



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

$\tau(1S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
9460.40±0.10 OUR AVERAGE				
9460.37±0.01±2.85	15M	¹ AAIJ	24AC	LHCB $\tau(1S) \rightarrow \mu^+ \mu^-$
9460.40±0.09±0.04		² SHAMOV	23	RVUE $e^+ e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9460.11±0.11±0.07		³ SHAMOV	23	RVUE $e^+ e^- \rightarrow$ hadrons
9460.51±0.09±0.05		^{4,5} ARTAMONOV	00	MD1 $e^+ e^- \rightarrow$ hadrons
9460.60±0.09±0.05		^{6,7} BARU	92B	MD1 $e^+ e^- \rightarrow$ hadrons
9460.59±0.12		BARU	86	MD1 $e^+ e^- \rightarrow$ hadrons
9460.6 ±0.4		^{7,8} ARTAMONOV	84	MD1 $e^+ e^- \rightarrow$ hadrons
9459.97±0.11±0.07		⁹ MACKAY	84	CUSB $e^+ e^- \rightarrow$ hadrons

¹ Observed in prompt pp production.
² Reanalysis of MD1 data using the electron mass from COHEN 87, the radiative corrections from KURAEV 85 and interference effects.
³ Obtained by reanalysing CUSB data (MACKAY 84), but not authored by the CUSB collaboration.
⁴ Reanalysis of BARU 92B and ARTAMONOV 84 using new electron mass (COHEN 87).
⁵ Superseded by SHAMOV 23.
⁶ Supersedes BARU 86.
⁷ Superseded by ARTAMONOV 00.
⁸ Value includes data of ARTAMONOV 82.
⁹ Reanalysed by SHAMOV 23.

$\tau(1S)$ WIDTH

VALUE (keV)	DOCUMENT ID
54.02±1.25 OUR EVALUATION	See the Note on “Width Determinations of the τ States”

$\tau(1S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
$\Gamma_1 \quad \tau^+ \tau^-$	(2.60 ±0.10) %	
$\Gamma_2 \quad e^+ e^-$	(2.39 ±0.08) %	
$\Gamma_3 \quad \mu^+ \mu^-$	(2.48 ±0.04) %	

Hadronic decays

$\Gamma_4 \quad g g g$	(81.7 ±0.7) %	
$\Gamma_5 \quad \gamma g g$	(2.2 ±0.6) %	
$\Gamma_6 \quad \eta'(958) \text{ anything}$	(2.94 ±0.24) %	
$\Gamma_7 \quad J/\psi(1S) \text{ anything}$	(5.4 ±0.4) × 10 ⁻⁴	S=1.4
$\Gamma_8 \quad J/\psi(1S) \eta_c$	< 2.2 × 10 ⁻⁶	CL=90%

Γ_9	$J/\psi(1S)\chi_{c0}$	< 3.4	$\times 10^{-6}$	CL=90%
Γ_{10}	$J/\psi(1S)\chi_{c1}$	(3.9 ± 1.2)	$\times 10^{-6}$	
Γ_{11}	$J/\psi(1S)\chi_{c2}$	< 1.4	$\times 10^{-6}$	CL=90%
Γ_{12}	$J/\psi(1S)\eta_c(2S)$	< 2.2	$\times 10^{-6}$	CL=90%
Γ_{13}	$J/\psi(1S)X(3940)$	< 5.4	$\times 10^{-6}$	CL=90%
Γ_{14}	$J/\psi(1S)X(4160)$	< 5.4	$\times 10^{-6}$	CL=90%
Γ_{15}	$X(4350)$ anything, $X \rightarrow J/\psi(1S)\phi$	< 8.1	$\times 10^{-6}$	CL=90%
Γ_{16}	$T_{c\bar{c}1}(3900)^\pm$ anything, $T_{c\bar{c}1} \rightarrow J/\psi(1S)\pi^\pm$	< 1.3	$\times 10^{-5}$	CL=90%
Γ_{17}	$T_{c\bar{c}1}(4200)^\pm$ anything, $Z_c \rightarrow J/\psi(1S)\pi^\pm$	< 6.0	$\times 10^{-5}$	CL=90%
Γ_{18}	$T_{c\bar{c}1}(4430)^\pm$ anything, $T_{c\bar{c}1} \rightarrow J/\psi(1S)\pi^\pm$	< 4.9	$\times 10^{-5}$	CL=90%
Γ_{19}	$X_{cs}^\pm$ anything, $X \rightarrow J/\psi K^\pm$	< 5.7	$\times 10^{-6}$	CL=90%
Γ_{20}	$\psi(4230)$ anything, $\psi \rightarrow J/\psi(1S)\pi^+\pi^-$	< 3.8	$\times 10^{-5}$	CL=90%
Γ_{21}	$\psi(4230)$ anything, $\psi \rightarrow J/\psi(1S)K^+K^-$	< 7.5	$\times 10^{-6}$	CL=90%
Γ_{22}	$\chi_{c1}(4140)$ anything, $\chi_{c1} \rightarrow J/\psi(1S)\phi$	< 5.2	$\times 10^{-6}$	CL=90%
Γ_{23}	χ_{c0} anything	< 4	$\times 10^{-3}$	CL=90%
Γ_{24}	χ_{c1} anything	(1.90 ± 0.35)	$\times 10^{-4}$	
Γ_{25}	$\chi_{c1}(1P)X_{tetra}$	< 3.78	$\times 10^{-5}$	CL=90%
Γ_{26}	χ_{c2} anything	(2.8 ± 0.8)	$\times 10^{-4}$	
Γ_{27}	$\psi(2S)$ anything	(1.23 ± 0.20)	$\times 10^{-4}$	
Γ_{28}	$\psi(2S)\eta_c$	< 3.6	$\times 10^{-6}$	CL=90%
Γ_{29}	$\psi(2S)\chi_{c0}$	< 6.5	$\times 10^{-6}$	CL=90%
Γ_{30}	$\psi(2S)\chi_{c1}$	< 4.5	$\times 10^{-6}$	CL=90%
Γ_{31}	$\psi(2S)\chi_{c2}$	< 2.1	$\times 10^{-6}$	CL=90%
Γ_{32}	$\psi(2S)\eta_c(2S)$	< 3.2	$\times 10^{-6}$	CL=90%
Γ_{33}	$\psi(2S)X(3940)$	< 2.9	$\times 10^{-6}$	CL=90%
Γ_{34}	$\psi(2S)X(4160)$	< 2.9	$\times 10^{-6}$	CL=90%
Γ_{35}	$\psi(4230)$ anything, $\psi \rightarrow \psi(2S)\pi^+\pi^-$	< 7.9	$\times 10^{-5}$	CL=90%
Γ_{36}	$\psi(4360)$ anything, $\psi \rightarrow \psi(2S)\pi^+\pi^-$	< 5.2	$\times 10^{-5}$	CL=90%
Γ_{37}	$\psi(4660)$ anything, $\psi \rightarrow \psi(2S)\pi^+\pi^-$	< 2.2	$\times 10^{-5}$	CL=90%
Γ_{38}	$T_{c\bar{c}}(4050)^\pm$ anything, $X \rightarrow \psi(2S)\pi^\pm$	< 8.8	$\times 10^{-5}$	CL=90%
Γ_{39}	$T_{c\bar{c}1}(4430)^\pm$ anything, $T_{c\bar{c}1} \rightarrow \psi(2S)\pi^\pm$	< 6.7	$\times 10^{-5}$	CL=90%
Γ_{40}	$\chi_{c1}(3872)$ anything	< 2.2	$\times 10^{-4}$	CL=90%

