$\Upsilon(10860)$

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

$\Upsilon(10860)$ MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$10885.2^{+2.6}_{-1.6}$ OUR AVERAGE				
$10885.3 \pm 1.5^{+2.2}_{-0.9}$	[1] MIZUK	19	BELL	$e^+e^- \to \Upsilon(nS)\pi^+\pi^-$
$10884.7^{+3.6}_{-3.4}{}^{+8.9}_{-1.0}$	[2] MIZUK	16	BELL	$e^+e^- \to h_b(1P,2P)\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10882 ± 1	[3] DONG	20A		$e^+e^- \to b\overline{b}$
$10881.8^{+1.0}_{-1.1} \pm 1.2$	[4,5] SANTEL	16	BELL	$e^+e^- \to$ hadrons
$10891.1 \pm 3.2^{+1.2}_{-2.0}$	[6,7] SANTEL	16	BELL	$e^+e^- \to \Upsilon(1S,2S,3S)\pi^+\pi^-$
10879 ± 3	[8,9] CHEN	10	BELL	$e^+e^- \to$ hadrons
$10888.4^{+2.7}_{-2.6} \pm 1.2$	[10] CHEN	10	BELL	$e^+e^- \to \Upsilon(1S,2S,3S)\pi^+\pi^-$
10876 ± 2	[8] AUBERT	09E	BABR	$e^+e^- \to$ hadrons
10869 ± 2	[11] AUBERT	09E	BABR	$e^+e^- \to$ hadrons
$10868 \pm 6 \pm 5$	[12] BESSON	85	CLEO	$e^+e^- \to$ hadrons
10845 ± 20	[13] LOVELOCK	85	CUSB	$e^+e^- \to$ hadrons

[1] From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, n = 1, 2, 3, cross sections at 28 energy points within $\sqrt{s}$ = 10.6–11.05 GeV, including the initial-state radiation at $\Upsilon(10860)$.

[2] From a simultaneous fit to the $h_b(nP)\pi^+\pi^-$, n = 1, 2 cross sections at 22 energy points within $\sqrt{s}$ = 10.77–11.02 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with eight resonance parameters (a mass and width for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single relative phase, a single relative amplitude, and two overall normalization factors, one for each n). The systematic error estimate is dominated by possible interference with a small nonresonant continuum amplitude.

[3] From a fit to the dressed cross sections of AUBERT 09E by BaBar and SANTEL 16 by Belle above 10.68 GeV with a coherent sum of a continuum amplitude and three Breit-Wigner functions with constant widths.

[4] From a fit to the total hadronic cross sections measured at 60 energy points within $\sqrt{s}$ = 10.82–11.05 GeV to a pair of interfering Breit-Wigner amplitudes and two floating continuum amplitudes with $1/\sqrt{s}$ dependence, one coherent with the resonances and one incoherent, with six resonance parameters (a mass, width, and an amplitude for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, one relative phase, and one decoherence coefficient).

[5] Not including uncertain and potentially large systematic errors due to assumed continuum amplitude $1/\sqrt{s}$ dependence and related interference contributions.

[6] From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, n = 1, 2, 3, cross sections at 25energy points within $\sqrt{s}$ = 10.6–11.05 GeV to a pair of interfering Breit-Wigner amplitudesmodified by phase space factors, with fourteen resonance parameters (a mass, width, and threeamplitudes for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single universal relativephase, and three decoherence coefficients, one for each n). Continuum contributions weremeasured (and therefore fixed) to be zero.

[7] Superseded by MIZUK 19.

[8] In a model where a flat non-resonant $b\overline{b}$-continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated.

[9] The parameters of the $\Upsilon(11020)$ are fixed to those in AUBERT 09E.

[10] In a model where a flat nonresonant $\Upsilon(1S,2S,3S)\pi^+\pi^-$ continuum interferes with a single Breit-Wigner resonance.

[11] In a model where a non-resonant $b\overline{b}$-continuum represented by a threshold function at $\sqrt{s}=2m_B$ is incoherently added to a flat component interfering with two Breit-Wigner resonances. Not independent of other AUBERT 09E results. Systematic uncertainties not estimated.

[12] Assuming four Gaussians with radiative tails and a single step in R.

[13] In a coupled-channel model with three resonances and a smooth step in R.

