NODE=M048

$\Upsilon(3S)$

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

$\Upsilon(3S)$ MASS

NODE=M048M

NODE=M048M

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
10355.1±0.5	[1] SHAMOV	23	RVUE	$e^+ e^- \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10355.2±0.5	[2,3] ARTAMONOV	00	MD1	$e^+ e^- \to$ hadrons
10355.3±0.5	[4,5] BARU	86B	MD1	$e^+ e^- \to$ hadrons

[1] Reanalysis of MD1 data using the electron mass from COHEN 87, the radiative corrections from KURAEV 85 and interference effects. NODE=M048M;LINKAGE=A

[2] Reanalysis of BARU 86B using new electron mass (COHEN 87). NODE=M048M;LINKAGE=AR

[3] Superseded by SHAMOV 23. NODE=M048M;LINKAGE=B

[4] Reanalysis of ARTAMONOV 84. NODE=M048M;LINKAGE=C

[5] Superseded by ARTAMONOV 00. NODE=M048M;LINKAGE=RZ

$m_{\Upsilon(3S)} - m_{\Upsilon(2S)}$

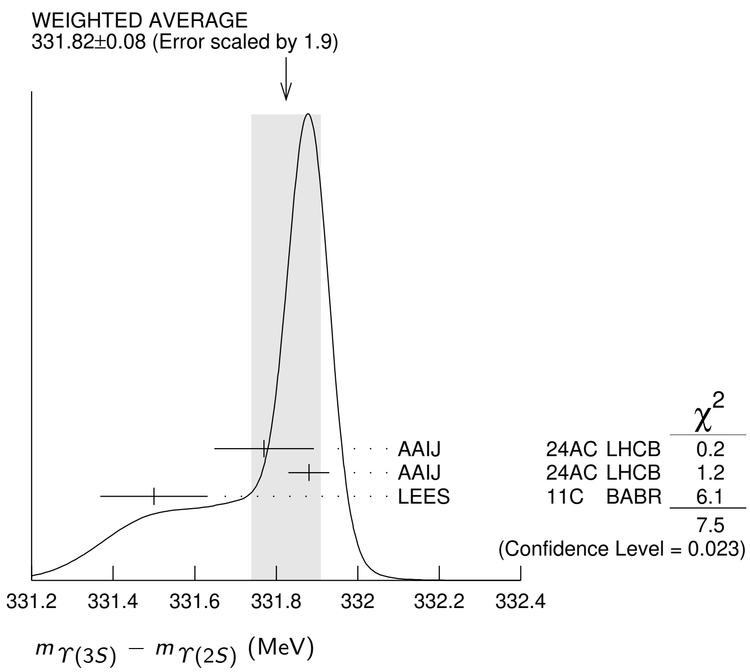
NODE=M048DM2

NODE=M048DM2

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
331.82±0.08 OUR AVERAGE		Error includes scale factor of 1.9. See the ideogram below.			
331.77±0.07±0.10	1.8M	[6] AAIJ	24AC	LHCB	$\Upsilon \to \mu^+ \mu^-$
331.88±0.03±0.04	1.5k	[6] AAIJ	24AC	LHCB	$\Upsilon(3S) \to \Upsilon(2S)\pi^+\pi^-$
331.50±0.02±0.13		LEES	11C	BABR	$e^+ e^- \to \pi^+ \pi^- X$

OCCUR=2

[6] Observed in prompt $p p$ production. NODE=M048DM2;LINKAGE=A



$\Upsilon(3S)$ WIDTH

NODE=M048W

NODE=M048W

VALUE (keV)	*DOCUMENT ID*
20.32±1.85 OUR EVALUATION	See the Note on "Width Determinations of the Υ States"

→ UNCHECKED ←

$\Upsilon(3S)$ DECAY MODES

NODE=M048215;NODE=M048

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
Γ_1	$\Upsilon(2S)$ anything	(10.6 ± 0.8) %		DESIG=8
Γ_2	$\Upsilon(2S)\pi^+\pi^-$	(2.82 ± 0.18) %	S=1.6	DESIG=4
Γ_3	$\Upsilon(2S)\pi^0\pi^0$	(1.85 ± 0.14) %		DESIG=10
Γ_4	$\Upsilon(2S)\gamma\gamma$	(5.0 ± 0.7) %		DESIG=12
Γ_5	$\Upsilon(2S)\pi^0$	$< 5.1 \times 10^{-4}$	CL=90%	DESIG=107
Γ_6	$\Upsilon(1S)\pi^+\pi^-$	(4.37 ± 0.08) %		DESIG=3
Γ_7	$\Upsilon(1S)\pi^0\pi^0$	(2.20 ± 0.13) %		DESIG=11
Γ_8	$\Upsilon(1S)\eta$	$< 1 \times 10^{-4}$	CL=90%	DESIG=9
Γ_9	$\Upsilon(1S)\pi^0$	$< 7 \times 10^{-5}$	CL=90%	DESIG=106
Γ_{10}	$h_b(1P)\pi^0$	$< 1.2 \times 10^{-3}$	CL=90%	DESIG=112
Γ_{11}	$h_b(1P)\pi^0 \rightarrow \gamma\eta_b(1S)\pi^0$	$(4.3 \pm 1.4) \times 10^{-4}$		DESIG=113
Γ_{12}	$h_b(1P)\pi^+\pi^-$	$< 1.2 \times 10^{-4}$	CL=90%	DESIG=114
Γ_{13}	$\tau^+\tau^-$	(2.29 ± 0.30) %		DESIG=16
Γ_{14}	$\mu^+\mu^-$	(2.18 ± 0.21) %	S=2.1	DESIG=1
Γ_{15}	e^+e^-	(2.18 ± 0.20) %		DESIG=2
Γ_{16}	hadrons	(93 ± 12) %		DESIG=101
Γ_{17}	ggg	(35.7 ± 2.6) %		DESIG=109
Γ_{18}	γgg	$(9.7 \pm 1.8) \times 10^{-3}$		DESIG=110
Γ_{19}	^2H anything	$(2.33 \pm 0.33) \times 10^{-5}$		DESIG=117
	Radiative decays			NODE=M048;CLUMP=B
Γ_{20}	$\gamma\chi_{b2}(2P)$	(13.1 ± 1.6) %	S=3.4	DESIG=5
Γ_{21}	$\gamma\chi_{b1}(2P)$	(12.6 ± 1.2) %	S=2.4	DESIG=6
Γ_{22}	$\gamma\chi_{b0}(2P)$	(5.9 ± 0.6) %	S=1.4	DESIG=7
Γ_{23}	$\gamma\chi_{b2}(1P)$	$(10.0 \pm 1.0) \times 10^{-3}$	S=1.7	DESIG=103
Γ_{24}	$\gamma\chi_{b1}(1P)$	$(9 \pm 5) \times 10^{-4}$	S=1.8	DESIG=104
Γ_{25}	$\gamma\chi_{b0}(1P)$	$(2.7 \pm 0.4) \times 10^{-3}$		DESIG=13
Γ_{26}	$\gamma\eta_b(2S)$	$< 6.2 \times 10^{-4}$	CL=90%	DESIG=14
Γ_{27}	$\gamma\eta_b(1S)$	$(5.1 \pm 0.7) \times 10^{-4}$		DESIG=15
Γ_{28}	$\gamma A^0 \rightarrow \gamma$ hadrons	$< 8 \times 10^{-5}$	CL=90%	DESIG=115
Γ_{29}	$\gamma X \rightarrow \gamma + \geq 4$ prongs	[a] $< 2.2 \times 10^{-4}$	CL=95%	DESIG=102
Γ_{30}	$\gamma A^0 \rightarrow \gamma\mu^+\mu^-$	$< 5.5 \times 10^{-6}$	CL=90%	DESIG=116
Γ_{31}	$\gamma A^0 \rightarrow \gamma\tau^+\tau^-$	[b] $< 1.6 \times 10^{-4}$	CL=90%	DESIG=108
	Lepton Family number (*LF*) violating modes			NODE=M048;CLUMP=C
Γ_{32}	$e^\pm\tau^\mp$ *LF*	$< 4.2 \times 10^{-6}$	CL=90%	DESIG=111
Γ_{33}	$e^\pm\mu^\mp$ *LF*	$< 3.6 \times 10^{-7}$	CL=90%	DESIG=119
Γ_{34}	$\mu^\pm\tau^\mp$ *LF*	$< 3.1 \times 10^{-6}$	CL=90%	DESIG=105

