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

NODE=MXXX046

B_s^0

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

NODE=S086

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

Mass $m_{B_s^0} = 5366.3 \pm 0.6$ MeV

NODE=S086M;DTYPE=M

Mean life $\tau = (1.470^{+0.026}_{-0.027}) \times 10^{-12}$ s

NODE=S086T;DTYPE=T;OUR EVAL; → NOT CHECKED ←

$c\tau = 441\ \mu$m

NODE=S086CTA;DTYPE=C;OUR EVAL

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

CLUMP=Y

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

NODE=S086D;DTYPE=y;CLUMP=Y

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

NODE=S086D1;DTYPE=y;CLUMP=Y;OUR EVAL;→ NOT CHECKED ←

$x_s = \Delta m_{B_s^0} / \Gamma_{B_s^0} = 26.1 \pm 0.5$

NODE=S086DG;DTYPE=y;CLUMP=Y;OUR EVAL;→ NOT CHECKED ←

$\chi_s = 0.49927 \pm 0.00003$

NODE=S086CHS;DTYPE=y;CLUMP=Y; OUR EVAL;→ NOT CHECKED ←

CP violation parameters in B_s^0

CLUMP=C

$\mathrm{Re}(\epsilon_{B_s^0}) \,/\, (1 + |\epsilon_{B_s^0}|^2) = (-0.75 \pm 2.52) \times 10^{-3}$

NODE=S086EPS;DTYPE=v;CLUMP=C; OUR EVAL;→ NOT CHECKED ←

CP Violation phase β_s in the B_s^0 System $= 0.35^{+0.20}_{-0.24}$

NODE=S086PHS;DTYPE=v;CLUMP=C

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

NODE=S086215;NODE=S086

The branching fraction $\mathrm{B}(B_s^0 \to D_s^- \ell^+ \nu_\ell \text{anything})$ is not a pure measurement since the measured product branching fraction $\mathrm{B}(\overline{b} \to B_s^0) \times \mathrm{B}(B_s^0 \to D_s^- \ell^+ \nu_\ell \text{anything})$ was used to determine $\mathrm{B}(\overline{b} \to B_s^0)$, 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) %		–	DESIG=8
$D_s^- \ell^+ \nu_\ell$ anything	[a]	(7.9 ± 2.4) %		–	DESIG=4
$D_s^- \pi^+$		$(3.2 \pm 0.9) \times 10^{-3}$	S=1.3	2320	DESIG=5
$D_s^- \pi^+ \pi^+ \pi^-$		$(8.4 \pm 3.3) \times 10^{-3}$		2301	DESIG=32
$D_s^{(*)+} D_s^{(*)-}$		$(4.9\ ^{+2.9}_{-2.5})$ %	S=1.2	–	DESIG=24
$D_s^+ D_s^-$		(1.1 ± 0.4) %		1823	DESIG=33
$D_s^{*+} D_s^-$		< 12.1 %	CL=90%	1742	DESIG=34
$D_s^{*+} D_s^{*-}$		< 25.7 %	CL=90%	1655	DESIG=35
$J/\psi(1S)\phi$		$(9.3 \pm 3.3) \times 10^{-4}$		1587	DESIG=7
$J/\psi(1S)\pi^0$		$< 1.2 \times 10^{-3}$	CL=90%	1786	DESIG=21
$J/\psi(1S)\eta$		$< 3.8 \times 10^{-3}$	CL=90%	1733	DESIG=22
$\psi(2S)\phi$		$(4.8 \pm 2.2) \times 10^{-4}$		1119	DESIG=6
$\pi^+\pi^-$		$< 1.7 \times 10^{-6}$	CL=90%	2680	DESIG=16
$\pi^0\pi^0$		$< 2.1 \times 10^{-4}$	CL=90%	2680	DESIG=14

$\eta\pi^0$			$< 1.0 \times 10^{-3}$	CL=90%	2653	DESIG=13
$\eta\eta$			$< 1.5 \times 10^{-3}$	CL=90%	2627	DESIG=12
$\rho^0\rho^0$			$< 3.20 \times 10^{-4}$	CL=90%	2569	DESIG=25
$\phi\rho^0$			$< 6.17 \times 10^{-4}$	CL=90%	2526	DESIG=28
$\phi\phi$			$(1.4 \pm 0.8) \times 10^{-5}$		2482	DESIG=30
π^+K^-			$< 5.6 \times 10^{-6}$	CL=90%	2659	DESIG=9
K^+K^-			$(3.3 \pm 0.9) \times 10^{-5}$		2637	DESIG=10
$\overline{K}^*(892)^0\rho^0$			$< 7.67 \times 10^{-4}$	CL=90%	2550	DESIG=26
$\overline{K}^*(892)^0 K^*(892)^0$			$< 1.681 \times 10^{-3}$	CL=90%	2531	DESIG=27
$\phi K^*(892)^0$			$< 1.013 \times 10^{-3}$	CL=90%	2507	DESIG=29
$p\overline{p}$			$< 5.9 \times 10^{-5}$	CL=90%	2514	DESIG=17
$\gamma\gamma$	*B1*		$< 5.3 \times 10^{-5}$	CL=90%	2683	DESIG=11
$\phi\gamma$			$< 1.2 \times 10^{-4}$	CL=90%	2586	DESIG=18

Lepton Family number (*LF*) violating modes or $\Delta B = 1$ weak neutral current (*B1*) modes NODE=S086;CLUMP=B

$\mu^+\mu^-$	*B1*		$< 4.7 \times 10^{-8}$	CL=90%	2681	DESIG=15
e^+e^-	*B1*		$< 5.4 \times 10^{-5}$	CL=90%	2683	DESIG=20
$e^\pm\mu^\mp$	*LF*	[b]	$< 6.1 \times 10^{-6}$	CL=90%	2682	DESIG=23
$\phi(1020)\mu^+\mu^-$	*B1*		$< 3.2 \times 10^{-6}$	CL=90%	2582	DESIG=31
$\phi\nu\overline{\nu}$	*B1*		$< 5.4 \times 10^{-3}$	CL=90%	2586	DESIG=19

B_s^*

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

NODE=S087

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

Mass $m = 5412.8 \pm 1.3$ MeV (S = 1.2) NODE=S087M;DTYPE=M

$m_{B_s^*} - m_{B_s} = 46.5 \pm 1.2$ MeV (S = 1.1) NODE=S087DM;DTYPE=D

B_s^* DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$B_s\gamma$	dominant	–	NODE=S087215;DESIG=1;OUR EST; → NOT CHECKED ←

$B_{s1}(5830)^0$

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

I, J, P need confirmation.

NODE=M187

Mass $m = 5829.4 \pm 0.7$ MeV NODE=M187M;DTYPE=M

$m_{B_{s1}^0} - m_{B^{*+}} = 504.41 \pm 0.25$ MeV NODE=M187DM;DTYPE=D

$B_{s1}(5830)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$B^{*+}K^-$	dominant	–	NODE=M187215;DESIG=1

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

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

I, J, P need confirmation.

NODE=M186

Mass $m = 5839.7 \pm 0.6$ MeV NODE=M186M;DTYPE=M

$m_{B_{s2}^{*0}} - m_{B_{s1}^0} = 10.5 \pm 0.6$ MeV NODE=M186DM;DTYPE=D

$B_{s2}^*(5840)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
B^+K^-	dominant	252	NODE=M186215;DESIG=1

NOTES

[a] Not a pure measurement. See note at head of B_s^0 Decay Modes. LINKAGE=X86

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