$\Upsilon(10860)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
37 ± 4 OUR AVERAGE				
$36.6^{+4.5}_{-3.9}{}^{+0.5}_{-1.1}$	[1] MIZUK	19	BELL	$e^+e^- \to \Upsilon(nS)\pi^+\pi^-$
$40.6^{+12.7}_{-8.0}{}^{+1.1}_{-19.1}$	[2] MIZUK	16	BELL	$e^+e^- \to h_b(1P,2P)\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
49.5 ± 1.5	[3] DONG	20A		$e^+e^- \to b\overline{b}$
$48.5^{+1.9}_{-1.8}{}^{+2.0}_{-2.8}$	[4,5] SANTEL	16	BELL	$e^+e^- \to$ hadrons
$53.7^{+7.1}_{-5.6}{}^{+1.3}_{-5.4}$	[6,7] SANTEL	16	BELL	$e^+e^- \to \Upsilon(1S,2S,3S)\pi^+\pi^-$
46^{+9}_{-7}	[8,9] CHEN	10	BELL	$e^+e^- \to$ hadrons
$30.7^{+8.3}_{-7.0} \pm 3.1$	[10] CHEN	10	BELL	$e^+e^- \to \Upsilon(1S,2S,3S)\pi^+\pi^-$
43 ± 4	[8] AUBERT	09E	BABR	$e^+e^- \to$ hadrons
74 ± 4	[11] AUBERT	09E	BABR	$e^+e^- \to$ hadrons
$112 \pm 17 \pm 23$	[12] BESSON	85	CLEO	$e^+e^- \to$ hadrons
110 ± 15	[13] LOVELOCK	85	CUSB	$e^+e^- \to$ hadrons

[1] From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, n = 1, 2, 3, cross sections at 28 energy points within $\sqrt{s}$ = 10.6–11.05 GeV, including the initial-state radiation at $\Upsilon(10860)$.

[2] From a simultaneous fit to the $h_b(nP)\pi^+\pi^-$, n = 1, 2 cross sections at 22 energy points within $\sqrt{s}$ = 10.77–11.02 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with eight resonance parameters (a mass and width for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single relative phase, a single relative amplitude, and two overall normalization factors, one for each n). The systematic error estimate is dominated by possible interference with a small nonresonant continuum amplitude.

[3] From a fit to the dressed cross sections of AUBERT 09E by BaBar and SANTEL 16 by Belle above 10.68 GeV with a coherent sum of a continuum amplitude and three Breit-Wigner functions with constant widths.

[4] From a fit to the total hadronic cross sections measured at 60 energy points within $\sqrt{s}$ = 10.82–11.05 GeV to a pair of interfering Breit-Wigner amplitudes and two floating continuum amplitudes with $1/\sqrt{s}$ dependence, one coherent with the resonances and one incoherent, with six resonance parameters (a mass, width, and an amplitude for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, one relative phase, and one decoherence coefficient).

[5] Not including uncertain and potentially large systematic errors due to assumed continuum amplitude $1/\sqrt{s}$ dependence and related interference contributions.

[6] From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, n = 1, 2, 3, cross sections at 25energy points within $\sqrt{s}$ = 10.6–11.05 GeV to a pair of interfering Breit-Wigner amplitudesmodified by phase space factors, with fourteen resonance parameters (a mass, width, and threeamplitudes for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single universal relativephase,

and three decoherence coefficients, one for each n). Continuum contributions weremeasured (and therefore fixed) to be zero.

[7] Superseded by MIZUK 19.

[8] In a model where a flat non-resonant $b\overline{b}$-continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated.

[9] The parameters of the $\Upsilon(11020)$ are fixed to those in AUBERT 09E.

[10] In a model where a flat nonresonant $\Upsilon(1S,2S,3S)\pi^+\pi^-$ continuum interferes with a single Breit-Wigner resonance.

[11] In a model where a non-resonant $b\overline{b}$-continuum represented by a threshold function at $\sqrt{s}$=$2m_B$ is incoherently added to a flat component interfering with two Breit-Wigner resonances. Not independent of other AUBERT 09E results. Systematic uncertainties not estimated.

[12] Assuming four Gaussians with radiative tails and a single step in R.

[13] In a coupled-channel model with three resonances and a smooth step in R.