[a] 1.5 GeV $< m_X <$ 5.0 GeV LINKAGE=C48

[b] For $m_{\tau^+\tau^-}$ in the ranges 4.03–9.52 and 9.61–10.10 GeV. LINKAGE=MRG

$\Upsilon(3S)$ $\Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

NODE=M048218

$\Gamma(\text{hadrons}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{16}\Gamma_{15}/\Gamma$

NODE=M048G2
NODE=M048G2

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.414±0.007 OUR AVERAGE				
0.413±0.004±0.006	ROSNER	06	CLEO	10.4 $e^+e^- \rightarrow$ hadrons
0.45 ±0.03 ±0.03	[7] GILES	84B	CLEO	$e^+e^- \rightarrow$ hadrons

[7] Radiative corrections reevaluated by BUCHMUELLER 88 following KURAEV 85. NODE=M048G2;LINKAGE=R

$\Gamma(\Upsilon(1S)\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_6\Gamma_{15}/\Gamma$

NODE=M048G01
NODE=M048G01

VALUE (eV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
18.46±0.27±0.77	6.4k	[8] AUBERT	08BP	BABR	$e^+e^- \rightarrow \gamma\pi^+\pi^-\ell^+\ell^-$

[8] Using B($\Upsilon(1S) \rightarrow e^+e^-$) = (2.38 ± 0.11)% and B($\Upsilon(1S) \rightarrow \mu^+\mu^-$) = (2.48 ± 0.05)%. NODE=M048G01;LINKAGE=AU

$\Upsilon(3S)$ PARTIAL WIDTHS

NODE=M048220

$\Gamma(e^+e^-)$ Γ_{15}

NODE=M048W2
NODE=M048W2

VALUE (keV)	DOCUMENT ID
0.443±0.008 OUR EVALUATION	

→ UNCHECKED ←

$\Upsilon(3S)$ BRANCHING RATIOS

NODE=M048225

$\Gamma(\Upsilon(2S)\text{anything})/\Gamma_{total}$ Γ_1/Γ

NODE=M048R8
NODE=M048R8

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.106 ±0.008 OUR AVERAGE					
0.1023±0.0105	4625	[9,10,11] BUTLER	94B	CLE2	$e^+e^- \to \ell^+\ell^- X$
0.111 ±0.012	4891	[10,11,12] BROCK	91	CLEO	$e^+e^- \to \pi^+\pi^- X$, $\pi^+\pi^-\ell^+\ell^-$

[9] Using B($\Upsilon(2S) \to \Upsilon(1S)\gamma\gamma$) = (0.038 ± 0.007)%, and B($\Upsilon(2S) \to \Upsilon(1S)\pi^0\pi^0$) = (1/2)B($\Upsilon(2S) \to \Upsilon(1S)\pi^+\pi^-$). NODE=M048R;LINKAGE=A

[10] Using B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.48 ± 0.06)%. With the assumption of $e\mu$ universality. NODE=M048R;LINKAGE=B

[11] Using B($\Upsilon(2S) \to \Upsilon(1S)\pi^+\pi^-$) = (18.5 ± 0.8)%. NODE=M048R;LINKAGE=D

[12] Using B($\Upsilon(2S) \to \mu^+\mu^-$) = (1.31 ± 0.21)%, B($\Upsilon(2S) \to \Upsilon(1S)\gamma\gamma$)×2B($\Upsilon(1S) \to \mu^+\mu^-$) = (0.188 ± 0.035)%, and B($\Upsilon(2S) \to \Upsilon(1S)\pi^0\pi^0$)×2B($\Upsilon(1S) \to \mu^+\mu^-$) = (0.436 ± 0.056)%. With the assumption of $e\mu$ universality. NODE=M048R;LINKAGE=C

$\Gamma(\Upsilon(2S)\pi^+\pi^-)/\Gamma_{total}$ Γ_2/Γ

NODE=M048R4
NODE=M048R4

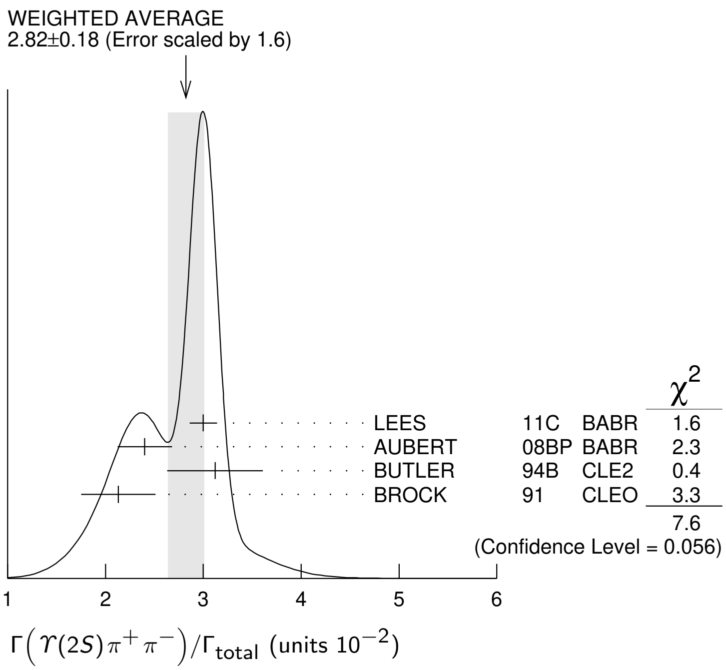
VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.82±0.18 OUR AVERAGE		Error includes scale factor of 1.6. See the ideogram below.			
3.00±0.02±0.14	543k	LEES	11C	BABR	$e^+e^- \to \pi^+\pi^- X$
2.40±0.10±0.26	800	[13] AUBERT	08BP	BABR	$e^+e^- \to \gamma\pi^+\pi^- e^+e^-$
3.12±0.49	980	[14,15] BUTLER	94B	CLE2	$e^+e^- \to \pi^+\pi^-\ell^+\ell^-$
2.13±0.38	974	[16] BROCK	91	CLEO	$e^+e^- \to \pi^+\pi^- X$, $\pi^+\pi^-\ell^+\ell^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.82±0.65±0.53	138	[16] WU	93	CUSB	$\Upsilon(3S) \to \pi^+\pi^-\ell^+\ell^-$
3.1 ±2.0	5	MAGERAS	82	CUSB	$\Upsilon(3S) \to \pi^+\pi^-\ell^+\ell^-$

