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

NODE=MXXX030

$\eta_b(1S)$

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

NODE=M171

Mass $m = 9398.7 \pm 2.0$ MeV (S = 1.5) NODE=M171M;DTYPE=M

Full width $\Gamma = 10^{+5}_{-4}$ MeV NODE=M171W;DTYPE=G

$\eta_b(1S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
hadrons	seen		–	NODE=M171225;DESIG=7
$3h^+3h^-$	not seen		4672	DESIG=1;OUR EST;→ UNCHECKED ←
$2h^+2h^-$	not seen		4689	DESIG=2;OUR EST;→ UNCHECKED ←
$4h^+4h^-$	not seen		4648	DESIG=4;OUR EST;→ UNCHECKED ←
$\gamma\gamma$	not seen		4699	DESIG=3;OUR EST;→ UNCHECKED ←
$\mu^+\mu^-$	$<9 \times 10^{-3}$	90%	4698	DESIG=5
$\tau^+\tau^-$	<8 %	90%	4350	DESIG=6

$\Upsilon(1S)$

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

NODE=M049

Mass $m = 9460.40 \pm 0.10$ MeV NODE=M049M;DTYPE=M

Full width $\Gamma = 54.02 \pm 1.25$ keV 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	NODE=M049215;DESIG=3
e^+e^-	(2.39 $\pm$0.08) %		4730	DESIG=2
$\mu^+\mu^-$	(2.48 $\pm$0.04) %		4729	DESIG=1
Hadronic decays				NODE=M049;CLUMP=A
ggg	(81.7 $\pm$0.7) %		–	DESIG=117
γgg	(2.2 $\pm$0.6) %		–	DESIG=118
$\eta'(958)$ anything	(2.94 $\pm$0.24) %		–	DESIG=73
$J/\psi(1S)$ anything	(5.4 $\pm$0.4) $\times 10^{-4}$	S=1.4	4223	DESIG=12
$J/\psi(1S)\eta_c$	$<$ 2.2 $\times 10^{-6}$	CL=90%	3623	DESIG=146
$J/\psi(1S)\chi_{c0}$	$<$ 3.4 $\times 10^{-6}$	CL=90%	3429	DESIG=147
$J/\psi(1S)\chi_{c1}$	(3.9 $\pm$1.2) $\times 10^{-6}$		3382	DESIG=148
$J/\psi(1S)\chi_{c2}$	$<$ 1.4 $\times 10^{-6}$	CL=90%	3359	DESIG=149
$J/\psi(1S)\eta_c(2S)$	$<$ 2.2 $\times 10^{-6}$	CL=90%	3317	DESIG=150
$J/\psi(1S)X(3940)$	$<$ 5.4 $\times 10^{-6}$	CL=90%	3148	DESIG=151
$J/\psi(1S)X(4160)$	$<$ 5.4 $\times 10^{-6}$	CL=90%	3020	DESIG=152
$X(4350)$ anything, $X \to J/\psi(1S)\phi$	$<$ 8.1 $\times 10^{-6}$	CL=90%	–	DESIG=167
$T_{c\overline{c}1}(3900)^\pm$ anything, $T_{c\overline{c}1} \to J/\psi(1S)\pi^\pm$	$<$ 1.3 $\times 10^{-5}$	CL=90%	–	DESIG=168
$T_{c\overline{c}1}(4200)^\pm$ anything, $Z_c \to J/\psi(1S)\pi^\pm$	$<$ 6.0 $\times 10^{-5}$	CL=90%	–	DESIG=169
$T_{c\overline{c}1}(4430)^\pm$ anything, $T_{c\overline{c}1} \to J/\psi(1S)\pi^\pm$	$<$ 4.9 $\times 10^{-5}$	CL=90%	–	DESIG=170
$P_{c\overline{c}s}(4459)/\overline{P}_{c\overline{c}s}(4459)$ anything	(3.5 $\pm$2.0) $\times 10^{-6}$		–	DESIG=201
$P_{c\overline{c}s}(4338)/\overline{P}_{c\overline{c}s}(4338)$ anything	$<$ 1.8 $\times 10^{-6}$	CL=90%	–	DESIG=203
$P_c(4312)$ anything, $P_c(4312) \to pJ/\psi(1S)$	$<$ 5.7 $\times 10^{-6}$	CL=90%	–	DESIG=205
$P_c(4440)$ anything, $P_c(4440) \to pJ/\psi(1S)$	$<$ 1.00 $\times 10^{-5}$	CL=90%	–	DESIG=206