Υ(10860) DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	$B\overline{B}X$	(73.5 $^{+1.5}_{-2.8}$) %	
Γ_2	$B\overline{B}$	(5.5 ±1.0) %	
Γ_3	$B\overline{B}^*$ + c.c.	(13.7 ±1.6) %	
Γ_4	$B^*\overline{B}^*$	(38.1 ±3.4) %	
Γ_5	$B\overline{B}^{(*)}\pi$	< 19.7 %	90%
Γ_6	$B\overline{B}\pi$	(0.0 ±1.2) %	
Γ_7	$B^*\overline{B}\pi$ + $B\overline{B}^*\pi$	(7.3 ±2.3) %	
Γ_8	$B^*\overline{B}^*\pi$	(1.0 ±1.4) %	
Γ_9	$B\overline{B}\pi\pi$	< 8.9 %	90%
Γ_{10}	$B_s^{(*)}\overline{B}_s^{(*)}$	(21.3 ±1.5) %	
Γ_{11}	$B_s\overline{B}_s$	(6 ±5) $\times 10^{-3}$	
Γ_{12}	$B_s\overline{B}_s^*$ + c.c.	(1.44±0.28) %	
Γ_{13}	$B_s^*\overline{B}_s^*$	(18.7 ±1.3) %	
Γ_{14}	no open-bottom	(4.8 $^{+4.0}_{-0.5}$) %	
Γ_{15}	e^+e^-	(8.3 ±2.1) $\times 10^{-6}$	
Γ_{16}	$K^*(892)^0\overline{K}^0$	< 1.0 $\times 10^{-5}$	90%
Γ_{17}	$\Upsilon(1S)\pi^+\pi^-$	(5.3 ±0.6) $\times 10^{-3}$	
Γ_{18}	$\Upsilon(1S)\eta$	(8.5 ±1.7) $\times 10^{-4}$	
Γ_{19}	$\Upsilon(1S)\eta'$	< 6.9 $\times 10^{-5}$	90%
Γ_{20}	$\Upsilon(2S)\pi^+\pi^-$	(7.8 ±1.3) $\times 10^{-3}$	
Γ_{21}	$\Upsilon(2S)\eta$	(4.1 ±0.6) $\times 10^{-3}$	
Γ_{22}	$\Upsilon(3S)\pi^+\pi^-$	(4.8 $^{+1.9}_{-1.7}$) $\times 10^{-3}$	
Γ_{23}	$\Upsilon(1S)K^+K^-$	(6.1 ±1.8) $\times 10^{-4}$	
Γ_{24}	$\eta\Upsilon_J(1D)$	(4.8 ±1.1) $\times 10^{-3}$	
Γ_{25}	$h_b(1P)\pi^+\pi^-$	(3.5 $^{+1.0}_{-1.3}$) $\times 10^{-3}$	

Γ_{26}	$h_b(2P)\pi^+\pi^-$	$(5.7\ ^{+1.7}_{-2.1})\times 10^{-3}$	
Γ_{27}	$\chi_{bJ}(1P)\pi^+\pi^-\pi^0$	$(2.5\ \pm 2.3)\times 10^{-3}$	
Γ_{28}	$\chi_{b0}(1P)\pi^+\pi^-\pi^0$	$< 6.3 \times 10^{-3}$	90%
Γ_{29}	$\chi_{b0}(1P)\omega$	$< 3.9 \times 10^{-3}$	90%
Γ_{30}	$\chi_{b0}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$< 4.8 \times 10^{-3}$	90%
Γ_{31}	$\chi_{b1}(1P)\pi^+\pi^-\pi^0$	$(1.85\pm 0.33)\times 10^{-3}$	
Γ_{32}	$\chi_{b1}(1P)\omega$	$(1.57\pm 0.30)\times 10^{-3}$	
Γ_{33}	$\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$(5.2\ \pm 1.9)\times 10^{-4}$	
Γ_{34}	$\chi_{b2}(1P)\pi^+\pi^-\pi^0$	$(1.17\pm 0.30)\times 10^{-3}$	
Γ_{35}	$\chi_{b2}(1P)\omega$	$(6.0\ \pm 2.7)\times 10^{-4}$	
Γ_{36}	$\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega}$	$(6\ \pm 4)\times 10^{-4}$	
Γ_{37}	$\gamma X_b \to \gamma \Upsilon(1S)\omega$	$< 3.8 \times 10^{-5}$	90%
Γ_{38}	$\eta_b(1S)\omega$	$< 1.3 \times 10^{-3}$	90%
Γ_{39}	$\eta_b(2S)\omega$	$< 5.6 \times 10^{-3}$	90%

Inclusive Decays.

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

Γ_{40}	ϕ anything	$(13.8\ ^{+2.4}_{-1.7})$ %
Γ_{41}	D^0 anything + c.c.	$(112\ \pm 6)$ %
Γ_{42}	D_s anything + c.c.	$(44.7\ \pm 2.6)$ %
Γ_{43}	J/ψ anything	(2.06 ± 0.21) %
Γ_{44}	B^0 anything + c.c.	$(77\ \pm 8)$ %
Γ_{45}	B^+ anything + c.c.	$(72\ \pm 6)$ %

Υ(10860) PARTIAL WIDTHS

$\Gamma(e^+e^-)$ $\qquad\Gamma_{15}$

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
0.31 ±0.07 OUR AVERAGE	Error includes scale factor of 1.3.			
0.22 ±0.05 ±0.07	BESSON	85	CLEO	$e^+e^- \to$ hadrons
0.365±0.070	LOVELOCK	85	CUSB	$e^+e^- \to$ hadrons

$\Gamma(e^+e^-) \times \Gamma(\Upsilon(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$ $\qquad\Gamma_{15}\Gamma_{17}/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.09±0.34	[1,2] MIZUK	19	BELL	$e^+e^- \to \Upsilon(\text{nS})\pi^+\pi^-$

[1] From a simultaneous fit to the $\Upsilon(\text{nS})\pi^+\pi^-$, n = 1, 2, 3, cross sections at 28 energy points within $\sqrt{s}$ = 10.6–11.05 GeV, including the initial-state radiation at Υ(10860).
[2] Reported as the range 0.75–1.43 eV obtained from multiple solutions of an amplitude fit within a model composed as a sum of Breit-Wigner functions.