Γ_{41}	$T_{c\bar{c}1}(4200)^+ T_{c\bar{c}1}(4200)^-$	< 2.23	$\times 10^{-5}$	CL=90%
Γ_{42}	$T_{c\bar{c}1}(3900)^\pm T_{c\bar{c}1}(4200)^\mp$	< 8.1	$\times 10^{-6}$	CL=90%
Γ_{43}	$T_{c\bar{c}1}(3900)^+ T_{c\bar{c}1}(3900)^-$	< 1.8	$\times 10^{-6}$	CL=90%
Γ_{44}	$T_{c\bar{c}}(4050)^+ T_{c\bar{c}}(4050)^-$	< 1.58	$\times 10^{-5}$	CL=90%
Γ_{45}	$T_{c\bar{c}}(4250)^+ T_{c\bar{c}}(4250)^-$	< 2.66	$\times 10^{-5}$	CL=90%
Γ_{46}	$T_{c\bar{c}}(4050)^\pm T_{c\bar{c}}(4250)^\mp$	< 4.42	$\times 10^{-5}$	CL=90%
Γ_{47}	$T_{c\bar{c}1}(4430)^+ T_{c\bar{c}1}(4430)^-$	< 2.03	$\times 10^{-5}$	CL=90%
Γ_{48}	$T_{c\bar{c}}(4055)^\pm T_{c\bar{c}}(4055)^\mp$	< 2.33	$\times 10^{-5}$	CL=90%
Γ_{49}	$T_{c\bar{c}}(4055)^\pm T_{c\bar{c}1}(4430)^\mp$	< 4.55	$\times 10^{-5}$	CL=90%
Γ_{50}	$\rho\pi$	< 3.68	$\times 10^{-6}$	CL=90%
Γ_{51}	$\omega\pi^0$	< 3.90	$\times 10^{-6}$	CL=90%
Γ_{52}	$\pi^+\pi^-$	< 5	$\times 10^{-4}$	CL=90%
Γ_{53}	K^+K^-	< 5	$\times 10^{-4}$	CL=90%
Γ_{54}	$p\bar{p}$	< 5	$\times 10^{-4}$	CL=90%
Γ_{55}	$\pi^+\pi^-\pi^0$	$(2.1 \pm 0.8) \times 10^{-6}$		
Γ_{56}	ϕK^+K^-	$(2.4 \pm 0.5) \times 10^{-6}$		
Γ_{57}	$\omega\pi^+\pi^-$	$(4.5 \pm 1.0) \times 10^{-6}$		
Γ_{58}	$K^*(892)^0 K^- \pi^+ + \text{c.c.}$	$(4.4 \pm 0.8) \times 10^{-6}$		
Γ_{59}	$\phi f_2'(1525)$	< 1.63	$\times 10^{-6}$	CL=90%
Γ_{60}	$\omega f_2(1270)$	< 1.79	$\times 10^{-6}$	CL=90%
Γ_{61}	$\rho(770) a_2(1320)$	< 2.24	$\times 10^{-6}$	CL=90%
Γ_{62}	$K^*(892)^0 \bar{K}_2^*(1430)^0 + \text{c.c.}$	$(3.0 \pm 0.8) \times 10^{-6}$		
Γ_{63}	$K_1(1270)^\pm K^\mp$	< 2.41	$\times 10^{-6}$	CL=90%
Γ_{64}	$K_1(1400)^\pm K^\mp$	$(1.0 \pm 0.4) \times 10^{-6}$		
Γ_{65}	$b_1(1235)^\pm \pi^\mp$	< 1.25	$\times 10^{-6}$	CL=90%
Γ_{66}	$\pi^+\pi^-\pi^0\pi^0$	$(1.28 \pm 0.30) \times 10^{-5}$		
Γ_{67}	$K_S^0 K^+ \pi^- + \text{c.c.}$	$(1.6 \pm 0.4) \times 10^{-6}$		
Γ_{68}	$K^*(892)^0 \bar{K}^0 + \text{c.c.}$	$(2.9 \pm 0.9) \times 10^{-6}$		
Γ_{69}	$K^*(892)^- K^+ + \text{c.c.}$	< 1.11	$\times 10^{-6}$	CL=90%
Γ_{70}	$f_1(1285)$ anything	$(4.6 \pm 3.1) \times 10^{-3}$		
Γ_{71}	$D^*(2010)^\pm$ anything	$(2.52 \pm 0.20) \%$		
Γ_{72}	$f_1(1285) X_{tetra}$	< 6.24	$\times 10^{-5}$	CL=90%
Γ_{73}	$^2\bar{H}$ anything	$(2.85 \pm 0.25) \times 10^{-5}$		
Γ_{74}	Sum of 100 exclusive modes	$(1.200 \pm 0.017) \%$		