$P_c(4457)$ anything, $P_c(4457) \to pJ/\psi(1S)$	$< 7.6 \times 10^{-6}$	CL=90%	–	DESIG=207
$p/\overline{p}J/\psi(1S)$ anything	$(8.1 \pm 0.8) \times 10^{-5}$		–	DESIG=204
$J/\psi(1S)\Lambda/\overline{\Lambda}$ anything	$(3.7 \pm 0.6) \times 10^{-5}$		–	DESIG=202
$X^{\pm}_{cs}$ anything, $X \to J/\psi K^{\pm}$	$< 5.7 \times 10^{-6}$	CL=90%	–	DESIG=173
$\psi(4230)$ anything, $\psi \to J/\psi(1S)\pi^+\pi^-$	$< 3.8 \times 10^{-5}$	CL=90%	–	DESIG=161
$\psi(4230)$ anything, $\psi \to J/\psi(1S)K^+K^-$	$< 7.5 \times 10^{-6}$	CL=90%	–	DESIG=165
$\chi_{c1}(4140)$ anything, $\chi_{c1} \to J/\psi(1S)\phi$	$< 5.2 \times 10^{-6}$	CL=90%	–	DESIG=166
χ_{c0} anything	$< 4 \times 10^{-3}$	CL=90%	–	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, $\psi \to \psi(2S)\pi^+\pi^-$	$< 7.9 \times 10^{-5}$	CL=90%	–	DESIG=162
$\psi(4360)$ anything, $\psi \to \psi(2S)\pi^+\pi^-$	$< 5.2 \times 10^{-5}$	CL=90%	–	DESIG=163
$\psi(4660)$ anything, $\psi \to \psi(2S)\pi^+\pi^-$	$< 2.2 \times 10^{-5}$	CL=90%	–	DESIG=164
$T_{c\overline{c}}(4050)^{\pm}$ anything, $X \to \psi(2S)\pi^{\pm}$	$< 8.8 \times 10^{-5}$	CL=90%	–	DESIG=171
$T_{c\overline{c}1}(4430)^{\pm}$ anything, $T_{c\overline{c}1} \to \psi(2S)\pi^{\pm}$	$< 6.7 \times 10^{-5}$	CL=90%	–	DESIG=172
$\chi_{c1}(3872)$ anything	$< 2.2 \times 10^{-4}$	CL=90%	–	DESIG=194
$T_{c\overline{c}1}(4200)^+ T_{c\overline{c}1}(4200)^-$	$< 2.23 \times 10^{-5}$	CL=90%	–	DESIG=178
$T_{c\overline{c}1}(3900)^{\pm} T_{c\overline{c}1}(4200)^{\mp}$	$< 8.1 \times 10^{-6}$	CL=90%	–	DESIG=179
$T_{c\overline{c}1}(3900)^+ T_{c\overline{c}1}(3900)^-$	$< 1.8 \times 10^{-6}$	CL=90%	–	DESIG=180
$T_{c\overline{c}}(4050)^+ T_{c\overline{c}}(4050)^-$	$< 1.58 \times 10^{-5}$	CL=90%	–	DESIG=181
$T_{c\overline{c}}(4250)^+ T_{c\overline{c}}(4250)^-$	$< 2.66 \times 10^{-5}$	CL=90%	–	DESIG=182
$T_{c\overline{c}}(4050)^{\pm} T_{c\overline{c}}(4250)^{\mp}$	$< 4.42 \times 10^{-5}$	CL=90%	–	DESIG=183
$T_{c\overline{c}1}(4430)^+ T_{c\overline{c}1}(4430)^-$	$< 2.03 \times 10^{-5}$	CL=90%	–	DESIG=184
$T_{c\overline{c}}(4055)^{\pm} T_{c\overline{c}}(4055)^{\mp}$	$< 2.33 \times 10^{-5}$	CL=90%	–	DESIG=186
$T_{c\overline{c}}(4055)^{\pm} T_{c\overline{c}1}(4430)^{\mp}$	$< 4.55 \times 10^{-5}$	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
$p\overline{p}$	$< 5 \times 10^{-4}$	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
$K^*(892)^0 K^-\pi^+$ + 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
$K^*(892)^0 \overline{K}^*_2(1430)^0$ + 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
$K^0_S K^+\pi^- +$ c.c.		$(1.6 \pm 0.4) \times 10^{-6}$		4696	DESIG=133
$K^*(892)^0 \overline{K}^0 +$ c.c.		$(2.9 \pm 0.9) \times 10^{-6}$		4675	DESIG=134
$K^*(892)^- K^+ +$ 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 ± 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 ± 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
$\gamma p\overline{p}$	[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
$\gamma\pi^+\pi^- p\overline{p}$		$(1.5 \pm 0.6) \times 10^{-4}$		4604	DESIG=15
$\gamma 2\pi^+ 2\pi^- p\overline{p}$		$(4 \pm 6) \times 10^{-5}$		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
$\gamma f_0(1500) \to \gamma K^+K^-$		$(1.0 \pm 0.4) \times 10^{-5}$		–	DESIG=192
$\gamma f_0(1710)$		$< 2.6 \times 10^{-4}$	CL=90%	4573	DESIG=53
$\gamma f_0(1710) \to \gamma K^+K^-$		$(1.01 \pm 0.32) \times 10^{-5}$		–	DESIG=112
$\gamma f_0(1710) \to \gamma\pi^+\pi^-$		$(5.3 \pm 2.0) \times 10^{-6}$		–	DESIG=191
$\gamma f_0(1710) \to \gamma\pi^0\pi^0$		$< 1.4 \times 10^{-6}$	CL=90%	–	DESIG=109
$\gamma f_0(1710) \to \gamma\eta\eta$		$< 1.8 \times 10^{-6}$	CL=90%	–	DESIG=110
$\gamma f_4(2050)$		$< 5.3 \times 10^{-5}$	CL=90%	4515	DESIG=104
$\gamma f_0(2200) \to \gamma K^+K^-$		$< 2 \times 10^{-4}$	CL=90%	4475	DESIG=69
$\gamma f_J(2220) \to \gamma K^+K^-$		$< 8 \times 10^{-7}$	CL=90%	4469	DESIG=60
$\gamma f_J(2220) \to \gamma\pi^+\pi^-$		$< 6 \times 10^{-7}$	CL=90%	–	DESIG=61
$\gamma f_J(2220) \to \gamma p\overline{p}$		$< 1.1 \times 10^{-6}$	CL=90%	–	DESIG=62
$\gamma\eta(2225) \to \gamma\phi\phi$		$< 3 \times 10^{-3}$	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
$\gamma\chi_{c1}$		$(4.7 ^{+2.4}_{-1.9}) \times 10^{-5}$		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
$\gamma\chi_{c1}(3872)$, $\chi_{c1} \to \pi^+\pi^-\pi^0 J/\psi$		$< 2.8 \times 10^{-6}$	CL=90%	–	DESIG=124
$\gamma\chi_{c0}(3915) \to \omega J/\psi$		$< 3.0 \times 10^{-6}$	CL=90%	–	DESIG=125
$\gamma\chi_{c1}(4140) \to \phi J/\psi$		$< 2.2 \times 10^{-6}$	CL=90%	–	DESIG=126
$\gamma X\overline{X}$ ($m_X < 3.1$ GeV)	[c]	$< 1 \times 10^{-3}$	CL=90%	–	DESIG=67
$\gamma X\overline{X}$ ($m_X < 4.5$ GeV)	[d]	$< 2.4 \times 10^{-4}$	CL=90%	–	DESIG=127
$\gamma X \to \gamma + \geq 4$ prongs	[e]	$< 1.78 \times 10^{-4}$	CL=95%	–	DESIG=113
$\gamma A^0 \to \gamma\mu^+\mu^-$	[f]	$< 9 \times 10^{-6}$	CL=90%	–	DESIG=114
$\gamma A^0 \to \gamma\tau^+\tau^-$	[a]	$< 1.30 \times 10^{-4}$	CL=90%	–	DESIG=115
$\gamma A^0 \to \gamma g g$	[g]	< 1 %	CL=90%	–	DESIG=129
$\gamma A^0 \to \gamma s\overline{s}$	[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