$\Gamma(e^+e^-) \times \Gamma(\Upsilon(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$ $\qquad\Gamma_{15}\Gamma_{20}/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.58±1.22	[1,2] MIZUK	19	BELL	$e^+e^- \to \Upsilon(\text{nS})\pi^+\pi^-$

[1] From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, n = 1, 2, 3, cross sections at 28 energy points within $\sqrt{s}$ = 10.6–11.05 GeV, including the initial-state radiation at $\Upsilon(10860)$.
[2] Reported as the range 1.35–3.80 eV obtained from multiple solutions of an amplitude fit within a model composed as a sum of Breit-Wigner functions.

$\Gamma(e^+e^-) \times \Gamma(\Upsilon(3S)\pi^+\pi^-)/\Gamma_{total}$ — $\Gamma_{15}\Gamma_{22}/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.73±0.30	[1,2] MIZUK	19	BELL	$e^+e^- \to \Upsilon(nS)\pi^+\pi^-$

[1] From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, n = 1, 2, 3, cross sections at 28 energy points within $\sqrt{s}$ = 10.6–11.05 GeV, including the initial-state radiation at $\Upsilon(10860)$.
[2] Reported as the range 0.43–1.03 eV obtained from multiple solutions of an amplitude fit within a model composed as a sum of Breit-Wigner functions.

$\Upsilon(10860)$ BRANCHING RATIOS

$\Gamma(B\overline{B}X)/\Gamma_{total}$ — Γ_1/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.735^{+0.015}_{-0.028}$ OUR AVERAGE					
$0.738^{+0.015}_{-0.029}$		ADACHI	250	BELL	$e^+e^- \to \Upsilon(5S)$
0.589±0.100±0.092		[1] HUANG	07	CLEO	$\Upsilon(5S) \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.737±0.032±0.051	1063	[2] DRUTSKOY	10	BELL	$\Upsilon(5S) \to B^+X,\ B^0X$

[1] Using measurements or limits from AQUINES 06.
[2] Not independent of DRUTSKOY 10 values for $\Upsilon(5S) \to B^{\pm,0}$ anything. Superseded by ADACHI 250.

$\Gamma(B\overline{B})/\Gamma_{total}$ — Γ_2/Γ

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
$5.5^{+1.0}_{-0.9}\pm0.4$		[1] DRUTSKOY	10	BELL	$\Upsilon(5S) \to B^+X,\ B^0X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<13.8	90	[2] HUANG	07	CLEO	$\Upsilon(5S) \to$ hadrons

[1] Assuming isospin conservation.
[2] Using measurements or limits from AQUINES 06.

$\Gamma(B\overline{B})/\Gamma(B\overline{B}X)$ — Γ_2/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.22	90	AQUINES	06	CLE3	$\Upsilon(5S) \to$ hadrons

$\Gamma(B\overline{B}^* + c.c.)/\Gamma_{total}$ — Γ_3/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.137±0.016 OUR AVERAGE				
0.137±0.013±0.011	[1] DRUTSKOY	10	BELL	$\Upsilon(5S) \to B^+X,\ B^0X$
0.143±0.053±0.027	[2] HUANG	07	CLEO	$\Upsilon(5S) \to$ hadrons

[1] Assuming isospin conservation.
[2] Using measurements or limits from AQUINES 06.

$\Gamma(B\overline{B}^* + \text{c.c.})/\Gamma(B\overline{B}X)$ — Γ_3/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.24±0.09±0.03	10	AQUINES	06	CLE3	$\Upsilon(5S) \rightarrow$ hadrons

$\Gamma(B^*\overline{B}^*)/\Gamma_{\text{total}}$ — Γ_4/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.381±0.034 OUR AVERAGE				
$0.375^{+0.021}_{-0.019}\pm0.030$	[1] DRUTSKOY	10	BELL	$\Upsilon(5S) \rightarrow B^+ X,\ B^0 X$
0.436±0.083±0.072	[2] HUANG	07	CLEO	$\Upsilon(5S) \rightarrow$ hadrons

[1] Assuming isospin conservation.
[2] Using measurements or limits from AQUINES 06.

