$h_b(2P)$

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

Quantum numbers are quark model predictions. $C = -$ established by $\eta_b \gamma$ decay.

$h_b(2P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
10259.8±0.5±1.1	90k	[1] MIZUK	12	BELL	$e^+e^- \rightarrow \pi^+\pi^-$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$10259.8 \pm 0.6^{+1.4}_{-1.0}$	83.9k	[2] ADACHI	12	BELL	10.86 $e^+e^- \rightarrow \pi^+\pi^-$ MM

[1] Observed with 9 standard deviations significance.
[2] Superseded by MIZUK 12.

$h_b(2P)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	hadrons	not seen	
Γ_2	$\eta_b(1S)\gamma$	(22 ± 5) %	
Γ_3	$\eta_b(2S)\gamma$	(48 ± 13) %	
Γ_4	$\Upsilon(1S)\eta$	$(7.1^{+4.0}_{-3.3}) \times 10^{-3}$	
Γ_5	$\Upsilon(1S)\pi^0$	$< 1.8 \times 10^{-3}$	90%
Γ_6	$\gamma\chi_{b0}(1P)$	< 27 %	90%
Γ_7	$\gamma\chi_{b1}(1P)$	$< 5.4 \times 10^{-3}$	90%
Γ_8	$\gamma\chi_{b2}(1P)$	< 1.3 %	90%

$h_b(2P)$ BRANCHING RATIOS

$\Gamma(\text{hadrons})/\Gamma_{\text{total}}$ — Γ_1/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
not seen	83.9k	ADACHI	12	BELL	10.86 $e^+e^- \rightarrow \pi^+\pi^-$ MM

$\Gamma(\eta_b(1S)\gamma)/\Gamma_{\text{total}}$ — Γ_2/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{22.3 \pm 3.8^{+3.1}_{-3.3}}$	10k	MIZUK	12	BELL	$e^+e^- \rightarrow (\gamma)\pi^+\pi^-$ hadrons

$\Gamma(\eta_b(2S)\gamma)/\Gamma_{\text{total}}$ — Γ_3/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{47.5 \pm 10.5^{+6.8}_{-7.7}}$	26k	MIZUK	12	BELL	$e^+e^- \rightarrow (\gamma)\pi^+\pi^-$ hadrons

$\Gamma(\Upsilon(1S)\eta)/\Gamma_{\text{total}}$ — Γ_4/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{7.1^{+3.7}_{-3.2} \pm 0.8}$	3.8	KOVALENKO	24	BELL	$e^+e^- \rightarrow \Upsilon(5S)$

$\Gamma(\Upsilon(1S)\pi^0)/\Gamma_{total}$ — Γ_5/Γ

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<1.8 \times 10^{-3}$	90	0.1	KOVALENKO	24	BELL	$e^+e^- \to \Upsilon(5S)$

$\Gamma(\gamma\chi_{b0}(1P))/\Gamma_{total}$ — Γ_6/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.7 \times 10^{-1}$	90	BOSCHETTI	25	BELL	$\Upsilon(10860) \to h_b(2P)\pi^+\pi^-$

$\Gamma(\gamma\chi_{b1}(1P))/\Gamma_{total}$ — Γ_7/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.4 \times 10^{-3}$	90	BOSCHETTI	25	BELL	$\Upsilon(10860) \to h_b(2P)\pi^+\pi^-$

$\Gamma(\gamma\chi_{b2}(1P))/\Gamma_{total}$ — Γ_8/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.3 \times 10^{-2}$	90	BOSCHETTI	25	BELL	$\Upsilon(10860) \to h_b(2P)\pi^+\pi^-$

$h_b(2P)$ REFERENCES

BOSCHETTI	25	PR D111 L011102	A. Boschetti *et al.*	(BELLE Collab.)
KOVALENKO	24	PRL 133 261901	E. Kovalenko *et al.*	(BELLE Collab.)
ADACHI	12	PRL 108 032001	I. Adachi *et al.*	(BELLE Collab.)
MIZUK	12	PRL 109 232002	R. Mizuk *et al.*	(BELLE Collab.)