Radiative decays

Γ_{75}	$\gamma\pi^+\pi^-$	$(6.3 \pm 1.8) \times 10^{-5}$		
Γ_{76}	$\gamma\pi^0\pi^0$	$(1.7 \pm 0.7) \times 10^{-5}$		
Γ_{77}	$\gamma\pi\pi$ (S-wave)	$(4.6 \pm 0.7) \times 10^{-5}$		
Γ_{78}	$\gamma\pi^0\eta$	< 2.4	$\times 10^{-6}$	CL=90%
Γ_{79}	$\gamma K^+ K^-$	[a] $(1.14 \pm 0.13) \times 10^{-5}$		
Γ_{80}	$\gamma p\bar{p}$	[b] < 6	$\times 10^{-6}$	CL=90%
Γ_{81}	$\gamma 2h^+ 2h^-$	$(7.0 \pm 1.5) \times 10^{-4}$		
Γ_{82}	$\gamma 3h^+ 3h^-$	$(5.4 \pm 2.0) \times 10^{-4}$		

Γ_{83}	$\gamma 4h^+ 4h^-$	$(7.4 \pm 3.5) \times 10^{-4}$	
Γ_{84}	$\gamma \pi^+ \pi^- K^+ K^-$	$(2.9 \pm 0.9) \times 10^{-4}$	
Γ_{85}	$\gamma 2\pi^+ 2\pi^-$	$(2.5 \pm 0.9) \times 10^{-4}$	
Γ_{86}	$\gamma 3\pi^+ 3\pi^-$	$(2.5 \pm 1.2) \times 10^{-4}$	
Γ_{87}	$\gamma 2\pi^+ 2\pi^- K^+ K^-$	$(2.4 \pm 1.2) \times 10^{-4}$	
Γ_{88}	$\gamma \pi^+ \pi^- p \bar{p}$	$(1.5 \pm 0.6) \times 10^{-4}$	
Γ_{89}	$\gamma 2\pi^+ 2\pi^- p \bar{p}$	$(4 \pm 6) \times 10^{-5}$	
Γ_{90}	$\gamma 2K^+ 2K^-$	$(2.0 \pm 2.0) \times 10^{-5}$	
Γ_{91}	$\gamma \eta'(958)$	< 1.9	$\times 10^{-6}$ CL=90%
Γ_{92}	$\gamma \eta$	< 1.0	$\times 10^{-6}$ CL=90%
Γ_{93}	$\gamma f_0(980)$	< 3	$\times 10^{-5}$ CL=90%
Γ_{94}	$\gamma f'_2(1525)$	$(2.9 \pm 0.6) \times 10^{-5}$	
Γ_{95}	$\gamma f_2(1270)$	$(1.01 \pm 0.06) \times 10^{-4}$	
Γ_{96}	$\gamma \eta(1405)$	< 8.2	$\times 10^{-5}$ CL=90%
Γ_{97}	$\gamma f_0(1500)$	< 1.5	$\times 10^{-5}$ CL=90%
Γ_{98}	$\gamma f_0(1500) \rightarrow \gamma K^+ K^-$	$(1.0 \pm 0.4) \times 10^{-5}$	
Γ_{99}	$\gamma f_0(1710)$	< 2.6	$\times 10^{-4}$ CL=90%
Γ_{100}	$\gamma f_0(1710) \rightarrow \gamma K^+ K^-$	$(1.01 \pm 0.32) \times 10^{-5}$	
Γ_{101}	$\gamma f_0(1710) \rightarrow \gamma \pi^+ \pi^-$	$(5.3 \pm 2.0) \times 10^{-6}$	
Γ_{102}	$\gamma f_0(1710) \rightarrow \gamma \pi^0 \pi^0$	< 1.4	$\times 10^{-6}$ CL=90%
Γ_{103}	$\gamma f_0(1710) \rightarrow \gamma \eta \eta$	< 1.8	$\times 10^{-6}$ CL=90%
Γ_{104}	$\gamma f_4(2050)$	< 5.3	$\times 10^{-5}$ CL=90%
Γ_{105}	$\gamma f_0(2200) \rightarrow \gamma K^+ K^-$	< 2	$\times 10^{-4}$ CL=90%
Γ_{106}	$\gamma f_J(2220) \rightarrow \gamma K^+ K^-$	< 8	$\times 10^{-7}$ CL=90%
Γ_{107}	$\gamma f_J(2220) \rightarrow \gamma \pi^+ \pi^-$	< 6	$\times 10^{-7}$ CL=90%
Γ_{108}	$\gamma f_J(2220) \rightarrow \gamma p \bar{p}$	< 1.1	$\times 10^{-6}$ CL=90%
Γ_{109}	$\gamma \eta(2225) \rightarrow \gamma \phi \phi$	< 3	$\times 10^{-3}$ CL=90%
Γ_{110}	$\gamma \eta_c(1S)$	< 2.9	$\times 10^{-5}$ CL=90%
Γ_{111}	$\gamma \eta_c(2S)$	< 4	$\times 10^{-4}$ CL=90%
Γ_{112}	$\gamma \chi_{c0}$	< 6.6	$\times 10^{-5}$ CL=90%
Γ_{113}	$\gamma \chi_{c1}$	$(4.7 \pm 2.4 \mp 1.9) \times 10^{-5}$	
Γ_{114}	$\gamma \chi_{c2}$	< 7.6	$\times 10^{-6}$ CL=90%
Γ_{115}	$\gamma \chi_{c1}(3872)$	< 4	$\times 10^{-5}$ CL=90%
Γ_{116}	$\gamma \chi_{c1}(3872), \chi_{c1} \rightarrow \pi^+ \pi^- \pi^0 J/\psi$	< 2.8	$\times 10^{-6}$ CL=90%
Γ_{117}	$\gamma \chi_{c0}(3915) \rightarrow \omega J/\psi$	< 3.0	$\times 10^{-6}$ CL=90%
Γ_{118}	$\gamma \chi_{c1}(4140) \rightarrow \phi J/\psi$	< 2.2	$\times 10^{-6}$ CL=90%
Γ_{119}	$\gamma X \bar{X} (m_X < 3.1 \text{ GeV})$	$[c] < 1$	$\times 10^{-3}$ CL=90%
Γ_{120}	$\gamma X \bar{X} (m_X < 4.5 \text{ GeV})$	$[d] < 2.4$	$\times 10^{-4}$ CL=90%
Γ_{121}	$\gamma X \rightarrow \gamma + \geq 4 \text{ prongs}$	$[e] < 1.78$	$\times 10^{-4}$ CL=95%
Γ_{122}	γA^0	$[f]$	
Γ_{123}	$\gamma A^0 \rightarrow \gamma \mu^+ \mu^-$	$[g] < 9$	$\times 10^{-6}$ CL=90%
Γ_{124}	$\gamma A^0 \rightarrow \gamma \tau^+ \tau^-$	$[a] < 1.30$	$\times 10^{-4}$ CL=90%