[13] Using B($\Upsilon(1S) \to e^+e^-$) = (2.38 ± 0.11)%, B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.48 ± 0.05)%, and $\Gamma_{ee}(\Upsilon(3S))$ = 0.443 ± 0.008 keV. NODE=M048R4;LINKAGE=AU

[14] From the exclusive mode. NODE=M048R;LINKAGE=M

[15] Using B($\Upsilon(2S) \to \Upsilon(1S)\gamma\gamma$) = (0.038 ± 0.007)%, and B($\Upsilon(2S) \to \Upsilon(1S)\pi^0\pi^0$) = (1/2)B($\Upsilon(2S) \to \Upsilon(1S)\pi^+\pi^-$). NODE=M048R4;LINKAGE=A

[16] Using B($\Upsilon(2S) \to \mu^+\mu^-$) = (1.31 ± 0.21)%, B($\Upsilon(2S) \to \Upsilon(1S)\gamma\gamma$)×2B($\Upsilon(1S) \to \mu^+\mu^-$) = (0.188 ± 0.035)%, and B($\Upsilon(2S) \to \Upsilon(1S)\pi^0\pi^0$)×2B($\Upsilon(1S) \to \mu^+\mu^-$) = (0.436 ± 0.056)%. With the assumption of $e\mu$ universality. NODE=M048R4;LINKAGE=C



$\Gamma(\Upsilon(2S)\pi^0\pi^0)/\Gamma_{total}$ Γ_3/Γ

NODE=M048R10

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.85±0.14 OUR AVERAGE					
1.82±0.09±0.12	4391	[17] BHARI	09	CLEO	$e^+e^- \to \pi^0\pi^0\ell^+\ell^-$
2.16±0.39		[18,19] BUTLER	94B	CLE2	$e^+e^- \to \pi^0\pi^0\ell^+\ell^-$
1.7 ±0.5 ±0.2	10	[20] HEINTZ	92	CSB2	$e^+e^- \to \pi^0\pi^0\ell^+\ell^-$

[17] Authors assume B($\Upsilon(1S) \to e^+e^-$) + B($\Upsilon(1S) \to \mu^+\mu^-$) = 4.06%. NODE=M048R10;LINKAGE=BH

[18] B($\Upsilon(2S) \to \mu^+\mu^-$) = (1.31 ± 0.21)% and assuming $e\mu$ universality. NODE=M048R;LINKAGE=K

[19] From the exclusive mode. NODE=M048R10;LINKAGE=M

[20] B($\Upsilon(2S) \to \mu^+\mu^-$) = (1.44 ± 0.10)% and assuming $e\mu$ universality. Supersedes HEINTZ 91. NODE=M048R;LINKAGE=G

$\Gamma(\Upsilon(2S)\gamma\gamma)/\Gamma_{total}$ Γ_4/Γ

NODE=M048R12

VALUE	DOCUMENT ID		TECN	COMMENT
0.0502±0.0069	[21] BUTLER	94B	CLE2	$e^+e^- \to \ell^+\ell^- 2\gamma$

[21] From the exclusive mode. NODE=M048R12;LINKAGE=M

$\Gamma(\Upsilon(2S)\pi^0)/\Gamma_{total}$ Γ_5/Γ

NODE=M048R25

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<0.51	90	[22] HE	08A	CLEO	$e^+e^- \to \ell^+\ell^-\gamma\gamma$

[22] Authors assume B($\Upsilon(2S) \to e^+e^-$) + B($\Upsilon(1S) \to \mu^+\mu^-$) = 4.06%. NODE=M048R25;LINKAGE=HE

$\Gamma(\Upsilon(1S)\pi^+\pi^-)/\Gamma_{total}$ Γ_6/Γ

NODE=M048R3

Abbreviation MM in the *COMMENT* field below stands for missing mass.

NODE=M048R3

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
4.37±0.08 OUR AVERAGE					
4.32±0.07±0.13	90k	[23] LEES	11L	BABR	$\Upsilon(3S) \to \pi^+\pi^-\ell^+\ell^-$
4.46±0.01±0.13	190k	[24] BHARI	09	CLEO	$e^+e^- \to \pi^+\pi^-$ MM
4.17±0.06±0.19	6.4k	[25] AUBERT	08BP	BABR	10.58 $e^+e^- \to \gamma\pi^+\pi^-\ell^+\ell^-$
4.52±0.35	11830	[26] BUTLER	94B	CLE2	$e^+e^- \to \pi^+\pi^- X$, $\pi^+\pi^-\ell^+\ell^-$
4.46±0.34±0.50	451	[26] WU	93	CUSB	$\Upsilon(3S) \to \pi^+\pi^-\ell^+\ell^-$
4.46±0.30	11221	[26] BROCK	91	CLEO	$e^+e^- \to \pi^+\pi^- X$, $\pi^+\pi^-\ell^+\ell^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.9 ±1.0	22	GREEN	82	CLEO	$\Upsilon(3S) \to \pi^+\pi^-\ell^+\ell^-$
3.9 ±1.3	26	MAGERAS	82	CUSB	$\Upsilon(3S) \to \pi^+\pi^-\ell^+\ell^-$

[23] Using B($\Upsilon(1S) \to e^+e^-$) = (2.38 ± 0.11)% and B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.48 ± 0.05)%. NODE=M048R3;LINKAGE=LE

[24] A weighted average of the inclusive and exclusive results. NODE=M048R3;LINKAGE=BH

[25] Using B($\Upsilon(2S) \to e^+e^-$) = (1.91 ± 0.16)%, B($\Upsilon(2S) \to \mu^+\mu^-$) = (1.93 ± 0.17)%, and $\Gamma_{ee}(\Upsilon(3S))$ = 0.443 ± 0.008 keV. NODE=M048R3;LINKAGE=AU

[26] Using B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.48 ± 0.06)%. With the assumption of $e\mu$ universality. NODE=M048R3;LINKAGE=B

$\Gamma(\Upsilon(2S)\pi^+\pi^-)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$ Γ_2/Γ_6

NODE=M048R28

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.577±0.026±0.060	800	[27] AUBERT	08BP	BABR	$e^+e^- \to \gamma\pi^+\pi^-\ell^+\ell^-$

