2680
$\pi^0\,\pi^0$		$<$ 2.1 $\times 10^{-4}$	90%	2680
$\eta\,\pi^0$		$<$ 1.0 $\times 10^{-3}$	90%	2654
$\eta\,\eta$		$<$ 1.5 $\times 10^{-3}$	90%	2627
$\rho^0\,\rho^0$		$<$ 3.20 $\times 10^{-4}$	90%	2569

$\phi\rho^0$		$<$ 6.17	$\times 10^{-4}$	90%	2526
$\phi\phi$		(1.9 $^{+\ 0.6}_{-\ 0.5}$)	$\times 10^{-5}$		2482
$\pi^+ K^-$		(5.3 $\pm$ 1.0)	$\times 10^{-6}$		2659
$K^+ K^-$		(2.64 $\pm$ 0.28)	$\times 10^{-5}$		2638
$K^0 \overline{K}^0$		$<$ 6.6	$\times 10^{-5}$	90%	2637
$\overline{K}^*(892)^0 \rho^0$		$<$ 7.67	$\times 10^{-4}$	90%	2550
$\overline{K}^*(892)^0 K^*(892)^0$		(2.8 $\pm$ 0.7)	$\times 10^{-5}$		2531
$\phi K^*(892)^0$		$<$ 1.013	$\times 10^{-3}$	90%	2507
$p\overline{p}$		$<$ 5.9	$\times 10^{-5}$	90%	2514
$\gamma\gamma$	*B1*	$<$ 8.7	$\times 10^{-6}$	90%	2683
$\phi\gamma$		(5.7 $^{+\ 2.2}_{-\ 1.9}$)	$\times 10^{-5}$		2587

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

$\mu^+ \mu^-$	*B1*	$<$ 6.4	$\times 10^{-9}$	90%	2681
$e^+ e^-$	*B1*	$<$ 2.8	$\times 10^{-7}$	90%	2683
$e^\pm \mu^\mp$	*LF*	[*b*] $<$ 2.0	$\times 10^{-7}$	90%	2682
$\phi(1020)\mu^+ \mu^-$	*B1*	(1.23 $^{+\ 0.40}_{-\ 0.34}$)	$\times 10^{-6}$		2582
$\phi\nu\overline{\nu}$	*B1*	$<$ 5.4	$\times 10^{-3}$	90%	2587

B_s^*

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

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

Mass $m = 5415.4^{+2.4}_{-2.1}$ MeV (S = 3.0)

$m_{B_s^*} - m_{B_s} = 48.7^{+2.3}_{-2.1}$ 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 $m = 5829.4 \pm 0.7$ MeV

$m_{B_{s1}^0} - m_{B^{*+}} = 504.41 \pm 0.25$ MeV

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

$B^*_{s2}(5840)^0$

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

Mass $m = 5839.7 \pm 0.6$ MeV
$m_{B^{*0}_{s2}} - m_{B^0_{s1}} = 10.5 \pm 0.6$ MeV

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

NOTES

[a] Not a pure measurement. See note at head of B^0_s Decay Modes.

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