Γ_{125}	$\gamma A^0 \rightarrow \gamma g g$	$[h] < 1$	%	CL=90%
Γ_{126}	$\gamma A^0 \rightarrow \gamma s \bar{s}$	$[h] < 1$	$\times 10^{-3}$	CL=90%

Lepton Family number (LF) violating modes

Γ_{127}	$e^\pm \mu^\mp$	LF	< 3.9	$\times 10^{-7}$	CL=90%
Γ_{128}	$\mu^\pm \tau^\mp$	LF	< 2.7	$\times 10^{-6}$	CL=90%
Γ_{129}	$e^\pm \tau^\mp$	LF	< 2.7	$\times 10^{-6}$	CL=90%
Γ_{130}	$\gamma e^\pm \mu^\mp$	LF	< 4.2	$\times 10^{-7}$	CL=90%
Γ_{131}	$\gamma \mu^\pm \tau^\mp$	LF	< 6.1	$\times 10^{-6}$	CL=90%
Γ_{132}	$\gamma e^\pm \tau^\mp$	LF	< 6.5	$\times 10^{-6}$	CL=90%

Other decays

Γ_{133}	invisible	< 3.0	$\times 10^{-4}$	CL=90%
Γ_{134}	hadrons	(96 $\pm$ 4) %		

[a] $2m_\tau < M(\tau^+ \tau^-) < 9.2$ GeV[b] 2 GeV $< m_{K^+ K^-} < 3$ GeV[c] $X \bar{X}$ = vectors with $m < 3.1$ GeV[d] X and $\bar{X}$ = zero spin with $m < 4.5$ GeV[e] 1.5 GeV $< m_X < 5.0$ GeV[f] A^0 = scalar with $m < 8.0$ GeV[g] 201 MeV $< M(\mu^+ \mu^-) < 3565$ MeV[h] 0.5 GeV $< m_X < 9.0$ GeV, where m_X is the invariant mass of the hadronic final state. **$\mathcal{R}(1S) \Gamma(i) \Gamma(e^+ e^-) / \Gamma(\text{total})$**

$\Gamma(\mu^+ \mu^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$				$\Gamma_3 \Gamma_2 / \Gamma$
VALUE (eV)	DOCUMENT ID	TECN	COMMENT	
31.2$\pm$1.6$\pm$1.7	KOBEL	92	CBAL	$e^+ e^- \rightarrow \mu^+ \mu^-$

$\Gamma(\text{hadrons}) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$				$\Gamma_{134} \Gamma_2 / \Gamma$
VALUE (keV)	DOCUMENT ID	TECN	COMMENT	
1.240$\pm$0.016 OUR AVERAGE				
1.252 $\pm$ 0.004 $\pm$ 0.019	¹ ROSNER	06	CLEO	9.5 $e^+ e^- \rightarrow$ hadrons
1.187 $\pm$ 0.023 $\pm$ 0.031	¹ BARU	92B	MD1	$e^+ e^- \rightarrow$ hadrons
1.23 $\pm$ 0.02 $\pm$ 0.05	¹ JAKUBOWSKI	88	CBAL	$e^+ e^- \rightarrow$ hadrons
1.37 $\pm$ 0.06 $\pm$ 0.09	² GILES	84B	CLEO	$e^+ e^- \rightarrow$ hadrons
1.23 $\pm$ 0.08 $\pm$ 0.04	² ALBRECHT	82	DASP	$e^+ e^- \rightarrow$ hadrons
1.13 $\pm$ 0.07 $\pm$ 0.11	² NICZYPORUK	82	LENA	$e^+ e^- \rightarrow$ hadrons
1.09 $\pm$ 0.25	² BOCK	80	CNTR	$e^+ e^- \rightarrow$ hadrons
1.35 $\pm$ 0.14	³ BERGER	79	PLUT	$e^+ e^- \rightarrow$ hadrons

¹ Radiative corrections evaluated following KURAEV 85.² Radiative corrections reevaluated by BUCHMUELLER 88 following KURAEV 85.³ Radiative corrections reevaluated by ALEXANDER 89 using $B(\mu\mu) = 0.026$.