[27] Using B($\Upsilon(1S) \to e^+e^-$) = (2.38 ± 0.11)%, B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.48 ± 0.05)%, B($\Upsilon(2S) \to e^+e^-$) = (1.91 ± 0.16)%, and B($\Upsilon(2S) \to \mu^+\mu^-$) = (1.93 ± 0.17)%. Not independent of other values reported by AUBERT 08BP. NODE=M048R28;LINKAGE=AU

$\Gamma(\Upsilon(1S)\pi^0\pi^0)/\Gamma_{total}$ Γ_7/Γ

NODE=M048R11

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.20±0.13 OUR AVERAGE					
2.24±0.09±0.11	6584	[28] BHARI	09	CLEO	$e^+e^- \to \pi^0\pi^0\ell^+\ell^-$
1.99±0.34	56	[29] BUTLER	94B	CLE2	$e^+e^- \to \pi^0\pi^0\ell^+\ell^-$
2.2 ±0.4 ±0.3	33	[30] HEINTZ	92	CSB2	$e^+e^- \to \pi^0\pi^0\ell^+\ell^-$

[28] Authors assume B($\Upsilon(1S) \to e^+e^-$) + B($\Upsilon(1S) \to \mu^+\mu^-$) = 4.96%. NODE=M048R11;LINKAGE=BH

[29] Using B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.48 ± 0.06)% and assuming $e\mu$ universality. NODE=M048R11;LINKAGE=B

[30] Using B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.57 ± 0.07)% and assuming $e\mu$ universality. Supersedes HEINTZ 91. NODE=M048R;LINKAGE=I

$\Gamma(\Upsilon(1S)\pi^0\pi^0)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$ — Γ_7/Γ_6

NODE=M048R26

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.501 ± 0.043	[31] BHARI	09	CLEO	$e^+e^- \to \Upsilon(3S)$

[31] Not independent of other values reported by BHARI 09.

NODE=M048R26;LINKAGE=BH

$\Gamma(\Upsilon(1S)\eta)/\Gamma_{total}$ — Γ_8/Γ

NODE=M048R9

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<0.1	90	[32] LEES	11L	BABR	$\Upsilon(3S) \to (\pi^+\pi^-)(\gamma\gamma)\ell^+\ell^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.8	90	[32,33] AUBERT	08BP	BABR	$e^+e^- \to \gamma\pi^+\pi^-\pi^0\ell^+\ell^-$
<0.18	90	[34] HE	08A	CLEO	$e^+e^- \to \ell^+\ell^-\eta$
<2.2	90	BROCK	91	CLEO	$e^+e^- \to \ell^+\ell^-\eta$

[32] Using B($\Upsilon(1S) \to e^+e^-$) = (2.38 ± 0.11)%, B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.48 ± 0.05)%.

NODE=M048R9;LINKAGE=LE

[33] Using $\Gamma_{ee}(\Upsilon(3S)) = 0.443 \pm 0.008$ keV.

NODE=M048R9;LINKAGE=AU

[34] Authors assume B($\Upsilon(1S) \to e^+e^-$) + B($\Upsilon(1S) \to \mu^+\mu^-$) = 4.96%.

NODE=M048R9;LINKAGE=HE

$\Gamma(\Upsilon(1S)\eta)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$ — Γ_8/Γ_6

NODE=M048R27

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
<0.23	90	[35] LEES	11L	BABR	$\Upsilon(3S) \to (\pi^+\pi^-)(\gamma\gamma)\ell^+\ell^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.9	90	[36] AUBERT	08BP	BABR	$e^+e^- \to \gamma\pi^+\pi^-(\pi^0)\ell^+\ell^-$

[35] Not independent of other values reported by LEES 11L.

NODE=M048R27;LINKAGE=LE

[36] Not independent of other values reported by AUBERT 08BP.

NODE=M048R27;LINKAGE=AU

$\Gamma(\Upsilon(1S)\pi^0)/\Gamma_{total}$ — Γ_9/Γ

NODE=M048R24

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<0.07	90	[37] HE	08A	CLEO	$e^+e^- \to \ell^+\ell^-\gamma\gamma$

[37] Authors assume B($\Upsilon(1S) \to e^+e^-$) + B($\Upsilon(1S) \to \mu^+\mu^-$) = 4.96%.

NODE=M048R24;LINKAGE=HE

$\Gamma(h_b(1P)\pi^0)/\Gamma_{total}$ — Γ_{10}/Γ

NODE=M048R03

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.2\times10^{-3}$	90	[38] GE	11	CLEO	$\Upsilon(3S) \to \pi^0$ anything

[38] Assuming $M(h_b(1P))$ = 9900 MeV and $\Gamma(h_b(1P))$ = 0 MeV, and allowing B($h_b(1P) \to \gamma\eta_b(1S)$) to vary from 0–100%.

NODE=M048R03;LINKAGE=GE

$\Gamma(h_b(1P)\pi^0 \to \gamma\eta_b(1S)\pi^0)/\Gamma_{total}$ — Γ_{11}/Γ

NODE=M048R33

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$4.3\pm1.1\pm0.9$	LEES	11K	BABR	$\Upsilon(3S) \to \eta_b\gamma\pi^0$

$\Gamma(h_b(1P)\pi^+\pi^-)/\Gamma_{total}$ — Γ_{12}/Γ

NODE=M048R34

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
< 1.2	90	[39] LEES	11C	BABR	$e^+e^- \to \pi^+\pi^-X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<18		[39] BUTLER	94B	CLE2	$e^+e^- \to \pi^+\pi^-X$
<15		[39] BROCK	91	CLEO	$e^+e^- \to \pi^+\pi^-X$

[39] For $M(h_b(1P))$ = 9900 MeV.

NODE=M048R34;LINKAGE=MH

$\Gamma(\tau^+\tau^-)/\Gamma_{total}$ — Γ_{13}/Γ

NODE=M048R18

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$2.29\pm0.21\pm0.22$	15k	[40] BESSON	07	CLEO	$e^+e^- \to \Upsilon(3S) \to \tau^+\tau^-$

[40] BESSON 07 reports [$\Gamma(\Upsilon(3S) \to \tau^+\tau^-)/\Gamma_{total}$] / [B($\Upsilon(3S) \to \mu^+\mu^-$)] = $1.05 \pm 0.08 \pm 0.05$ which we multiply by our best value B($\Upsilon(3S) \to \mu^+\mu^-$) = $(2.18\pm0.21)\times10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M048R18;LINKAGE=BE

