

$b\bar{b}$ MESONS (including possibly non- $q\bar{q}$ states)

NODE=MXXX030

 $\eta_b(1S)$

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

Mass $m = 9398.7 \pm 2.0$ MeV ($S = 1.5$)Full width $\Gamma = 10^{+5}_{-4}$ MeV

NODE=M171

NODE=M171M;DTYPE=M

NODE=M171W;DTYPE=G

$\eta_b(1S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
hadrons	seen		—
$3h^+ 3h^-$	not seen		4672
$2h^+ 2h^-$	not seen		4689
$4h^+ 4h^-$	not seen		4648
$\gamma\gamma$	not seen		4699
$\mu^+ \mu^-$	$< 9 \times 10^{-3}$	90%	4698
$\tau^+ \tau^-$	$< 8 \%$	90%	4350

NODE=M171225;DESIG=7

DESIG=1;OUR EST;→ UNCHECKED ←

DESIG=2;OUR EST;→ UNCHECKED ←

DESIG=4;OUR EST;→ UNCHECKED ←

DESIG=3;OUR EST;→ UNCHECKED ←

DESIG=5

DESIG=6

 $\Upsilon(1S)$

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

Mass $m = 9460.40 \pm 0.10$ MeVFull width $\Gamma = 54.02 \pm 1.25$ keV

NODE=M049

NODE=M049M;DTYPE=M

NODE=M049W;DTYPE=G;OUR EVAL;
→ UNCHECKED ←

$\Upsilon(1S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\tau^+ \tau^-$	(2.60 $\pm$ 0.10) %		4384
$e^+ e^-$	(2.39 $\pm$ 0.08) %		4730
$\mu^+ \mu^-$	(2.48 $\pm$ 0.04) %		4729

NODE=M049215;DESIG=3

DESIG=2

DESIG=1

Hadronic decays

$g g g$	(81.7 $\pm$ 0.7) %		—
$\gamma g g$	(2.2 $\pm$ 0.6) %		—
$\eta'(958)$ anything	(2.94 $\pm$ 0.24) %		—
$J/\psi(1S)$ anything	(5.4 $\pm$ 0.4) $\times 10^{-4}$	$S=1.4$	4223
$J/\psi(1S)\eta_c$	< 2.2	$\times 10^{-6}$ CL=90%	3623
$J/\psi(1S)\chi_{c0}$	< 3.4	$\times 10^{-6}$ CL=90%	3429
$J/\psi(1S)\chi_{c1}$	(3.9 $\pm$ 1.2) $\times 10^{-6}$		3382
$J/\psi(1S)\chi_{c2}$	< 1.4	$\times 10^{-6}$ CL=90%	3359
$J/\psi(1S)\eta_c(2S)$	< 2.2	$\times 10^{-6}$ CL=90%	3317
$J/\psi(1S)X(3940)$	< 5.4	$\times 10^{-6}$ CL=90%	3148
$J/\psi(1S)X(4160)$	< 5.4	$\times 10^{-6}$ CL=90%	3020
$X(4350)$ anything, $X \rightarrow J/\psi(1S)\phi$	< 8.1	$\times 10^{-6}$ CL=90%	—
$T_{c\bar{c}1}(3900)^\pm$ anything, $T_{c\bar{c}1} \rightarrow J/\psi(1S)\pi^\pm$	< 1.3	$\times 10^{-5}$ CL=90%	—
$T_{c\bar{c}1}(4200)^\pm$ anything, $Z_c \rightarrow J/\psi(1S)\pi^\pm$	< 6.0	$\times 10^{-5}$ CL=90%	—
$T_{c\bar{c}1}(4430)^\pm$ anything, $T_{c\bar{c}1} \rightarrow J/\psi(1S)\pi^\pm$	< 4.9	$\times 10^{-5}$ CL=90%	—
$X_{cs}^\pm$ anything, $X \rightarrow J/\psi K^\pm$	< 5.7	$\times 10^{-6}$ CL=90%	—
$\psi(4230)$ anything, $\psi \rightarrow J/\psi(1S)\pi^+\pi^-$	< 3.8	$\times 10^{-5}$ CL=90%	—
$\psi(4230)$ anything, $\psi \rightarrow J/\psi(1S)K^+K^-$	< 7.5	$\times 10^{-6}$ CL=90%	—
$\chi_{c1}(4140)$ anything, $\chi_{c1} \rightarrow J/\psi(1S)\phi$	< 5.2	$\times 10^{-6}$ CL=90%	—
χ_{c0} anything	< 4	$\times 10^{-3}$ CL=90%	—