$\Gamma(B^*\overline{B}^*)/\Gamma(B\overline{B}X)$ — Γ_4/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.74±0.15±0.08	31	AQUINES	06	CLE3	$\Upsilon(5S) \rightarrow$ hadrons

$\Gamma(B\overline{B}^{(*)}\pi)/\Gamma_{\text{total}}$ — Γ_5/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.197	90	[1] HUANG	07	CLEO	$\Upsilon(5S) \rightarrow$ hadrons

[1] Using measurements or limits from AQUINES 06.

$\Gamma(B\overline{B}^{(*)}\pi)/\Gamma(B\overline{B}X)$ — Γ_5/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.32	90	AQUINES	06	CLE3	$\Upsilon(5S) \rightarrow$ hadrons

$\Gamma(B\overline{B}\pi)/\Gamma_{\text{total}}$ — Γ_6/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.0±1.2±0.3	0	[1] DRUTSKOY	10	BELL	$\Upsilon(5S) \rightarrow B^{+,0}\pi^- X$

[1] Assuming isospin conservation.

$\left[\Gamma(B^*\overline{B}\pi) + \Gamma(B\overline{B}^*\pi)\right]/\Gamma_{\text{total}}$ — Γ_7/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{7.3^{+2.3}_{-2.1}\pm0.8}$	38	[1] DRUTSKOY	10	BELL	$\Upsilon(5S) \rightarrow B^{+,0}\pi^- X$

[1] Assuming isospin conservation.

$\Gamma(B^*\overline{B}^*\pi)/\Gamma_{\text{total}}$ — Γ_8/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.0^{+1.4}_{-1.3}\pm0.4}$	5	[1] DRUTSKOY	10	BELL	$\Upsilon(5S) \rightarrow B^{+,0}\pi^- X$

[1] Assuming isospin conservation.

$\Gamma(B\overline{B}\pi\pi)/\Gamma_{\text{total}}$ — Γ_9/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.089	90	[1] HUANG	07	CLEO	$\Upsilon(5S) \rightarrow$ hadrons

[1] Using measurements or limits from AQUINES 06.

$\Gamma(B\overline{B}\pi\pi)/\Gamma(B\overline{B}X)$ — Γ_9/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.14	90	AQUINES	06	CLE3	$\Upsilon(5S) \to$ hadrons

$\Gamma(B_s^{(*)}\overline{B}_s^{(*)})/\Gamma_{total}$ — $\Gamma_{10}/\Gamma = (\Gamma_{11}+\Gamma_{12}+\Gamma_{13})/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.213±0.015 OUR AVERAGE				
$0.214^{+0.015}_{-0.017}$	ADACHI	25O	BELL	$e^+e^- \to \Upsilon(5S)$
$0.21\ ^{+0.06}_{-0.03}$	[1] HUANG	07	CLEO	$\Upsilon(5S) \to D_s X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.172 ± 0.030	[2] ESEN	13	BELL	$\Upsilon(5S) \to D^0 X$, $D_s X$
$0.180\pm0.013\pm0.032$	[3] DRUTSKOY	07	BELL	$\Upsilon(5S) \to D^0 X$, $D_s X$
$0.160\pm0.026\pm0.058$	[4] ARTUSO	05B	CLEO	$e^+e^- \to D_x X$

[1] Supersedes ARTUSO 05B. Combining inclusive ϕ, D_s, and B measurements. Using $B(D_s^+ \to \phi\pi^+) = 4.4 \pm 0.6\%$ from PDG 06.

[2] Superseded by ADACHI 25O.

[3] Using $B(D_s^+ \to \phi\pi^+) = (4.4 \pm 0.6)\%$ from PDG 06. Superseded by ESEN 13

[4] Uses a model-dependent estimate $B(B_s \to D_s X) = (92 \pm 11)\%$.

$\Gamma(B_s^{(*)}\overline{B}_s^{(*)})/\Gamma(B\overline{B}X)$ — Γ_{10}/Γ_1

VALUE	DOCUMENT ID
$\mathbf{0.264^{+0.052}_{-0.045}}$ **OUR EVALUATION**	

$\Gamma(B_s^*\overline{B}_s^*)/\Gamma(B_s^{(*)}\overline{B}_s^{(*)})$ — $\Gamma_{13}/\Gamma_{10} = \Gamma_{13}/(\Gamma_{11}+\Gamma_{12}+\Gamma_{13})$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
87.8±1.5 OUR AVERAGE					
87.0 ± 1.7		[1,2] ESEN	13	BELL	$B_s^0 \to D_s^-\pi^+$
$90.5\pm3.2\pm0.1$	227	[2,3] LI	12	BELL	$B_s^0 \to J/\psi\eta^{(\prime)}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$90.1^{+3.8}_{-4.0}\pm0.2$		[4] LOUVOT	09	BELL	10.86 $e^+e^- \to B_s^{(*)}\overline{B}_s^{(*)}$
$93\ ^{+7}_{-9}\ \pm1$		[4] DRUTSKOY	07A	BELL	Superseded by LOUVOT 09

[1] Supersedes LOUVOT 09.