$\Gamma(\tau^+\tau^-)/\Gamma(\mu^+\mu^-)$ — Γ_{13}/Γ_{14}

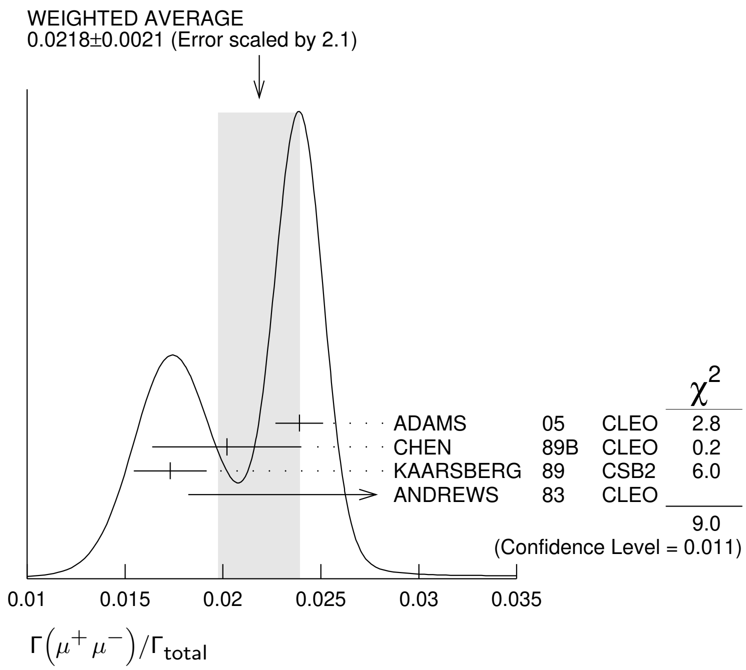
NODE=M048R19

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.968 ± 0.016 OUR AVERAGE					
$0.966\pm0.008\pm0.014$	2.2M	LEES	20E	BABR	$e^+e^- \to \Upsilon(3S)$
$1.05\pm0.08\pm0.05$	15k	BESSON	07	CLEO	$e^+e^- \to \Upsilon(3S)$

$\Gamma(\mu^+\mu^-)/\Gamma_{total}$ Γ_{14}/Γ

NODE=M048R1
NODE=M048R1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0218±0.0021 OUR AVERAGE Error includes scale factor of 2.1. See the ideogram below.					
0.0239±0.0007±0.0010	81k	ADAMS	05	CLEO	$e^+e^- \to \mu^+\mu^-$
0.0202±0.0019±0.0033		CHEN	89B	CLEO	$e^+e^- \to \mu^+\mu^-$
0.0173±0.0015±0.0011		KAARSBERG	89	CSB2	$e^+e^- \to \mu^+\mu^-$
0.033 ±0.013 ±0.007	1096	ANDREWS	83	CLEO	$e^+e^- \to \mu^+\mu^-$



$\Gamma(ggg)/\Gamma_{total}$ Γ_{17}/Γ

NODE=M048R30
NODE=M048R30

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
35.7±2.6	3M	[41] BESSON	06A	CLEO	$\Upsilon(3S) \to$ hadrons

[41] Calculated using BESSON 06A value of $\Gamma(\gamma gg)/\Gamma(ggg) = (2.72 \pm 0.06 \pm 0.32 \pm 0.37)\%$ and the PDG 08 values of B($\Upsilon(2S)$ + anything) = (10.6 ± 0.8)%, B($\pi^+\pi^-\Upsilon(1S)$) = (4.40 ± 0.10)%, B($\pi^0\pi^0\Upsilon(1S)$) = (2.20 ± 0.13)%, B($\gamma\chi_{b2}(2P)$) = (13.1 ± 1.6)%, B($\gamma\chi_{b1}(2P)$) = (12.6 ± 1.2)%, B($\gamma\chi_{b0}(2P)$) = (5.9 ± 0.6)%, B($\gamma\chi_{b0}(1P)$) = (0.30 ± 0.11)% ,B($\mu^+\mu^-$) = (2.18 ± 0.21)%, and $R_{hadrons}$ = 3.51. The statistical error is negligible and the systematic error is partially correlated with $\Gamma(\gamma gg)/\Gamma_{total}$ BESSON 06A value.

NODE=M048R30;LINKAGE=BE

$\Gamma(\gamma gg)/\Gamma_{total}$ Γ_{18}/Γ

NODE=M048R31
NODE=M048R31

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.97±0.18	60k	[42] BESSON	06A	CLEO	$\Upsilon(3S) \to \gamma$ + hadrons

[42] Calculated using BESSON 06A values of $\Gamma(\gamma gg)/\Gamma(ggg) = (2.72 \pm 0.06 \pm 0.32 \pm 0.37)\%$ and $\Gamma(ggg)/\Gamma_{total}$. The statistical error is negligible and the systematic error is partially correlated with $\Gamma(ggg)/\Gamma_{total}$ BESSON 06A value.

NODE=M048R31;LINKAGE=BE

$\Gamma(\gamma gg)/\Gamma(ggg)$ Γ_{18}/Γ_{17}

NODE=M048R32
NODE=M048R32

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.72±0.06±0.49	3M	BESSON	06A	CLEO	$\Upsilon(3S) \to (\gamma +)$ hadrons

$\Gamma(\overline{^2H}$ anything$)/\Gamma_{total}$ Γ_{19}/Γ

NODE=M048R00
NODE=M048R00

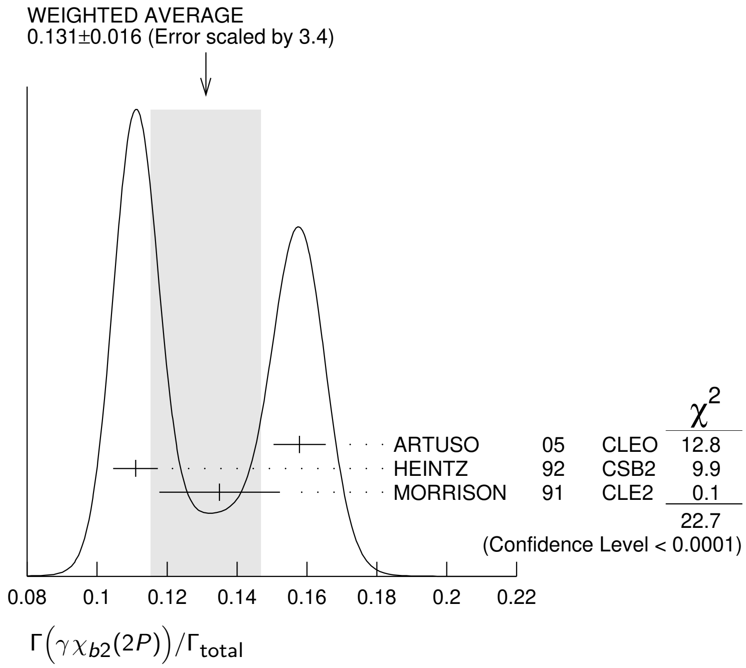
VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
$2.33 \pm 0.15^{+0.31}_{-0.28}$	LEES	14G	BABR	$e^+e^- \to \overline{^2H}\ X$

$\Gamma(\gamma\chi_{b2}(2P))/\Gamma_{total}$ Γ_{20}/Γ

NODE=M048R5
NODE=M048R5

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.131 ±0.016 OUR AVERAGE Error includes scale factor of 3.4. See the ideogram below.					
0.1579±0.0017±0.0073	568k	ARTUSO	05	CLEO	$e^+e^- \to \gamma X$
0.111 ±0.005 ±0.004	10319	[43] HEINTZ	92	CSB2	$e^+e^- \to \gamma X$
0.135 ±0.003 ±0.017	30741	MORRISON	91	CLE2	$e^+e^- \to \gamma X$

