$b\overline{b}$ MESONS

$\eta_b(1S)$

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

Mass $m = 9399.0 \pm 2.3$ MeV (S = 1.6)
Full width $\Gamma = 10^{+5}_{-4}$ MeV

$\eta_b(1S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
hadrons	seen		−
$3h^+3h^-$	not seen		4673
$2h^+2h^-$	not seen		4689
$\gamma\gamma$	not seen		4700
$\mu^+\mu^-$	$<9 \times 10^{-3}$	90%	4698
$\tau^+\tau^-$	<8 %	90%	4351

$\Upsilon(1S)$

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

Mass $m = 9460.30 \pm 0.26$ MeV (S = 3.3)
Full width $\Gamma = 54.02 \pm 1.25$ keV
$\Gamma_{ee} = 1.340 \pm 0.018$ keV

$\Upsilon(1S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\tau^+\tau^-$	(2.60 $\pm$0.10) %		4384
e^+e^-	(2.38 $\pm$0.11) %		4730
$\mu^+\mu^-$	(2.48 $\pm$0.05) %		4729
Hadronic decays			
ggg	(81.7 $\pm$0.7) %		−
γgg	(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%	3624
$J/\psi(1S)\chi_{c0}$	< 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%	3316
$J/\psi(1S)X(3940)$	< 5.4 $\times 10^{-6}$	CL=90%	3148
$J/\psi(1S)X(4160)$	< 5.4 $\times 10^{-6}$	CL=90%	3018
$X(4350)$ anything, $X \to$ $J/\psi(1S)\phi$	< 8.1 $\times 10^{-6}$	CL=90%	−

$X(3900)^{\pm}$ anything, $X \rightarrow$ $J/\psi(1S)\pi^{\pm}$	$<$ 1.3	$\times 10^{-5}$ CL=90%	$-$
$X(4200)^{\pm}$ anything, $X \rightarrow$ $J/\psi(1S)\pi^{\pm}$	$<$ 6.0	$\times 10^{-5}$ CL=90%	$-$
$X(4430)^{\pm}$ anything, $X \rightarrow$ $J/\psi(1S)\pi^{\pm}$	$<$ 4.9	$\times 10^{-5}$ CL=90%	$-$
$X_{cs}^{\pm}$ anything, $X \rightarrow$ $J/\psi K^{\pm}$	$<$ 5.7	$\times 10^{-6}$ CL=90%	$-$
$X(3872)$ anything, $X \rightarrow$ $J/\psi(1S)\pi^{+}\pi^{-}$	$<$ 9.5	$\times 10^{-6}$ CL=90%	$-$
$X(4260)$ anything, $X \rightarrow$ $J/\psi(1S)\pi^{+}\pi^{-}$	$<$ 3.8	$\times 10^{-5}$ CL=90%	$-$
$X(4260)$ anything, $X \rightarrow$ $J/\psi(1S)K^{+}K^{-}$	$<$ 7.5	$\times 10^{-6}$ CL=90%	$-$
$X(4140)$ anything, $X \rightarrow$ $J/\psi(1S)\phi$	$<$ 5.2	$\times 10^{-6}$ CL=90%	$-$
χ_{c0} anything	$<$ 4	$\times 10^{-3}$ CL=90%	$-$
χ_{c1} anything	(1.90 $\pm$0.35) $\times 10^{-4}$		$-$
χ_{c2} anything	(2.8 $\pm$0.8) $\times 10^{-4}$		$-$
$\psi(2S)$ anything	(1.23 $\pm$0.20) $\times 10^{-4}$		$-$
$\psi(2S)\eta_c$	$<$ 3.6	$\times 10^{-6}$ CL=90%	3345
$\psi(2S)\chi_{c0}$	$<$ 6.5	$\times 10^{-6}$ CL=90%	3124
$\psi(2S)\chi_{c1}$	$<$ 4.5	$\times 10^{-6}$ CL=90%	3070
$\psi(2S)\chi_{c2}$	$<$ 2.1	$\times 10^{-6}$ CL=90%	3043
$\psi(2S)\eta_c(2S)$	$<$ 3.2	$\times 10^{-6}$ CL=90%	2993
$\psi(2S)X(3940)$	$<$ 2.9	$\times 10^{-6}$ CL=90%	2797
$\psi(2S)X(4160)$	$<$ 2.9	$\times 10^{-6}$ CL=90%	2642
$X(4260)$ anything, $X \rightarrow$ $\psi(2S)\pi^{+}\pi^{-}$	$<$ 7.9	$\times 10^{-5}$ CL=90%	$-$
$X(4360)$ anything, $X \rightarrow$ $\psi(2S)\pi^{+}\pi^{-}$	$<$ 5.2	$\times 10^{-5}$ CL=90%	$-$
$X(4660)$ anything, $X \rightarrow$ $\psi(2S)\pi^{+}\pi^{-}$	$<$ 2.2	$\times 10^{-5}$ CL=90%	$-$
$X(4050)^{\pm}$ anything, $X \rightarrow$ $\psi(2S)\pi^{\pm}$	$<$ 8.8	$\times 10^{-5}$ CL=90%	$-$
$X(4430)^{\pm}$ anything, $X \rightarrow$ $\psi(2S)\pi^{\pm}$	$<$ 6.7	$\times 10^{-5}$ CL=90%	$-$
$\rho\pi$	$<$ 3.68	$\times 10^{-6}$ CL=90%	4697
$\omega\pi^0$	$<$ 3.90	$\times 10^{-6}$ CL=90%	4697
$\pi^{+}\pi^{-}$	$<$ 5	$\times 10^{-4}$ CL=90%	4728
$K^{+}K^{-}$	$<$ 5	$\times 10^{-4}$ CL=90%	4704
$p\overline{p}$	$<$ 5	$\times 10^{-4}$ CL=90%	4636
$\pi^{+}\pi^{-}\pi^0$	(2.1 $\pm$0.8) $\times 10^{-6}$		4725
$\phi K^{+}K^{-}$	(2.4 $\pm$0.5) $\times 10^{-6}$		4622