$\Upsilon(1S)$ PARTIAL WIDTHS **$\Gamma(e^+e^-)$** **Γ_2** VALUE (keV)DOCUMENT ID **1.340 ± 0.018 OUR EVALUATION** **$\Upsilon(1S)$ BRANCHING RATIOS** **$\Gamma(\tau^+\tau^-)/\Gamma_{\text{total}}$** **$\Gamma_1/\Gamma$** VALUE (units 10^{-2})EVTSDOCUMENT IDTECNCOMMENT **2.60 ± 0.10 OUR AVERAGE**2.53 $\pm$ 0.13 $\pm$ 0.04 60k ¹ BESSON 07 CLEO $e^+e^- \rightarrow \Upsilon(1S) \rightarrow \tau^+\tau^-$ 2.61 $\pm$ 0.12 $^{+0.09}_{-0.13}$ 25k CINABRO 94B CLE2 $e^+e^- \rightarrow \tau^+\tau^-$ 2.7 $\pm$ 0.4 $\pm$ 0.2 ² ALBRECHT 85C ARG $\Upsilon(2S) \rightarrow \pi^+\pi^-\tau^+\tau^-$ 3.4 $\pm$ 0.4 $\pm$ 0.4 GILES 83 CLEO $e^+e^- \rightarrow \tau^+\tau^-$

¹ BESSON 07 reports $[\Gamma(\Upsilon(1S) \rightarrow \tau^+\tau^-)/\Gamma_{\text{total}}] / [B(\Upsilon(1S) \rightarrow \mu^+\mu^-)] = 1.02 \pm 0.02 \pm 0.05$ which we multiply by our best value $B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = (2.48 \pm 0.04) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Using $B(\Upsilon(1S) \rightarrow ee) = B(\Upsilon(1S) \rightarrow \mu\mu) = 0.0256$; not used for width evaluations.

 $\Gamma(e^+e^-)/\Gamma_{\text{total}}$ **Γ_2/Γ** VALUE (units 10^{-2})EVTSDOCUMENT IDTECNCOMMENT **2.39 ± 0.08 OUR AVERAGE**2.40 $\pm$ 0.01 $\pm$ 0.12 191k PATRA 22 BELL $\Upsilon(2S) \rightarrow \pi^+\pi^-e^+e^-$ 2.29 $\pm$ 0.08 $\pm$ 0.11 ALEXANDER 98 CLE2 $\Upsilon(2S) \rightarrow \pi^+\pi^-e^+e^-$ 2.42 $\pm$ 0.14 $\pm$ 0.14 307 ALBRECHT 87 ARG $\Upsilon(2S) \rightarrow \pi^+\pi^-e^+e^-$ 2.8 $\pm$ 0.3 $\pm$ 0.2 826 BESSON 84 CLEO $\Upsilon(2S) \rightarrow \pi^+\pi^-e^+e^-$ 5.1 $\pm$ 3.0 BERGER 80C PLUT $e^+e^- \rightarrow e^+e^-$ **$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$** **$\Gamma_3/\Gamma$** VALUE (units 10^{-2})EVTSDOCUMENT IDTECNCOMMENT **2.48 ± 0.04 OUR AVERAGE**2.46 $\pm$ 0.01 $\pm$ 0.11 246k PATRA 22 BELL $\Upsilon(2S) \rightarrow \pi^+\pi^-\mu^+\mu^-$ 2.49 $\pm$ 0.02 $\pm$ 0.07 345k ADAMS 05 CLEO $e^+e^- \rightarrow \mu^+\mu^-$ 2.49 $\pm$ 0.08 $\pm$ 0.13 ALEXANDER 98 CLE2 $\Upsilon(2S) \rightarrow \pi^+\pi^-\mu^+\mu^-$ 2.12 $\pm$ 0.20 $\pm$ 0.10 ¹ BARU 92 MD1 $e^+e^- \rightarrow \mu^+\mu^-$ 2.31 $\pm$ 0.12 $\pm$ 0.10 ¹ KOBEL 92 CBAL $e^+e^- \rightarrow \mu^+\mu^-$ 2.52 $\pm$ 0.07 $\pm$ 0.07 CHEN 89B CLEO $e^+e^- \rightarrow \mu^+\mu^-$ 2.61 $\pm$ 0.09 $\pm$ 0.11 KAARSBERG 89 CSB2 $e^+e^- \rightarrow \mu^+\mu^-$ 2.30 $\pm$ 0.25 $\pm$ 0.13 86 ALBRECHT 87 ARG $\Upsilon(2S) \rightarrow \pi^+\pi^-\mu^+\mu^-$ 2.9 $\pm$ 0.3 $\pm$ 0.2 864 BESSON 84 CLEO $\Upsilon(2S) \rightarrow \pi^+\pi^-\mu^+\mu^-$ 2.7 $\pm$ 0.3 $\pm$ 0.3 ANDREWS 83 CLEO $e^+e^- \rightarrow \mu^+\mu^-$ 3.2 $\pm$ 1.3 $\pm$ 0.3 ALBRECHT 82 DASP $e^+e^- \rightarrow \mu^+\mu^-$

3.8 ± 1.5 ± 0.2	NICZYPORUK 82	LENA	$e^+e^- \rightarrow \mu^+\mu^-$
1.4 $+3.4$ -1.4	BOCK	80	CNTR $e^+e^- \rightarrow \mu^+\mu^-$
2.2 ± 2.0	BERGER	79	PLUT $e^+e^- \rightarrow \mu^+\mu^-$

¹ Taking into account interference between the resonance and continuum.

$\Gamma(\tau^+\tau^-)/\Gamma(\mu^+\mu^-)$ Γ_1/Γ_3

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
1.008± 0.023 OUR AVERAGE				
1.005 ± 0.013 ± 0.022	0.7M	¹ DEL-AMO-SA..10c	BABR	$\Upsilon(3S) \rightarrow \pi^+\pi^-\Upsilon(1S)$
1.02 ± 0.02 ± 0.05	60k	BESSON	07	CLEO $e^+e^- \rightarrow \Upsilon(1S)$

¹ Allows any number of extra photons with total energy < 500 MeV.

$\Gamma(ggg)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
81.7± 0.7	20M	¹ BESSON	06A	CLEO $\Upsilon(1S) \rightarrow \text{hadrons}$

¹ Calculated using the value $\Gamma(\gamma gg)/\Gamma(ggg) = (2.70 \pm 0.01 \pm 0.13 \pm 0.24)\%$ from BESSON 06A and PDG 08 values of $B(\mu^+\mu^-) = (2.48 \pm 0.05)\%$ and $R_{\text{hadrons}} = 3.51$. The statistical error is negligible and the systematic error is partially correlated with that of $\Gamma(\gamma gg)/\Gamma_{\text{total}}$ measurement of BESSON 06A.