[2] With $N(B_s^{(*)}\overline{B}_s^{(*)}) = (7.11 \pm 1.30) \times 10^6$.

[3] The ratios $N(B_s^*\overline{B}_s^*)$ / $N(B_s^{(*)}\overline{B}_s^{(*)})$ and $N(B_s^*\overline{B}_s^0)$ / $N(B_s^{(*)}\overline{B}_s^{(*)})$ are measured with a correlation coefficient of -0.72.

[4] From a measurement of $\sigma(e^+e^- \to B_s^*\overline{B}_s^*)$ / $\sigma(e^+e^- \to B_s^{(*)}\overline{B}_s^{(*)})$ at $\sqrt{s} = 10.86$ GeV.

$\Gamma(B_s\overline{B}_s)/\Gamma(B_s^{(*)}\overline{B}_s^{(*)})$ — $\Gamma_{11}/\Gamma_{10} = \Gamma_{11}/(\Gamma_{11}+\Gamma_{12}+\Gamma_{13})$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
$\mathbf{2.6^{+2.6}_{-2.5}}$	LOUVOT	09	BELL	10.86 $e^+e^- \to B_s^{(*)}\overline{B}_s^{(*)}$

$\Gamma(B_s \overline{B}_s)/\Gamma(B_s^* \overline{B}_s^*)$ — Γ_{11}/Γ_{13}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.16	90	BONVICINI	06	CLE3	$e^+ e^-$

$\Gamma(B_s \overline{B}_s^* + \text{c.c.})/\Gamma(B_s^{(*)} \overline{B}_s^{(*)})$ — $\Gamma_{12}/\Gamma_{10} = \Gamma_{12}/(\Gamma_{11}+\Gamma_{12}+\Gamma_{13})$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
6.7±1.2 OUR AVERAGE					
7.3±1.4		[1,2] ESEN	13	BELL	$B_s^0 \to D_s^- \pi^+$
4.9±2.5±0.0	227	[2,3] LI	12	BELL	$B_s^0 \to J/\psi \eta^{(\prime)}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$7.3^{+3.3}_{-3.0}\pm0.1$		LOUVOT	09	BELL	10.86 $e^+ e^- \to B_s^{(*)} \overline{B}_s^{(*)}$

[1] Supersedes LOUVOT 09.
[2] With $N(B_s^{(*)} \overline{B}_s^{(*)}) = (7.11 \pm 1.30) \times 10^6$.
[3] The ratios $N(B_s^* \overline{B}_s^*)$ / $N(B_s^{(*)} \overline{B}_s^{(*)})$ and $N(B_s^* \overline{B}_s^0)$ / $N(B_s^{(*)} \overline{B}_s^{(*)})$ are measured with a correlation coefficient of -0.72.

$\Gamma(B_s \overline{B}_s^* + \text{c.c.})/\Gamma(B_s^* \overline{B}_s^*)$ — Γ_{12}/Γ_{13}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.16	90	BONVICINI	06	CLE3	$e^+ e^-$

$\Gamma(\text{no open-bottom})/\Gamma_{\text{total}}$ — Γ_{14}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.048^{+0.036}_{-0.005}}$	ADACHI	25O	BELL	$e^+ e^- \to \Upsilon(5S)$

$\Gamma(K^*(892)^0 \overline{K}^0)/\Gamma_{\text{total}}$ — Γ_{16}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.0 \times 10^{-5}}$	90	SHEN	13A	BELL	$e^+ e^- \to K^*(892)^0 \overline{K}^0$

$\Gamma(\eta \Upsilon_J(1D))/\Gamma_{\text{total}}$ — Γ_{24}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
4.82±0.92±0.67	[1] TAMPONI	18	BELL	$e^+ e^- \to \Upsilon(5S) \to \eta X$

[1] Mainly $J = 2$, assumes no continuum contribution under $\Upsilon(5S)$.

$\Gamma(\Upsilon(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$ — Γ_{17}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
5.3±0.3±0.5	325	[1] CHEN	08	BELL	10.87 $e^+ e^- \to \Upsilon(1S)\pi^+\pi^-$

[1] Assuming that the observed events are solely due to the $\Upsilon(5S)$ resonance.