NODE=M049;CLUMP=A

DESIG=117

DESIG=118

DESIG=73

DESIG=12

DESIG=146

DESIG=147

DESIG=148

DESIG=149

DESIG=150

DESIG=151

DESIG=152

DESIG=167

DESIG=168

DESIG=169

DESIG=170

DESIG=173

DESIG=161

DESIG=165

DESIG=166

DESIG=5

χ_{c1} anything	$(1.90 \pm 0.35) \times 10^{-4}$	—	DESIG=6
$\chi_{c1}(1P)X_{tetra}$	$< 3.78 \times 10^{-5}$	CL=90%	DESIG=175
χ_{c2} anything	$(2.8 \pm 0.8) \times 10^{-4}$	—	DESIG=7
$\psi(2S)$ anything	$(1.23 \pm 0.20) \times 10^{-4}$	—	DESIG=8
$\psi(2S)\eta_c$	$< 3.6 \times 10^{-6}$	CL=90%	3345 DESIG=153
$\psi(2S)\chi_{c0}$	$< 6.5 \times 10^{-6}$	CL=90%	3124 DESIG=154
$\psi(2S)\chi_{c1}$	$< 4.5 \times 10^{-6}$	CL=90%	3070 DESIG=155
$\psi(2S)\chi_{c2}$	$< 2.1 \times 10^{-6}$	CL=90%	3043 DESIG=156
$\psi(2S)\eta_c(2S)$	$< 3.2 \times 10^{-6}$	CL=90%	2994 DESIG=157
$\psi(2S)X(3940)$	$< 2.9 \times 10^{-6}$	CL=90%	2797 DESIG=158
$\psi(2S)X(4160)$	$< 2.9 \times 10^{-6}$	CL=90%	2645 DESIG=159
$\psi(4230)$ anything, $\psi \rightarrow$	$< 7.9 \times 10^{-5}$	CL=90%	— DESIG=162
$\psi(2S)\pi^+\pi^-$			
$\psi(4360)$ anything, $\psi \rightarrow$	$< 5.2 \times 10^{-5}$	CL=90%	— DESIG=163
$\psi(2S)\pi^+\pi^-$			
$\psi(4660)$ anything, $\psi \rightarrow$	$< 2.2 \times 10^{-5}$	CL=90%	— DESIG=164
$\psi(2S)\pi^+\pi^-$			
$T_{c\bar{c}}(4050)^\pm$ anything, $X \rightarrow$	$< 8.8 \times 10^{-5}$	CL=90%	— DESIG=171
$\psi(2S)\pi^\pm$			
$T_{c\bar{c}1}(4430)^\pm$ anything,	$< 6.7 \times 10^{-5}$	CL=90%	— DESIG=172
$T_{c\bar{c}1} \rightarrow \psi(2S)\pi^\pm$			
$\chi_{c1}(3872)$ anything	$< 2.2 \times 10^{-4}$	CL=90%	— DESIG=194
$T_{c\bar{c}1}(4200)^+ T_{c\bar{c}1}(4200)^-$	$< 2.23 \times 10^{-5}$	CL=90%	— DESIG=178
$T_{c\bar{c}1}(3900)^\pm T_{c\bar{c}1}(4200)^\mp$	$< 8.1 \times 10^{-6}$	CL=90%	— DESIG=179
$T_{c\bar{c}1}(3900)^+ T_{c\bar{c}1}(3900)^-$	$< 1.8 \times 10^{-6}$	CL=90%	— DESIG=180
$T_{c\bar{c}}(4050)^+ T_{c\bar{c}}(4050)^-$	$< 1.58 \times 10^{-5}$	CL=90%	— DESIG=181
$T_{c\bar{c}}(4250)^+ T_{c\bar{c}}(4250)^-$	$< 2.66 \times 10^{-5}$	CL=90%	— DESIG=182
$T_{c\bar{c}}(4050)^\pm T_{c\bar{c}}(4250)^\mp$	$< 4.42 \times 10^{-5}$	CL=90%	— DESIG=183
$T_{c\bar{c}1}(4430)^+ T_{c\bar{c}1}(4430)^-$	$< 2.03 \times 10^{-5}$	CL=90%	— DESIG=184
$T_{c\bar{c}}(4055)^\pm T_{c\bar{c}}(4055)^\mp$	$< 2.33 \times 10^{-5}$	CL=90%	— DESIG=186
$T_{c\bar{c}}(4055)^\pm T_{c\bar{c}1}(4430)^\mp$	$< 4.55 \times 10^{-5}$	CL=90%	— DESIG=189
$\rho\pi$	$< 3.68 \times 10^{-6}$	CL=90%	4697 DESIG=11
$\omega\pi^0$	$< 3.90 \times 10^{-6}$	CL=90%	4697 DESIG=131
$\pi^+\pi^-$	$< 5 \times 10^{-4}$	CL=90%	4728 DESIG=23
K^+K^-	$< 5 \times 10^{-4}$	CL=90%	4704 DESIG=24
$p\bar{p}$	$< 5 \times 10^{-4}$	CL=90%	4636 DESIG=25
$\pi^+\pi^-\pi^0$	$(2.1 \pm 0.8) \times 10^{-6}$		4725 DESIG=72
ϕK^+K^-	$(2.4 \pm 0.5) \times 10^{-6}$		4623 DESIG=136
$\omega\pi^+\pi^-$	$(4.5 \pm 1.0) \times 10^{-6}$		4694 DESIG=137
$K^*(892)^0 K^- \pi^+ + \text{c.c.}$	$(4.4 \pm 0.8) \times 10^{-6}$		4667 DESIG=138
$\phi f'_2(1525)$	$< 1.63 \times 10^{-6}$	CL=90%	4551 DESIG=139
$\omega f_2(1270)$	$< 1.79 \times 10^{-6}$	CL=90%	4611 DESIG=140
$\rho(770) a_2(1320)$	$< 2.24 \times 10^{-6}$	CL=90%	4605 DESIG=141
$K^*(892)^0 \bar{K}_2^*(1430)^0 + \text{c.c.}$	$(3.0 \pm 0.8) \times 10^{-6}$		4579 DESIG=142
$K_1(1270)^\pm K^\mp$	$< 2.41 \times 10^{-6}$	CL=90%	4634 DESIG=143
$K_1(1400)^\pm K^\mp$	$(1.0 \pm 0.4) \times 10^{-6}$		4613 DESIG=144
$b_1(1235)^\pm \pi^\mp$	$< 1.25 \times 10^{-6}$	CL=90%	4649 DESIG=145
$\pi^+\pi^-\pi^0\pi^0$	$(1.28 \pm 0.30) \times 10^{-5}$		4720 DESIG=132
$K_S^0 K^+ \pi^- + \text{c.c.}$	$(1.6 \pm 0.4) \times 10^{-6}$		4696 DESIG=133
$K^*(892)^0 \bar{K}^0 + \text{c.c.}$	$(2.9 \pm 0.9) \times 10^{-6}$		4675 DESIG=134
$K^*(892)^- K^+ + \text{c.c.}$	$< 1.11 \times 10^{-6}$	CL=90%	4675 DESIG=135
$f_1(1285)$ anything	$(4.6 \pm 3.1) \times 10^{-3}$	—	DESIG=174
$D^*(2010)^\pm$ anything	$(2.52 \pm 0.20) \%$	—	DESIG=30
$f_1(1285)X_{tetra}$	$< 6.24 \times 10^{-5}$	CL=90%	— DESIG=176
2H anything	$(2.85 \pm 0.25) \times 10^{-5}$	—	DESIG=107
Sum of 100 exclusive modes	$(1.200 \pm 0.017) \%$	—	DESIG=128

Radiative decays

NODE=M049;CLUMP=B

$\gamma\pi^+\pi^-$	(6.3 $\pm$ 1.8) $\times 10^{-5}$	4728	DESIG=70
$\gamma\pi^0\pi^0$	(1.7 $\pm$ 0.7) $\times 10^{-5}$	4728	DESIG=71
$\gamma\pi\pi$ (S-wave)	(4.6 $\pm$ 0.7) $\times 10^{-5}$	4728	DESIG=190
$\gamma\pi^0\eta$	< 2.4 $\times 10^{-6}$ CL=90%	4713	DESIG=111
γK^+K^-	[a] (1.14 $\pm$ 0.13) $\times 10^{-5}$	4704	DESIG=102
$\gamma p\bar{p}$	[b] < 6 $\times 10^{-6}$ CL=90%	4636	DESIG=103
$\gamma 2h^+2h^-$	(7.0 $\pm$ 1.5) $\times 10^{-4}$	4720	DESIG=20
$\gamma 3h^+3h^-$	(5.4 $\pm$ 2.0) $\times 10^{-4}$	4703	DESIG=21
$\gamma 4h^+4h^-$	(7.4 $\pm$ 3.5) $\times 10^{-4}$	4679	DESIG=22
$\gamma\pi^+\pi^-K^+K^-$	(2.9 $\pm$ 0.9) $\times 10^{-4}$	4686	DESIG=14
$\gamma 2\pi^+2\pi^-$	(2.5 $\pm$ 0.9) $\times 10^{-4}$	4720	DESIG=13
$\gamma 3\pi^+3\pi^-$	(2.5 $\pm$ 1.2) $\times 10^{-4}$	4703	DESIG=17
$\gamma 2\pi^+2\pi^-K^+K^-$	(2.4 $\pm$ 1.2) $\times 10^{-4}$	4659	DESIG=18
$\gamma\pi^+\pi^-p\bar{p}$	(1.5 $\pm$ 0.6) $\times 10^{-4}$	4604	DESIG=15
$\gamma 2\pi^+2\pi^-p\bar{p}$	(4 $\pm$ 6) $\times 10^{-5}$	4563	DESIG=19
$\gamma 2K^+2K^-$	(2.0 $\pm$ 2.0) $\times 10^{-5}$	4601	DESIG=16
$\gamma\eta'(958)$	< 1.9 $\times 10^{-6}$ CL=90%	4682	DESIG=55
$\gamma\eta$	< 1.0 $\times 10^{-6}$ CL=90%	4714	DESIG=54
$\gamma f_0(980)$	< 3 $\times 10^{-5}$ CL=90%	4678	DESIG=105
$\gamma f_2'(1525)$	(2.9 $\pm$ 0.6) $\times 10^{-5}$	4609	DESIG=52
$\gamma f_2(1270)$	(1.01 $\pm$ 0.06) $\times 10^{-4}$	4644	DESIG=51
$\gamma\eta(1405)$	< 8.2 $\times 10^{-5}$ CL=90%	4625	DESIG=65
$\gamma f_0(1500)$	< 1.5 $\times 10^{-5}$ CL=90%	4608	DESIG=108
$\gamma f_0(1500) \rightarrow \gamma K^+K^-$	(1.0 $\pm$ 0.4) $\times 10^{-5}$	—	DESIG=192
$\gamma f_0(1710)$	< 2.6 $\times 10^{-4}$ CL=90%	4571	DESIG=53
$\gamma f_0(1710) \rightarrow \gamma K^+K^-$	(1.01 $\pm$ 0.32) $\times 10^{-5}$	—	DESIG=112
$\gamma f_0(1710) \rightarrow \gamma\pi^+\pi^-$	(5.3 $\pm$ 2.0) $\times 10^{-6}$	—	DESIG=191
$\gamma f_0(1710) \rightarrow \gamma\pi^0\pi^0$	< 1.4 $\times 10^{-6}$ CL=90%	—	DESIG=109
$\gamma f_0(1710) \rightarrow \gamma\eta\eta$	< 1.8 $\times 10^{-6}$ CL=90%	—	DESIG=110
$\gamma f_4(2050)$	< 5.3 $\times 10^{-5}$ CL=90%	4515	DESIG=104
$\gamma f_0(2200) \rightarrow \gamma K^+K^-$	< 2 $\times 10^{-4}$ CL=90%	4475	DESIG=69
$\gamma f_J(2220) \rightarrow \gamma K^+K^-$	< 8 $\times 10^{-7}$ CL=90%	4469	DESIG=60
$\gamma f_J(2220) \rightarrow \gamma\pi^+\pi^-$	< 6 $\times 10^{-7}$ CL=90%	—	DESIG=61
$\gamma f_J(2220) \rightarrow \gamma p\bar{p}$	< 1.1 $\times 10^{-6}$ CL=90%	—	DESIG=62
$\gamma\eta(2225) \rightarrow \gamma\phi\phi$	< 3 $\times 10^{-3}$ CL=90%	4469	DESIG=68
$\gamma\eta_c(1S)$	< 2.9 $\times 10^{-5}$ CL=90%	4260	DESIG=119
$\gamma\eta_c(2S)$	< 4 $\times 10^{-4}$ CL=90%	4031	DESIG=193
$\gamma\chi_{c0}$	< 6.6 $\times 10^{-5}$ CL=90%	4114	DESIG=120
$\gamma\chi_{c1}$	(4.7 $\pm$ 2.4 $\pm$ 1.9) $\times 10^{-5}$	4079	DESIG=121
$\gamma\chi_{c2}$	< 7.6 $\times 10^{-6}$ CL=90%	4062	DESIG=122
$\gamma\chi_{c1}(3872)$	< 4 $\times 10^{-5}$ CL=90%	3938	DESIG=195
$\gamma\chi_{c1}(3872), \chi_{c1} \rightarrow \pi^+\pi^-\pi^0 J/\psi$	< 2.8 $\times 10^{-6}$ CL=90%	—	DESIG=124
$\gamma\chi_{c0}(3915) \rightarrow \omega J/\psi$	< 3.0 $\times 10^{-6}$ CL=90%	—	DESIG=125
$\gamma\chi_{c1}(4140) \rightarrow \phi J/\psi$	< 2.2 $\times 10^{-6}$ CL=90%	—	DESIG=126
$\gamma X\bar{X}(m_X < 3.1 \text{ GeV})$	[c] < 1 $\times 10^{-3}$ CL=90%	—	DESIG=67
$\gamma X\bar{X}(m_X < 4.5 \text{ GeV})$	[d] < 2.4 $\times 10^{-4}$ CL=90%	—	DESIG=127
$\gamma X \rightarrow \gamma + \geq 4 \text{ prongs}$	[e] < 1.78 $\times 10^{-4}$ CL=95%	—	DESIG=113
$\gamma A^0 \rightarrow \gamma\mu^+\mu^-$	[f] < 9 $\times 10^{-6}$ CL=90%	—	DESIG=114
$\gamma A^0 \rightarrow \gamma\tau^+\tau^-$	[a] < 1.30 $\times 10^{-4}$ CL=90%	—	DESIG=115
$\gamma A^0 \rightarrow \gamma g g$	[g] < 1 % CL=90%	—	DESIG=129
$\gamma A^0 \rightarrow \gamma s\bar{s}$	[g] < 1 $\times 10^{-3}$ CL=90%	—	DESIG=130