$\Gamma(\gamma gg)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
2.20± 0.60	400k	¹ BESSON	06A	CLEO $\Upsilon(1S) \rightarrow \gamma + \text{hadrons}$

¹ Calculated using BESSON 06A values of $\Gamma(\gamma gg)/\Gamma(ggg) = (2.70 \pm 0.01 \pm 0.13 \pm 0.24)\%$ and $\Gamma(ggg)/\Gamma_{\text{total}}$. The statistical error is negligible and the systematic error is partially correlated with that of $\Gamma(ggg)/\Gamma_{\text{total}}$ measurement of BESSON 06A.

$\Gamma(\gamma gg)/\Gamma(ggg)$ Γ_5/Γ_4

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
2.70$\pm 0.01$$\pm 0.27$	20M	BESSON	06A	CLEO $\Upsilon(1S) \rightarrow (\gamma +) \text{hadrons}$

$\Gamma(\eta'(958) \text{ anything})/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0294± 0.0024 OUR AVERAGE			
0.030 ± 0.002 ± 0.002	AQUINES	06A	CLE3 $\Upsilon(1S) \rightarrow \eta' \text{ anything}$
0.028 ± 0.004 ± 0.002	ARTUSO	03	CLE2 $\Upsilon(1S) \rightarrow \eta' \text{ anything}$

$\Gamma(J/\psi(1S) \text{ anything})/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
5.4 ± 0.4 OUR FIT					Error includes scale factor of 1.4.
5.4 ± 0.4 OUR AVERAGE					Error includes scale factor of 1.5.
5.25 ± 0.13 ± 0.25		3k	SHEN	16	BELL $e^+e^- \rightarrow J/\psi X$
6.4 ± 0.4 ± 0.6		730	BRIERE	04	CLEO $e^+e^- \rightarrow J/\psi X$
11 ± 4 ± 2			¹ FULTON	89	CLEO $e^+e^- \rightarrow \mu^+\mu^- X$

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

<6.8	90	ALBRECHT	92J	ARG	$e^+e^- \rightarrow e^+e^- X$, $\mu^+\mu^- X$
<17	90	MASCHMANN	90	CBAL	$e^+e^- \rightarrow \text{hadrons}$
<200	90	NICZYPORUK	83	LENA	

¹ Using $B((J/\psi) \rightarrow \mu^+ \mu^-) = (6.9 \pm 0.9)\%$.

$\Gamma(J/\psi(1S)\eta_c)/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.2 \times 10^{-6}$	90	YANG	14	BELL $e^+ e^- \rightarrow J/\psi X$

$\Gamma(J/\psi(1S)\chi_{c0})/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<3.4 \times 10^{-6}$	90	YANG	14	BELL $e^+ e^- \rightarrow J/\psi X$

$\Gamma(J/\psi(1S)\chi_{c1})/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.90 \pm 1.21 \pm 0.23$	20	YANG	14	BELL $e^+ e^- \rightarrow J/\psi X$

$\Gamma(J/\psi(1S)\chi_{c2})/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.4 \times 10^{-6}$	90	YANG	14	BELL $e^+ e^- \rightarrow J/\psi X$

$\Gamma(J/\psi(1S)\eta_c(2S))/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.2 \times 10^{-6}$	90	YANG	14	BELL $e^+ e^- \rightarrow J/\psi X$

$\Gamma(J/\psi(1S)X(3940))/\Gamma_{\text{total}}$ Γ_{13}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<5.4 \times 10^{-6}$	90	YANG	14	BELL $e^+ e^- \rightarrow J/\psi X$

$\Gamma(J/\psi(1S)X(4160))/\Gamma_{\text{total}}$ Γ_{14}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<5.4 \times 10^{-6}$	90	YANG	14	BELL $e^+ e^- \rightarrow J/\psi X$

$\Gamma(X(4350) \text{ anything, } X \rightarrow J/\psi(1S)\phi)/\Gamma_{\text{total}}$ Γ_{15}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<8.1 \times 10^{-6}$	90	SHEN	16	BELL $\Upsilon(1S) \rightarrow J/\psi K^+ K^- X$

$\Gamma(T_{c\bar{c}1}(3900)^\pm \text{ anything, } T_{c\bar{c}1} \rightarrow J/\psi(1S)\pi^\pm)/\Gamma_{\text{total}}$ Γ_{16}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.3 \times 10^{-5}$	90	SHEN	16	BELL $\Upsilon(1S) \rightarrow J/\psi \pi^\pm X$

$\Gamma(T_{c\bar{c}1}(4200)^\pm \text{ anything, } Z_c \rightarrow J/\psi(1S)\pi^\pm)/\Gamma_{\text{total}}$ Γ_{17}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<6.0 \times 10^{-5}$	90	SHEN	16	BELL $\Upsilon(1S) \rightarrow J/\psi \pi^\pm X$

$\Gamma(T_{c\bar{c}1}(4430)^\pm \text{ anything, } T_{c\bar{c}1} \rightarrow J/\psi(1S)\pi^\pm)/\Gamma_{\text{total}}$ Γ_{18}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<4.9 \times 10^{-5}$	90	SHEN	16	BELL $\Upsilon(1S) \rightarrow J/\psi \pi^\pm X$

$\Gamma(X_{cs}^\pm \text{ anything, } X \rightarrow J/\psi K^\pm)/\Gamma_{\text{total}}$ Γ_{19}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<5.7 \times 10^{-6}$	90	SHEN	16	BELL $\Upsilon(1S) \rightarrow J/\psi K^- X$

$\Gamma(\psi(4230) \text{ anything}, \psi \rightarrow J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$ **Γ_{20}/Γ**

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<3.8 \times 10^{-5}$	90	SHEN	16	BELL $\Upsilon(1S) \rightarrow J/\psi \pi^+ \pi^- X$

 $\Gamma(\psi(4230) \text{ anything}, \psi \rightarrow J/\psi(1S)K^+K^-)/\Gamma_{\text{total}}$ **Γ_{21}/Γ**

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<7.5 \times 10^{-6}$	90	SHEN	16	BELL $\Upsilon(1S) \rightarrow J/\psi K^+ K^- X$