$\omega \pi^+ \pi^-$	(4.5 $\pm$1.0) $\times 10^{-6}$		4694
$K^*(892)^0 K^- \pi^+ +$ c.c.	(4.4 $\pm$0.8) $\times 10^{-6}$		4667
$\phi f_2'(1525)$	< 1.63 $\times 10^{-6}$ CL=90%		4549
$\omega f_2(1270)$	< 1.79 $\times 10^{-6}$ CL=90%		4611
$\rho(770) a_2(1320)$	< 2.24 $\times 10^{-6}$ CL=90%		4605
$K^*(892)^0 \overline{K}_2^*(1430)^0 +$ c.c.	(3.0 $\pm$0.8) $\times 10^{-6}$		4579
$K_1(1270)^\pm K^\mp$	< 2.41 $\times 10^{-6}$ CL=90%		4631
$K_1(1400)^\pm K^\mp$	(1.0 $\pm$0.4) $\times 10^{-6}$		4613
$b_1(1235)^\pm \pi^\mp$	< 1.25 $\times 10^{-6}$ CL=90%		4649
$\pi^+ \pi^- \pi^0 \pi^0$	(1.28 $\pm$0.30) $\times 10^{-5}$		4720
$K_S^0 K^+ \pi^- +$ c.c.	(1.6 $\pm$0.4) $\times 10^{-6}$		4696
$K^*(892)^0 \overline{K}^0 +$ c.c.	(2.9 $\pm$0.9) $\times 10^{-6}$		4675
$K^*(892)^- K^+ +$ c.c.	< 1.11 $\times 10^{-6}$ CL=90%		4675
$D^*(2010)^\pm$ anything	(2.52 $\pm$0.20) %		−
^2H anything	(2.85 $\pm$0.25) $\times 10^{-5}$		−
Sum of 100 exclusive modes	(1.200$\pm$0.017) %		−

Radiative decays

$\gamma \pi^+ \pi^-$	(6.3 $\pm$1.8) $\times 10^{-5}$		4728
$\gamma \pi^0 \pi^0$	(1.7 $\pm$0.7) $\times 10^{-5}$		4728
$\gamma \pi^0 \eta$	< 2.4 $\times 10^{-6}$ CL=90%		4713
$\gamma K^+ K^-$	[a] (1.14 $\pm$0.13) $\times 10^{-5}$		4704
$\gamma p \overline{p}$	[b] < 6 $\times 10^{-6}$ CL=90%		4636
$\gamma 2h^+ 2h^-$	(7.0 $\pm$1.5) $\times 10^{-4}$		4720
$\gamma 3h^+ 3h^-$	(5.4 $\pm$2.0) $\times 10^{-4}$		4703
$\gamma 4h^+ 4h^-$	(7.4 $\pm$3.5) $\times 10^{-4}$		4679
$\gamma \pi^+ \pi^- K^+ K^-$	(2.9 $\pm$0.9) $\times 10^{-4}$		4686
$\gamma 2\pi^+ 2\pi^-$	(2.5 $\pm$0.9) $\times 10^{-4}$		4720
$\gamma 3\pi^+ 3\pi^-$	(2.5 $\pm$1.2) $\times 10^{-4}$		4703
$\gamma 2\pi^+ 2\pi^- K^+ K^-$	(2.4 $\pm$1.2) $\times 10^{-4}$		4658
$\gamma \pi^+ \pi^- p \overline{p}$	(1.5 $\pm$0.6) $\times 10^{-4}$		4604
$\gamma 2\pi^+ 2\pi^- p \overline{p}$	(4 $\pm$6) $\times 10^{-5}$		4563
$\gamma 2K^+ 2K^-$	(2.0 $\pm$2.0) $\times 10^{-5}$		4601
$\gamma \eta'(958)$	< 1.9 $\times 10^{-6}$ CL=90%		4682
$\gamma \eta$	< 1.0 $\times 10^{-6}$ CL=90%		4714
$\gamma f_0(980)$	< 3 $\times 10^{-5}$ CL=90%		4678
$\gamma f_2'(1525)$	(3.8 $\pm$0.9) $\times 10^{-5}$		4607
$\gamma f_2(1270)$	(1.01 $\pm$0.09) $\times 10^{-4}$		4644
$\gamma \eta(1405)$	< 8.2 $\times 10^{-5}$ CL=90%		4625
$\gamma f_0(1500)$	< 1.5 $\times 10^{-5}$ CL=90%		4611
$\gamma f_0(1710)$	< 2.6 $\times 10^{-4}$ CL=90%		4573
$\gamma f_0(1710) \rightarrow \gamma K^+ K^-$	< 7 $\times 10^{-6}$ CL=90%		−
$\gamma f_0(1710) \rightarrow \gamma \pi^0 \pi^0$	< 1.4 $\times 10^{-6}$ CL=90%		−
$\gamma f_0(1710) \rightarrow \gamma \eta \eta$	< 1.8 $\times 10^{-6}$ CL=90%		−