Lepton Family number (LF) violating modes

NODE=M049;CLUMP=C

$e^\pm\mu^\mp$	LF	< 3.9 $\times 10^{-7}$ CL=90%	4730	DESIG=196
$\mu^\pm\tau^\mp$	LF	< 2.7 $\times 10^{-6}$ CL=90%	4563	DESIG=116
$e^\pm\tau^\mp$	LF	< 2.7 $\times 10^{-6}$ CL=90%	4563	DESIG=197
$\gamma e^\pm\mu^\mp$	LF	< 4.2 $\times 10^{-7}$ CL=90%	4730	DESIG=198
$\gamma\mu^\pm\tau^\mp$	LF	< 6.1 $\times 10^{-6}$ CL=90%	4563	DESIG=199
$\gamma e^\pm\tau^\mp$	LF	< 6.5 $\times 10^{-6}$ CL=90%	4563	DESIG=200

Other decays

invisible	< 3.0	$\times 10^{-4}$	CL=90%	—
hadrons	(96 $\pm$ 4)	%		—

NODE=M049;CLUMP=D

DESIG=106

DESIG=101

 $\chi_{b0}(1P)$

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

 J needs confirmation.

NODE=M076

$$\text{Mass } m = 9859.44 \pm 0.42 \pm 0.31 \text{ MeV}$$

NODE=M076M;DTYPE=M;OUR EVAL;
→ UNCHECKED ←

$\chi_{b0}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma \Upsilon(1S)$	(1.94 $\pm$ 0.27) %		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 $\pm$ 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 $\pm$ 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
$J/\psi(1S)$ anything	< 2.3 $\times 10^{-3}$	90%	—

NODE=M076215;DESIG=1

DESIG=2

DESIG=3

DESIG=4

DESIG=5

DESIG=6

DESIG=7

DESIG=8

DESIG=9

DESIG=10

DESIG=11

DESIG=12

DESIG=13

DESIG=14

DESIG=15

DESIG=16

DESIG=17

DESIG=18

DESIG=19

DESIG=20

 $\chi_{b1}(1P)$

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

 J needs confirmation.

NODE=M077

$$\text{Mass } m = 9892.78 \pm 0.26 \pm 0.31 \text{ MeV}$$

NODE=M077M;DTYPE=M;OUR EVAL;
→ UNCHECKED ←

$$m_{\chi_{b1}(1P)} - m_{\Upsilon(1S)} = 432.10 \pm 0.28 \text{ MeV}$$

NODE=M077A00;DTYPE=D

$\chi_{b1}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	P (MeV/c)	
$\gamma \Upsilon(1S)$	(35.2 $\pm$ 2.0) %		423	NODE=M077215;DESIG=1
$D^0 X$	(12.6 $\pm$ 2.2) %		—	DESIG=2
$\pi^+ \pi^- K^+ K^- \pi^0$	(2.0 $\pm$ 0.6) $\times 10^{-4}$		4892	DESIG=3
$2\pi^+ \pi^- K^- K_S^0$	(1.3 $\pm$ 0.5) $\times 10^{-4}$		4892	DESIG=4
$2\pi^+ \pi^- K^- K_S^0 2\pi^0$	< 6 $\times 10^{-4}$	90%	4863	DESIG=5
$2\pi^+ 2\pi^- 2\pi^0$	(8.0 $\pm$ 2.5) $\times 10^{-4}$		4921	DESIG=6
$2\pi^+ 2\pi^- K^+ K^-$	(1.5 $\pm$ 0.5) $\times 10^{-4}$		4878	DESIG=7
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	(3.5 $\pm$ 1.2) $\times 10^{-4}$		4863	DESIG=8
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(8.6 $\pm$ 3.2) $\times 10^{-4}$		4845	DESIG=9
$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	(9.3 $\pm$ 3.3) $\times 10^{-4}$		4844	DESIG=10
$3\pi^+ 3\pi^-$	(1.9 $\pm$ 0.6) $\times 10^{-4}$		4921	DESIG=11
$3\pi^+ 3\pi^- 2\pi^0$	(1.7 $\pm$ 0.5) $\times 10^{-3}$		4898	DESIG=12
$3\pi^+ 3\pi^- K^+ K^-$	(2.6 $\pm$ 0.8) $\times 10^{-4}$		4844	DESIG=13
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	(7.5 $\pm$ 2.6) $\times 10^{-4}$		4825	DESIG=14
$4\pi^+ 4\pi^-$	(2.6 $\pm$ 0.9) $\times 10^{-4}$		4897	DESIG=15
$4\pi^+ 4\pi^- 2\pi^0$	(1.4 $\pm$ 0.6) $\times 10^{-3}$		4867	DESIG=16
ω anything	(4.9 $\pm$ 1.4) %		—	DESIG=21
ωX_{tetra}	< 4.44 $\times 10^{-4}$	90%	—	DESIG=22
$J/\psi J/\psi$	< 2.7 $\times 10^{-5}$	90%	3857	DESIG=17
$J/\psi \psi(2S)$	< 1.7 $\times 10^{-5}$	90%	3594	DESIG=18
$\psi(2S) \psi(2S)$	< 6 $\times 10^{-5}$	90%	3298	DESIG=19
$J/\psi(1S)$ anything	< 1.1 $\times 10^{-3}$	90%	—	DESIG=20
$J/\psi(1S) X_{tetra}$	< 2.27 $\times 10^{-4}$	90%	—	DESIG=23

 $h_b(1P)$

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

NODE=M204

Mass $m = 9899.3 \pm 0.8$ MeV

NODE=M204M;DTYPE=M

$h_b(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	P (MeV/c)	
$\eta_b(1S) \gamma$	(52 $^{+6}_{-5}$) %		488	NODE=M204215;DESIG=1
$\Upsilon(1S) \pi^0$	< 1.8 $\times 10^{-3}$	90%	408	DESIG=2

 $\chi_{b2}(1P)$

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

J needs confirmation.

