

**$\eta_b(2S)$** 

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

OMITTED FROM SUMMARY TABLE

Quantum numbers shown are quark-model predictions.

 **$\eta_b(2S)$  MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>9999.0 \pm 3.5^{+2.8}_{-1.9}</math></b>	26k	<sup>1</sup> MIZUK	12	BELL $e^+e^- \rightarrow \gamma\pi^+\pi^- +$ hadrons

• • • We do not use the following data for averages, fits, limits, etc. • • •

$9974.6 \pm 2.3 \pm 2.1$	$11 \pm 4$	<sup>2,3,4</sup> DOBBS	12	$\Upsilon(2S) \rightarrow \gamma$ hadrons
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<sup>1</sup> Assuming  $\Gamma_{\eta_b(2S)} = 4.9$  MeV. Not independent of the corresponding mass difference measurement.<sup>2</sup> SANDILYA 13 (Belle Collab.) search for such a state reconstructed in the same 26 exclusive hadronic final states as DOBBS 12 using a sample of  $(157.8 \pm 3.6) \times 10^6$   $\Upsilon(2S)$  decays or about 17 times larger and find no evidence for a signal. Their 90% C.L. upper limit on the branching fraction  $B(\Upsilon(2S) \rightarrow \eta_b(2S)\gamma) \times \sum_i B(\eta_b(2S) \rightarrow X_i) < 4.9 \times 10^{-6}$ , summed over the exclusive hadronic final states  $X_i$ , is an order of magnitude smaller than that reported by DOBBS 12.<sup>3</sup> Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.<sup>4</sup> Assuming  $\Gamma_{\eta_b(2S)} = 5$  MeV. Not independent of the corresponding mass difference measurement. **$m_{\Upsilon(2S)} - m_{\eta_b(2S)}$** 

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>24.3 \pm 3.5^{+2.8}_{-1.9}</math></b>	26k	<sup>5</sup> MIZUK	12	BELL $e^+e^- \rightarrow \gamma\pi^+\pi^- +$ hadrons

• • • We do not use the following data for averages, fits, limits, etc. • • •

$48.7 \pm 2.3 \pm 2.1$	$11 \pm 4$	<sup>6,7,8</sup> DOBBS	12	$\Upsilon(2S) \rightarrow \gamma$ hadrons
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<sup>5</sup> Assuming  $\Gamma_{\eta_b(2S)} = 4.9$  MeV. Not independent of the corresponding mass measurement.<sup>6</sup> SANDILYA 13 (Belle Collab.) search for such a state reconstructed in the same 26 exclusive hadronic final states as DOBBS 12 using a sample of  $(157.8 \pm 3.6) \times 10^6$   $\Upsilon(2S)$  decays or about 17 times larger and find no evidence for a signal. Their 90% C.L. upper limit on the branching fraction  $B(\Upsilon(2S) \rightarrow \eta_b(2S)\gamma) \times \sum_i B(\eta_b(2S) \rightarrow X_i) < 4.9 \times 10^{-6}$ , summed over the exclusive hadronic final states  $X_i$ , is an order of magnitude smaller than that reported by DOBBS 12.<sup>7</sup> Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.<sup>8</sup> Assuming  $\Gamma_{\eta_b(2S)} = 5$  MeV. Not independent of the corresponding mass measurement. **$\eta_b(2S)$  WIDTH**

VALUE (MeV)	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt;24</math></b>	90	MIZUK	12	BELL $e^+e^- \rightarrow \gamma\pi^+\pi^-$ hadrons

## $\eta_b(2S)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ hadrons	seen

## $\eta_b(2S)$ BRANCHING RATIOS

$\Gamma(\text{hadrons})/\Gamma_{\text{total}}$			$\Gamma_1/\Gamma$
VALUE	EVTS	DOCUMENT ID	TECN COMMENT
<b>seen</b>	26k	MIZUK	12 BELL $e^+e^- \rightarrow \gamma\pi^+\pi^-$ hadrons
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
seen	<sup>9,10</sup>	DOBBS	12 $\Upsilon(2S) \rightarrow \gamma$ hadrons

<sup>9</sup>SANDILYA 13 (Belle Collab.) search for such a state reconstructed in the same 26 exclusive hadronic final states as DOBBS 12 using a sample of  $(157.8 \pm 3.6) \times 10^6$   $\Upsilon(2S)$  decays or about 17 times larger and find no evidence for a signal. Their 90% C.L. upper limit on the branching fraction  $B(\Upsilon(2S) \rightarrow \eta_b(2S)\gamma) \times \sum_i B(\eta_b(2S) \rightarrow X_i) < 4.9 \times 10^{-6}$ , summed over the exclusive hadronic final states  $X_i$ , is an order of magnitude smaller than that reported by DOBBS 12.

<sup>10</sup>Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.

## $\eta_b(2S)$ REFERENCES

SANDILYA	13	PRL 111 112001	S. Sandilya <i>et al.</i>	(BELLE Collab.)
DOBBS	12	PRL 109 082001	S. Dobbs <i>et al.</i>	
MIZUK	12	PRL 109 232002	R. Mizuk <i>et al.</i>	(BELLE Collab.)