 $\Gamma(\chi_{c1}(4140) \text{ anything}, \chi_{c1} \rightarrow J/\psi(1S)\phi)/\Gamma_{\text{total}}$ **Γ_{22}/Γ**

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<5.2 \times 10^{-6}$	90	SHEN	16	BELL $\Upsilon(1S) \rightarrow J/\psi K^+ K^- X$

 $\Gamma(\chi_{c0} \text{ anything})/\Gamma(J/\psi(1S) \text{ anything})$ **Γ_{23}/Γ_7**

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<7.4	90	BRIERE	04	CLEO $e^+e^- \rightarrow J/\psi X$

 $\Gamma(\chi_{c1} \text{ anything})/\Gamma_{\text{total}}$ **Γ_{24}/Γ**

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.90 ± 0.35 OUR FIT				
$1.90 \pm 0.43 \pm 0.14$	215	JIA	17	BELL $\Upsilon(1S) \rightarrow \gamma J/\psi(1S)$

 $\Gamma(\chi_{c1} \text{ anything})/\Gamma(J/\psi(1S) \text{ anything})$ **Γ_{24}/Γ_7**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.35 ± 0.07 OUR FIT				
$0.35 \pm 0.08 \pm 0.06$	52 ± 12	BRIERE	04	CLEO $e^+e^- \rightarrow J/\psi X$

 $\Gamma(\chi_{c1}(1P)X_{\text{tetra}})/\Gamma_{\text{total}}$ **Γ_{25}/Γ**

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<37.8 \times 10^{-6}$	90	¹ JIA	17A	BELL $e^+e^- \rightarrow \text{hadrons}$

¹ For a tetraquark state X_{tetra} , with mass in the range 1.16–2.46 GeV and width in the range 0–0.3 GeV. Measured 90% CL limits as a function of X_{tetra} mass and width range from 4.4×10^{-6} to 37.8×10^{-6} .

 $\Gamma(\chi_{c2} \text{ anything})/\Gamma(J/\psi(1S) \text{ anything})$ **Γ_{26}/Γ_7**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$0.52 \pm 0.12 \pm 0.09$	47 ± 11	BRIERE	04	CLEO $e^+e^- \rightarrow J/\psi X$

 $\Gamma(\psi(2S) \text{ anything})/\Gamma_{\text{total}}$ **Γ_{27}/Γ**

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.23 \pm 0.17 \pm 0.11$	215	SHEN	16	BELL $e^+e^- \rightarrow \psi(2S)X$

 $\Gamma(\psi(2S) \text{ anything})/\Gamma(J/\psi(1S) \text{ anything})$ **Γ_{27}/Γ_7**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$0.41 \pm 0.11 \pm 0.08$	42 ± 11	BRIERE	04	CLEO $e^+e^- \rightarrow J/\psi \pi^+ \pi^- X$

 $\Gamma(\psi(2S)\eta_c)/\Gamma_{\text{total}}$ **Γ_{28}/Γ**

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<3.6 \times 10^{-6}$	90	YANG	14	BELL $e^+e^- \rightarrow \psi(2S)X$

$\Gamma(\psi(2S)\chi_{c0})/\Gamma_{\text{total}}$					Γ_{29}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<6.5 \times 10^{-6}$	90	YANG	14	BELL	$e^+e^- \rightarrow \psi(2S)X$
$\Gamma(\psi(2S)\chi_{c1})/\Gamma_{\text{total}}$					Γ_{30}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<4.5 \times 10^{-6}$	90	YANG	14	BELL	$e^+e^- \rightarrow \psi(2S)X$
$\Gamma(\psi(2S)\chi_{c2})/\Gamma_{\text{total}}$					Γ_{31}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<2.1 \times 10^{-6}$	90	YANG	14	BELL	$e^+e^- \rightarrow \psi(2S)X$
$\Gamma(\psi(2S)\eta_c(2S))/\Gamma_{\text{total}}$					Γ_{32}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<3.2 \times 10^{-6}$	90	YANG	14	BELL	$e^+e^- \rightarrow \psi(2S)X$
$\Gamma(\psi(2S)X(3940))/\Gamma_{\text{total}}$					Γ_{33}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<2.9 \times 10^{-6}$	90	YANG	14	BELL	$e^+e^- \rightarrow \psi(2S)X$
$\Gamma(\psi(2S)X(4160))/\Gamma_{\text{total}}$					Γ_{34}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<2.9 \times 10^{-6}$	90	YANG	14	BELL	$e^+e^- \rightarrow \psi(2S)X$
$\Gamma(\psi(4230) \text{ anything, } \psi \rightarrow \psi(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{35}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<7.9 \times 10^{-5}$	90	SHEN	16	BELL	$\Upsilon(1S) \rightarrow \psi(2S)\pi^+\pi^-X$
$\Gamma(\psi(4360) \text{ anything, } \psi \rightarrow \psi(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{36}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<5.2 \times 10^{-5}$	90	SHEN	16	BELL	$\Upsilon(1S) \rightarrow \psi(2S)\pi^+\pi^-X$
$\Gamma(\psi(4660) \text{ anything, } \psi \rightarrow \psi(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{37}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<2.2 \times 10^{-5}$	90	SHEN	16	BELL	$\Upsilon(1S) \rightarrow \psi(2S)\pi^+\pi^-X$
$\Gamma(T_{c\bar{c}}(4050)^\pm \text{ anything, } X \rightarrow \psi(2S)\pi^\pm)/\Gamma_{\text{total}}$					Γ_{38}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<8.8 \times 10^{-5}$	90	SHEN	16	BELL	$\Upsilon(1S) \rightarrow \psi(2S)\pi^\pm X$
$\Gamma(T_{c\bar{c}1}(4430)^\pm \text{ anything, } T_{c\bar{c}1} \rightarrow \psi(2S)\pi^\pm)/\Gamma_{\text{total}}$					Γ_{39}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<6.7 \times 10^{-5}$	90	SHEN	16	BELL	$\Upsilon(1S) \rightarrow \psi(2S)\pi^\pm X$
$\Gamma(\chi_{c1}(3872) \text{ anything})/\Gamma_{\text{total}}$					Γ_{40}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<2.2 \times 10^{-4}$	90	¹ SHEN	16	BELL	$\Upsilon(1S) \rightarrow$ $J/\psi\pi^+\pi^-X$

¹ SHEN 16 reports $[\Gamma(\Upsilon(1S) \rightarrow \chi_{c1}(3872)\text{anything})/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))] < 9.5 \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S)) = 4.3 \times 10^{-2}$.

