$b\bar{b}$ 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
$\mu^+\mu^-$	$<9\times10^{-3}$	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)	Confidence level	p (MeV/c)
$\tau^+\tau^-$	(2.60 ±0.10) %		4384
e^+e^-	(2.38 ±0.11) %		4730
$\mu^+\mu^-$	(2.48 ±0.05) %		4729
Hadronic decays			
ggg	(81.7 ±0.7) %		–
γgg	(2.2 ±0.6) %		–
$\eta'(958)$ anything	(2.94 ±0.24) %		–
$J/\psi(1S)$ anything	(6.5 ±0.7) $\times10^{-4}$		4223
$J/\psi(1S)\eta_c$	< 2.2 $\times10^{-6}$	90%	3624
$J/\psi(1S)\chi_{c0}$	< 3.4 $\times10^{-6}$	90%	3429
$J/\psi(1S)\chi_{c1}$	(3.9 ±1.2) $\times10^{-6}$		3382
$J/\psi(1S)\chi_{c2}$	< 1.4 $\times10^{-6}$	90%	3359
$J/\psi(1S)\eta_c(2S)$	< 2.2 $\times10^{-6}$	90%	3316
$J/\psi(1S)X(3940)$	< 5.4 $\times10^{-6}$	90%	3148
$J/\psi(1S)X(4160)$	< 5.4 $\times10^{-6}$	90%	3018
χ_{c0} anything	< 5 $\times10^{-3}$	90%	–
χ_{c1} anything	(2.3 ±0.7) $\times10^{-4}$		–