NODE=M049;CLUMP=D

invisible	$<$ 3.0	$\times 10^{-4}$	CL=90%	–	DESIG=106
hadrons	(96 $\pm$4) %			–	DESIG=101

$\chi_{b0}(1P)$

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

J needs confirmation.

NODE=M076

Mass $m = 9859.44 \pm 0.42 \pm 0.31$ 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	NODE=M076215;DESIG=1
$D^0 X$	$<$ 10.4	%	90%	–	DESIG=2
$\pi^+\pi^- K^+ K^- \pi^0$	$<$ 1.6	$\times 10^{-4}$	90%	4875	DESIG=3
$2\pi^+\pi^- K^- K^0_S$	$<$ 5	$\times 10^{-5}$	90%	4875	DESIG=4
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	$<$ 5	$\times 10^{-4}$	90%	4846	DESIG=5
$2\pi^+ 2\pi^- 2\pi^0$	$<$ 2.1	$\times 10^{-4}$	90%	4905	DESIG=6
$2\pi^+ 2\pi^- K^+ K^-$	(1.1 $\pm$0.6)	$\times 10^{-4}$		4861	DESIG=7
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	$<$ 2.7	$\times 10^{-4}$	90%	4846	DESIG=8
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	$<$ 5	$\times 10^{-4}$	90%	4828	DESIG=9
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	$<$ 1.6	$\times 10^{-4}$	90%	4827	DESIG=10
$3\pi^+ 3\pi^-$	$<$ 8	$\times 10^{-5}$	90%	4904	DESIG=11
$3\pi^+ 3\pi^- 2\pi^0$	$<$ 6	$\times 10^{-4}$	90%	4881	DESIG=12
$3\pi^+ 3\pi^- K^+ K^-$	(2.4 $\pm$1.2)	$\times 10^{-4}$		4827	DESIG=13
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	$<$ 1.0	$\times 10^{-3}$	90%	4808	DESIG=14
$4\pi^+ 4\pi^-$	$<$ 8	$\times 10^{-5}$	90%	4880	DESIG=15
$4\pi^+ 4\pi^- 2\pi^0$	$<$ 2.1	$\times 10^{-3}$	90%	4850	DESIG=16
$J/\psi J/\psi$	$<$ 7	$\times 10^{-5}$	90%	3836	DESIG=17
$J/\psi\,\psi(2S)$	$<$ 1.2	$\times 10^{-4}$	90%	3571	DESIG=18
$\psi(2S)\,\psi(2S)$	$<$ 3.1	$\times 10^{-5}$	90%	3273	DESIG=19
$J/\psi(1S)$ anything	$<$ 2.3	$\times 10^{-3}$	90%	–	DESIG=20

$\chi_{b1}(1P)$

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

J needs confirmation.

NODE=M077

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

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

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

NODE=M077A00;DTYPE=D

$\chi_{b1}(1P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$\gamma\,\Upsilon(1S)$	(35.2 ± 2.0) %		423	NODE=M077215;DESIG=1
$D^0 X$	(12.6 ± 2.2) %		–	DESIG=2
$\pi^+\pi^- K^+ K^- \pi^0$	$(2.0 \pm 0.6) \times 10^{-4}$		4892	DESIG=3
$2\pi^+\pi^- K^- K^0_S$	$(1.3 \pm 0.5) \times 10^{-4}$		4892	DESIG=4
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	$< 6 \times 10^{-4}$	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
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	$(9.3 \pm 3.3) \times 10^{-4}$		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 ± 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

$h_b(1P)$

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

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

$\chi_{b2}(1P)$

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

J needs confirmation.

NODE=M078

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

NODE=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 ± 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
$2\pi^+\pi^- K^- K^0_S$	$< 1.0 \times 10^{-4}$	90%	4901	DESIG=4
$2\pi^+\pi^- K^- K^0_S 2\pi^0$	$(5.3\pm2.4) \times 10^{-4}$		4873	DESIG=5
$2\pi^+ 2\pi^- 2\pi^0$	$(3.5\pm1.4) \times 10^{-4}$		4931	DESIG=6
$2\pi^+ 2\pi^- K^+ K^-$	$(1.1\pm0.4) \times 10^{-4}$		4888	DESIG=7
$2\pi^+ 2\pi^- K^+ K^- \pi^0$	$(2.1\pm0.9) \times 10^{-4}$		4872	DESIG=8
$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	$(3.9\pm1.8) \times 10^{-4}$		4855	DESIG=9
$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	$< 5 \times 10^{-4}$	90%	4854	DESIG=10
$3\pi^+ 3\pi^-$	$(7.0\pm3.1) \times 10^{-5}$		4931	DESIG=11
$3\pi^+ 3\pi^- 2\pi^0$	$(1.0\pm0.4) \times 10^{-3}$		4908	DESIG=12
$3\pi^+ 3\pi^- K^+ K^-$	$< 8 \times 10^{-5}$	90%	4854	DESIG=13
$3\pi^+ 3\pi^- K^+ K^- \pi^0$	$(3.6\pm1.5) \times 10^{-4}$		4835	DESIG=14
$4\pi^+ 4\pi^-$	$(8 \pm 4) \times 10^{-5}$		4907	DESIG=15
$4\pi^+ 4\pi^- 2\pi^0$	$(1.8\pm0.7) \times 10^{-3}$		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	$(1.5\pm0.4) \times 10^{-3}$		–	DESIG=20