$\Gamma(\Upsilon(1S)\eta)/\Gamma_{\text{total}}$ — Γ_{18}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
0.85±0.15±0.08	[1,2] KOVALENKO	21	BELL	$e^+ e^- \to \Upsilon(5S)$

[1] Assuming that the observed events are solely due to the $\Upsilon(5S)$ resonance.
[2] Using a data sample of 118.3 fb^{-1} of $e^+ e^-$ collisions at $\sqrt{s} = 10.866$ GeV.

$\Gamma(\Upsilon(1S)\eta')/\Gamma_{total}$ Γ_{19}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<6.9\times10^{-5}$	90	[1,2] KOVALENKO 21	BELL	$e^+e^-\to\Upsilon(5S)$

[1] Assuming that the observed events are solely due to the $\Upsilon(5S)$ resonance.
[2] Using a data sample of 118.3 fb^{-1} of e^+e^- collisions at $\sqrt{s}=10.866$ GeV.

$\Gamma(\Upsilon(2S)\pi^+\pi^-)/\Gamma_{total}$ Γ_{20}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
7.8±0.6±1.1	186	[1] CHEN 08	BELL	10.87 $e^+e^-\to\Upsilon(2S)\pi^+\pi^-$

[1] Assuming that the observed events are solely due to the $\Upsilon(5S)$ resonance.

$\Gamma(\Upsilon(2S)\eta)/\Gamma_{total}$ Γ_{21}/Γ

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
4.13±0.41±0.37	[1,2] KOVALENKO 21	BELL	$e^+e^-\to\Upsilon(5S)$

[1] Assuming that the observed events are solely due to the $\Upsilon(5S)$ resonance.
[2] Using a data sample of 118.3 fb^{-1} of e^+e^- collisions at $\sqrt{s}=10.866$ GeV.

$\Gamma(\Upsilon(3S)\pi^+\pi^-)/\Gamma_{total}$ Γ_{22}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$\mathbf{4.8^{+1.8}_{-1.5}\pm0.7}$	10	[1] CHEN 08	BELL	10.87 $e^+e^-\to\Upsilon(3S)\pi^+\pi^-$

[1] Assuming that the observed events are solely due to the $\Upsilon(5S)$ resonance.

$\Gamma(\Upsilon(1S)K^+K^-)/\Gamma_{total}$ Γ_{23}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$\mathbf{6.1^{+1.6}_{-1.4}\pm1.0}$	20	[1] CHEN 08	BELL	10.87 $e^+e^-\to\Upsilon(1S)K^+K^-$

[1] Assuming that the observed events are solely due to the $\Upsilon(5S)$ resonance.

$\Gamma(h_b(1P)\pi^+\pi^-)/\Gamma(\Upsilon(2S)\pi^+\pi^-)$ Γ_{25}/Γ_{20}

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{0.45\pm0.08^{+0.07}_{-0.12}}$	ADACHI 12	BELL	10.86 $e^+e^-\to$ hadrons

$\Gamma(h_b(2P)\pi^+\pi^-)/\Gamma(\Upsilon(2S)\pi^+\pi^-)$ Γ_{26}/Γ_{20}

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{0.77\pm0.08^{+0.22}_{-0.17}}$	ADACHI 12	BELL	10.86 $e^+e^-\to$ hadrons

$\Gamma(h_b(1P)\pi^+\pi^-)/\Gamma(h_b(2P)\pi^+\pi^-)$ Γ_{25}/Γ_{26}

VALUE	DOCUMENT ID	TECN	COMMENT
0.616±0.052±0.017	MIZUK 16	BELL	$e^+e^-\to h_b(1P,2P)\pi^+\pi^-$

$\Gamma(\chi_{bJ}(1P)\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{27}/Γ

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
2.5±0.6±2.2	YIN 18	BELL	$e^+e^-\to$ hadrons

$\Gamma(\chi_{b0}(1P)\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{28}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.3 \times 10^{-3}$	90	[1] HE	14	BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.

$\Gamma(\chi_{b0}(1P)\omega)/\Gamma_{total}$ Γ_{29}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.9 \times 10^{-3}$	90	[1] HE	14	BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.

$\Gamma(\chi_{b0}(1P)(\pi^+\pi^-\pi^0)_{non-\omega})/\Gamma_{total}$ Γ_{30}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<4.8 \times 10^{-3}$	90	[1] HE	14	BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.

$\Gamma(\chi_{b1}(1P)\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{31}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.85±0.23±0.23	80	[1] HE	14	BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.

$\Gamma(\chi_{b1}(1P)\omega)/\Gamma_{total}$ Γ_{32}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.57±0.22±0.21	60	[1] HE	14	BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.

$\Gamma(\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{non-\omega})/\Gamma_{total}$ Γ_{33}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.52±0.15±0.11	24	[1] HE	14	BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.

$\Gamma(\chi_{b2}(1P)\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{34}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.17±0.27±0.14	29	[1] HE	14	BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.