χ_{c2} anything		$(3.4 \pm 1.0) \times 10^{-4}$			–
$\psi(2S)$ anything		$(2.7 \pm 0.9) \times 10^{-4}$			–
$\psi(2S)\eta_c$		$< 3.6 \times 10^{-6}$		90%	3345
$\psi(2S)\chi_{c0}$		$< 6.5 \times 10^{-6}$		90%	3124
$\psi(2S)\chi_{c1}$		$< 4.5 \times 10^{-6}$		90%	3070
$\psi(2S)\chi_{c2}$		$< 2.1 \times 10^{-6}$		90%	3043
$\psi(2S)\eta_c(2S)$		$< 3.2 \times 10^{-6}$		90%	2993
$\psi(2S)X(3940)$		$< 2.9 \times 10^{-6}$		90%	2797
$\psi(2S)X(4160)$		$< 2.9 \times 10^{-6}$		90%	2642
$\rho\pi$		$< 3.68 \times 10^{-6}$		90%	4697
$\omega\pi^0$		$< 3.90 \times 10^{-6}$		90%	4697
$\pi^+\pi^-$		$< 5 \times 10^{-4}$		90%	4728
K^+K^-		$< 5 \times 10^{-4}$		90%	4704
$p\overline{p}$		$< 5 \times 10^{-4}$		90%	4636
$\pi^+\pi^-\pi^0$		$(2.1 \pm 0.8) \times 10^{-6}$			4725
ϕK^+K^-		$(2.4 \pm 0.5) \times 10^{-6}$			4622
$\omega\pi^+\pi^-$		$(4.5 \pm 1.0) \times 10^{-6}$			4694
$K^*(892)^0K^-\pi^+$ + c.c.		$(4.4 \pm 0.8) \times 10^{-6}$			4667
$\phi f_2'(1525)$		$< 1.63 \times 10^{-6}$		90%	4549
$\omega f_2(1270)$		$< 1.79 \times 10^{-6}$		90%	4611
$\rho(770)a_2(1320)$		$< 2.24 \times 10^{-6}$		90%	4605
$K^*(892)^0\overline{K}_2^*(1430)^0$ + c.c.		$(3.0 \pm 0.8) \times 10^{-6}$			4579
$K_1(1270)^\pm K^\mp$		$< 2.41 \times 10^{-6}$		90%	4631
$K_1(1400)^\pm K^\mp$		$(1.0 \pm 0.4) \times 10^{-6}$			4613
$b_1(1235)^\pm\pi^\mp$		$< 1.25 \times 10^{-6}$		90%	4649
$\pi^+\pi^-\pi^0\pi^0$		$(1.28 \pm 0.30) \times 10^{-5}$			4720
$K_S^0K^+\pi^-$ + 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.		$< 1.11 \times 10^{-6}$		90%	4675
$\overline{D^*(2010)^\pm}$ anything		(2.52 ± 0.20) %			–
$\overline{^2H}$ anything		$(2.85 \pm 0.25) \times 10^{-5}$			–
Sum of 100 exclusive modes		(1.200 ± 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
$\gamma\pi^0\eta$		$< 2.4 \times 10^{-6}$		90%	4713
γK^+K^-	[a]	$(1.14 \pm 0.13) \times 10^{-5}$			4704
$\gamma p\overline{p}$	[b]	$< 6 \times 10^{-6}$		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	± 1.2)	$\times 10^{-4}$		4703
$\gamma 2\pi^+ 2\pi^- K^+ K^-$		(2.4	± 1.2)	$\times 10^{-4}$		4658
$\gamma \pi^+ \pi^- p\overline{p}$		(1.5	± 0.6)	$\times 10^{-4}$		4604
$\gamma 2\pi^+ 2\pi^- p\overline{p}$		(4	± 6)	$\times 10^{-5}$		4563
$\gamma 2K^+ 2K^-$		(2.0	± 2.0)	$\times 10^{-5}$		4601
