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 $m_{B_s^0} = 5366.3 \pm 0.6$ MeV (S = 1.1)

Mean life $\tau = (1.472^{+0.024}_{-0.026}) \times 10^{-12}$ s

$c\tau = 441\ \mu$m

$\Delta\Gamma_{B_s^0} = \Gamma_{B_{sL}^0} - \Gamma_{B_{sH}^0} = (0.062^{+0.034}_{-0.037}) \times 10^{12}\ \text{s}^{-1}$

$= 18.6^{+10.2}_{-11.1}\ \mu$m

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

$\Delta m_{B_s^0} = m_{B_{sH}^0} - m_{B_{sL}^0} = (17.77 \pm 0.12) \times 10^{12}\ \hbar\ \text{s}^{-1}$

$= (117.0 \pm 0.8) \times 10^{-10}$ MeV

$x_s = \Delta m_{B_s^0}/\Gamma_{B_s^0} = 26.2 \pm 0.5$

$\chi_s = 0.49927 \pm 0.00003$

CP violation parameters in B_s^0

$\text{Re}(\epsilon_{B_s^0}) / (1 + |\epsilon_{B_s^0}|^2) = (-0.9 \pm 2.6) \times 10^{-3}$

CP Violation phase $\beta_s = 0.47^{+0.13}_{-0.21}$ or $1.09^{+0.21}_{-0.13}$

These branching fractions all scale with B($\overline{b} \rightarrow B_s^0$), the LEP B_s^0 production fraction. The first four were evaluated using B($\overline{b} \rightarrow B_s^0$) = (10.7 ± 1.2)% and the rest assume B($\overline{b} \rightarrow B_s^0$) = 12%.

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

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_s^0 DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
D_s^- anything		(93 $\pm$25) %		–
$D_s^-\,\ell^+\,\nu_\ell$ anything	[a]	(7.9 $\pm$ 2.4) %		–
$D_{s1}(2536)^-\,\mu^+\,\nu_\mu X \times$ B($D_{s1}^- \to D^{*-}\,K_S^0$)		(2.4 $\pm$ 0.7) $\times 10^{-3}$		–
$D_s^-\,\pi^+$		(3.2 $\pm$ 0.5) $\times 10^{-3}$		2320
$D_s^-\,\pi^+\,\pi^+\,\pi^-$		(8.4 $\pm$ 3.3) $\times 10^{-3}$		2301
$D_s^\mp\,K^\pm$		(3.0 $\pm$ 0.7) $\times 10^{-4}$		2292
$D_s^+\,D_s^-$		(1.04 $\pm$ 0.35) %		1823
$D_s^{*+}\,D_s^-$		$<$ 12.1 %	90%	1742
$D_s^{*+}\,D_s^{*-}$		$<$ 25.7 %	90%	1655
$D_s^{(*)+}\,D_s^{(*)-}$		(4.0 $\pm$ 1.5) %		–
$J/\psi(1S)\,\phi$		(1.3 $\pm$ 0.4) $\times 10^{-3}$		1587
$J/\psi(1S)\,\pi^0$		$<$ 1.2 $\times 10^{-3}$	90%	1786
$J/\psi(1S)\,\eta$		$<$ 3.8 $\times 10^{-3}$	90%	1733
$\psi(2S)\,\phi$		(6.8 $\pm$ 2.7) $\times 10^{-4}$		1119
$\pi^+\,\pi^-$		$<$ 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%	2653
$\eta\,\eta$		$<$ 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
$\phi\,\phi$		(1.4 $\pm$ 0.8) $\times 10^{-5}$		2482
$\pi^+\,K^-$		(4.9 $\pm$ 1.0) $\times 10^{-6}$		2659
$K^+\,K^-$		(3.3 $\pm$ 0.9) $\times 10^{-5}$		2637
$\overline{K}^*(892)^0\,\rho^0$		$<$ 7.67 $\times 10^{-4}$	90%	2550
$\overline{K}^*(892)^0\,K^*(892)^0$		$<$ 1.681 $\times 10^{-3}$	90%	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 $^{+\ 2.2}_{-\ 1.9}$) $\times 10^{-5}$		2586
Lepton Family number (*LF*) violating modes or $\Delta B = 1$ weak neutral current (*B1*) modes				
$\mu^+\,\mu^-$	*B1*	$<$ 4.7 $\times 10^{-8}$	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*	$<$ 3.2 $\times 10^{-6}$	90%	2582
$\phi\,\nu\,\overline{\nu}$	*B1*	$<$ 5.4 $\times 10^{-3}$	90%	2586

B_s^*

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

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

Mass $m = 5415.4 \pm 1.4$ MeV (S = 2.5)
$m_{B_s^*} - m_{B_s} = 49.0 \pm 1.5$ MeV (S = 2.0)

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

$B_{s1}(5830)^0$

$I(J^P) = \frac{1}{2}(1^+)$
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	–

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

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

Mass $m = 5839.7 \pm 0.6$ MeV
$m_{B_{s2}^{*0}} - m_{B_{s1}^0} = 10.5 \pm 0.6$ 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_s^0 Decay Modes.

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