$\gamma f_4(2050)$		$<\ 5.3$	$\times 10^{-5}$ CL=90%	4515
$\gamma f_0(2200) \to \gamma K^+ K^-$		$<\ 2$	$\times 10^{-4}$ CL=90%	4475
$\gamma f_J(2220) \to \gamma K^+ K^-$		$<\ 8$	$\times 10^{-7}$ CL=90%	4469
$\gamma f_J(2220) \to \gamma \pi^+ \pi^-$		$<\ 6$	$\times 10^{-7}$ CL=90%	−
$\gamma f_J(2220) \to \gamma p \overline{p}$		$<\ 1.1$	$\times 10^{-6}$ CL=90%	−
$\gamma \eta(2225) \to \gamma \phi \phi$		$<\ 3$	$\times 10^{-3}$ CL=90%	4469
$\gamma \eta_c(1S)$		$<\ 5.7$	$\times 10^{-5}$ CL=90%	4260
$\gamma \chi_{c0}$		$<\ 6.5$	$\times 10^{-4}$ CL=90%	4114
$\gamma \chi_{c1}$		$<\ 2.3$	$\times 10^{-5}$ CL=90%	4079
$\gamma \chi_{c2}$		$<\ 7.6$	$\times 10^{-6}$ CL=90%	4062
$\gamma X(3872) \to \pi^+ \pi^- J/\psi$		$<\ 1.6$	$\times 10^{-6}$ CL=90%	−
$\gamma X(3872) \to \pi^+ \pi^- \pi^0 J/\psi$		$<\ 2.8$	$\times 10^{-6}$ CL=90%	−
$\gamma X(3915) \to \omega J/\psi$		$<\ 3.0$	$\times 10^{-6}$ CL=90%	−
$\gamma X(4140) \to \phi J/\psi$		$<\ 2.2$	$\times 10^{-6}$ CL=90%	−
γX	[c]	$<\ 4.5$	$\times 10^{-6}$ CL=90%	−
$\gamma X \overline{X}(m_X < 3.1 \text{ GeV})$	[d]	$<\ 1$	$\times 10^{-3}$ CL=90%	−
$\gamma X \overline{X}(m_X < 4.5 \text{ GeV})$	[e]	$<\ 2.4$	$\times 10^{-4}$ CL=90%	−
$\gamma X \to \gamma + \geq 4$ prongs	[f]	$<\ 1.78$	$\times 10^{-4}$ CL=95%	−
$\gamma a_1^0 \to \gamma \mu^+ \mu^-$	[g]	$<\ 9$	$\times 10^{-6}$ CL=90%	−
$\gamma a_1^0 \to \gamma \tau^+ \tau^-$	[a]	$<\ 1.30$	$\times 10^{-4}$ CL=90%	−
$\gamma a_1^0 \to \gamma g g$	[h]	$<\ 1$	% CL=90%	−
$\gamma a_1^0 \to \gamma s \overline{s}$	[h]	$<\ 1$	$\times 10^{-3}$ CL=90%	−

Lepton Family number (*LF*) violating modes

$\mu^\pm \tau^\mp$	LF	$<\ 6.0$	$\times 10^{-6}$ CL=95%	4563

Other decays

invisible	$<\ 3.0$	$\times 10^{-4}$ CL=90%	−

$\chi_{b0}(1P)$ [i]

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

Mass $m = 9859.44 \pm 0.42 \pm 0.31$ MeV
Mass $m = 32.5 \pm 0.9$ MeV

$\chi_{b0}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)		Confidence level	p (MeV/c)
$\gamma \Upsilon(1S)$	$(\ 1.94 \pm 0.27)$ %			†
$D^0 X$	$<\ 10.4$	%	90%	−
$\pi^+ \pi^- K^+ K^- \pi^0$	$<\ 1.6$	$\times 10^{-4}$	90%	†
$2\pi^+ \pi^- K^- K^0_S$	$<\ 5$	$\times 10^{-5}$	90%	†
$2\pi^+ \pi^- K^- K^0_S 2\pi^0$	$<\ 5$	$\times 10^{-4}$	90%	†
$2\pi^+ 2\pi^- 2\pi^0$	$<\ 2.1$	$\times 10^{-4}$	90%	†
$2\pi^+ 2\pi^- K^+ K^-$	$(\ 1.1 \pm 0.6\ ) \times 10^{-4}$			†
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	$<\ 2.7$	$\times 10^{-4}$	90%	†

$2\pi^+2\pi^-K^+K^-2\pi^0$	< 5	$\times 10^{-4}$	90%	†
$3\pi^+2\pi^-K^-K_S^0\pi^0$	< 1.6	$\times 10^{-4}$	90%	†
$3\pi^+3\pi^-$	< 8	$\times 10^{-5}$	90%	†
$3\pi^+3\pi^-2\pi^0$	< 6	$\times 10^{-4}$	90%	†
$3\pi^+3\pi^-K^+K^-$	(2.4 ±1.2) $\times 10^{-4}$			†
$3\pi^+3\pi^-K^+K^-\pi^0$	< 1.0	$\times 10^{-3}$	90%	†
$4\pi^+4\pi^-$	< 8	$\times 10^{-5}$	90%	†
$4\pi^+4\pi^-2\pi^0$	< 2.1	$\times 10^{-3}$	90%	†
$J/\psi J/\psi$	< 7	$\times 10^{-5}$	90%	†
$J/\psi\psi(2S)$	< 1.2	$\times 10^{-4}$	90%	†
$\psi(2S)\psi(2S)$	< 3.1	$\times 10^{-5}$	90%	†

$\chi_{b1}(1P)$ [i]

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

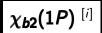J needs confirmation.

Mass $m = 9892.78 \pm 0.26 \pm 0.31$ MeV

$\chi_{b1}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma\,\Upsilon(1S)$	(35.0±2.1) %		423
$D^0 X$	(12.6±2.2) %		−
$\pi^+\pi^-K^+K^-\pi^0$	(2.0±0.6) $\times 10^{-4}$		4892
$2\pi^+\pi^-K^-K_S^0$	(1.3±0.5) $\times 10^{-4}$		4892
$2\pi^+\pi^-K^-K_S^0 2\pi^0$	< 6 $\times 10^{-4}$	90%	4863
$2\pi^+2\pi^-2\pi^0$	(8.0±2.5) $\times 10^{-4}$		4921
$2\pi^+2\pi^-K^+K^-$	(1.5±0.5) $\times 10^{-4}$		4878
$2\pi^+2\pi^-K^+K^-\pi^0$	(3.5±1.2) $\times 10^{-4}$		4863
$2\pi^+2\pi^-K^+K^-2\pi^0$	(8.6±3.2) $\times 10^{-4}$		4845
$3\pi^+2\pi^-K^-K_S^0\pi^0$	(9.3±3.3) $\times 10^{-4}$		4844
$3\pi^+3\pi^-$	(1.9±0.6) $\times 10^{-4}$		4921
$3\pi^+3\pi^-2\pi^0$	(1.7±0.5) $\times 10^{-3}$		4898
$3\pi^+3\pi^-K^+K^-$	(2.6±0.8) $\times 10^{-4}$		4844
$3\pi^+3\pi^-K^+K^-\pi^0$	(7.5±2.6) $\times 10^{-4}$		4825
$4\pi^+4\pi^-$	(2.6±0.9) $\times 10^{-4}$		4897
$4\pi^+4\pi^-2\pi^0$	(1.4±0.6) $\times 10^{-3}$		4867
$J/\psi J/\psi$	< 2.7 $\times 10^{-5}$	90%	3857
$J/\psi\psi(2S)$	< 1.7 $\times 10^{-5}$	90%	3594
$\psi(2S)\psi(2S)$	< 6 $\times 10^{-5}$	90%	3298