$\gamma \eta'(958)$		$<$ 1.9		$\times 10^{-6}$	90%	4682
$\gamma \eta$		$<$ 1.0		$\times 10^{-6}$	90%	4714
$\gamma f_0(980)$		$<$ 3		$\times 10^{-5}$	90%	4678
$\gamma f_2'(1525)$		(3.8	± 0.9)	$\times 10^{-5}$		4607
$\gamma f_2(1270)$		(1.01	± 0.09)	$\times 10^{-4}$		4644
$\gamma \eta(1405)$		$<$ 8.2		$\times 10^{-5}$	90%	4625
$\gamma f_0(1500)$		$<$ 1.5		$\times 10^{-5}$	90%	4611
$\gamma f_0(1710)$		$<$ 2.6		$\times 10^{-4}$	90%	4573
$\gamma f_0(1710) \rightarrow \gamma K^+ K^-$		$<$ 7		$\times 10^{-6}$	90%	–
$\gamma f_0(1710) \rightarrow \gamma \pi^0 \pi^0$		$<$ 1.4		$\times 10^{-6}$	90%	–
$\gamma f_0(1710) \rightarrow \gamma \eta \eta$		$<$ 1.8		$\times 10^{-6}$	90%	–
$\gamma f_4(2050)$		$<$ 5.3		$\times 10^{-5}$	90%	4515
$\gamma f_0(2200) \rightarrow \gamma K^+ K^-$		$<$ 2		$\times 10^{-4}$	90%	4475
$\gamma f_J(2220) \rightarrow \gamma K^+ K^-$		$<$ 8		$\times 10^{-7}$	90%	4469
$\gamma f_J(2220) \rightarrow \gamma \pi^+ \pi^-$		$<$ 6		$\times 10^{-7}$	90%	–
$\gamma f_J(2220) \rightarrow \gamma p\overline{p}$		$<$ 1.1		$\times 10^{-6}$	90%	–
$\gamma \eta(2225) \rightarrow \gamma \phi\phi$		$<$ 3		$\times 10^{-3}$	90%	4469
$\gamma \eta_c(1S)$		$<$ 5.7		$\times 10^{-5}$	90%	4260
$\gamma \chi_{c0}$		$<$ 6.5		$\times 10^{-4}$	90%	4114
$\gamma \chi_{c1}$		$<$ 2.3		$\times 10^{-5}$	90%	4079
$\gamma \chi_{c2}$		$<$ 7.6		$\times 10^{-6}$	90%	4062
$\gamma X(3872) \rightarrow \pi^+ \pi^- J/\psi$		$<$ 1.6		$\times 10^{-6}$	90%	–
$\gamma X(3872) \rightarrow \pi^+ \pi^- \pi^0 J/\psi$		$<$ 2.8		$\times 10^{-6}$	90%	–
$\gamma X(3915) \rightarrow \omega J/\psi$		$<$ 3.0		$\times 10^{-6}$	90%	–
$\gamma X(4140) \rightarrow \phi J/\psi$		$<$ 2.2		$\times 10^{-6}$	90%	–
γX	[c]	$<$ 4.5		$\times 10^{-6}$	90%	–
$\gamma X\overline{X}(m_X < 3.1$ GeV)	[d]	$<$ 1		$\times 10^{-3}$	90%	–
$\gamma X\overline{X}(m_X < 4.5$ GeV)	[e]	$<$ 2.4		$\times 10^{-4}$	90%	–
$\gamma X \rightarrow \gamma +\geq 4$ prongs	[f]	$<$ 1.78		$\times 10^{-4}$	95%	–
$\gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-$	[g]	$<$ 9		$\times 10^{-6}$	90%	–
$\gamma a_1^0 \rightarrow \gamma \tau^+ \tau^-$	[a]	$<$ 1.30		$\times 10^{-4}$	90%	–
$\gamma a_1^0 \rightarrow \gamma g g$	[h]	$<$ 1		%	90%	–
$\gamma a_1^0 \rightarrow \gamma s\overline{s}$	[h]	$<$ 1		$\times 10^{-3}$	90%	–