[43] Supersedes NARAIN 91. NODE=M048R;LINKAGE=H

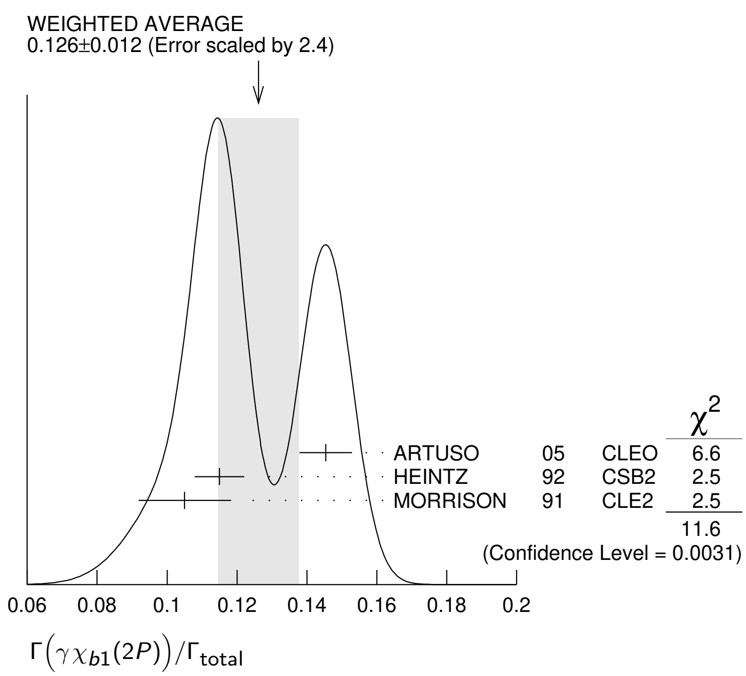


$\Gamma(\gamma\chi_{b1}(2P))/\Gamma_{total}$ Γ_{21}/Γ

NODE=M048R6
NODE=M048R6

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
0.126 ±0.012 OUR AVERAGE Error includes scale factor of 2.4. See the ideogram below.				
0.1454±0.0018±0.0073	537k	ARTUSO 05	CLEO	$e^+e^- \to \gamma X$
0.115 ±0.005 ±0.005	11147	[44] HEINTZ 92	CSB2	$e^+e^- \to \gamma X$
0.105 $^{+0.003}_{-0.002}$ ±0.013	25759	MORRISON 91	CLE2	$e^+e^- \to \gamma X$

[44] Supersedes NARAIN 91. NODE=M048R6;LINKAGE=H

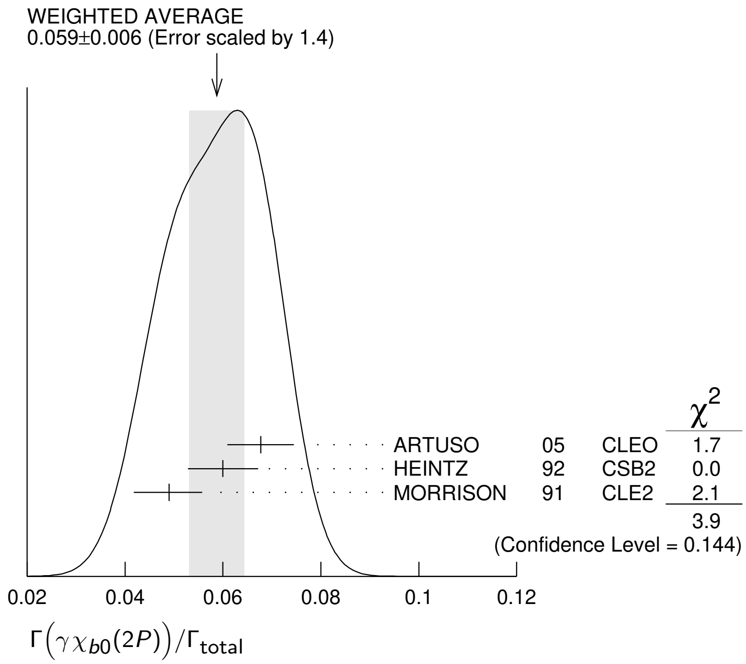


$\Gamma(\gamma\chi_{b0}(2P))/\Gamma_{total}$ Γ_{22}/Γ

NODE=M048R7
NODE=M048R7

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
0.059 ±0.006 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.				
0.0677±0.0020±0.0065	225k	ARTUSO 05	CLEO	$e^+e^- \to \gamma X$
0.060 ±0.004 ±0.006	4959	[45] HEINTZ 92	CSB2	$e^+e^- \to \gamma X$
0.049 $^{+0.003}_{-0.004}$ ±0.006	9903	MORRISON 91	CLE2	$e^+e^- \to \gamma X$

[45] Supersedes NARAIN 91. NODE=M048R7;LINKAGE=H



$\Gamma(\gamma\chi_{b2}(1P))/\Gamma_{total}$ Γ_{23}/Γ

NODE=M048R21
NODE=M048R21

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
10.0±1.0 OUR AVERAGE			Error includes scale factor of 1.7.		
$8.0\pm1.3\pm0.4$		126	[46,47] KORNICER 11	CLEO	$e^+e^- \to \gamma\gamma\ell^+\ell^-$
$10.5\pm0.3^{+0.7}_{-0.6}$		9.7k	LEES 11J	BABR	$\Upsilon(3S) \to X\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<19	90		[48] ASNER 08A	CLEO	$\Upsilon(3S) \to \gamma +$ hadrons
seen			[49] HEINTZ 92	CSB2	$e^+e^- \to \gamma\gamma\ell^+\ell^-$

[46] Assuming B($\Upsilon(1S) \to \ell^+\ell^-$) = (2.48 ± 0.05)%. NODE=M048R21;LINKAGE=KA

[47] KORNICER 11 reports $[\Gamma(\Upsilon(3S) \to \gamma\chi_{b2}(1P))/\Gamma_{total}] \times [B(\chi_{b2}(1P) \to \gamma\Upsilon(1S))] = (1.435 \pm 0.162 \pm 0.169) \times 10^{-3}$ which we divide by our best value $B(\chi_{b2}(1P) \to \gamma\Upsilon(1S)) = (18.0 \pm 1.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=M048R21;LINKAGE=KR

[48] ASNER 08A reports $[\Gamma(\Upsilon(3S) \to \gamma\chi_{b2}(1P))/\Gamma_{total}]$ / $[B(\Upsilon(2S) \to \gamma\chi_{b2}(1P))] < 27.1 \times 10^{-2}$ which we multiply by our best value $B(\Upsilon(2S) \to \gamma\chi_{b2}(1P)) = 7.15 \times 10^{-2}$. NODE=M048R21;LINKAGE=AS