$h_b(1P)$

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

Mass $m = 9899.3 \pm 0.8$ MeV

$h_b(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta_b(1S)\gamma$	(52^{+6}_{-5}) %	488

$\chi_{b2}(1P)$ [i]

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

Mass $m = 9912.21 \pm 0.26 \pm 0.31$ MeV

$\chi_{b2}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma\,\Upsilon(1S)$	(18.8 ± 1.1) %		442
$D^0 X$	< 7.9 %	90%	−
$\pi^+\pi^- K^+ K^- \pi^0$	$(8 \pm 5) \times 10^{-5}$		4902
$2\pi^+\pi^- K^- K^0_S$	$< 1.0 \times 10^{-4}$	90%	4901
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	$(5.3\pm2.4) \times 10^{-4}$		4873
$2\pi^+2\pi^- 2\pi^0$	$(3.5\pm1.4) \times 10^{-4}$		4931
$2\pi^+2\pi^- K^+ K^-$	$(1.1\pm0.4) \times 10^{-4}$		4888
$2\pi^+2\pi^- K^+ K^- \pi^0$	$(2.1\pm0.9) \times 10^{-4}$		4872
$2\pi^+2\pi^- K^+ K^- 2\pi^0$	$(3.9\pm1.8) \times 10^{-4}$		4855
$3\pi^+2\pi^- K^- K^0_S \pi^0$	$< 5 \times 10^{-4}$	90%	4854
$3\pi^+3\pi^-$	$(7.0\pm3.1) \times 10^{-5}$		4931
$3\pi^+3\pi^- 2\pi^0$	$(1.0\pm0.4) \times 10^{-3}$		4908
$3\pi^+3\pi^- K^+ K^-$	$< 8 \times 10^{-5}$	90%	4854
$3\pi^+3\pi^- K^+ K^- \pi^0$	$(3.6\pm1.5) \times 10^{-4}$		4835
$4\pi^+4\pi^-$	$(8 \pm 4) \times 10^{-5}$		4907
$4\pi^+4\pi^- 2\pi^0$	$(1.8\pm0.7) \times 10^{-3}$		4877
$J/\psi J/\psi$	$< 4 \times 10^{-5}$	90%	3869
$J/\psi\psi(2S)$	$< 5 \times 10^{-5}$	90%	3608
$\psi(2S)\psi(2S)$	$< 1.6 \times 10^{-5}$	90%	3313

$\Upsilon(2S)$

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

Mass $m = 10023.26 \pm 0.31$ MeV
$m_{\Upsilon(3S)} - m_{\Upsilon(2S)} = 331.50 \pm 0.13$ MeV
Full width $\Gamma = 31.98 \pm 2.63$ keV
$\Gamma_{ee} = 0.612 \pm 0.011$ keV

$\Upsilon(2S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\Upsilon(1S)\pi^+\pi^-$	(17.85 ± 0.26) %		475
$\Upsilon(1S)\pi^0\pi^0$	(8.6 ± 0.4) %		480
$\tau^+\tau^-$	(2.00 ± 0.21) %		4686
$\mu^+\mu^-$	(1.93 ± 0.17) %	S=2.2	5011
e^+e^-	(1.91 ± 0.16) %		5012
$\Upsilon(1S)\pi^0$	$< 4 \times 10^{-5}$	CL=90%	531
$\Upsilon(1S)\eta$	$(2.9\pm 0.4)\times 10^{-4}$	S=2.0	126
$J/\psi(1S)$ anything	$< 6 \times 10^{-3}$	CL=90%	4533
$J/\psi(1S)\eta_c$	$< 5.4 \times 10^{-6}$	CL=90%	3984
$J/\psi(1S)\chi_{c0}$	$< 3.4 \times 10^{-6}$	CL=90%	3808
$J/\psi(1S)\chi_{c1}$	$< 1.2 \times 10^{-6}$	CL=90%	3765
$J/\psi(1S)\chi_{c2}$	$< 2.0 \times 10^{-6}$	CL=90%	3744
$J/\psi(1S)\eta_c(2S)$	$< 2.5 \times 10^{-6}$	CL=90%	3706
$J/\psi(1S)X(3940)$	$< 2.0 \times 10^{-6}$	CL=90%	3555
$J/\psi(1S)X(4160)$	$< 2.0 \times 10^{-6}$	CL=90%	3440
χ_{c1} anything	$(2.2\pm 0.5)\times 10^{-4}$		–
χ_{c2} anything	$(2.3\pm 0.8)\times 10^{-4}$		–
$\psi(2S)\eta_c$	$< 5.1 \times 10^{-6}$	CL=90%	3732
$\psi(2S)\chi_{c0}$	$< 4.7 \times 10^{-6}$	CL=90%	3536
$\psi(2S)\chi_{c1}$	$< 2.5 \times 10^{-6}$	CL=90%	3488
$\psi(2S)\chi_{c2}$	$< 1.9 \times 10^{-6}$	CL=90%	3464
$\psi(2S)\eta_c(2S)$	$< 3.3 \times 10^{-6}$	CL=90%	3421
$\psi(2S)X(3940)$	$< 3.9 \times 10^{-6}$	CL=90%	3250
$\psi(2S)X(4160)$	$< 3.9 \times 10^{-6}$	CL=90%	3118
$\overline{^2H}$ anything	$(2.78^{+0.30}_{-0.26})\times 10^{-5}$	S=1.2	–
hadrons	(94 ± 11) %		–
ggg	(58.8 ± 1.2) %		–
γgg	(1.87 ± 0.28) %		–
ϕK^+K^-	$(1.6\pm 0.4)\times 10^{-6}$		4910
$\omega\pi^+\pi^-$	$< 2.58 \times 10^{-6}$	CL=90%	4977
$K^*(892)^0 K^-\pi^+ +$ c.c.	$(2.3\pm 0.7)\times 10^{-6}$		4952
$\phi f_2'(1525)$	$< 1.33 \times 10^{-6}$	CL=90%	4841
$\omega f_2(1270)$	$< 5.7 \times 10^{-7}$	CL=90%	4899
$\rho(770)a_2(1320)$	$< 8.8 \times 10^{-7}$	CL=90%	4894
$K^*(892)^0 \overline{K}_2^*(1430)^0 +$ c.c.	$(1.5\pm 0.6)\times 10^{-6}$		4869
$K_1(1270)^\pm K^\mp$	$< 3.22 \times 10^{-6}$	CL=90%	4918
$K_1(1400)^\pm K^\mp$	$< 8.3 \times 10^{-7}$	CL=90%	4901
$b_1(1235)^\pm \pi^\mp$	$< 4.0 \times 10^{-7}$	CL=90%	4935
$\rho\pi$	$< 1.16 \times 10^{-6}$	CL=90%	4981
$\pi^+\pi^-\pi^0$	$< 8.0 \times 10^{-7}$	CL=90%	5007
$\omega\pi^0$	$< 1.63 \times 10^{-6}$	CL=90%	4980