Lepton Family number (*LF*) violating modes

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

Other decays

invisible		$<$ 3.0		$\times 10^{-4}$	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

$\chi_{b0}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma\,\Upsilon(1S)$	(1.76±0.35) %		391
$D^0 X$	< 10.4 %	90%	–
$\pi^+\pi^- K^+ K^- \pi^0$	< 1.6 $\times 10^{-4}$	90%	4875
$2\pi^+\pi^- K^- K^0_S$	< 5 $\times 10^{-5}$	90%	4875
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	< 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 ±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
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	< 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 ±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

$\chi_{b1}(1P)$ [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)
$\gamma\,\Upsilon(1S)$	(33.9±2.2) %		423
$D^0 X$	(12.6±2.2) %		–
$\pi^+\pi^- K^+ K^- \pi^0$	(2.0±0.6) $\times 10^{-4}$		4892
$2\pi^+\pi^- K^- K^0_S$	(1.3±0.5) $\times 10^{-4}$		4892
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	< 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
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	(9.3±3.3) $\times 10^{-4}$		4844
$3\pi^+ 3\pi^-$	(1.9±0.6) $\times 10^{-4}$		4921

$3\pi^+3\pi^-2\pi^0$	$(\ 1.7\pm0.5)\times10^{-3}$			4898
$3\pi^+3\pi^-K^+K^-$	$(\ 2.6\pm0.8)\times10^{-4}$			4844
$3\pi^+3\pi^-K^+K^-\pi^0$	$(\ 7.5\pm2.6)\times10^{-4}$			4825
$4\pi^+4\pi^-$	$(\ 2.6\pm0.9)\times10^{-4}$			4897
$4\pi^+4\pi^-2\pi^0$	$(\ 1.4\pm0.6)\times10^{-3}$			4867
$J/\psi\,J/\psi$	$<\ 2.7\ \times10^{-5}$		90%	3857
$J/\psi\psi(2S)$	$<\ 1.7\ \times10^{-5}$		90%	3594
$\psi(2S)\psi(2S)$	$<\ 6\ \times10^{-5}$		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)
$\gamma\,\Upsilon(1S)$	(19.1±1.2) %		442
D^0X	$<$ 7.9 %	90%	–
$\pi^+\pi^-K^+K^-\pi^0$	$(\ 8\ \pm5\ )\times10^{-5}$		4902
$2\pi^+\pi^-K^-K^0_S$	$<\ 1.0\ \times10^{-4}$	90%	4901
$2\pi^+\pi^-K^-K^0_S2\pi^0$	$(\ 5.3\pm2.4)\times10^{-4}$		4873
$2\pi^+2\pi^-2\pi^0$	$(\ 3.5\pm1.4)\times10^{-4}$		4931
$2\pi^+2\pi^-K^+K^-$	$(\ 1.1\pm0.4)\times10^{-4}$		4888
$2\pi^+2\pi^-K^+K^-\pi^0$	$(\ 2.1\pm0.9)\times10^{-4}$		4872
$2\pi^+2\pi^-K^+K^-2\pi^0$	$(\ 3.9\pm1.8)\times10^{-4}$		4855
$3\pi^+2\pi^-K^-K^0_S\pi^0$	$<\ 5\ \times10^{-4}$	90%	4854
$3\pi^+3\pi^-$	$(\ 7.0\pm3.1)\times10^{-5}$		4931
$3\pi^+3\pi^-2\pi^0$	$(\ 1.0\pm0.4)\times10^{-3}$		4908
$3\pi^+3\pi^-K^+K^-$	$<\ 8\ \times10^{-5}$	90%	4854
$3\pi^+3\pi^-K^+K^-\pi^0$	$(\ 3.6\pm1.5)\times10^{-4}$		4835
$4\pi^+4\pi^-$	$(\ 8\ \pm4\ )\times10^{-5}$		4907
$4\pi^+4\pi^-2\pi^0$	$(\ 1.8\pm0.7)\times10^{-3}$		4877
$J/\psi\,J/\psi$	$<\ 4\ \times10^{-5}$	90%	3869
$J/\psi\psi(2S)$	$<\ 5\ \times10^{-5}$	90%	3608
$\psi(2S)\psi(2S)$	$<\ 1.6\ \times10^{-5}$	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 ± 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
$\psi(2S)\eta_c$	< 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 ± 0.4) $\times 10^{-6}$		4910
$\omega\pi^+\pi^-$	< 2.58 $\times 10^{-6}$	CL=90%	4977
$K^*(892)^0K^-\pi^+$ + c.c.	(2.3 ± 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 ± 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± 0.28)	$\times 10^{-5}$		5002
$K^0_S K^+\pi^-$ + c.c.		(1.14± 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± 0.30)	$\times 10^{-3}$		–

Radiative decays

$\gamma\chi_{b1}(1P)$		(6.9 ± 0.4) %			130
$\gamma\chi_{b2}(1P)$		(7.15± 0.35) %			110
$\gamma\chi_{b0}(1P)$		(3.8 ± 0.4) %			162
$\gamma f_0(1710)$		$<$ 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 ± 1.5)	$\times 10^{-4}$		605
$\gamma\eta_b(1S) \to \gamma$Sum of 26 exclusive modes		$<$ 3.7	$\times 10^{-6}$	CL=90%	–
$\gamma X_{b\overline{b}} \to \gamma$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%	–
$\gamma a_1^0 \to \gamma\mu^+\mu^-$		$<$ 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	300
$\eta\,\Upsilon(1S)$	not seen	426
$\pi^+\pi^-\,\Upsilon(1S)$	$(6.6\pm1.6)\times10^{-3}$	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

$\chi_{b0}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\gamma\,\Upsilon(2S)$	(4.6 ± 2.1) %		207
$\gamma\,\Upsilon(1S)$	$(9\ \ \pm6\ \ )\times10^{-3}$		743
D^0X	< 8.2 %	90%	–
$\pi^+\pi^-K^+K^-\pi^0$	< 3.4 $\times10^{-5}$	90%	5064
$2\pi^+\pi^-K^-K^0_S$	< 5 $\times10^{-5}$	90%	5063
$2\pi^+\pi^-K^-K^0_S2\pi^0$	< 2.2 $\times10^{-4}$	90%	5036
$2\pi^+2\pi^-2\pi^0$	< 2.4 $\times10^{-4}$	90%	5092
$2\pi^+2\pi^-K^+K^-$	< 1.5 $\times10^{-4}$	90%	5050
$2\pi^+2\pi^-K^+K^-\pi^0$	< 2.2 $\times10^{-4}$	90%	5035
$2\pi^+2\pi^-K^+K^-2\pi^0$	< 1.1 $\times10^{-3}$	90%	5019
$3\pi^+2\pi^-K^-K^0_S\pi^0$	< 7 $\times10^{-4}$	90%	5018
$3\pi^+3\pi^-$	< 7 $\times10^{-5}$	90%	5091
$3\pi^+3\pi^-2\pi^0$	< 1.2 $\times10^{-3}$	90%	5070
$3\pi^+3\pi^-K^+K^-$	< 1.5 $\times10^{-4}$	90%	5017
$3\pi^+3\pi^-K^+K^-\pi^0$	< 7 $\times10^{-4}$	90%	4999
$4\pi^+4\pi^-$	< 1.7 $\times10^{-4}$	90%	5069
$4\pi^+4\pi^-2\pi^0$	< 6 $\times10^{-4}$	90%	5039