NODE=M078

Mass $m = 9912.21 \pm 0.26 \pm 0.31$ MeVNODE=M078M;DTYPE=M;OUR EVAL;
→ UNCHECKED ←

$\chi_{b2}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$\gamma \Upsilon(1S)$	$(18.0 \pm 1.0) \%$		442	NODE=M078215;DESIG=1
$D^0 X$	$< 7.9 \%$	90%	—	DESIG=2
$\pi^+ \pi^- K^+ K^- \pi^0$	$(8 \pm 5) \times 10^{-5}$		4902	DESIG=3
$2\pi^+ \pi^- K^- K_S^0$	$< 1.0 \times 10^{-4}$	90%	4901	DESIG=4
$2\pi^+ \pi^- K^- K_S^0 2\pi^0$	$(5.3 \pm 2.4) \times 10^{-4}$		4873	DESIG=5
$2\pi^+ 2\pi^- 2\pi^0$	$(3.5 \pm 1.4) \times 10^{-4}$		4931	DESIG=6
$2\pi^+ 2\pi^- K^+ K^-$	$(1.1 \pm 0.4) \times 10^{-4}$		4888	DESIG=7
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	$(2.1 \pm 0.9) \times 10^{-4}$		4872	DESIG=8
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	$(3.9 \pm 1.8) \times 10^{-4}$		4855	DESIG=9
$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	$< 5 \times 10^{-4}$	90%	4854	DESIG=10
$3\pi^+ 3\pi^-$	$(7.0 \pm 3.1) \times 10^{-5}$		4931	DESIG=11
$3\pi^+ 3\pi^- 2\pi^0$	$(1.0 \pm 0.4) \times 10^{-3}$		4908	DESIG=12
$3\pi^+ 3\pi^- K^+ K^-$	$< 8 \times 10^{-5}$	90%	4854	DESIG=13
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	$(3.6 \pm 1.5) \times 10^{-4}$		4835	DESIG=14
$4\pi^+ 4\pi^-$	$(8 \pm 4) \times 10^{-5}$		4907	DESIG=15
$4\pi^+ 4\pi^- 2\pi^0$	$(1.8 \pm 0.7) \times 10^{-3}$		4877	DESIG=16
$J/\psi J/\psi$	$< 4 \times 10^{-5}$	90%	3869	DESIG=17
$J/\psi \psi(2S)$	$< 5 \times 10^{-5}$	90%	3608	DESIG=18
$\psi(2S) \psi(2S)$	$< 1.6 \times 10^{-5}$	90%	3313	DESIG=19
$J/\psi(1S)$ anything	$(1.5 \pm 0.4) \times 10^{-3}$		—	DESIG=20

$\Upsilon(2S)$

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

Mass $m = 10023.4 \pm 0.5$ MeV $m_{\Upsilon(2S)} - m_{\Upsilon(1S)} = 562.81 \pm 0.11$ MeVFull width $\Gamma = 31.98 \pm 2.63$ keV

NODE=M052

NODE=M052M;DTYPE=M

NODE=M052A00;DTYPE=D

NODE=M052W;DTYPE=G;OUR EVAL;
→ UNCHECKED ←

$\Upsilon(2S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
$\Upsilon(1S) \pi^+ \pi^-$	$(17.85 \pm 0.26) \%$		475	NODE=M052215;DESIG=4
$\Upsilon(1S) \pi^0 \pi^0$	$(8.6 \pm 0.4) \%$		480	DESIG=5
$\tau^+ \tau^-$	$(2.00 \pm 0.21) \%$		4686	DESIG=3
$\mu^+ \mu^-$	$(1.93 \pm 0.17) \%$	S=2.2	5011	DESIG=1
$e^+ e^-$	$(1.91 \pm 0.16) \%$		5012	DESIG=2
$\Upsilon(1S) \pi^0$	$< 4 \times 10^{-5}$	CL=90%	531	DESIG=10
$\Upsilon(1S) \eta$	$(2.9 \pm 0.4) \times 10^{-4}$	S=2.0	126	DESIG=6
$J/\psi(1S)$ anything	$< 6 \times 10^{-3}$	CL=90%	4533	DESIG=20
$J/\psi(1S) \eta_c$	$< 5.4 \times 10^{-6}$	CL=90%	3984	DESIG=143
$J/\psi(1S) \chi_{c0}$	$< 3.4 \times 10^{-6}$	CL=90%	3808	DESIG=144
$J/\psi(1S) \chi_{c1}$	$< 1.2 \times 10^{-6}$	CL=90%	3765	DESIG=145
$J/\psi(1S) \chi_{c2}$	$< 2.0 \times 10^{-6}$	CL=90%	3745	DESIG=146
$J/\psi(1S) \eta_c(2S)$	$< 2.5 \times 10^{-6}$	CL=90%	3706	DESIG=147
$J/\psi(1S) X(3940)$	$< 2.0 \times 10^{-6}$	CL=90%	3555	DESIG=148
$J/\psi(1S) X(4160)$	$< 2.0 \times 10^{-6}$	CL=90%	3442	DESIG=149
χ_{c1} anything	$(2.2 \pm 0.5) \times 10^{-4}$		—	DESIG=157
$\chi_{c1}(1P)^0 X_{tetra}$	$< 3.67 \times 10^{-5}$	CL=90%	—	DESIG=160
χ_{c2} anything	$(2.3 \pm 0.8) \times 10^{-4}$		—	DESIG=158
$\psi(2S) \eta_c$	$< 5.1 \times 10^{-6}$	CL=90%	3732	DESIG=150
$\psi(2S) \chi_{c0}$	$< 4.7 \times 10^{-6}$	CL=90%	3536	DESIG=151
$\psi(2S) \chi_{c1}$	$< 2.5 \times 10^{-6}$	CL=90%	3488	DESIG=152
$\psi(2S) \chi_{c2}$	$< 1.9 \times 10^{-6}$	CL=90%	3464	DESIG=153
$\psi(2S) \eta_c(2S)$	$< 3.3 \times 10^{-6}$	CL=90%	3422	DESIG=154
$\psi(2S) X(3940)$	$< 3.9 \times 10^{-6}$	CL=90%	3250	DESIG=155
$\psi(2S) X(4160)$	$< 3.9 \times 10^{-6}$	CL=90%	3120	DESIG=156
$T_{c\bar{c}1}(3900)^+ T_{c\bar{c}1}(3900)^-$	$< 1.0 \times 10^{-6}$	CL=90%	—	DESIG=162
$T_{c\bar{c}1}(4200)^+ T_{c\bar{c}1}(4200)^-$	$< 1.67 \times 10^{-5}$	CL=90%	—	DESIG=163
$T_{c\bar{c}1}(3900)^\pm T_{c\bar{c}1}(4200)^\mp$	$< 7.3 \times 10^{-6}$	CL=90%	—	DESIG=164
$T_{c\bar{c}}(4050)^+ T_{c\bar{c}}(4050)^-$	$< 1.35 \times 10^{-5}$	CL=90%	—	DESIG=165