$\Upsilon(2S)$

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

NODE=M052

Mass $m = 10023.4 \pm 0.5$ MeV NODE=M052M;DTYPE=M

$m_{\Upsilon(2S)} - m_{\Upsilon(1S)} = 562.81 \pm 0.11$ MeV NODE=M052A00;DTYPE=D

Full width $\Gamma = 31.98 \pm 2.63$ keV 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 ± 0.26) %		475	NODE=M052215;DESIG=4
$\Upsilon(1S)\pi^0\pi^0$	(8.6 ± 0.4) %		480	DESIG=5
$\tau^+\tau^-$	(2.00 ± 0.21) %		4686	DESIG=3
$\mu^+\mu^-$	(1.93 ± 0.17) %	S=2.2	5011	DESIG=1
e^+e^-	(1.91 ± 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

$T_{c\overline{c}}(4250)^{+}\, T_{c\overline{c}}(4250)^{-}$	$< 2.67 \times 10^{-5}$	CL=90%	–	DESIG=166
$T_{c\overline{c}}(4050)^{\pm}\, T_{c\overline{c}}(4250)^{\mp}$	$< 2.72 \times 10^{-5}$	CL=90%	–	DESIG=167
$T_{c\overline{c}1}(4430)^{+}\, T_{c\overline{c}1}(4430)^{-}$	$< 2.03 \times 10^{-5}$	CL=90%	–	DESIG=168
$T_{c\overline{c}}(4055)^{\pm}\, T_{c\overline{c}}(4055)^{\mp}$	$< 1.11 \times 10^{-5}$	CL=90%	–	DESIG=170
$T_{c\overline{c}}(4055)^{\pm}\, T_{c\overline{c}1}(4430)^{\mp}$	$< 2.11 \times 10^{-5}$	CL=90%	–	DESIG=171
$P_{c\overline{c}s}(4459)\,/\,\overline{P}_{c\overline{c}s}(4459)$ anything	$(2.9 \pm 1.7) \times 10^{-6}$		–	DESIG=189
$P_{c\overline{c}s}(4338)\,/\,\overline{P}_{c\overline{c}s}(4338)$ anything	$< 1.6 \times 10^{-6}$	CL=90%	–	DESIG=191
$P_c(4457)$ anything, $P_c(4457) \to p J/\psi(1S)$	$< 4.6 \times 10^{-6}$	CL=90%	–	DESIG=195
$P_c(4440)$ anything, $P_c(4440) \to p J/\psi(1S)$	$< 1.18 \times 10^{-5}$	CL=90%	–	DESIG=194
$P_c(4312)$ anything, $P_c(4312) \to p J/\psi(1S)$	$< 7.2 \times 10^{-6}$	CL=90%	–	DESIG=193
$p\,/\,\overline{p}\, J/\psi(1S)$ anything	$(4.3 \pm 0.6) \times 10^{-5}$		–	DESIG=192
$J/\psi(1S)\,\Lambda\,/\,\overline{\Lambda}$ anything	$(2.2 \pm 0.6) \times 10^{-5}$		–	DESIG=190
$\overline{^2H}$ anything	$(2.78^{+0.30}_{-0.26}) \times 10^{-5}$	S=1.2	–	DESIG=16
hadrons	(94 ± 11) %		–	DESIG=101
$g\,g\,g$	(58.8 ± 1.2) %		–	DESIG=105
$\gamma\, g\, g$	(1.87 ± 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
$K^*(892)^0 K^- \pi^+ +$ 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
$K^*(892)^0 \overline{K}{}_2^*(1430)^0 +$ 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%	4920	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
$K_S^0 K^+ \pi^- +$ c.c.	$(1.14 \pm 0.33) \times 10^{-6}$		4979	DESIG=130
$K^*(892)^0 \overline{K}{}^0 +$ c.c.	$< 4.22 \times 10^{-6}$	CL=90%	4959	DESIG=131
$K^*(892)^- K^+ +$ 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
$D_s^+ D_{s1}(2536)^-$, $D_{s1}^- \to K^- D^*(2007)^0$	$(1.6 \pm 0.4) \times 10^{-5}$		–	DESIG=178
$D_s^+ D_{s1}(2536)^-$, $D_{s1}^- \to K_S^0 D^*(2010)^-$	$(8.4 \pm 2.3) \times 10^{-6}$		–	DESIG=179
$D_s^{*+} D_{s1}(2536)^-$, $D_{s1}^- \to K^- D^*(2007)^0$	$(1.4 \pm 0.4) \times 10^{-5}$		–	DESIG=181
$D_s^{*+} D_{s1}(2536)^-$, $D_{s1}^- \to K_S^0 D^*(2010)^-$	$(8.2 \pm 3.1) \times 10^{-6}$		–	DESIG=182
$D_s^+ D_{s2}^*(2573)^-$, $D_{s2}^{*-} \to K^- D^0$	$(1.4 \pm 0.4) \times 10^{-5}$		–	DESIG=184
$D_s^+ D_{s2}^*(2573)^-$, $D_{s2}^{*-} \to K_S^0 D^-$	$(6.9 \pm 3.0) \times 10^{-6}$		–	DESIG=185
$D_s^{*+} D_{s2}^*(2573)^-$, $D_{s2}^{*-} \to K^- D^0$	$(9 \pm 5) \times 10^{-6}$		–	DESIG=187
$D_s^{*+} D_{s2}^*(2573)^-$, $D_{s2}^{*-} \to K_S^0 D^-$	$(5 \pm 6) \times 10^{-6}$		–	DESIG=188
Sum of 100 exclusive modes	$(2.90 \pm 0.30) \times 10^{-3}$		–	DESIG=121