$\pi^+\pi^-\pi^0\pi^0$	$(1.30\pm 0.28)\times 10^{-5}$		5002
$K^0_S K^+\pi^- +$ c.c.	$(1.14\pm 0.33)\times 10^{-6}$		4979
$K^*(892)^0\overline{K}^0 +$ c.c.	$< 4.22 \times 10^{-6}$	CL=90%	4959
$K^*(892)^- K^+ +$ c.c.	$< 1.45 \times 10^{-6}$	CL=90%	4960
Sum of 100 exclusive modes	$(2.90\pm 0.30)\times 10^{-3}$		–

Radiative decays

$\gamma\chi_{b1}(1P)$	$(6.9\pm 0.4)\%$		130
$\gamma\chi_{b2}(1P)$	$(7.15\pm 0.35)\%$		110
$\gamma\chi_{b0}(1P)$	$(3.8\pm 0.4)\%$		5012
$\gamma f_0(1710)$	$< 5.9 \times 10^{-4}$	CL=90%	4864
$\gamma f'_2(1525)$	$< 5.3 \times 10^{-4}$	CL=90%	4896
$\gamma f_2(1270)$	$< 2.41 \times 10^{-4}$	CL=90%	4930
$\gamma\eta_c(1S)$	$< 2.7 \times 10^{-5}$	CL=90%	4568
$\gamma\chi_{c0}$	$< 1.0 \times 10^{-4}$	CL=90%	4430
$\gamma\chi_{c1}$	$< 3.6 \times 10^{-6}$	CL=90%	4397
$\gamma\chi_{c2}$	$< 1.5 \times 10^{-5}$	CL=90%	4381
$\gamma X(3872) \to \pi^+\pi^- J/\psi$	$< 8 \times 10^{-7}$	CL=90%	–
$\gamma X(3872) \to \pi^+\pi^-\pi^0 J/\psi$	$< 2.4 \times 10^{-6}$	CL=90%	–
$\gamma X(3915) \to \omega J/\psi$	$< 2.8 \times 10^{-6}$	CL=90%	–
$\gamma X(4140) \to \phi J/\psi$	$< 1.2 \times 10^{-6}$	CL=90%	–
$\gamma X(4350) \to \phi J/\psi$	$< 1.3 \times 10^{-6}$	CL=90%	–
$\gamma\eta_b(1S)$	$(3.9\pm 1.5)\times 10^{-4}$		605
$\gamma\eta_b(1S) \to \gamma$ Sum of 26 exclusive modes	$< 3.7 \times 10^{-6}$	CL=90%	–
$\gamma X_{b\bar b} \to \gamma$ Sum of 26 exclusive modes	$< 4.9 \times 10^{-6}$	CL=90%	–
$\gamma X \to \gamma + \geq 4$ prongs	[j] $< 1.95 \times 10^{-4}$	CL=95%	–
$\gamma A^0 \to \gamma$ hadrons	$< 8 \times 10^{-5}$	CL=90%	–
$\gamma a^0_1 \to \gamma\mu^+\mu^-$	$< 8.3 \times 10^{-6}$	CL=90%	–

Lepton Family number (*LF*) violating modes

$e^\pm\tau^\mp$	*LF*	$< 3.2 \times 10^{-6}$	CL=90%	4854
$\mu^\pm\tau^\mp$	*LF*	$< 3.3 \times 10^{-6}$	CL=90%	4854

$\Upsilon(1D)$

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

Mass $m = 10163.7 \pm 1.4$ MeV (S = 1.7)

$\Upsilon(1D)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\gamma\gamma\,\Upsilon(1S)$	seen	679
$\gamma\chi_{bJ}(1P)$	seen	5082
$\eta\,\Upsilon(1S)$	not seen	426
$\pi^+\pi^-\,\Upsilon(1S)$	$(6.6\pm1.6)\times 10^{-3}$	623

$\chi_{b0}(2P)$ [i]