$T_{c\bar{c}}(4250)^+ T_{c\bar{c}}(4250)^-$	$< 2.67 \times 10^{-5}$	CL=90%	—	DESIG=166
$T_{c\bar{c}}(4050)^\pm T_{c\bar{c}}(4250)^\mp$	$< 2.72 \times 10^{-5}$	CL=90%	—	DESIG=167
$T_{c\bar{c}1}(4430)^+ T_{c\bar{c}1}(4430)^-$	$< 2.03 \times 10^{-5}$	CL=90%	—	DESIG=168
$T_{c\bar{c}}(4055)^\pm T_{c\bar{c}}(4055)^\mp$	$< 1.11 \times 10^{-5}$	CL=90%	—	DESIG=170
$T_{c\bar{c}}(4055)^\pm T_{c\bar{c}1}(4430)^\mp$	$< 2.11 \times 10^{-5}$	CL=90%	—	DESIG=171
2H anything	$(2.78^{+0.30}_{-0.26}) \times 10^{-5}$	S=1.2	—	DESIG=16
hadrons	$(94 \pm 11) \%$		—	DESIG=101
ggg	$(58.8 \pm 1.2) \%$		—	DESIG=105
$\gamma g g$	$(1.87 \pm 0.28) \%$		—	DESIG=106
$\phi K^+ K^-$	$(1.6 \pm 0.4) \times 10^{-6}$		4910	DESIG=133
$\omega \pi^+ \pi^-$	$< 2.58 \times 10^{-6}$	CL=90%	4977	DESIG=134
$K^*(892)^0 K^- \pi^+ + \text{c.c.}$	$(2.3 \pm 0.7) \times 10^{-6}$		4952	DESIG=135
$\phi f'_2(1525)$	$< 1.33 \times 10^{-6}$	CL=90%	4843	DESIG=136
$\omega f_2(1270)$	$< 5.7 \times 10^{-7}$	CL=90%	4899	DESIG=137
$\rho(770) a_2(1320)$	$< 8.8 \times 10^{-7}$	CL=90%	4894	DESIG=138
$K^*(892)^0 \bar{K}_2^*(1430)^0 + \text{c.c.}$	$(1.5 \pm 0.6) \times 10^{-6}$		4869	DESIG=139
$K_1(1270)^\pm K^\mp$	$< 3.22 \times 10^{-6}$	CL=90%	4921	DESIG=140
$K_1(1400)^\pm K^\mp$	$< 8.3 \times 10^{-7}$	CL=90%	4901	DESIG=141
$b_1(1235)^\pm \pi^\mp$	$< 4.0 \times 10^{-7}$	CL=90%	4935	DESIG=142
$\rho \pi$	$< 1.16 \times 10^{-6}$	CL=90%	4981	DESIG=126
$\pi^+ \pi^- \pi^0$	$< 8.0 \times 10^{-7}$	CL=90%	5007	DESIG=127
$\omega \pi^0$	$< 1.63 \times 10^{-6}$	CL=90%	4980	DESIG=128
$\pi^+ \pi^- \pi^0 \pi^0$	$(1.30 \pm 0.28) \times 10^{-5}$		5002	DESIG=129
$K_S^0 K^+ \pi^- + \text{c.c.}$	$(1.14 \pm 0.33) \times 10^{-6}$		4979	DESIG=130
$K^*(892)^0 \bar{K}^0 + \text{c.c.}$	$< 4.22 \times 10^{-6}$	CL=90%	4959	DESIG=131
$K^*(892)^- K^+ + \text{c.c.}$	$< 1.45 \times 10^{-6}$	CL=90%	4960	DESIG=132
$f_1(1285)$ anything	$(2.2 \pm 1.6) \times 10^{-3}$		—	DESIG=159
$f_1(1285) X_{tetra}$	$< 6.47 \times 10^{-5}$	CL=90%	—	DESIG=161
$D_s^+ D_{s1}(2536)^-, D_{s1}^- \rightarrow K^- D^*(2007)^0$	$(1.6 \pm 0.4) \times 10^{-5}$		—	DESIG=178
$D_s^+ D_{s1}(2536)^-, D_{s1}^- \rightarrow K_S^0 D^*(2010)^-$	$(8.4 \pm 2.3) \times 10^{-6}$		—	DESIG=179
$D_s^{*+} D_{s1}(2536)^-, D_{s1}^- \rightarrow K^- D^*(2007)^0$	$(1.4 \pm 0.4) \times 10^{-5}$		—	DESIG=181
$D_s^{*+} D_{s1}(2536)^-, D_{s1}^- \rightarrow K_S^0 D^*(2010)^-$	$(8.2 \pm 3.1) \times 10^{-6}$		—	DESIG=182
$D_s^+ D_{s2}^*(2573)^-, D_{s2}^{*-} \rightarrow K^- D^0$	$(1.4 \pm 0.4) \times 10^{-5}$		—	DESIG=184
$D_s^+ D_{s2}^*(2573)^-, D_{s2}^{*-} \rightarrow K_S^0 D^-$	$(6.9 \pm 3.0) \times 10^{-6}$		—	DESIG=185
$D_s^{*+} D_{s2}^*(2573)^-, D_{s2}^{*-} \rightarrow K^- D^0$	$(9 \pm 5) \times 10^{-6}$		—	DESIG=187
$D_s^{*+} D_{s2}^*(2573)^-, D_{s2}^{*-} \rightarrow K_S^0 D^-$	$(5 \pm 6) \times 10^{-6}$		—	DESIG=188
Sum of 100 exclusive modes	$(2.90 \pm 0.30) \times 10^{-3}$		—	DESIG=121

Radiative decays

$\gamma \chi_{b1}(1P)$	$(6.9 \pm 0.4) \%$	130	DESIG=8
$\gamma \chi_{b2}(1P)$	$(7.15 \pm 0.35) \%$	111	DESIG=7
$\gamma \chi_{b0}(1P)$	$(3.8 \pm 0.4) \%$	163	DESIG=9
$\gamma f_0(1710)$	$< 5.9 \times 10^{-4}$	CL=90% 4862	DESIG=13
$\gamma f'_2(1525)$	$< 5.3 \times 10^{-4}$	CL=90% 4897	DESIG=12
$\gamma f_2(1270)$	$< 2.41 \times 10^{-4}$	CL=90% 4931	DESIG=11
$\gamma \eta_c(1S)$	$< 2.7 \times 10^{-5}$	CL=90% 4568	DESIG=111
$\gamma \chi_{c0}$	$< 1.0 \times 10^{-4}$	CL=90% 4430	DESIG=112
$\gamma \chi_{c1}$	$< 3.6 \times 10^{-6}$	CL=90% 4397	DESIG=113
$\gamma \chi_{c2}$	$< 1.5 \times 10^{-5}$	CL=90% 4381	DESIG=114

NODE=M052;CLUMP=A

$\gamma\chi_{c1}(3872)$	< 1.8	$\times 10^{-5}$	CL=90%	4264	DESIG=172
$\gamma\chi_{c1}(3872), \chi_{c1} \rightarrow \pi^+\pi^-\pi^0 J/\psi$	< 2.4	$\times 10^{-6}$	CL=90%	—	DESIG=116
$\gamma\chi_{c0}(3915) \rightarrow \omega J/\psi$	< 2.8	$\times 10^{-6}$	CL=90%	—	DESIG=117
$\gamma\chi_{c1}(4140) \rightarrow \phi J/\psi$	< 1.2	$\times 10^{-6}$	CL=90%	—	DESIG=118
$\gamma X(4350) \rightarrow \phi J/\psi$	< 1.3	$\times 10^{-6}$	CL=90%	—	DESIG=119
$\gamma\eta_b(1S)$	$(5.5 \pm_{-0.9}^{+1.1}) \times 10^{-4}$		S=1.2	605	DESIG=102
$\gamma\eta_b(1S) \rightarrow \gamma$ Sum of 26 exclusive modes	< 3.7	$\times 10^{-6}$	CL=90%	—	DESIG=124
$\gamma X_{b\bar{b}} \rightarrow \gamma$ Sum of 26 exclusive modes	< 4.9	$\times 10^{-6}$	CL=90%	—	DESIG=125
$\gamma X \rightarrow \gamma + \geq 4$ prongs	$[h] < 1.95$	$\times 10^{-4}$	CL=95%	—	DESIG=103
$\gamma A^0 \rightarrow \gamma$ hadrons	< 8	$\times 10^{-5}$	CL=90%	—	DESIG=108
$\gamma A^0 \rightarrow \gamma\mu^+\mu^-$	< 8.3	$\times 10^{-6}$	CL=90%	—	DESIG=123

Lepton Family number (LF) violating modes

$e^\pm\tau^\mp$	LF	< 1.12	$\times 10^{-6}$	CL=90%	4854	NODE=M052;CLUMP=B DESIG=107
$\mu^\pm\tau^\mp$	LF	< 2.3	$\times 10^{-7}$	CL=90%	4854	DESIG=104

$\tau_2(1D)$

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

was $\Upsilon(1D)$

$$\text{Mass } m = 10163.7 \pm 1.4 \text{ MeV} \quad (S = 1.7)$$

NODE=M177

NODE=M177M;DTYPE=M

$\tau_2(1D)$ 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
$\pi^+\pi^- \Upsilon(1S)$	$(6.6 \pm 1.6) \times 10^{-3}$	623

NODE=M177215;DESIG=1;OUR EVAL;
DESIG=2;OUR EVAL; $\rightarrow$ UNCHECKED $\leftarrow$
DESIG=3;OUR EVAL; $\rightarrow$ UNCHECKED $\leftarrow$
DESIG=4

$\chi_{b0}(2P)$

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

J needs confirmation.