$\chi_{b1}(2P)$ [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)	Scale factor	p (MeV/c)
$\omega\,\Upsilon(1S)$	$(\ 1.63^{+0.40}_{-0.34})$ %		135
$\gamma\,\Upsilon(2S)$	(19.9 ±1.9) %		230
$\gamma\,\Upsilon(1S)$	(9.2 ±0.8) %	1.1	764
$\pi\pi\,\chi_{b1}(1P)$	(9.1 ±1.3) $\times 10^{-3}$		238
$D^0 X$	(8.8 ±1.7) %		–
$\pi^+\pi^- K^+ K^-\pi^0$	(3.1 ±1.0) $\times 10^{-4}$		5075
$2\pi^+\pi^- K^- K^0_S$	(1.1 ±0.5) $\times 10^{-4}$		5075
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	(7.7 ±3.2) $\times 10^{-4}$		5047
$2\pi^+ 2\pi^- 2\pi^0$	(5.9 ±2.0) $\times 10^{-4}$		5104
$2\pi^+ 2\pi^- K^+ K^-$	(10 ±4) $\times 10^{-5}$		5062
$2\pi^+ 2\pi^- K^+ K^-\pi^0$	(5.5 ±1.8) $\times 10^{-4}$		5047
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(10 ±4) $\times 10^{-4}$		5030
$3\pi^+ 2\pi^- K^- K^0_S\pi^0$	(6.7 ±2.6) $\times 10^{-4}$		5029
$3\pi^+ 3\pi^-$	(1.2 ±0.4) $\times 10^{-4}$		5103
$3\pi^+ 3\pi^- 2\pi^0$	(1.2 ±0.4) $\times 10^{-3}$		5081
$3\pi^+ 3\pi^- K^+ K^-$	(2.0 ±0.8) $\times 10^{-4}$		5029
$3\pi^+ 3\pi^- K^+ K^-\pi^0$	(6.1 ±2.2) $\times 10^{-4}$		5011
$4\pi^+ 4\pi^-$	(1.7 ±0.6) $\times 10^{-4}$		5080
$4\pi^+ 4\pi^- 2\pi^0$	(1.9 ±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
$m_{\chi_{b2}(2P)} - m_{\chi_{b1}(2P)} = 13.4 \pm 0.6$ MeV

$\chi_{b2}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\omega\,\Upsilon(1S)$	$(\ 1.10^{+0.34}_{-0.30})$ %		194
$\gamma\,\Upsilon(2S)$	(10.6 ±2.6) %	S=2.0	242
$\gamma\,\Upsilon(1S)$	(7.0 ±0.7) %		777
$\pi\pi\,\chi_{b2}(1P)$	(5.1 ±0.9) $\times 10^{-3}$		229
$D^0 X$	< 2.4 %	CL=90%	–
$\pi^+\pi^- K^+ K^-\pi^0$	< 1.1 $\times 10^{-4}$	CL=90%	5082
$2\pi^+\pi^- K^- K^0_S$	< 9 $\times 10^{-5}$	CL=90%	5082
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	< 7 $\times 10^{-4}$	CL=90%	5054
$2\pi^+ 2\pi^- 2\pi^0$	(3.9 ±1.6) $\times 10^{-4}$		5110
$2\pi^+ 2\pi^- K^+ K^-$	(9 ±4) $\times 10^{-5}$		5068
$2\pi^+ 2\pi^- K^+ K^-\pi^0$	(2.4 ±1.1) $\times 10^{-4}$		5054
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(4.7 ±2.3) $\times 10^{-4}$		5037