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

Mass $m = 10232.5 \pm 0.4 \pm 0.5$ MeV
Mass $m = 23.8 \pm 1.7$ MeV

$\chi_{b0}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)		Confidence level	p (MeV/c)
$\gamma\, \Upsilon(2S)$	(1.38 ± 0.30) %			†
$\gamma\, \Upsilon(1S)$	$(3.8\ \pm1.7\ )\times 10^{-3}$			†
$D^0 X$	< 8.2	%	90%	−
$\pi^+\pi^- K^+ K^- \pi^0$	< 3.4	$\times 10^{-5}$	90%	†
$2\pi^+\pi^- K^- K^0_S$	< 5	$\times 10^{-5}$	90%	†
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	< 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%	†
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	< 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%	†

$\chi_{b1}(2P)$ [i]

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

Mass $m = 10255.46 \pm 0.22 \pm 0.50$ MeV
$m_{\chi_{b1}(2P)} - m_{\chi_{b0}(2P)} = 23.5 \pm 1.0$ MeV

$\chi_{b1}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\omega\, \Upsilon(1S)$	$(\ 1.63^{+0.40}_{-0.34})$ %	135
$\gamma\, \Upsilon(2S)$	$(18.1\ \pm1.9\ )$ %	230
$\gamma\, \Upsilon(1S)$	$(\ 9.9\ \pm1.0\ )$ %	764
$\pi\pi\, \chi_{b1}(1P)$	$(\ 9.1\ \pm1.3\ )\times 10^{-3}$	238
$D^0 X$	$(\ 8.8\ \pm1.7\ )$ %	−
$\pi^+\pi^- K^+ K^- \pi^0$	$(\ 3.1\ \pm1.0\ )\times 10^{-4}$	5075
$2\pi^+\pi^- K^- K^0_S$	$(\ 1.1\ \pm0.5\ )\times 10^{-4}$	5075
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	$(\ 7.7\ \pm3.2\ )\times 10^{-4}$	5047
$2\pi^+ 2\pi^- 2\pi^0$	$(\ 5.9\ \pm2.0\ )\times 10^{-4}$	5104

$2\pi^+ 2\pi^- K^+ K^-$	$(10 \pm 4) \times 10^{-5}$	5062
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	$(5.5 \pm 1.8) \times 10^{-4}$	5047
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	$(10 \pm 4) \times 10^{-4}$	5030
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	$(6.7 \pm 2.6) \times 10^{-4}$	5029
$3\pi^+ 3\pi^-$	$(1.2 \pm 0.4) \times 10^{-4}$	5103
$3\pi^+ 3\pi^- 2\pi^0$	$(1.2 \pm 0.4) \times 10^{-3}$	5081
$3\pi^+ 3\pi^- K^+ K^-$	$(2.0 \pm 0.8) \times 10^{-4}$	5029
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	$(6.1 \pm 2.2) \times 10^{-4}$	5011
$4\pi^+ 4\pi^-$	$(1.7 \pm 0.6) \times 10^{-4}$	5080
$4\pi^+ 4\pi^- 2\pi^0$	$(1.9 \pm 0.7) \times 10^{-3}$	5051

$\chi_{b2}(2P)$ [i]

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

Mass $m = 10268.65 \pm 0.22 \pm 0.50$ MeV
$m_{\chi_{b2}(2P)} - m_{\chi_{b1}(2P)} = 13.10 \pm 0.24$ MeV

$\chi_{b2}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\omega \Upsilon(1S)$	$(1.10^{+0.34}_{-0.30})\ \%$		194
$\gamma \Upsilon(2S)$	$(8.9 \pm 1.2)\ \%$		242
$\gamma \Upsilon(1S)$	$(6.6 \pm 0.8)\ \%$		777
$\pi\pi \chi_{b2}(1P)$	$(5.1 \pm 0.9) \times 10^{-3}$		229
$D^0 X$	$< 2.4\ \%$	90%	$-$
$\pi^+ \pi^- K^+ K^- \pi^0$	$< 1.1 \times 10^{-4}$	90%	5082
$2\pi^+ \pi^- K^- K^0_S$	$< 9 \times 10^{-5}$	90%	5082
$2\pi^+ \pi^- K^- K^0_S 2\pi^0$	$< 7 \times 10^{-4}$	90%	5054
$2\pi^+ 2\pi^- 2\pi^0$	$(3.9 \pm 1.6) \times 10^{-4}$		5110
$2\pi^+ 2\pi^- K^+ K^-$	$(9 \pm 4) \times 10^{-5}$		5068
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	$(2.4 \pm 1.1) \times 10^{-4}$		5054
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	$(4.7 \pm 2.3) \times 10^{-4}$		5037
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	$< 4 \times 10^{-4}$	90%	5036
$3\pi^+ 3\pi^-$	$(9 \pm 4) \times 10^{-5}$		5110
$3\pi^+ 3\pi^- 2\pi^0$	$(1.2 \pm 0.4) \times 10^{-3}$		5088
$3\pi^+ 3\pi^- K^+ K^-$	$(1.4 \pm 0.7) \times 10^{-4}$		5036
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	$(4.2 \pm 1.7) \times 10^{-4}$		5017
$4\pi^+ 4\pi^-$	$(9 \pm 5) \times 10^{-5}$		5087
$4\pi^+ 4\pi^- 2\pi^0$	$(1.3 \pm 0.5) \times 10^{-3}$		5058

$\Upsilon(3S)$

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

Mass $m = 10355.2 \pm 0.5$ MeV
$m_{\Upsilon(3S)} - m_{\Upsilon(2S)} = 331.50 \pm 0.13$ MeV
Full width $\Gamma = 20.32 \pm 1.85$ keV
$\Gamma_{ee} = 0.443 \pm 0.008$ keV