$$\text{Mass } m = 10232.5 \pm 0.4 \pm 0.5 \text{ MeV}$$

NODE=M079

NODE=M079M;DTYPE=M;OUR EVAL;
 $\rightarrow$ UNCHECKED $\leftarrow$

$\chi_{b0}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma \Upsilon(2S)$	$(1.38 \pm 0.30) \%$		207
$\gamma \Upsilon(1S)$	$(3.8 \pm 1.7) \times 10^{-3}$		743
$D^0 X$	< 8.2	%	90%
$\pi^+\pi^- K^+ K^- \pi^0$	< 3.4	$\times 10^{-5}$	90%
$2\pi^+\pi^- K^- K_S^0$	< 5	$\times 10^{-5}$	90%
$2\pi^+\pi^- K^- K_S^0 2\pi^0$	< 2.2	$\times 10^{-4}$	90%
$2\pi^+ 2\pi^- 2\pi^0$	< 2.4	$\times 10^{-4}$	90%
$2\pi^+ 2\pi^- K^+ K^-$	< 1.5	$\times 10^{-4}$	90%
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	< 2.2	$\times 10^{-4}$	90%
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	< 1.1	$\times 10^{-3}$	90%
$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	< 7	$\times 10^{-4}$	90%
$3\pi^+ 3\pi^-$	< 7	$\times 10^{-5}$	90%
$3\pi^+ 3\pi^- 2\pi^0$	< 1.2	$\times 10^{-3}$	90%
$3\pi^+ 3\pi^- K^+ K^-$	< 1.5	$\times 10^{-4}$	90%
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	< 7	$\times 10^{-4}$	90%
$4\pi^+ 4\pi^-$	< 1.7	$\times 10^{-4}$	90%
$4\pi^+ 4\pi^- 2\pi^0$	< 6	$\times 10^{-4}$	90%

NODE=M079215;DESIG=2

DESIG=1

DESIG=3

DESIG=4

DESIG=5

DESIG=6

DESIG=7

DESIG=8

DESIG=9

DESIG=10

DESIG=11

DESIG=12

DESIG=13

DESIG=14

DESIG=15

DESIG=16

DESIG=17

$\chi_{b1}(2P)$

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

J needs confirmation.

$$\text{Mass } m = 10255.46 \pm 0.22 \pm 0.50 \text{ MeV}$$

$$m_{\chi_{b1}(2P)} - m_{\chi_{b0}(2P)} = 23.5 \pm 1.0 \text{ MeV}$$

$$m_{\chi_{b1}(2P)} - m_{\Upsilon(1S)} = 793.6 \pm 0.8 \text{ MeV}$$

NODE=M080

NODE=M080M;DTYPE=M;OUR EVAL;

$\rightarrow$ UNCHECKED $\leftarrow$

NODE=M080M2;DTYPE=D

NODE=M080A02;DTYPE=D

$\chi_{b1}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$\omega \Upsilon(1S)$	($1.63^{+0.40}_{-0.34}$) %	134	NODE=M080215;DESIG=3
$\gamma \Upsilon(2S)$	(18.1 ± 1.9) %	229	DESIG=2
$\gamma \Upsilon(1S)$	(9.9 ± 1.0) %	764	DESIG=1
$\pi\pi\chi_{b1}(1P)$	(9.1 ± 1.3) $\times 10^{-3}$	238	DESIG=4
$D^0 X$	(8.8 ± 1.7) %	—	DESIG=5
$\pi^+ \pi^- K^+ K^- \pi^0$	(3.1 ± 1.0) $\times 10^{-4}$	5075	DESIG=6
$2\pi^+ \pi^- K^- K_S^0$	(1.1 ± 0.5) $\times 10^{-4}$	5075	DESIG=7
$2\pi^+ \pi^- K^- K_S^0 2\pi^0$	(7.7 ± 3.2) $\times 10^{-4}$	5047	DESIG=8
$2\pi^+ 2\pi^- 2\pi^0$	(5.9 ± 2.0) $\times 10^{-4}$	5104	DESIG=9
$2\pi^+ 2\pi^- K^+ K^-$	(10 ± 4) $\times 10^{-5}$	5062	DESIG=10
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	(5.5 ± 1.8) $\times 10^{-4}$	5047	DESIG=11
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(10 ± 4) $\times 10^{-4}$	5030	DESIG=12
$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	(6.7 ± 2.6) $\times 10^{-4}$	5029	DESIG=13
$3\pi^+ 3\pi^-$	(1.2 ± 0.4) $\times 10^{-4}$	5103	DESIG=14
$3\pi^+ 3\pi^- 2\pi^0$	(1.2 ± 0.4) $\times 10^{-3}$	5081	DESIG=15
$3\pi^+ 3\pi^- K^+ K^-$	(2.0 ± 0.8) $\times 10^{-4}$	5029	DESIG=16
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	(6.1 ± 2.2) $\times 10^{-4}$	5011	DESIG=17
$4\pi^+ 4\pi^-$	(1.7 ± 0.6) $\times 10^{-4}$	5080	DESIG=18
$4\pi^+ 4\pi^- 2\pi^0$	(1.9 ± 0.7) $\times 10^{-3}$	5051	DESIG=19

 $h_b(2P)$

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

NODE=M205

Mass $m = 10259.8 \pm 1.2$ MeV

NODE=M205M;DTYPE=M

$h_b(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
hadrons	not seen	—	—	NODE=M205215;DESIG=1
$\eta_b(1S)\gamma$	(22 ± 5) %	825	825	DESIG=2
$\eta_b(2S)\gamma$	(48 ± 13) %	257	257	DESIG=3
$\Upsilon(1S)\eta$	($7.1^{+4.0}_{-3.3}$) $\times 10^{-3}$	559	559	DESIG=4
$\Upsilon(1S)\pi^0$	$< 1.8 \times 10^{-3}$	90%	757	DESIG=5

 $\chi_{b2}(2P)$

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

 J needs confirmation.

NODE=M081

Mass $m = 10268.65 \pm 0.22 \pm 0.50$ MeV

$$m_{\chi_{b2}(2P)} - m_{\chi_{b1}(2P)} = 13.2 \pm 0.4 \text{ MeV} \quad (S = 1.8)$$

NODE=M081M;DTYPE=M;OUR EVAL;
 $\rightarrow$ UNCHECKED $\leftarrow$
 NODE=M081M2;DTYPE=D

$\chi_{b2}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$\omega \mathcal{T}(1S)$	$(1.10^{+0.34}_{-0.30}) \%$		194	NODE=M081215;DESIG=3
$\gamma \mathcal{T}(2S)$	$(8.9 \pm 1.2) \%$		242	DESIG=2
$\gamma \mathcal{T}(1S)$	$(6.6 \pm 0.8) \%$		776	DESIG=1
$\pi\pi\chi_{b2}(1P)$	$(5.1 \pm 0.9) \times 10^{-3}$		229	DESIG=4
$D^0 X$	$< 2.4 \%$	90%	—	DESIG=5
$\pi^+\pi^-K^+K^-\pi^0$	$< 1.1 \times 10^{-4}$	90%	5082	DESIG=6
$2\pi^+\pi^-K^-K_S^0$	$< 9 \times 10^{-5}$	90%	5082	DESIG=7
$2\pi^+\pi^-K^-K_S^0 2\pi^0$	$< 7 \times 10^{-4}$	90%	5054	DESIG=8
$2\pi^+2\pi^-2\pi^0$	$(3.9 \pm 1.6) \times 10^{-4}$		5110	DESIG=9
$2\pi^+2\pi^-K^+K^-$	$(9 \pm 4) \times 10^{-5}$		5068	DESIG=10
$2\pi^+2\pi^-K^+K^-\pi^0$	$(2.4 \pm 1.1) \times 10^{-4}$		5054	DESIG=11
$2\pi^+2\pi^-K^+K^-2\pi^0$	$(4.7 \pm 2.3) \times 10^{-4}$		5037	DESIG=12
$3\pi^+2\pi^-K^-K_S^0\pi^0$	$< 4 \times 10^{-4}$	90%	5036	DESIG=13
$3\pi^+3\pi^-$	$(9 \pm 4) \times 10^{-5}$		5110	DESIG=14
$3\pi^+3\pi^-2\pi^0$	$(1.2 \pm 0.4) \times 10^{-3}$		5088	DESIG=15
$3\pi^+3\pi^-K^+K^-$	$(1.4 \pm 0.7) \times 10^{-4}$		5036	DESIG=16
$3\pi^+3\pi^-K^+K^-\pi^0$	$(4.2 \pm 1.7) \times 10^{-4}$		5017	DESIG=17
$4\pi^+4\pi^-$	$(9 \pm 5) \times 10^{-5}$		5087	DESIG=18
$4\pi^+4\pi^-2\pi^0$	$(1.3 \pm 0.5) \times 10^{-3}$		5058	DESIG=19