[49] HEINTZ 92, while unable to distinguish between different J states, measures $\sum_J B(\Upsilon(3S) \to \gamma\chi_{bJ}) \times B(\chi_{bJ} \to \gamma\Upsilon(1S)) = (1.7 \pm 0.4 \pm 0.6) \times 10^{-3}$ for J = 0,1,2 using inclusive $\Upsilon(1S)$ decays and $(1.2^{+0.4}_{-0.3} \pm 0.09) \times 10^{-3}$ for J = 1,2 using $\Upsilon(1S) \to \ell^+\ell^-$. NODE=M048R21;LINKAGE=HE

$\Gamma(\gamma\chi_{b1}(1P))/\Gamma_{total}$ Γ_{24}/Γ

NODE=M048R22
NODE=M048R22

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.9±0.5 OUR AVERAGE			Error includes scale factor of 1.8.		
$1.5\pm0.4\pm0.1$		50	[50,51] KORNICER 11	CLEO	$e^+e^- \to \gamma\gamma\ell^+\ell^-$
$0.5\pm0.3^{+0.2}_{-0.1}$			LEES 11J	BABR	$\Upsilon(3S) \to X\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.7	90		[52] ASNER 08A	CLEO	$\Upsilon(3S) \to \gamma +$ hadrons
seen			[53] HEINTZ 92	CSB2	$e^+e^- \to \gamma\gamma\ell^+\ell^-$

[50] Assuming B($\Upsilon(1S) \to \ell^+\ell^-$) = (2.48 ± 0.05)%. NODE=M048R22;LINKAGE=KA

[51] KORNICER 11 reports $[\Gamma(\Upsilon(3S) \to \gamma\chi_{b1}(1P))/\Gamma_{total}] \times [B(\chi_{b1}(1P) \to \gamma\Upsilon(1S))] = (5.38 \pm 1.20 \pm 0.95) \times 10^{-4}$ which we divide by our best value $B(\chi_{b1}(1P) \to \gamma\Upsilon(1S)) = (35.2 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=M048R22;LINKAGE=KR

[52] ASNER 08A reports $[\Gamma(\Upsilon(3S) \to \gamma\chi_{b1}(1P))/\Gamma_{total}]$ / $[B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] < 2.5 \times 10^{-2}$ which we multiply by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = 6.9 \times 10^{-2}$. NODE=M048R22;LINKAGE=AS

[53] HEINTZ 92, while unable to distinguish between different J states, measures $\sum_J B(\Upsilon(3S) \to \gamma\chi_{bJ}) \times B(\chi_{bJ} \to \gamma\Upsilon(1S)) = (1.7 \pm 0.4 \pm 0.6) \times 10^{-3}$ for J = 0,1,2 using inclusive $\Upsilon(1S)$ decays and $(1.2^{+0.4}_{-0.3} \pm 0.09) \times 10^{-3}$ for J = 1,2 using $\Upsilon(1S) \to \ell^+\ell^-$. NODE=M048R22;LINKAGE=HE

$\Gamma(\gamma\chi_{b0}(1P))/\Gamma_{total}$ Γ_{25}/Γ

NODE=M048R15

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.27±0.04 OUR AVERAGE						
0.27±0.04±0.02		2.3k	LEES	11J	BABR	$\Upsilon(3S) \to X\gamma$
0.30±0.04±0.10		8.7k	ARTUSO	05	CLEO	$e^+e^- \to \gamma X$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.8	90		[54] ASNER	08A	CLEO	$\Upsilon(3S) \to \gamma +$ hadrons

[54] ASNER 08A reports $[\Gamma(\Upsilon(3S) \to \gamma\chi_{b0}(1P))/\Gamma_{total}] / [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 21.9 \times 10^{-2}$ which we multiply by our best value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

NODE=M048R15;LINKAGE=AS

$\Gamma(\gamma\eta_b(2S))/\Gamma_{total}$ Γ_{26}/Γ

NODE=M048R16

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
< 6.2	90	ARTUSO	05	CLEO	$e^+e^- \to \gamma X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<19	90	LEES	11J	BABR	$\Upsilon(3S) \to X\gamma$

$\Gamma(\gamma\eta_b(1S))/\Gamma_{total}$ Γ_{27}/Γ

NODE=M048R17

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
5.1±0.7 OUR AVERAGE						
7.1±1.8±1.3		2.3 ± 0.5k	[55] BONVICINI	10	CLEO	$\Upsilon(3S) \to \gamma X$
4.8±0.5±0.6		19 ± 3k	[55] AUBERT	09AQ	BABR	$\Upsilon(3S) \to \gamma X$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<8.5	90		LEES	11J	BABR	$\Upsilon(3S) \to X\gamma$
4.8±0.5±1.2		19 ± 3k	[55,56] AUBERT	08V	BABR	$\Upsilon(3S) \to \gamma X$
<4.3	90		[57] ARTUSO	05	CLEO	$e^+e^- \to \gamma X$

[55] Assuming $\Gamma_{\eta_b(1S)} = 10$ MeV.

NODE=M048R17;LINKAGE=BO

[56] Systematic error re-evaluated by AUBERT 09AQ.

NODE=M048R17;LINKAGE=AU

[57] Superseded by BONVICINI 10.

NODE=M048R17;LINKAGE=SU

$\Gamma(\gamma A^0 \to \gamma\,\text{hadrons})/\Gamma_{total}$ Γ_{28}/Γ

NODE=M048R02

(0.3 GeV $< m_{A^0} <$ 7 GeV)

NODE=M048R02

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<8 \times 10^{-5}$	90	[58] LEES	11H	BABR	$\Upsilon(3S) \to \gamma$ hadrons

[58] For a narrow scalar or pseudoscalar, A^0, excluding known resonances, with mass in the range 0.3–7 GeV. Measured 90% CL limits as a function of m_{A^0} range from 1×10^{-6} to 8×10^{-5}.

NODE=M048R02;LINKAGE=LE

$\Gamma(\gamma X \to \gamma + \geq 4\,\text{prongs})/\Gamma_{total}$ Γ_{29}/Γ

NODE=M048R20

(1.5 GeV $< m_X <$ 5.0 GeV)

NODE=M048R20

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<2.2	95	ROSNER	07A	CLEO	$e^+e^- \to \gamma X$

$\Gamma(\gamma A^0 \to \gamma\mu^+\mu^-)/\Gamma_{total}$ Γ_{30}/Γ

NODE=M048R04

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
<5.5	90	[59] AUBERT	09Z	BABR	$e^+e^- \to \gamma A^0 \to \gamma\mu^+\mu^-$

[59] For a narrow scalar or pseudoscalar, A^0, with mass in the range 212–9300 MeV, excluding J/ψ and $\psi(2S)$. Measured 90% CL limits as a function of m_{A^0} range from 0.27–5.5 $\times 10^{-6}$.

NODE=M048R04;LINKAGE=AU

$\Gamma(\gamma A^0 \to \gamma\tau^+\tau^-)/\Gamma_{total}$ Γ_{31}/Γ

NODE=M048R29

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.6 \times 10^{-4}$	90	[60] AUBERT	09P	BABR	$e^+e^- \to \gamma A^0 \to \gamma\tau^+\tau^-$

[60] For a narrow scalar or pseudoscalar, A^0, with $M(\tau^+\tau^-)$ in the ranges 4.03–9.52 and 9.61–10.10 GeV. Measured 90% CL limits as a function of $M(\tau^+\tau^-)$ range from 1.5–16 $\times 10^{-5}$.