Radiative decays

NODE=M052;CLUMP=A

$\gamma \chi_{b1}(1P)$		(6.9 ± 0.4) %		130	DESIG=8
$\gamma \chi_{b2}(1P)$		(7.15± 0.35) %		111	DESIG=7
$\gamma \chi_{b0}(1P)$		(3.8 ± 0.4) %		163	DESIG=9
$\gamma f_0(1710)$		$< 5.9 \times 10^{-4}$	CL=90%	4864	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%	4567	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
$\gamma \chi_{c1}(3872)$		$< 1.8 \times 10^{-5}$	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
$\gamma \eta_b(1S)$		$(5.5 {}^{+1.1}_{-0.9}) \times 10^{-4}$	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

NODE=M052;CLUMP=B

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

$\Upsilon_2(1D)$

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

NODE=M177

was $\Upsilon(1D)$

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

NODE=M177M;DTYPE=M

$\Upsilon_2(1D)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$\gamma\gamma \Upsilon(1S)$	seen	679	NODE=M177215;DESIG=1;OUR EVAL; → UNCHECKED ←
$\gamma \chi_{bJ}(1P)$	seen	300	DESIG=2;OUR EVAL;→ UNCHECKED ←
$\eta \Upsilon(1S)$	not seen	426	DESIG=3;OUR EVAL;→ UNCHECKED ←
$\pi^+\pi^- \Upsilon(1S)$	$(6.6\pm1.6) \times 10^{-3}$	623	DESIG=4

$\chi_{b0}(2P)$

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

J needs confirmation.

NODE=M079

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

NODE=M079M;DTYPE=M;OUR EVAL; → UNCHECKED ←

$\chi_{b0}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$\gamma\,\Upsilon(2S)$	(1.38 ± 0.30) %		207	NODE=M079215;DESIG=2
$\omega\,\Upsilon(1S)$	$(5.5\ \pm2.0\ )\times10^{-3}$		†	DESIG=18
$\gamma\,\Upsilon(1S)$	$(3.8\ \pm1.7\ )\times10^{-3}$		743	DESIG=1
$D^0 X$	<8.2 %	90%	–	DESIG=3
$\pi^+\pi^-K^+K^-\pi^0$	$<3.4\times10^{-5}$	90%	5064	DESIG=4
$2\pi^+\pi^-K^-K^0_S$	$<5\times10^{-5}$	90%	5063	DESIG=5
$2\pi^+\pi^-K^-K^0_S2\pi^0$	$<2.2\times10^{-4}$	90%	5036	DESIG=6
$2\pi^+2\pi^-2\pi^0$	$<2.4\times10^{-4}$	90%	5092	DESIG=7
$2\pi^+2\pi^-K^+K^-$	$<1.5\times10^{-4}$	90%	5050	DESIG=8
$2\pi^+2\pi^-K^+K^-\pi^0$	$<2.2\times10^{-4}$	90%	5035	DESIG=9
$2\pi^+2\pi^-K^+K^-2\pi^0$	$<1.1\times10^{-3}$	90%	5019	DESIG=10
$3\pi^+2\pi^-K^-K^0_S\pi^0$	$<7\times10^{-4}$	90%	5018	DESIG=11
$3\pi^+3\pi^-$	$<7\times10^{-5}$	90%	5091	DESIG=12
$3\pi^+3\pi^-2\pi^0$	$<1.2\times10^{-3}$	90%	5070	DESIG=13
$3\pi^+3\pi^-K^+K^-$	$<1.5\times10^{-4}$	90%	5017	DESIG=14
$3\pi^+3\pi^-K^+K^-\pi^0$	$<7\times10^{-4}$	90%	4999	DESIG=15
$4\pi^+4\pi^-$	$<1.7\times10^{-4}$	90%	5069	DESIG=16
$4\pi^+4\pi^-2\pi^0$	$<6\times10^{-4}$	90%	5039	DESIG=17

$\chi_{b1}(2P)$

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

NODE=M080

Mass $m = 10255.46 \pm 0.22 \pm 0.50$ MeV NODE=M080M;DTYPE=M;OUR EVAL; → UNCHECKED ←