 $\mathcal{T}(3S)$

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

Mass $m = 10355.1 \pm 0.5$ MeV $m_{\mathcal{T}(3S)} - m_{\mathcal{T}(2S)} = 331.82 \pm 0.08$ MeV ($S = 1.9$)Full width $\Gamma = 20.32 \pm 1.85$ keV

NODE=M048

NODE=M048M;DTYPE=M

NODE=M048DM2;DTYPE=D

NODE=M048W;DTYPE=G;OUR EVAL;
→ UNCHECKED ←

$\mathcal{T}(3S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
$\mathcal{T}(2S)$ anything	$(10.6 \pm 0.8) \%$		296	NODE=M048215;DESIG=8
$\mathcal{T}(2S)\pi^+\pi^-$	$(2.82 \pm 0.18) \%$	$S=1.6$	176	DESIG=4
$\mathcal{T}(2S)\pi^0\pi^0$	$(1.85 \pm 0.14) \%$		190	DESIG=10
$\mathcal{T}(2S)\gamma\gamma$	$(5.0 \pm 0.7) \%$		326	DESIG=12
$\mathcal{T}(2S)\pi^0$	$< 5.1 \times 10^{-4}$	CL=90%	298	DESIG=107
$\mathcal{T}(1S)\pi^+\pi^-$	$(4.37 \pm 0.08) \%$		813	DESIG=3
$\mathcal{T}(1S)\pi^0\pi^0$	$(2.20 \pm 0.13) \%$		816	DESIG=11
$\mathcal{T}(1S)\eta$	$< 1 \times 10^{-4}$	CL=90%	677	DESIG=9
$\mathcal{T}(1S)\pi^0$	$< 7 \times 10^{-5}$	CL=90%	846	DESIG=106
$h_b(1P)\pi^0$	$< 1.2 \times 10^{-3}$	CL=90%	426	DESIG=112
$h_b(1P)\pi^0 \rightarrow \gamma\eta_b(1S)\pi^0$	$(4.3 \pm 1.4) \times 10^{-4}$		—	DESIG=113
$h_b(1P)\pi^+\pi^-$	$< 1.2 \times 10^{-4}$	CL=90%	352	DESIG=114
$\tau^+\tau^-$	$(2.29 \pm 0.30) \%$		4863	DESIG=16
$\mu^+\mu^-$	$(2.18 \pm 0.21) \%$	$S=2.1$	5176	DESIG=1
e^+e^-	$(2.18 \pm 0.20) \%$		5178	DESIG=2
hadrons	$(93 \pm 12) \%$		—	DESIG=101
$g g g$	$(35.7 \pm 2.6) \%$		—	DESIG=109
$\gamma g g$	$(9.7 \pm 1.8) \times 10^{-3}$		—	DESIG=110
2H anything	$(2.33 \pm 0.33) \times 10^{-5}$		—	DESIG=117

Radiative decays

$\gamma\chi_{b2}(2P)$	$(13.1 \pm 1.6) \%$	$S=3.4$	86	NODE=M048;CLUMP=B DESIG=5
$\gamma\chi_{b1}(2P)$	$(12.6 \pm 1.2) \%$	$S=2.4$	99	DESIG=6
$\gamma\chi_{b0}(2P)$	$(5.9 \pm 0.6) \%$	$S=1.4$	122	DESIG=7
$\gamma\chi_{b2}(1P)$	$(10.0 \pm 1.0) \times 10^{-3}$	$S=1.7$	433	DESIG=103
$\gamma\chi_{b1}(1P)$	$(9 \pm 5) \times 10^{-4}$	$S=1.8$	452	DESIG=104
$\gamma\chi_{b0}(1P)$	$(2.7 \pm 0.4) \times 10^{-3}$		484	DESIG=13
$\gamma\eta_b(2S)$	$< 6.2 \times 10^{-4}$	CL=90%	350	DESIG=14
$\gamma\eta_b(1S)$	$(5.1 \pm 0.7) \times 10^{-4}$		912	DESIG=15
$\gamma A^0 \rightarrow \gamma$ hadrons	$< 8 \times 10^{-5}$	CL=90%	—	DESIG=115
$\gamma X \rightarrow \gamma + \geq 4$ prongs	$[i] < 2.2 \times 10^{-4}$	CL=95%	—	DESIG=102
$\gamma A^0 \rightarrow \gamma\mu^+\mu^-$	$< 5.5 \times 10^{-6}$	CL=90%	—	DESIG=116
$\gamma A^0 \rightarrow \gamma\tau^+\tau^-$	$[j] < 1.6 \times 10^{-4}$	CL=90%	—	DESIG=108

Lepton Family number (LF) violating modes

$e^\pm \tau^\mp$	LF	< 4.2	$\times 10^{-6}$	CL=90%	5025
$e^\pm \mu^\mp$	LF	< 3.6	$\times 10^{-7}$	CL=90%	5177
$\mu^\pm \tau^\mp$	LF	< 3.1	$\times 10^{-6}$	CL=90%	5025

NODE=M048;CLUMP=C
 DESIG=111
 DESIG=119
 DESIG=105

 $\chi_{b1}(3P)$

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

J needs confirmation.

Mass $m = 10513.4 \pm 0.7$ MeV

NODE=M206

NODE=M206M;DTYPE=M

 $\chi_{b1}(3P)$ DECAY MODES

	Fraction (Γ_i/Γ)	p (MeV/c)
$\Upsilon(1S)\gamma$	seen	1000
$\Upsilon(2S)\gamma$	seen	479
$\Upsilon(3S)\gamma$	seen	157

NODE=M206215;DESIG=1
 DESIG=2
 DESIG=3

 $\chi_{b2}(3P)$

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

J needs confirmation.

Mass $m = 10524.0 \pm 0.8$ MeV

NODE=M238

NODE=M238M;DTYPE=M

 $\chi_{b2}(3P)$ DECAY MODES

	Fraction (Γ_i/Γ)	p (MeV/c)
$\Upsilon(3S)\gamma$	seen	168

NODE=M238215;DESIG=1

 $\Upsilon(4S)$

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

also known as $\Upsilon(10580)$ Mass $m = 10579.4 \pm 1.2$ MeVFull width $\Gamma = 20.5 \pm 2.5$ MeV

NODE=M047

NODE=M047M;DTYPE=M

NODE=M047W;DTYPE=G

$\Upsilon(4S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$B\bar{B}$	> 96 %	95%	326
$B^+ B^-$	(51.4 $\pm$ 0.6) %		331
$D_s^+ \text{ anything } + \text{ c.c.}$	(17.8 $\pm$ 2.6) %		—
$B^0 \bar{B}^0$	(48.6 $\pm$ 0.6) %		326
$J/\psi K_S^0 + (J/\psi, \eta_c) K_S^0$	< 4 $\times 10^{-7}$	90%	—
non- $B\bar{B}$	< 4 %	95%	—
$e^+ e^-$	(1.57 $\pm$ 0.08) $\times 10^{-5}$		5290
$\rho^+ \rho^-$	< 5.7 $\times 10^{-6}$	90%	5233
$K^*(892)^0 \bar{K}^0$	< 2.0 $\times 10^{-6}$	90%	5240
$J/\psi(1S)$ anything	< 1.9 $\times 10^{-4}$	95%	—
$D^{*+} \text{ anything } + \text{ c.c.}$	< 7.4 %	90%	5099
ϕ anything	(7.1 $\pm$ 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
$\Upsilon(1S) \pi^+ \pi^-$	(8.2 $\pm$ 0.4) $\times 10^{-5}$		1026
$\Upsilon(1S) \eta$	(1.81 $\pm$ 0.18) $\times 10^{-4}$		924
$\Upsilon(1S) \eta'$	(3.4 $\pm$ 0.9) $\times 10^{-5}$		—
$\Upsilon(2S) \pi^+ \pi^-$	(8.2 $\pm$ 0.8) $\times 10^{-5}$		468
$h_b(1P) \pi^+ \pi^-$	not seen		600
$h_b(1P) \eta$	(2.18 $\pm$ 0.21) $\times 10^{-3}$		390
$\eta_b(1S) \omega$	< 1.8 $\times 10^{-4}$	90%	—
2H anything	< 1.3 $\times 10^{-5}$	90%	—

