

$$h_b(1P)$$

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

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

$h_b(1P)$ MASS

VALUE (MeV)	EVTs	DOCUMENT ID	TECN	COMMENT
9899.3±0.8 OUR AVERAGE				
9899.3±0.4±1.0	112k	TAMPONI	15	BELL $e^+e^- \rightarrow \gamma\eta + \text{hadrons}$
9899.1±0.4±1.0	70k	MIZUK	12	BELL $e^+e^- \rightarrow \pi^+\pi^- \text{ hadrons}$
9902 ±4 ±2	10.8k	LEES	11K	BABR $\Upsilon(3S) \rightarrow \eta_b\gamma\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9898.2 ^{+1.1+1.0} _{-1.0-1.1}	50.0k	¹ ADACHI	12	BELL $10.86\ e^+e^- \rightarrow \pi^+\pi^- \text{ MM}$
¹ Superseded by MIZUK 12.				

$h_b(1P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1\quad \eta_b(1S)\gamma$	(52 ⁺⁶ ₋₅) %	
$\Gamma_2\quad \Upsilon(1S)\pi^0$	< 1.8 × 10 ⁻³	90%

$h_b(1P)$ BRANCHING RATIOS

$\Gamma(\eta_b(1S)\gamma)/\Gamma_{\text{total}}$				Γ_1/Γ	
VALUE (units 10 ⁻²)	EVTs	DOCUMENT ID	TECN	COMMENT	
52 ⁺⁶₋₅ OUR AVERAGE					
56 ±8 ±4	33.1k	¹ TAMPONI	15	BELL $e^+e^- \rightarrow \gamma\eta + \text{hadrons}$	
49.2±5.7 ^{+5.6} _{-3.3}	24k	MIZUK	12	BELL $e^+e^- \rightarrow (\gamma)\pi^+\pi^- \text{ hadrons}$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen	10.8k	LEES	11K	BABR $\Upsilon(3S) \rightarrow \eta_b\gamma\pi^0$	
¹ Using $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20)\%$.					

$\Gamma(\Upsilon(1S)\pi^0)/\Gamma_{\text{total}}$				Γ_2/Γ	
VALUE	CL%	EVTs	DOCUMENT ID	TECN	COMMENT
<1.8 × 10 ⁻³	90	0.43	KOVALENKO	24	BELL $e^+e^- \rightarrow \Upsilon(5S)$

$h_b(1P)$ REFERENCES

KOVALENKO	24	PRL 133 261901	E. Kovalenko <i>et al.</i>	(BELLE Collab.)
TAMPONI	15	PRL 115 142001	U. Tamponi <i>et al.</i>	(BELLE Collab.)
ADACHI	12	PRL 108 032001	I. Adachi <i>et al.</i>	(BELLE Collab.)
MIZUK	12	PRL 109 232002	R. Mizuk <i>et al.</i>	(BELLE Collab.)
LEES	11K	PR D84 091101	J.P. Lees <i>et al.</i>	(BABAR Collab.)