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 $\tau = (1.516 \pm 0.011) \times 10^{-12}$ s

$c\tau = 454.5$ μm

$\Delta\Gamma_{B_s^0} = \Gamma_{B_{sL}^0} - \Gamma_{B_{sH}^0} = (0.081 \pm 0.011) \times 10^{12}$ 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}

$= (1.164 \pm 0.005) \times 10^{-8}$ MeV

$x_s = \Delta m_{B_s^0}/\Gamma_{B_s^0} = 26.82 \pm 0.23$

$\chi_s = 0.499309 \pm 0.000012$

CP violation parameters in B_s^0

$\mathrm{Re}(\epsilon_{B_s^0}) \,/\, (1 + |\epsilon_{B_s^0}|^2) = (-4.3 \pm 1.4) \times 10^{-3}$

CP Violation phase $\beta_s = (4^{+10}_{-13}) \times 10^{-2}$

$A_{CP}(B_s \to \pi^+ K^-) = 0.29 \pm 0.07$

$A_{CP}(B_s^0 \to [K^+ K^-]_D \overline{K}^*(892)^0) = 0.04 \pm 0.16$

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

The branching fraction $B(B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell \text{anything})$ is not a pure measurement since the measured product branching fraction $B(\overline{b} \rightarrow B_s^0) \times B(B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell \text{anything})$ 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)	Scale factor/ Confidence level	p (MeV/c)
D_s^- anything		(93 ±25) %		–
$\ell \nu_\ell X$		(9.5 ± 2.7) %		–
$D_s^- \ell^+ \nu_\ell$ anything	[a]	(7.9 ± 2.4) %		–
$D_{s1}(2536)^- \mu^+ \nu_\mu$, $D_{s1}^- \rightarrow D^{*-} K_S^0$		(2.6 ± 0.7) $\times 10^{-3}$		–
$D_{s1}(2536)^- X \mu^+ \nu$, $D_{s1}^- \rightarrow \overline{D}^0 K^+$		(4.3 ± 1.7) $\times 10^{-3}$		–
$D_{s2}(2573)^- X \mu^+ \nu$, $D_{s2}^- \rightarrow \overline{D}^0 K^+$		(2.6 ± 1.2) $\times 10^{-3}$		–
$D_s^- \pi^+$		(3.04 ± 0.23) $\times 10^{-3}$		2320
$D_s^- \rho^+$		(7.0 ± 1.5) $\times 10^{-3}$		2248
$D_s^- \pi^+ \pi^+ \pi^-$		(6.3 ± 1.1) $\times 10^{-3}$		2301
$D_{s1}(2536)^- \pi^+$, $D_{s1}^- \rightarrow D_s^- \pi^+ \pi^-$		(2.5 ± 0.8) $\times 10^{-5}$		–
$D_s^\mp K^\pm$		(2.03 ± 0.28) $\times 10^{-4}$	S=1.3	2293
$D_s^- K^+ \pi^+ \pi^-$		(3.3 ± 0.7) $\times 10^{-4}$		2249
$D_s^+ D_s^-$		(5.3 ± 0.8) $\times 10^{-3}$		1824
$D_s^{*-} \pi^+$		(2.0 ± 0.5) $\times 10^{-3}$		2265
$D_s^{*-} \rho^+$		(9.7 ± 2.2) $\times 10^{-3}$		2191
$D_s^{*+} D_s^- + D_s^{*-} D_s^+$		(1.30 ± 0.22) %	S=1.1	1742
$D_s^{*+} D_s^{*-}$		(1.87 ± 0.30) %		1655
$D_s^{(*)+} D_s^{(*)-}$		(4.5 ± 1.4) %		–
$\overline{D}^0 \overline{K}^*(892)^0$		(4.7 ± 1.4) $\times 10^{-4}$		2264
$\overline{D}^0 K^+ K^-$		(4.2 ± 1.9) $\times 10^{-5}$		2242
$J/\psi(1S) \phi$		(10.0 $^{+3.2}_{-1.8}$) $\times 10^{-4}$		1588
$J/\psi(1S) \pi^0$		< 1.2 $\times 10^{-3}$	CL=90%	1786
$J/\psi(1S) \eta$		(4.0 ± 0.7) $\times 10^{-4}$	S=1.3	1733
$J/\psi(1S) K_S^0$		(2.1 ± 0.6) $\times 10^{-5}$	S=2.1	1743
$J/\psi(1S) K^*(892)^0$		(4.4 ± 0.9) $\times 10^{-5}$		1637