$3\pi^+2\pi^-K^-K^0_S\pi^0$	$<$ 4	$\times 10^{-4}$	CL=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
$h_b(1P)\pi^0 \rightarrow \gamma\eta_b(1S)\pi^0$	(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^-	seen			5178
ggg	(35.7 $\pm$2.6) %			–
γgg	(9.7 $\pm$1.8)	$\times 10^{-3}$		–
$\overline{^2H}$ 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	122
$\gamma\chi_{b2}(1P)$	(9.9 $\pm$1.3)	$\times 10^{-3}$	S=2.0	434
$\gamma A^0 \rightarrow \gamma$ hadrons	$<$ 8	$\times 10^{-5}$	CL=90%	–
$\gamma\chi_{b1}(1P)$	(9 $\pm$5)	$\times 10^{-4}$	S=1.9	452
$\gamma\chi_{b0}(1P)$	(2.7 $\pm$0.4)	$\times 10^{-3}$		484

$\gamma\eta_b(2S)$		$<$	6.2	$\times 10^{-4}$	CL=90%	350
$\gamma\eta_b(1S)$		(	5.1 $\pm$0.7)	$\times 10^{-4}$		912
$\gamma X \rightarrow \gamma +$ $\geq$ 4 prongs	[k]	$<$	2.2	$\times 10^{-4}$	CL=95%	–
$\gamma a_1^0 \rightarrow \gamma\mu^+\mu^-$		$<$	5.5	$\times 10^{-6}$	CL=90%	–
$\gamma a_1^0 \rightarrow \gamma\tau^+\tau^-$	[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

$\chi_{b1}(3P)$

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

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 $\Upsilon(10580)$

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

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 $\pm$0.6)		%		331
D_s^+ anything + c.c.	(17.8 $\pm$2.6)		%		–
$B^0\overline{B}^0$	(48.6 $\pm$0.6)		%		326
$J/\psi K_S^0 + (J/\psi,\ \eta_c)K_S^0$	$<$ 4	$\times 10^{-7}$		90%	–
non-$B\overline{B}$	$<$ 4		%	95%	–
e^+e^-	(1.57$\pm$0.08)	$\times 10^{-5}$			5290
$\rho^+\rho^-$	$<$ 5.7	$\times 10^{-6}$		90%	5233
$K^*(892)^0\overline{K}^0$	$<$ 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 $\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
$\Upsilon(1S)\pi^+\pi^-$	$(8.1 \pm 0.6) \times 10^{-5}$		1026
$\Upsilon(1S)\eta$	$(1.96 \pm 0.28) \times 10^{-4}$		924
$\Upsilon(2S)\pi^+\pi^-$	$(8.6 \pm 1.3) \times 10^{-5}$		468
$h_b(1P)\pi^+\pi^-$	not seen		600
$h_b(1P)\eta$	$(2.18 \pm 0.21) \times 10^{-3}$		390
$\overline{^2H}$ 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)
$\Upsilon(1S)\pi^+$	seen	1077
$\Upsilon(2S)\pi^+$	seen	551
$\Upsilon(3S)\pi^+$	seen	207
$h_b(1P)\pi^+$	seen	671
$h_b(2P)\pi^+$	seen	313