$m_{\chi_{b1}(2P)} - m_{\chi_{b0}(2P)} = 23.5 \pm 1.0$ MeV NODE=M080M2;DTYPE=D

$m_{\chi_{b1}(2P)} - m_{\Upsilon(1S)} = 793.6 \pm 0.8$ MeV NODE=M080A02;DTYPE=D

$\chi_{b1}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor	p (MeV/c)	
$\omega\,\Upsilon(1S)$	$(\ 2.1\pm0.4)$ %	1.6	134	NODE=M080215;DESIG=3
$\gamma\,\Upsilon(2S)$	(18.1 ± 1.9) %		229	DESIG=2
$\gamma\,\Upsilon(1S)$	$(\ 9.9\pm1.0)$ %		764	DESIG=1
$\pi\pi\chi_{b1}(1P)$	$(\ 9.1\pm1.3)\times10^{-3}$		238	DESIG=4
$D^0 X$	$(\ 8.8\pm1.7)$ %		–	DESIG=5
$\pi^+\pi^-K^+K^-\pi^0$	$(\ 3.1\pm1.0)\times10^{-4}$		5075	DESIG=6
$2\pi^+\pi^-K^-K^0_S$	$(\ 1.1\pm0.5)\times10^{-4}$		5075	DESIG=7
$2\pi^+\pi^-K^-K^0_S2\pi^0$	$(\ 7.7\pm3.2)\times10^{-4}$		5047	DESIG=8
$2\pi^+2\pi^-2\pi^0$	$(\ 5.9\pm2.0)\times10^{-4}$		5104	DESIG=9
$2\pi^+2\pi^-K^+K^-$	$(10\ \ \pm4\ \ )\times10^{-5}$		5062	DESIG=10
$2\pi^+2\pi^-K^+K^-\pi^0$	$(\ 5.5\pm1.8)\times10^{-4}$		5047	DESIG=11
$2\pi^+2\pi^-K^+K^-2\pi^0$	$(10\ \ \pm4\ \ )\times10^{-4}$		5030	DESIG=12
$3\pi^+2\pi^-K^-K^0_S\pi^0$	$(\ 6.7\pm2.6)\times10^{-4}$		5029	DESIG=13
$3\pi^+3\pi^-$	$(\ 1.2\pm0.4)\times10^{-4}$		5103	DESIG=14
$3\pi^+3\pi^-2\pi^0$	$(\ 1.2\pm0.4)\times10^{-3}$		5081	DESIG=15
$3\pi^+3\pi^-K^+K^-$	$(\ 2.0\pm0.8)\times10^{-4}$		5029	DESIG=16
$3\pi^+3\pi^-K^+K^-\pi^0$	$(\ 6.1\pm2.2)\times10^{-4}$		5011	DESIG=17
$4\pi^+4\pi^-$	$(\ 1.7\pm0.6)\times10^{-4}$		5080	DESIG=18
$4\pi^+4\pi^-2\pi^0$	$(\ 1.9\pm0.7)\times10^{-3}$		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	DESIG=2
$\eta_b(2S)\gamma$	(48 ± 13) %		257	DESIG=3
$\Upsilon(1S)\eta$	$(7.1^{+4.0}_{-3.3}) \times 10^{-3}$		559	DESIG=4
$\Upsilon(1S)\pi^0$	$< 1.8 \times 10^{-3}$	90%	757	DESIG=5
$\gamma\chi_{b0}(1P)$	< 27 %	90%	393	DESIG=6
$\gamma\chi_{b1}(1P)$	$< 5.4 \times 10^{-3}$	90%	360	DESIG=7
$\gamma\chi_{b2}(1P)$	< 1.3 %	90%	342	DESIG=8

$\chi_{b2}(2P)$

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

NODE=M081

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

NODE=M081M;DTYPE=M;OUR EVAL; → UNCHECKED ←

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

NODE=M081M2;DTYPE=D

$\chi_{b2}(2P)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
$\omega\Upsilon(1S)$	$(5.7\pm2.0) \times 10^{-3}$	S=1.5	194	NODE=M081215;DESIG=3
$\gamma\Upsilon(2S)$	(8.9 ± 1.2) %		242	DESIG=2
$\gamma\Upsilon(1S)$	(6.6 ± 0.8) %		776	DESIG=1
$\pi\pi\chi_{b2}(1P)$	$(5.1\pm0.9) \times 10^{-3}$		229	DESIG=4
$D^0 X$	< 2.4 %	CL=90%	–	DESIG=5
$\pi^+\pi^-K^+K^-\pi^0$	$< 1.1 \times 10^{-4}$	CL=90%	5082	DESIG=6
$2\pi^+\pi^-K^-K^0_S$	$< 9 \times 10^{-5}$	CL=90%	5082	DESIG=7
$2\pi^+\pi^-K^-K^0_S2\pi^0$	$< 7 \times 10^{-4}$	CL=90%	5054	DESIG=8
$2\pi^+2\pi^-2\pi^0$	$(3.9\pm1.6) \times 10^{-4}$		5110	DESIG=9
$2\pi^+2\pi^-K^+K^-$	$(9 \pm4) \times 10^{-5}$		5068	DESIG=10
$2\pi^+2\pi^-K^+K^-\pi^0$	$(2.4\pm1.1) \times 10^{-4}$		5054	DESIG=11
$2\pi^+2\pi^-K^+K^-2\pi^0$	$(4.7\pm2.3) \times 10^{-4}$		5037	DESIG=12
$3\pi^+2\pi^-K^-K^0_S\pi^0$	$< 4 \times 10^{-4}$	CL=90%	5036	DESIG=13
$3\pi^+3\pi^-$	$(9 \pm4) \times 10^{-5}$		5110	DESIG=14
$3\pi^+3\pi^-2\pi^0$	$(1.2\pm0.4) \times 10^{-3}$		5088	DESIG=15
$3\pi^+3\pi^-K^+K^-$	$(1.4\pm0.7) \times 10^{-4}$		5036	DESIG=16
$3\pi^+3\pi^-K^+K^-\pi^0$	$(4.2\pm1.7) \times 10^{-4}$		5017	DESIG=17
$4\pi^+4\pi^-$	$(9 \pm5) \times 10^{-5}$		5087	DESIG=18
$4\pi^+4\pi^-2\pi^0$	$(1.3\pm0.5) \times 10^{-3}$		5058	DESIG=19

$\Upsilon(3S)$

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

NODE=M048

Mass $m = 10355.1 \pm 0.5$ MeV

NODE=M048M;DTYPE=M

$m_{\Upsilon(3S)} - m_{\Upsilon(2S)} = 331.82 \pm 0.08$ MeV (S = 1.9)