NODE=M048R29;LINKAGE=AU

LEPTON FAMILY NUMBER (*LF*) VIOLATING MODES

NODE=M048230

$\Gamma(e^\pm\tau^\mp)/\Gamma_{total}$ Γ_{32}/Γ

NODE=M048R01

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
<4.2	90	LEES	10B	BABR	$e^+e^- \to e^\pm\tau^\mp$

$\Gamma(e^{\pm}\mu^{\mp})/\Gamma_{total}$ Γ_{33}/Γ

NODE=M048R07

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<3.6 × 10^{-7}	90	LEES	22A	BABR	$e^+e^- \to e^{\pm}\mu^{\mp}$

$\Gamma(\mu^{\pm}\tau^{\mp})/\Gamma_{total}$ Γ_{34}/Γ

NODE=M048R23

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
< 3.1	90	LEES	10B	BABR	$e^+e^- \to \mu^{\pm}\tau^{\mp}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<20.3	95	LOVE	08A	CLEO	$e^+e^- \to \mu^{\pm}\tau^{\mp}$

Υ(3S) REFERENCES

NODE=M048

AAIJ	24AC	JHEP 2410 122	R. Aaij *et al.*	(LHCb Collab.)	REFID=63036
SHAMOV	23	PL B839 137766	A.G. Shamov, O.L. Rezanova	(NOVO, NOVOU)	REFID=62012
LEES	22A	PRL 128 091804	J.P. Lees *et al.*	(BABAR Collab.)	REFID=61659
LEES	20E	PRL 125 241801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=60700
LEES	14G	PR D89 111102	J.P. Lees *et al.*	(BABAR Collab.)	REFID=55939
GE	11	PR D84 032008	J.Y. Ge *et al.*	(CLEO Collab.)	REFID=53960
KORNICER	11	PR D83 054003	M. Kornicer *et al.*	(CLEO Collab.)	REFID=16769
LEES	11C	PR D84 011104	J.P. Lees *et al.*	(BABAR Collab.)	REFID=16775
LEES	11H	PRL 107 221803	J.P. Lees *et al.*	(BABAR Collab.)	REFID=53877
LEES	11J	PR D84 072002	J.P. Lees *et al.*	(BABAR Collab.)	REFID=53936
LEES	11K	PR D84 091101	J.P. Lees *et al.*	(BABAR Collab.)	REFID=53937
LEES	11L	PR D84 092003	J.P. Lees *et al.*	(BABAR Collab.)	REFID=53938
BONVICINI	10	PR D81 031104	G. Bonvicini *et al.*	(CLEO Collab.)	REFID=53231
LEES	10B	PRL 104 151802	J.P. Lees *et al.*	(BABAR Collab.)	REFID=53355
AUBERT	09AQ	PRL 103 161801	B. Aubert *et al.*	(BABAR Collab.)	REFID=53106
AUBERT	09P	PRL 103 181801	B. Aubert *et al.*	(BABAR Collab.)	REFID=53062
AUBERT	09Z	PRL 103 081803	B. Aubert *et al.*	(BABAR Collab.)	REFID=52930
BHARI	09	PR D79 011103	S.R. Bhari *et al.*	(CLEO Collab.)	REFID=52662
ASNER	08A	PR D78 091103	D.M. Asner *et al.*	(CLEO Collab.)	REFID=52574
AUBERT	08BP	PR D78 112002	B. Aubert *et al.*	(BABAR Collab.)	REFID=52660
AUBERT	08V	PRL 101 071801	B. Aubert *et al.*	(BABAR Collab.)	REFID=52262
HE	08A	PRL 101 192001	Q. He *et al.*	(CLEO Collab.)	REFID=52587
LOVE	08A	PRL 101 201601	W. Love *et al.*	(CLEO Collab.)	REFID=52592
PDG	08	PL B667 1	C. Amsler *et al.*	(PDG Collab.)	REFID=52166
BESSON	07	PRL 98 052002	D. Besson *et al.*	(CLEO Collab.)	REFID=51620
ROSNER	07A	PR D76 117102	J.L. Rosner *et al.*	(CLEO Collab.)	REFID=52079
BESSON	06A	PR D74 012003	D. Besson *et al.*	(CLEO Collab.)	REFID=51147
ROSNER	06	PRL 96 092003	J.L. Rosner *et al.*	(CLEO Collab.)	REFID=51035
ADAMS	05	PRL 94 012001	G.S. Adams *et al.*	(CLEO Collab.)	REFID=50452
ARTUSO	05	PRL 94 032001	M. Artuso *et al.*	(CLEO Collab.)	REFID=50454
ARTAMONOV	00	PL B474 427	A.S. Artamonov *et al.*		REFID=47424
BUTLER	94B	PR D49 40	F. Butler *et al.*	(CLEO Collab.)	REFID=43799
WU	93	PL B301 307	Q.W. Wu *et al.*	(CUSB Collab.)	REFID=43313
HEINTZ	92	PR D46 1928	U. Heintz *et al.*	(CUSB II Collab.)	REFID=43604
BROCK	91	PR D43 1448	I.C. Brock *et al.*	(CLEO Collab.)	REFID=41579
HEINTZ	91	PRL 66 1563	U. Heintz *et al.*	(CUSB Collab.)	REFID=41580
MORRISON	91	PRL 67 1696	R.J. Morrison *et al.*	(CLEO Collab.)	REFID=41634
NARAIN	91	PRL 66 3113	M. Narain *et al.*	(CUSB Collab.)	REFID=41586
CHEN	89B	PR D39 3528	W.Y. Chen *et al.*	(CLEO Collab.)	REFID=40919
KAARSBERG	89	PRL 62 2077	T.M. Kaarsberg *et al.*	(CUSB Collab.)	REFID=40733
BUCHMUEL...	88	HE e^+e^- Physics 412	W. Buchmueller, S. Cooper	(HANN, DESY, MIT)	REFID=40034
Editors: A. Ali and P. Soeding, World Scientific, Singapore					
COHEN	87	RMP 59 1121	E.R. Cohen, B.N. Taylor	(RISC, NBS)	REFID=11616
BARU	86B	ZPHY C32 622 (errat.)	S.E. Baru *et al.*	(NOVO)	REFID=22338
KURAEV	85	SJNP 41 466	E.A. Kuraev, V.S. Fadin	(NOVO)	REFID=40033
		Translated from YAF 41 733.			
ARTAMONOV	84	PL 137B 272	A.S. Artamonov *et al.*	(NOVO)	REFID=22278
GILES	84B	PR D29 1285	R. Giles *et al.*	(CLEO Collab.)	REFID=22280
ANDREWS	83	PRL 50 807	D.E. Andrews *et al.*	(CLEO Collab.)	REFID=22273
GREEN	82	PRL 49 617	J. Green *et al.*	(CLEO Collab.)	REFID=22321
MAGERAS	82	PL 118B 453	G. Mageras *et al.*	(COLU, CORN, LSU+)	REFID=22359