$X(10610)^0$

$I^G(J^P) = 1^+(1^+)$

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 $m = 10891 \pm 4$ MeV
Full width $\Gamma = 54 \pm 7$ 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)
$B\overline{B}X$	$(\ 76.2\ ^{+2.7}_{-4.0}\ )\ \%$		–
$B\overline{B}$	$(\ 5.5\ \pm1.0\ )\ \%$		1334
$B\overline{B}^* +$ c.c.	$(\ 13.7\ \pm1.6\ )\ \%$		–
$B^*\overline{B}^*$	$(\ 38.1\ \pm3.4\ )\ \%$		1141
$B\overline{B}^{(*)}\pi$	$<\ 19.7\ \%$	90%	1031
$B\overline{B}\pi$	$(\ 0.0\ \pm1.2\ )\ \%$		1031
$B^*\overline{B}\pi + B\overline{B}^*\pi$	$(\ 7.3\ \pm2.3\ )\ \%$		–
$B^*\overline{B}^*\pi$	$(\ 1.0\ \pm1.4\ )\ \%$		761
$B\overline{B}\pi\pi$	$<\ 8.9\ \%$	90%	580
$B_s^{(*)}\overline{B}_s^{(*)}$	$(\ 20.1\ \pm3.1\ )\ \%$		923
$B_s\overline{B}_s$	$(\ 5\ \pm5\ )\times10^{-3}$		923
$B_s\overline{B}_s^* +$ c.c.	$(\ 1.35\pm0.32)\ \%$		–
$B_s^*\overline{B}_s^*$	$(\ 17.6\ \pm2.7\ )\ \%$		572
no open-bottom	$(\ 3.8\ ^{+5.0}_{-0.5}\ )\ \%$		–
e^+e^-	$(\ 5.7\ \pm1.5\ )\times10^{-6}$		5446
$K^*(892)^0\overline{K}^0$	$<\ 1.0\ \times10^{-5}$	90%	5398
$\Upsilon(1S)\pi^+\pi^-$	$(\ 5.3\ \pm0.6\ )\times10^{-3}$		1311
$\Upsilon(2S)\pi^+\pi^-$	$(\ 7.8\ \pm1.3\ )\times10^{-3}$		789
$\Upsilon(3S)\pi^+\pi^-$	$(\ 4.8\ ^{+1.9}_{-1.7}\ )\times10^{-3}$		446
$\Upsilon(1S)K^+K^-$	$(\ 6.1\ \pm1.8\ )\times10^{-4}$		966
$h_b(1P)\pi^+\pi^-$	$(\ 3.5\ ^{+1.0}_{-1.3}\ )\times10^{-3}$		908
$h_b(2P)\pi^+\pi^-$	$(\ 6.0\ ^{+2.1}_{-1.8}\ )\times10^{-3}$		550
$\chi_{b0}(1P)\pi^+\pi^-\pi^0$	$<\ 6.3\ \times10^{-3}$	90%	900
$\chi_{b0}(1P)\omega$	$<\ 3.9\ \times10^{-3}$	90%	640
$\chi_{b0}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$<\ 4.8\ \times10^{-3}$	90%	–
$\chi_{b1}(1P)\pi^+\pi^-\pi^0$	$(\ 1.85\pm0.33)\times10^{-3}$		867
$\chi_{b1}(1P)\omega$	$(\ 1.57\pm0.30)\times10^{-3}$		591
$\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$(\ 5.2\ \pm1.9\ )\times10^{-4}$		–
$\chi_{b2}(1P)\pi^+\pi^-\pi^0$	$(\ 1.17\pm0.30)\times10^{-3}$		847
$\chi_{b2}(1P)\omega$	$(\ 6.0\ \pm2.7\ )\times10^{-4}$		561
$\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$(\ 6\ \pm4\ )\times10^{-4}$		–
$\gamma X_b \rightarrow \gamma\Upsilon(1S)\omega$	$<\ 3.8\ \times10^{-5}$	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.	$(108\ \pm8\ )\ \%$		–

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

$\Upsilon(11020)$

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

Mass $m = 10987.5^{+11.0}_{-3.4}$ MeV
Full width $\Gamma = 61^{+9}_{-28}$ MeV
$\Gamma_{ee} = 0.130 \pm 0.030$ keV

$\Upsilon(11020)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$e^+ e^-$	$(2.1^{+1.1}_{-0.6}) \times 10^{-6}$	5494

NOTES

[*a*] $2m_\tau < \mathrm{M}(\tau^+\tau^-) < 9.2$ 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 $< \mathrm{M}(\mu^+\mu^-) <$ 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.