NODE=M047215;DESIG=8;OUR EST;
 DESIG=10 UNCHECKED ←

DESIG=12
 DESIG=11
 DESIG=15
 DESIG=6
 DESIG=1
 DESIG=16
 DESIG=22
 DESIG=2
 DESIG=3
 DESIG=4
 DESIG=13
 DESIG=18
 DESIG=19
 DESIG=20
 DESIG=5
 DESIG=7
 DESIG=17
 DESIG=26
 DESIG=9
 DESIG=21
 DESIG=23
 DESIG=27
 DESIG=14

Double Radiative Decays

$\gamma\gamma \Upsilon(D) \rightarrow \gamma\gamma \eta \Upsilon(1S)$	< 2.3 $\times 10^{-5}$	90%	—
---	------------------------	-----	---

NODE=M047;CLUMP=B
 DESIG=24

 $\Upsilon(10860)$

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

Mass $m = 10885.2^{+2.6}_{-1.6}$ MeV
 Full width $\Gamma = 37 \pm 4$ MeV

NODE=M092

NODE=M092M;DTYPE=M
 NODE=M092W;DTYPE=G

$\Upsilon(10860)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	P (MeV/c)	
$B\bar{B}X$	(76.2 $^{+2.7}_{-4.0}$) %	—	—	NODE=M092215;DESIG=9
$B\bar{B}$	(5.5 ± 1.0) %	—	1322	DESIG=2
$B\bar{B}^* + \text{c.c.}$	(13.7 ± 1.6) %	—	—	DESIG=3
$B^*\bar{B}^*$	(38.1 ± 3.4) %	—	1127	DESIG=4
$B\bar{B}^{(*)}\pi$	< 19.7 %	90%	1015	DESIG=10
$B\bar{B}\pi$	(0.0 ± 1.2) %	—	1015	DESIG=23
$B^*\bar{B}\pi + B\bar{B}^*\pi$	(7.3 ± 2.3) %	—	—	DESIG=24
$B^*\bar{B}^*\pi$	(1.0 ± 1.4) %	—	739	DESIG=25
$B\bar{B}\pi\pi$	< 8.9 %	90%	550	DESIG=11
$B_s^{(*)}\bar{B}_s^{(*)}$	(20.1 ± 3.1) %	—	904	DESIG=16
$B_s\bar{B}_s$	(5 ± 5) $\times 10^{-3}$	—	904	DESIG=5
$B_s\bar{B}_s^* + \text{c.c.}$	(1.35 ± 0.32) %	—	—	DESIG=7
$B_s^*\bar{B}_s^*$	(17.6 ± 2.7) %	—	543	DESIG=8
no open-bottom	(3.8 $^{+5.0}_{-0.5}$) %	—	—	DESIG=28
e^+e^-	(8.3 ± 2.1) $\times 10^{-6}$	—	5443	DESIG=1
$K^*(892)^0\bar{K}^0$	< 1.0 $\times 10^{-5}$	90%	5395	DESIG=29
$\Upsilon(1S)\pi^+\pi^-$	(5.3 ± 0.6) $\times 10^{-3}$	—	1306	DESIG=17
$\Upsilon(1S)\eta$	(8.5 ± 1.7) $\times 10^{-4}$	—	1229	DESIG=44
$\Upsilon(1S)\eta'$	< 6.9 $\times 10^{-5}$	90%	985	DESIG=45
$\Upsilon(2S)\pi^+\pi^-$	(7.8 ± 1.3) $\times 10^{-3}$	—	783	DESIG=18
$\Upsilon(2S)\eta$	(4.1 ± 0.6) $\times 10^{-3}$	—	639	DESIG=46
$\Upsilon(3S)\pi^+\pi^-$	(4.8 $^{+1.9}_{-1.7}$) $\times 10^{-3}$	—	440	DESIG=19
$\Upsilon(1S)K^+K^-$	(6.1 ± 1.8) $\times 10^{-4}$	—	959	DESIG=20
$\eta\Upsilon_J(1D)$	(4.8 ± 1.1) $\times 10^{-3}$	—	—	DESIG=40
$h_b(1P)\pi^+\pi^-$	(3.5 $^{+1.0}_{-1.3}$) $\times 10^{-3}$	—	903	DESIG=26
$h_b(2P)\pi^+\pi^-$	(5.7 $^{+1.7}_{-2.1}$) $\times 10^{-3}$	—	544	DESIG=27
$\chi_{bJ}(1P)\pi^+\pi^-\pi^0$	(2.5 ± 2.3) $\times 10^{-3}$	—	894	DESIG=41
$\chi_{b0}(1P)\pi^+\pi^-\pi^0$	< 6.3 $\times 10^{-3}$	90%	894	DESIG=30
$\chi_{b0}(1P)\omega$	< 3.9 $\times 10^{-3}$	90%	631	DESIG=31
$\chi_{b0}(1P)(\pi^+\pi^-\pi^0)_{\text{non-}\omega}$	< 4.8 $\times 10^{-3}$	90%	—	DESIG=32
$\chi_{b1}(1P)\pi^+\pi^-\pi^0$	(1.85 ± 0.33) $\times 10^{-3}$	—	861	DESIG=33
$\chi_{b1}(1P)\omega$	(1.57 ± 0.30) $\times 10^{-3}$	—	582	DESIG=34
$\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{\text{non-}\omega}$	(5.2 ± 1.9) $\times 10^{-4}$	—	—	DESIG=35
$\chi_{b2}(1P)\pi^+\pi^-\pi^0$	(1.17 ± 0.30) $\times 10^{-3}$	—	841	DESIG=36
$\chi_{b2}(1P)\omega$	(6.0 ± 2.7) $\times 10^{-4}$	—	552	DESIG=37
$\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non-}\omega}$	(6 ± 4) $\times 10^{-4}$	—	—	DESIG=38
$\gamma\chi_b \rightarrow \gamma\Upsilon(1S)\omega$	< 3.8 $\times 10^{-5}$	90%	—	DESIG=39
$\eta_b(1S)\omega$	< 1.3 $\times 10^{-3}$	90%	1177	DESIG=42
$\eta_b(2S)\omega$	< 5.6 $\times 10^{-3}$	90%	399	DESIG=43

Inclusive Decays.

NODE=M092;CLUMP=I

These decay modes are submodes of one or more of the decay modes above.

NODE=M092

ϕ anything	(13.8 $^{+2.4}_{-1.7}$) %	—	DESIG=12
D^0 anything + c.c.	(112 ± 6) %	—	DESIG=13
D_s anything + c.c.	(44.7 ± 2.6) %	—	DESIG=6
J/ψ anything	(2.06 ± 0.21) %	—	DESIG=14
B^0 anything + c.c.	(77 ± 8) %	—	DESIG=21
B^+ anything + c.c.	(72 ± 6) %	—	DESIG=22

 $\Upsilon(11020)$

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

NODE=M093

Mass $m = 11000 \pm 4$ MeV

NODE=M093M;DTYPE=M

Full width $\Gamma = 24^{+8}_{-6}$ MeV

NODE=M093W;DTYPE=G

$\Upsilon(11020)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$e^+ e^-$	$(5.4^{+1.9}_{-2.1}) \times 10^{-6}$	5500	NODE=M093215;DESIG=1
$\chi_{bJ}(1P)\pi^+\pi^-\pi^0$	$(9^{+9}_{-8}) \times 10^{-3}$	1007	DESIG=2
$\chi_{b1}(1P)\pi^+\pi^-\pi^0$	seen	975	DESIG=3
$\chi_{b2}(1P)\pi^+\pi^-\pi^0$	seen	956	DESIG=4

NOTES

[a] $2m_\tau < M(\tau^+\tau^-) < 9.2$ GeV	LINKAGE=E49
[b] 2 GeV $< m_{K^+K^-} < 3$ GeV	LINKAGE=G49
[c] $X\bar{X}$ = vectors with $m < 3.1$ GeV	LINKAGE=B49
[d] X and $\bar{X}$ = zero spin with $m < 4.5$ GeV	LINKAGE=F49
[e] 1.5 GeV $< m_X < 5.0$ GeV	LINKAGE=C49
[f] 201 MeV $< M(\mu^+\mu^-) < 3565$ MeV	LINKAGE=D49
[g] 0.5 GeV $< m_X < 9.0$ GeV, where m_X is the invariant mass of the hadronic final state.	LINKAGE=I49
[h] 1.5 GeV $< m_X < 5.0$ GeV	LINKAGE=C52
[i] 1.5 GeV $< m_X < 5.0$ GeV	LINKAGE=C48
[j] For $m_{\tau^+\tau^-}$ in the ranges 4.03–9.52 and 9.61–10.10 GeV.	LINKAGE=MRG