$\Upsilon(10753)$

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

OMITTED FROM SUMMARY TABLE

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

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

$\Upsilon(10753)$ MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$10752.7 \pm 5.9^{+0.7}_{-1.1}$	[1] MIZUK	19	BELL	$e^+e^- \to \Upsilon(\mathrm{nS})\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10761 ± 2	[2] DONG	20A		$e^+e^- \to b\overline{b}$

[1] From a simultaneous fit to the $\Upsilon(\mathrm{nS})\pi^+\pi^-$, $n = 1, 2, 3$, cross sections at 28 energy points within $\sqrt{s} = 10.63$–11.02 GeV, including the initial-state radiation at $\Upsilon(10860)$.

[2] From 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	$e^+e^- \to \Upsilon(\mathrm{nS})\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
48.5 $\pm$ 3.0	[2] DONG	20A		$e^+e^- \to b\overline{b}$

[1] From a simultaneous fit to the $\Upsilon(\mathrm{nS})\pi^+\pi^-$, $n = 1, 2, 3$, cross sections at 28 energy points within $\sqrt{s} = 10.63$–11.02 GeV, including the initial-state radiation at $\Upsilon(10860)$.

[2] From 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^-

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

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

VALUE (eV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.295 ± 0.175	[1,2] MIZUK	19	BELL	$e^+e^- \to \Upsilon(\text{nS})\pi^+\pi^-$

[1] From a simultaneous fit to the $\Upsilon(\text{nS})\pi^+\pi^-$, $n = 1$, 2, 3, cross sections at 28 energy points within $\sqrt{s} = 10.63$–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.

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

VALUE (eV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.875 ± 0.345	[1,2] MIZUK	19	BELL	$e^+e^- \to \Upsilon(\text{nS})\pi^+\pi^-$

[1] From a simultaneous fit to the $\Upsilon(\text{nS})\pi^+\pi^-$, $n = 1$, 2, 3, cross sections at 28 energy points within $\sqrt{s} = 10.63$–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.

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

VALUE (eV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.235 ± 0.025	[1,2] MIZUK	19	BELL	$e^+e^- \to \Upsilon(\text{nS})\pi^+\pi^-$

[1] From a simultaneous fit to the $\Upsilon(\text{nS})\pi^+\pi^-$, $n = 1$, 2, 3, cross sections at 28 energy points within $\sqrt{s} = 10.63$–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.

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

VALUE (eV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
$0.63 \pm 0.39 \pm 0.20$	68	[1] ADACHI	23	BELL	$e^+e^- \to \pi^+\pi^-\pi^0\gamma\,\Upsilon(1S)$

[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.

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

VALUE (eV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
$0.53 \pm 0.46 \pm 0.15$	68	[1] ADACHI	23	BELL	$e^+e^- \to \pi^+\pi^-\pi^0\gamma\,\Upsilon(1S)$

[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 *et al.*	(BELLE II Collab.)
DONG	20A	CP C44 083001	X.-K. Dong *et al.*	
MIZUK	19	JHEP 1910 220	R. Mizuk *et al.*	(BELLE Collab.)
SANTEL	16	PR D93 011101	D. Santel *et al.*	(BELLE Collab.)
AUBERT	09E	PRL 102 012001	B. Aubert *et al.*	(BABAR Collab.)