NODE=M048DM2;DTYPE=D

Full width $\Gamma = 20.32 \pm 1.85$ keV

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

$\Upsilon(3S)$ DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
$\Upsilon(2S)$ anything		(10.6 ± 0.8) %		296	NODE=M048215;DESIG=8
$\Upsilon(2S)\pi^+\pi^-$		(2.82 ± 0.18) %	S=1.6	176	DESIG=4
$\Upsilon(2S)\pi^0\pi^0$		(1.85 ± 0.14) %		190	DESIG=10
$\Upsilon(2S)\gamma\gamma$		(5.0 ± 0.7) %		326	DESIG=12
$\Upsilon(2S)\pi^0$		$< 5.1 \times 10^{-4}$	CL=90%	298	DESIG=107
$\Upsilon(1S)\pi^+\pi^-$		(4.37 ± 0.08) %		813	DESIG=3
$\Upsilon(1S)\pi^0\pi^0$		(2.20 ± 0.13) %		816	DESIG=11
$\Upsilon(1S)\eta$		$< 1 \times 10^{-4}$	CL=90%	677	DESIG=9
$\Upsilon(1S)\pi^0$		$< 7 \times 10^{-5}$	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 ± 0.30) %		4863	DESIG=16
$\mu^+\mu^-$		(2.18 ± 0.21) %	S=2.1	5176	DESIG=1
e^+e^-		(2.18 ± 0.20) %		5178	DESIG=2
hadrons		(93 ± 12) %		–	DESIG=101
ggg		(35.7 ± 2.6) %		–	DESIG=109
γgg		$(9.7 \pm 1.8) \times 10^{-3}$		–	DESIG=110
^2H anything		$(2.33\pm 0.33) \times 10^{-5}$		–	DESIG=117
Radiative decays					NODE=M048;CLUMP=B
$\gamma\chi_{b2}(2P)$		(13.1 ± 1.6) %	S=3.4	86	DESIG=5
$\gamma\chi_{b1}(2P)$		(12.6 ± 1.2) %	S=2.4	99	DESIG=6
$\gamma\chi_{b0}(2P)$		(5.9 ± 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					NODE=M048;CLUMP=C
$e^\pm\tau^\mp$	*LF*	$< 4.2 \times 10^{-6}$	CL=90%	5025	DESIG=111
$e^\pm\mu^\mp$	*LF*	$< 3.6 \times 10^{-7}$	CL=90%	5177	DESIG=119
$\mu^\pm\tau^\mp$	*LF*	$< 3.1 \times 10^{-6}$	CL=90%	5025	DESIG=105

$\chi_{b1}(3P)$

$I^G(J^{PC}) = 0^+(1^{++})$
J needs confirmation. NODE=M206

Mass $m = 10513.4 \pm 0.7$ MeV NODE=M206M;DTYPE=M

$\chi_{b1}(3P)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)	
$\Upsilon(1S)\gamma$	seen	1000	NODE=M206215;DESIG=1
$\Upsilon(2S)\gamma$	seen	479	DESIG=2
$\Upsilon(3S)\gamma$	seen	157	DESIG=3

$\chi_{b2}(3P)$

$I^G(J^{PC}) = 0^+(2^{++})$
J needs confirmation. NODE=M238

Mass $m = 10524.0 \pm 0.8$ MeV 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

$\Upsilon(4S)$

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

NODE=M047

also known as $\Upsilon(10580)$

Mass $m = 10579.4 \pm 1.2$ MeV NODE=M047M;DTYPE=M

Full width $\Gamma = 20.5 \pm 2.5$ MeV NODE=M047W;DTYPE=G

$\Upsilon(4S)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$B\overline{B}$	> 96 %	95%	326	NODE=M047215;DESIG=8;OUR EST; → UNCHECKED ←
B^+B^-	$(51.1 \ ^{+\ 0.7}_{-\ 1.1})$ %		331	DESIG=10
D_s^+ anything + c.c.	(17.8 ± 2.6) %		–	DESIG=12
$B^0\overline{B}^0$	(48.6 ± 0.8) %		326	DESIG=11
$J/\psi K_S^0 + (J/\psi, \eta_c)K_S^0$	$< 4 \times 10^{-7}$	90%	–	DESIG=15
non-$B\overline{B}$	$(2.64^{+13.00}_{-\ 0.20}) \times 10^{-3}$		–	DESIG=6
e^+e^-	$(1.57 \pm 0.08) \times 10^{-5}$		5290	DESIG=1
$\rho^+\rho^-$	$< 5.7 \times 10^{-6}$	90%	5233	DESIG=16
$K^*(892)^0\overline{K}^0$	$< 2.0 \times 10^{-6}$	90%	5240	DESIG=22
$J/\psi(1S)$ anything	$< 1.9 \times 10^{-4}$	95%	–	DESIG=2
D^{*+} anything + c.c.	< 7.4 %	90%	5099	DESIG=3
ϕ anything	(7.1 ± 0.6) %		5240	DESIG=4
$\phi\eta$	$< 1.8 \times 10^{-6}$	90%	5226	DESIG=13
$\phi\eta'$	$< 4.3 \times 10^{-6}$	90%	5196	DESIG=18
$\rho\eta$	$< 1.3 \times 10^{-6}$	90%	5247	DESIG=19
$\rho\eta'$	$< 2.5 \times 10^{-6}$	90%	5217	DESIG=20
$\Upsilon(1S)$ anything	$< 4 \times 10^{-3}$	90%	1053	DESIG=5
$\Upsilon(1S)\pi^+\pi^-$	$(8.2 \pm 0.4) \times 10^{-5}$		1026	DESIG=7
$\Upsilon(1S)\eta$	$(1.81 \pm 0.18) \times 10^{-4}$		924	DESIG=17
$\Upsilon(1S)\eta'$	$(3.4 \pm 0.9) \times 10^{-5}$		–	DESIG=26
$\Upsilon(2S)\pi^+\pi^-$	$(8.2 \pm 0.8) \times 10^{-5}$		468	DESIG=9
$h_b(1P)\pi^+\pi^-$	not seen		600	DESIG=21
$h_b(1P)\eta$	$(2.18 \pm 0.21) \times 10^{-3}$		390	DESIG=23
$\eta_b(1S)\omega$	$< 1.8 \times 10^{-4}$	90%	–	DESIG=27
^2H anything	$< 1.3 \times 10^{-5}$	90%	–	DESIG=14
Double Radiative Decays				NODE=M047;CLUMP=B
$\gamma\gamma\,\Upsilon(\mathrm{D}) \to \gamma\gamma\eta\,\Upsilon(1S)$	$< 2.3 \times 10^{-5}$	90%	–	DESIG=24

