

$\Upsilon(10753)$

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

OMITTED FROM SUMMARY TABLEA 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**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$10752.7 \pm 5.9^{+0.7}_{-1.1}$	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**

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

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

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 $e^+e^- \rightarrow \Upsilon(nS)\pi^+\pi^-$
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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 $e^+e^- \rightarrow \Upsilon(nS)\pi^+\pi^-$
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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 $e^+e^- \rightarrow \Upsilon(nS)\pi^+\pi^-$
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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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$0.63 \pm 0.39 \pm 0.20$	68	¹ ADACHI	23	BELL $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$
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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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$0.53 \pm 0.46 \pm 0.15$	68	¹ ADACHI	23	BELL $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma\Upsilon(1S)$
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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.)