

$\Upsilon(10753)$

$$J^{PC} = 1^{--}$$

OMITTED FROM SUMMARY TABLE
A candidate for $\Upsilon(3D)$ state or an exotic structure.

Seen by MIZUK 19 in $e^+e^- \rightarrow \Upsilon(nS)\pi^+\pi^-$ ($n=1,2,3$) with a significance of 5.2σ .

$\Upsilon(10753)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$10752.7 \pm 5.9^{+0.7}_{-1.1}$	¹ MIZUK	19 BELL	$e^+e^- \rightarrow \Upsilon(nS)\pi^+\pi^-$

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

10761 ± 2	² DONG	20A	$e^+e^- \rightarrow b\bar{b}$
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¹From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, $n = 1, 2, 3$, cross sections at 28 energy points within $\sqrt{s} = 10.63\text{--}11.02$ GeV, including the initial-state radiation at $\Upsilon(10860)$.
²From 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.

$\Upsilon(10753)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$35.5^{+17.6+3.9}_{-11.3-3.3}$	¹ MIZUK	19 BELL	$e^+e^- \rightarrow \Upsilon(nS)\pi^+\pi^-$

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48.5 ± 3.0	² DONG	20A	$e^+e^- \rightarrow b\bar{b}$
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¹From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, $n = 1, 2, 3$, cross sections at 28 energy points within $\sqrt{s} = 10.63\text{--}11.02$ GeV, including the initial-state radiation at $\Upsilon(10860)$.
²From 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.

$\Upsilon(10753)$ DECAY MODES

Mode	
Γ_1	$\Upsilon(1S)\pi^+\pi^-$
Γ_2	$\Upsilon(2S)\pi^+\pi^-$
Γ_3	$\Upsilon(3S)\pi^+\pi^-$
Γ_4	$\omega\chi_{b1}(1P)$
Γ_5	$\omega\chi_{b2}(1P)$
Γ_6	e^+e^-

$\Upsilon(10753) \Gamma(i) \Gamma(e^+ e^-) / \Gamma(\text{total})$

$$\Gamma(\Upsilon(1S)\pi^+\pi^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_1 \Gamma_6 / \Gamma$$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.295 ± 0.175 1,2 MIZUK 19 BELL $e^+ e^- \rightarrow \Upsilon(nS)\pi^+\pi^-$ ¹ From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, $n = 1, 2, 3$, cross sections at 28 energy points within $\sqrt{s} = 10.63\text{--}11.02$ GeV, including the initial-state radiation at $\Upsilon(10860)$.² Reported as the range 0.12–0.47 eV obtained from multiple solutions of an amplitude fit within a model composed as a sum of Breit-Wigner functions.

$$\Gamma(\Upsilon(2S)\pi^+\pi^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_2 \Gamma_6 / \Gamma$$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.875 ± 0.345 1,2 MIZUK 19 BELL $e^+ e^- \rightarrow \Upsilon(nS)\pi^+\pi^-$ ¹ From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, $n = 1, 2, 3$, cross sections at 28 energy points within $\sqrt{s} = 10.63\text{--}11.02$ GeV, including the initial-state radiation at $\Upsilon(10860)$.² Reported as the range 0.53–1.22 eV obtained from multiple solutions of an amplitude fit within a model composed as a sum of Breit-Wigner functions.

$$\Gamma(\Upsilon(3S)\pi^+\pi^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_3 \Gamma_6 / \Gamma$$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.235 ± 0.025 1,2 MIZUK 19 BELL $e^+ e^- \rightarrow \Upsilon(nS)\pi^+\pi^-$ ¹ From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, $n = 1, 2, 3$, cross sections at 28 energy points within $\sqrt{s} = 10.63\text{--}11.02$ GeV, including the initial-state radiation at $\Upsilon(10860)$.² Reported as the range 0.21–0.26 eV obtained from multiple solutions of an amplitude fit within a model composed as a sum of Breit-Wigner functions.

$$\Gamma(\omega\chi_{b1}(1P)) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_4 \Gamma_6 / \Gamma$$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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0.63 ± 0.39 ± 0.20 68 1 ADACHI 23 BELL $e^+ e^- \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$ ¹ A fit solution with constructive interference. The other solution corresponding to destructive interference gives a value of $2.01 \pm 0.38 \pm 0.76$ eV.

$$\Gamma(\omega\chi_{b2}(1P)) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_5 \Gamma_6 / \Gamma$$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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0.53 ± 0.46 ± 0.15 68 1 ADACHI 23 BELL $e^+ e^- \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$ ¹ A fit solution with constructive interference. The other solution corresponding to destructive interference gives a value of $1.32 \pm 0.44 \pm 0.55$ eV. $\Upsilon(10753)$ REFERENCES

ADACHI	23	PRL 130 091902	I. Adachi <i>et al.</i>	(BELLE II Collab.)
DONG	20A	CP C44 083001	X.-K. Dong <i>et al.</i>	
MIZUK	19	JHEP 1910 220	R. Mizuk <i>et al.</i>	(BELLE Collab.)
SANTEL	16	PR D93 011101	D. Santel <i>et al.</i>	(BELLE Collab.)
AUBERT	09E	PRL 102 012001	B. Aubert <i>et al.</i>	(BABAR Collab.)