$\Upsilon(3S)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\Upsilon(2S)$ anything	$(10.6 \pm 0.8)\%$		296
$\Upsilon(2S)\pi^+\pi^-$	$(2.82\pm 0.18)\%$	S=1.6	177
$\Upsilon(2S)\pi^0\pi^0$	$(1.85\pm 0.14)\%$		190
$\Upsilon(2S)\gamma\gamma$	$(5.0 \pm 0.7)\%$		327
$\Upsilon(2S)\pi^0$	$< 5.1 \times 10^{-4}$	CL=90%	298
$\Upsilon(1S)\pi^+\pi^-$	$(4.37\pm 0.08)\%$		813
$\Upsilon(1S)\pi^0\pi^0$	$(2.20\pm 0.13)\%$		816
$\Upsilon(1S)\eta$	$< 1 \times 10^{-4}$	CL=90%	677
$\Upsilon(1S)\pi^0$	$< 7 \times 10^{-5}$	CL=90%	846
$h_b(1P)\pi^0$	$< 1.2 \times 10^{-3}$	CL=90%	426
$h_b(1P)\pi^0 \to \gamma\eta_b(1S)\pi^0$	$(4.3 \pm 1.4)\times 10^{-4}$		–
$h_b(1P)\pi^+\pi^-$	$< 1.2 \times 10^{-4}$	CL=90%	353
$\tau^+\tau^-$	$(2.29\pm 0.30)\%$		4863
$\mu^+\mu^-$	$(2.18\pm 0.21)\%$	S=2.1	5177
e^+e^-	$(2.18\pm 0.20)\%$		5178
hadrons	$(93 \pm12)\%$		–
ggg	$(35.7 \pm 2.6)\%$		–
γgg	$(9.7 \pm 1.8)\times 10^{-3}$		–
^2H anything	$(2.33\pm 0.33)\times 10^{-5}$		–

Radiative decays

$\gamma\chi_{b2}(2P)$	$(13.1 \pm 1.6)\%$	S=3.4	86
$\gamma\chi_{b1}(2P)$	$(12.6 \pm 1.2)\%$	S=2.4	99
$\gamma\chi_{b0}(2P)$	$(5.9 \pm 0.6)\%$	S=1.4	5178
$\gamma\chi_{b2}(1P)$	$(9.9 \pm 1.2)\times 10^{-3}$	S=1.9	434
$\gamma\chi_{b1}(1P)$	$(9 \pm 5)\times 10^{-4}$	S=1.8	452
$\gamma\chi_{b0}(1P)$	$(2.7 \pm 0.4)\times 10^{-3}$		5178
$\gamma\eta_b(2S)$	$< 6.2 \times 10^{-4}$	CL=90%	350
$\gamma\eta_b(1S)$	$(5.1 \pm 0.7)\times 10^{-4}$		912
$\gamma A^0 \to \gamma$ hadrons	$< 8 \times 10^{-5}$	CL=90%	–
$\gamma X \to \gamma + \geq 4$ prongs	$[k] < 2.2 \times 10^{-4}$	CL=95%	–
$\gamma a_1^0 \to \gamma\mu^+\mu^-$	$< 5.5 \times 10^{-6}$	CL=90%	–
$\gamma a_1^0 \to \gamma\tau^+\tau^-$	$[l] < 1.6 \times 10^{-4}$	CL=90%	–

Lepton Family number (*LF*) violating modes

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

$\chi_{b1}(3P)$ $\qquad\qquad I^G(J^{PC}) = 0^+(1^{++})$

Mass $m = 10512.1 \pm 2.3$ MeV

$\chi_{b1}(3P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Upsilon(1S)\gamma$	seen	999
$\Upsilon(2S)\gamma$	seen	477
$\Upsilon(3S)\gamma$	seen	156

$\Upsilon(4S)$ or $\Upsilon(10580)$ $\qquad\qquad I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 10579.4 \pm 1.2$ MeV
Full width $\Gamma = 20.5 \pm 2.5$ MeV
$\Gamma_{ee} = 0.272 \pm 0.029$ keV (S = 1.5)

$\Upsilon(4S)$ DECAY MODES	Fraction (Γ_i/Γ)		Confidence level	p (MeV/c)
$B\overline{B}$	> 96	%	95%	326
B^+B^-	(51.4 ±0.6) %			331
D_s^+ anything + c.c.	(17.8 ±2.6) %			–
$B^0\overline{B}^0$	(48.6 ±0.6) %			326
$J/\psi K_S^0 + (J/\psi, \eta_c)K_S^0$	< 4	$\times 10^{-7}$	90%	–
non-$B\overline{B}$	< 4	%	95%	–
e^+e^-	(1.57±0.08) $\times 10^{-5}$			5290
$\rho^+\rho^-$	< 5.7	$\times 10^{-6}$	90%	5233
$K^*(892)^0\overline{K}^0$	< 2.0	$\times 10^{-6}$	90%	5240
$J/\psi(1S)$ anything	< 1.9	$\times 10^{-4}$	95%	–
D^{*+} anything + c.c.	< 7.4	%	90%	5099
ϕ anything	(7.1 ±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
$\Upsilon(1S)\pi^+\pi^-$	(8.1 ±0.6) $\times 10^{-5}$			1026
$\Upsilon(1S)\eta$	(1.96±0.28) $\times 10^{-4}$			924

$\Upsilon(2S)\pi^+\pi^-$	(8.6 ± 1.3) $\times 10^{-5}$		468
$h_b(1P)\pi^+\pi^-$	not seen		600
$h_b(1P)\eta$	(2.18 ± 0.21) $\times 10^{-3}$		390
^2H anything	< 1.3 $\times 10^{-5}$	90%	–

$X(10610)^{\pm}$ $I^G(J^P) = 1^+(1^+)$

Mass $m = 10607.2 \pm 2.0$ MeV
Full width $\Gamma = 18.4 \pm 2.4$ MeV

$X(10610)^-$ decay modes are charge conjugates of the modes below.