$\Gamma(\chi_{b2}(1P)\omega)/\Gamma_{total}$ Γ_{35}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.60±0.23±0.15	13	[1] HE	14	BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.

$\Gamma(\chi_{b2}(1P)\omega)/\Gamma(\chi_{b1}(1P)\omega)$ — Γ_{35}/Γ_{32}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.38\pm0.16\pm0.09$	[1] HE	14	BELL	$\Upsilon(5S) \to \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Accounting for correlated systematics.

$\Gamma(\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega})/\Gamma_{\text{total}}$ — Γ_{36}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$0.61\pm0.22\pm0.28$	16	[1] HE	14	BELL	$\Upsilon(5S) \to \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \to b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.

$\Gamma(\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega})/\Gamma(\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{\text{non}-\omega})$ — Γ_{36}/Γ_{33}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.20\pm0.55\pm0.65$	[1] HE	14	BELL	$\Upsilon(5S) \to \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Accounting for correlated systematics.

$\Gamma(\eta_b(1S)\omega)/\Gamma_{\text{total}}$ — Γ_{38}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.3\times10^{-3}$	90	[1] OSKIN	20	BELL	$e^+e^- \to \omega X$

[1] Using $\sigma_{b\overline{b}} = 0.340 \pm 0.016$ nb from TAMPONI 15.

$\Gamma(\eta_b(2S)\omega)/\Gamma_{\text{total}}$ — Γ_{39}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.6\times10^{-3}$	90	[1] OSKIN	20	BELL	$e^+e^- \to \omega X$

[1] Using $\sigma_{b\overline{b}} = 0.340 \pm 0.016$ nb from TAMPONI 15.

$\Gamma(\gamma X_b \to \gamma\Upsilon(1S)\omega)/\Gamma_{\text{total}}$ — Γ_{37}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.8\times10^{-5}$	90	[1] HE	14	BELL	$\Upsilon(5S) \to \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$

[1] Assuming that all the $b\overline{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \to b\overline{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14. For a state X_b with mass between 10.55 GeV/c^2 and 10.65 GeV/c^2, the obtained 90% upper limit as a function of m_{X_b} varies from 2.6×10^{-5} to 3.8×10^{-5}.

$\Gamma(\phi\text{ anything})/\Gamma_{\text{total}}$ — Γ_{40}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$0.138\pm0.007^{+0.023}_{-0.015}$	HUANG	07	CLEO	$\Upsilon(5S) \to \phi X$

$\Gamma(D^0\text{ anything} + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{41}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$1.117\pm0.005\pm0.060$	[1] ZHUKOVA	23	BELL	$\Upsilon(5S) \to D^0 X,\ \overline{D}^0 X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.076\pm0.040\pm0.068$	DRUTSKOY	07	BELL	$\Upsilon(5S) \to D^0 X,\ \overline{D}^0 X$

[1] Supersedes DRUTSKOY 07.

$\Gamma(D_s$ anything + c.c.$)/\Gamma_{total}$ — Γ_{42}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.447±0.026 OUR AVERAGE				
0.447±0.003±0.027	[1] ZHUKOVA	23	BELL	$\Upsilon(5S) \to D_s^{\pm} X$
0.44 ±0.09 ±0.04	[2] ARTUSO	05B	CLE3	$\Upsilon(5S) \to D_s^{\pm} X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.472±0.024±0.072	[3] DRUTSKOY	07	BELL	$\Upsilon(5S) \to D_s^{\pm} X$

[1] Supersedes DRUTSKOY 07.

[2] ARTUSO 05B reports $[\Gamma(\Upsilon(10860) \to D_s$ anything + c.c.$)/\Gamma_{total}] \times [B(D_s^+ \to \phi\pi^+)] = 0.0198 \pm 0.0019 \pm 0.0038$ which we divide by our best (shown rounded) value $B(D_s^+ \to \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

[3] Using $B(D_s^+ \to \phi\pi^+) = (4.4 \pm 0.6)\%$ from PDG 06.

$\Gamma(J/\psi$ anything$)/\Gamma_{total}$ — Γ_{43}/Γ

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
2.060±0.160±0.134	DRUTSKOY	07	BELL	$\Upsilon(5S) \to J/\psi X$

$\Gamma(B^0$ anything + c.c.$)/\Gamma_{total}$ — Γ_{44}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.770^{+0.058}_{-0.056}\pm0.061}$	352	DRUTSKOY	10	BELL	$\Upsilon(5S) \to B^0 X$

$\Gamma(B^+$ anything + c.c.$)/\Gamma_{total}$ — Γ_{45}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.721^{+0.039}_{-0.038}\pm0.050}$	711	DRUTSKOY	10	BELL	$\Upsilon(5S) \to B^+ X$

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