$\Upsilon(10753)$

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

NODE=M243

Mass $m = 10756.6 \pm 2.8$ MeV NODE=M243M;DTYPE=M

Full width $\Gamma = 29 \pm 9$ MeV NODE=M243W;DTYPE=G

$\Upsilon(10860)$

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

NODE=M092

Mass $m = 10885.2^{+2.6}_{-1.6}$ MeV NODE=M092M;DTYPE=M

Full width $\Gamma = 37 \pm 4$ MeV NODE=M092W;DTYPE=G

$\Upsilon(10860)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)	
$B\overline{B}X$	$(73.5 {+1.5 \atop -2.8})\%$		–	NODE=M092215;DESIG=9
$B\overline{B}$	$(5.5 \pm 1.0)\%$		1322	DESIG=2
$B\overline{B}^* +$ c.c.	$(13.7 \pm 1.6)\%$		–	DESIG=3
$B^*\overline{B}^*$	$(38.1 \pm 3.4)\%$		1127	DESIG=4
$B\overline{B}^{(*)}\pi$	$< 19.7\%$	90%	1015	DESIG=10
$B\overline{B}\pi$	$(0.0 \pm 1.2)\%$		1015	DESIG=23
$B^*\overline{B}\pi + B\overline{B}^*\pi$	$(7.3 \pm 2.3)\%$		–	DESIG=24
$B^*\overline{B}^*\pi$	$(1.0 \pm 1.4)\%$		739	DESIG=25
$B\overline{B}\pi\pi$	$< 8.9\%$	90%	550	DESIG=11
$B_s^{(*)}\overline{B}_s^{(*)}$	$(21.3 \pm 1.5)\%$		904	DESIG=16
$B_s\overline{B}_s$	$(6 \pm 5) \times 10^{-3}$		904	DESIG=5
$B_s\overline{B}_s^* +$ c.c.	$(1.44 \pm 0.28)\%$		–	DESIG=7
$B_s^*\overline{B}_s^*$	$(18.7 \pm 1.3)\%$		543	DESIG=8
no open-bottom	$(4.8 {+4.0 \atop -0.5})\%$		–	DESIG=28
e^+e^-	$(8.3 \pm 2.1) \times 10^{-6}$		5443	DESIG=1
$K^*(892)^0\overline{K}^0$	$< 1.0 \times 10^{-5}$	90%	5395	DESIG=29
$\Upsilon(1S)\pi^+\pi^-$	$(5.3 \pm 0.6) \times 10^{-3}$		1306	DESIG=17
$\Upsilon(1S)\eta$	$(8.5 \pm 1.7) \times 10^{-4}$		1229	DESIG=44
$\Upsilon(1S)\eta'$	$< 6.9 \times 10^{-5}$	90%	985	DESIG=45
$\Upsilon(2S)\pi^+\pi^-$	$(7.8 \pm 1.3) \times 10^{-3}$		783	DESIG=18
$\Upsilon(2S)\eta$	$(4.1 \pm 0.6) \times 10^{-3}$		639	DESIG=46
$\Upsilon(3S)\pi^+\pi^-$	$(4.8 {+1.9 \atop -1.7}) \times 10^{-3}$		440	DESIG=19
$\Upsilon(1S)K^+K^-$	$(6.1 \pm 1.8) \times 10^{-4}$		959	DESIG=20
$\eta\Upsilon_J(1D)$	$(4.8 \pm 1.1) \times 10^{-3}$		–	DESIG=40
$h_b(1P)\pi^+\pi^-$	$(3.5 {+1.0 \atop -1.3}) \times 10^{-3}$		903	DESIG=26
$h_b(2P)\pi^+\pi^-$	$(5.7 {+1.7 \atop -2.1}) \times 10^{-3}$		544	DESIG=27
$\chi_{bJ}(1P)\pi^+\pi^-\pi^0$	$(2.5 \pm 2.3) \times 10^{-3}$		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
$\chi_{b1}(1P)\pi^+\pi^-\pi^0$	$(1.85 \pm 0.33) \times 10^{-3}$		861	DESIG=33
$\chi_{b1}(1P)\omega$	$(1.57 \pm 0.30) \times 10^{-3}$		582	DESIG=34
$\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$(5.2 \pm 1.9) \times 10^{-4}$		–	DESIG=35
$\chi_{b2}(1P)\pi^+\pi^-\pi^0$	$(1.17 \pm 0.30) \times 10^{-3}$		841	DESIG=36
$\chi_{b2}(1P)\omega$	$(6.0 \pm 2.7) \times 10^{-4}$		552	DESIG=37
$\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$(6 \pm 4) \times 10^{-4}$		–	DESIG=38
$\gamma X_b \to \gamma\Upsilon(1S)\omega$	$< 3.8 \times 10^{-5}$	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	$(13.8 {+2.4 \atop -1.7})\%$		–	DESIG=12
D^0 anything + c.c.	$(112 \pm 6)\%$		–	DESIG=13
D_s anything + c.c.	$(44.7 \pm 2.6)\%$		–	DESIG=6
J/ψ anything	$(2.06 \pm 0.21)\%$		–	DESIG=14
B^0 anything + c.c.	$(77 \pm 8)\%$		–	DESIG=21
B^+ anything + c.c.	$(72 \pm 6)\%$		–	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

Υ(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*] $X\overline{X}$ = vectors with $m <$ 3.1 GeV LINKAGE=B49

[*d*] X and $\overline{X}$ = 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