$X(10610)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Upsilon(1S)\pi^+$	($5.4^{+1.9}_{-1.5}$) $\times 10^{-3}$	1077
$\Upsilon(2S)\pi^+$	($3.6^{+1.1}_{-0.8}$) %	551
$\Upsilon(3S)\pi^+$	($2.1^{+0.8}_{-0.6}$) %	207
$h_b(1P)\pi^+$	($3.5^{+1.2}_{-0.9}$) %	671
$h_b(2P)\pi^+$	($4.7^{+1.7}_{-1.3}$) %	313
$B^+\overline{B}^0$	not seen	505
$B^+\overline{B}^{*0} + B^{*+}\overline{B}^0$	($85.6^{+2.1}_{-2.9}$) %	–
$B^{*+}\overline{B}^{*0}$	not seen	†

$X(10610)^0$ $I^G(J^P) = 1^+(1^+)$

Mass $m = 10609 \pm 6$ MeV

$X(10610)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Upsilon(1S)\pi^0$	not seen	1079
$\Upsilon(2S)\pi^0$	seen	554
$\Upsilon(3S)\pi^0$	seen	212

$\Upsilon(10860)$ $I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 10889.9^{+3.2}_{-2.6}$ MeV
Full width $\Gamma = 51^{+6}_{-7}$ MeV
$\Gamma_{ee} = 0.31 \pm 0.07$ keV   (S = 1.3)

$\Upsilon(10860)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$B\overline{B}X$	(76.2 $^{+2.7}_{-4.0}$) %		–
$B\overline{B}$	(5.5 ±1.0) %		1332
$B\overline{B}{}^* +$ c.c.	(13.7 ±1.6) %		–
$B^*\overline{B}{}^*$	(38.1 ±3.4) %		1138
$B\overline{B}{}^{(*)}\pi$	< 19.7 %	90%	1027
$B\overline{B}\pi$	(0.0 ±1.2) %		1027
$B^*\overline{B}\pi + B\overline{B}{}^*\pi$	(7.3 ±2.3) %		–
$B^*\overline{B}{}^*\pi$	(1.0 ±1.4) %		756
$B\overline{B}\pi\pi$	< 8.9 %	90%	574
$B_s^{(*)}\overline{B}_s^{(*)}$	(20.1 ±3.1) %		919
$B_s\overline{B}_s$	(5 ±5) $\times 10^{-3}$		919
$B_s\overline{B}_s^* +$ c.c.	(1.35±0.32) %		–
$B_s^*\overline{B}_s^*$	(17.6 ±2.7) %		566
no open-bottom	(3.8 $^{+5.0}_{-0.5}$) %		–
e^+e^-	(6.1 ±1.6) $\times 10^{-6}$		5445
$K^*(892)^0\overline{K}{}^0$	< 1.0 $\times 10^{-5}$	90%	5397
$\Upsilon(1S)\pi^+\pi^-$	(5.3 ±0.6) $\times 10^{-3}$		1310
$\Upsilon(2S)\pi^+\pi^-$	(7.8 ±1.3) $\times 10^{-3}$		788
$\Upsilon(3S)\pi^+\pi^-$	(4.8 $^{+1.9}_{-1.7}$) $\times 10^{-3}$		445
$\Upsilon(1S)K^+K^-$	(6.1 ±1.8) $\times 10^{-4}$		965
$h_b(1P)\pi^+\pi^-$	(3.5 $^{+1.0}_{-1.3}$) $\times 10^{-3}$		907
$h_b(2P)\pi^+\pi^-$	(5.7 $^{+1.7}_{-2.1}$) $\times 10^{-3}$		548
$\chi_{b0}(1P)\pi^+\pi^-\pi^0$	< 6.3 $\times 10^{-3}$	90%	5440
$\chi_{b0}(1P)\omega$	< 3.9 $\times 10^{-3}$	90%	5417
$\chi_{b0}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	< 4.8 $\times 10^{-3}$	90%	–
$\chi_{b1}(1P)\pi^+\pi^-\pi^0$	(1.85±0.33) $\times 10^{-3}$		865
$\chi_{b1}(1P)\omega$	(1.57±0.30) $\times 10^{-3}$		589
$\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	(5.2 ±1.9) $\times 10^{-4}$		–
$\chi_{b2}(1P)\pi^+\pi^-\pi^0$	(1.17±0.30) $\times 10^{-3}$		846
$\chi_{b2}(1P)\omega$	(6.0 ±2.7) $\times 10^{-4}$		559
$\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	(6 ±4) $\times 10^{-4}$		–
$\gamma X_b \to \gamma\Upsilon(1S)\omega$	< 3.8 $\times 10^{-5}$	90%	–

Inclusive Decays.

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

ϕ anything	(13.8 $^{+2.4}_{-1.7}$) %		–
D^0 anything $+$ c.c.	(108 ±8) %		–

D_s anything $+$ c.c.	(46 ± 6) %	−
J/ψ anything	(2.06$\pm$0.21) %	−
B^0 anything $+$ c.c.	(77 ± 8) %	−
B^+ anything $+$ c.c.	(72 ± 6) %	−

$\Upsilon(11020)$ $\qquad\qquad\qquad I^G(J^{PC}) = 0^-(1^{--})$

Mass $m = 10992.9^{+10.0}_{-3.1}$ MeV
Full width $\Gamma = 49^{+9}_{-15}$ MeV
$\Gamma_{ee} = 0.130 \pm 0.030$ keV

$\Upsilon(11020)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$e^+ e^-$	$(2.7^{+1.0}_{-0.8}) \times 10^{-6}$	5496

NOTES

[a] $2m_\tau < M(\tau^+\tau^-) < 9.2$ GeV

[b] 2 GeV $< m_{K^+K^-} < 3$ GeV

[c] X = scalar with $m < 8.0$ GeV

[d] $X\overline{X}$ = vectors with $m < 3.1$ GeV

[e] X and $\overline{X}$ = zero spin with $m < 4.5$ GeV

[f] 1.5 GeV $< m_X < 5.0$ GeV

[g] 201 MeV $< M(\mu^+\mu^-) < 3565$ MeV

[h] 0.5 GeV $< m_X < 9.0$ GeV, where m_X is the invariant mass of the hadronic final state.

[i] Spectroscopic labeling for these states is theoretical, pending experimental information.

[j] 1.5 GeV $< m_X < 5.0$ GeV

[k] 1.5 GeV $< m_X < 5.0$ GeV

[l] For $m_{\tau^+\tau^-}$ in the ranges 4.03–9.52 and 9.61–10.10 GeV.