$J/\psi(1S)\eta'$		$(3.4 \pm 0.5) \times 10^{-4}$		1612
$J/\psi(1S)\pi^+\pi^-$		$(2.0 {}^{+0.6}_{-0.4}) \times 10^{-4}$		1775
$J/\psi(1S)f_0(980)$, $f_0 \to \pi^+\pi^-$		$(1.29 {}^{+0.40}_{-0.23}) \times 10^{-4}$		–
$J/\psi(1S)f_0(1370)$, $f_0 \to \pi^+\pi^-$		$(3.9 {}^{+0.9}_{-1.7}) \times 10^{-5}$		–
$J/\psi(1S)f_2(1270)$, $f_2 \to \pi^+\pi^-$		$(10 {}^{+5}_{-4}) \times 10^{-7}$		–
$J/\psi(1S)\pi^+\pi^-$ (nonresonant)		$(1.7 {}^{+1.1}_{-0.4}) \times 10^{-5}$		1775
$J/\psi(1S)f_2'(1525)$		$(2.6 {}^{+0.9}_{-0.6}) \times 10^{-4}$		1304
$\psi(2S)f_2'(1525)$		$(2.1 {}^{+1.0}_{-0.8}) \times 10^{-4}$		587
$\psi(2S)\phi$		$(5.0 {}^{+1.6}_{-1.0}) \times 10^{-4}$		1120
$\pi^+\pi^-$		$(7.6 \pm 1.9) \times 10^{-7}$	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
$\phi\rho^0$		$< 6.17 \times 10^{-4}$	CL=90%	2526
$\phi\phi$		$(1.8 {}^{+0.6}_{-0.4}) \times 10^{-5}$		2482
π^+K^-		$(5.5 \pm 0.6) \times 10^{-6}$		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
$\overline{K}^*(892)^0\rho^0$		$< 7.67 \times 10^{-4}$	CL=90%	2550
$\overline{K}^*(892)^0K^*(892)^0$		$(2.8 \pm 0.7) \times 10^{-5}$		2531
$\phi K^*(892)^0$		$< 1.013 \times 10^{-3}$	CL=90%	2507
$p\overline{p}$		$< 5.9 \times 10^{-5}$	CL=90%	2514
$\gamma\gamma$	*B1*	$< 8.7 \times 10^{-6}$	CL=90%	2683
$\phi\gamma$		$(3.6 \pm 0.4) \times 10^{-5}$		2587

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

$\mu^+\mu^-$	*B1*	$(3.2 {}^{+1.5}_{-1.2}) \times 10^{-9}$		2681
e^+e^-	*B1*	$< 2.8 \times 10^{-7}$	CL=90%	2683
$e^\pm\mu^\mp$	*LF*	[b] $< 2.0 \times 10^{-7}$	CL=90%	2682
$\phi(1020)\mu^+\mu^-$	*B1*	$(1.13 {}^{+0.40}_{-0.29}) \times 10^{-6}$		2582
$\phi\nu\overline{\nu}$	*B1*	$< 5.4 \times 10^{-3}$	CL=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 $m = 5828.7 \pm 0.4$ MeV (S = 1.2)

$m_{B_{s1}^0} - m_{B^{*+}} = 504.41 \pm 0.25$ 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 $m = 5839.96 \pm 0.20$ MeV

$m_{B_{s2}^{*0}} - m_{B_{s1}^0} = 10.5 \pm 0.6$ MeV

Full width $\Gamma = 1.6 \pm 0.5$ MeV

$B_{s2}^*(5840)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
B^+K^-	dominant	253

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.