$\Gamma(T_{c\bar{c}1}(4200)^+ T_{c\bar{c}1}(4200)^-)/\Gamma_{\text{total}}$ Γ_{41}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<22.3 \times 10^{-6}$	90	¹ JIA	18	BELL $\Upsilon(1S) \rightarrow J/\psi \pi^\pm X$

¹ Assuming $B(T_{c\bar{c}1}(4200)^\pm \rightarrow J/\psi \pi^\pm) = 1$.

$\Gamma(T_{c\bar{c}1}(3900)^\pm T_{c\bar{c}1}(4200)^\mp)/\Gamma_{\text{total}}$ Γ_{42}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<8.1 \times 10^{-6}$	90	¹ JIA	18	BELL $\Upsilon(1S) \rightarrow J/\psi \pi^\pm X$

¹ Assuming $B(T_{c\bar{c}1}(4200)^\pm \rightarrow J/\psi \pi^\pm) = 1 = B(T_{c\bar{c}1}(3900)^\pm \rightarrow J/\psi \pi^\pm)$.

$\Gamma(T_{c\bar{c}1}(3900)^+ T_{c\bar{c}1}(3900)^-)/\Gamma_{\text{total}}$ Γ_{43}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.8 \times 10^{-6}$	90	¹ JIA	18	BELL $\Upsilon(1S) \rightarrow J/\psi \pi^\pm X$

¹ Assuming $B(T_{c\bar{c}1}(3900)^\pm \rightarrow J/\psi \pi^\pm) = 1$

$\Gamma(T_{c\bar{c}}(4050)^+ T_{c\bar{c}}(4050)^-)/\Gamma_{\text{total}}$ Γ_{44}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<15.8 \times 10^{-6}$	90	¹ JIA	18	BELL $\Upsilon(1S) \rightarrow \chi_{c1}(1P) \pi^\pm X$

¹ Assuming $B(T_{c\bar{c}}(4050)^\pm \rightarrow \chi_{c1}(1P) \pi^\pm) = 1$

$\Gamma(T_{c\bar{c}}(4250)^+ T_{c\bar{c}}(4250)^-)/\Gamma_{\text{total}}$ Γ_{45}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<26.6 \times 10^{-6}$	90	¹ JIA	18	BELL $\Upsilon(1S) \rightarrow \chi_{c1}(1P) \pi^\pm X$

¹ Assuming $B(T_{c\bar{c}}(4250)^\pm \rightarrow \chi_{c1}(1P) \pi^\pm) = 1$

$\Gamma(T_{c\bar{c}}(4050)^\pm T_{c\bar{c}}(4250)^\mp)/\Gamma_{\text{total}}$ Γ_{46}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<44.2 \times 10^{-6}$	90	¹ JIA	18	BELL $\Upsilon(1S) \rightarrow \chi_{c1}(1P) \pi^\pm X$

¹ Assuming $B(T_{c\bar{c}}(4050)^\pm \rightarrow \chi_{c1}(1P) \pi^\pm) = 1 = B(T_{c\bar{c}}(4250)^\pm \rightarrow \chi_{c1}(1P) \pi^\pm)$

$\Gamma(T_{c\bar{c}1}(4430)^+ T_{c\bar{c}1}(4430)^-)/\Gamma_{\text{total}}$ Γ_{47}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<20.3 \times 10^{-6}$	90	¹ JIA	18	BELL $\Upsilon(2S) \rightarrow \psi(2S) \pi^\pm X$

¹ Assuming $B(T_{c\bar{c}1}(4430)^\pm \rightarrow \psi(2S) \pi^\pm) = 1$

$\Gamma(T_{c\bar{c}}(4055)^\pm T_{c\bar{c}}(4055)^\mp)/\Gamma_{\text{total}}$ Γ_{48}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<23.3 \times 10^{-6}$	90	¹ JIA	18	BELL $\Upsilon(1S) \rightarrow \psi(2S) \pi^\pm X$

¹ Assuming $B(T_{c\bar{c}}(4055)^\pm \rightarrow \psi(2S) \pi^\pm) = 1$

$\Gamma(T_{c\bar{c}}(4055)^\pm T_{c\bar{c}1}(4430)^\mp)/\Gamma_{\text{total}}$ Γ_{49}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<45.5 \times 10^{-6}$	90	¹ JIA	18	BELL $\Upsilon(1S) \rightarrow \psi(2S) \pi^\pm X$

¹ Assuming $B(T_{c\bar{c}}(4055)^\pm \rightarrow \psi(2S) \pi^\pm) = 1 = B(T_{c\bar{c}1}(4430)^\pm \rightarrow \psi(2S) \pi^\pm)$

$\Gamma(\rho\pi)/\Gamma_{\text{total}}$ Γ_{50}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<3.68	90	SHEN 13	BELL	$\Upsilon(1S) \rightarrow \pi^+ \pi^- \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1 $\times 10^3$	90	BLINOV 90	MD1	$\Upsilon(1S) \rightarrow \rho^0 \pi^0$
<2 $\times 10^2$	90	FULTON 90B		$\Upsilon(1S) \rightarrow \rho^0 \pi^0$
<2.1 $\times 10^3$	90	NICZYPORUK 83	LENA	$\Upsilon(1S) \rightarrow \rho^0 \pi^0$

$\Gamma(\omega\pi^0)/\Gamma_{\text{total}}$ Γ_{51}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<3.90	90	SHEN 13	BELL	$\Upsilon(1S) \rightarrow \pi^+ \pi^- \pi^0 \pi^0$

$\Gamma(\pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{52}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<5	90	BARU 92	MD1	$\Upsilon(1S) \rightarrow \pi^+ \pi^-$

$\Gamma(K^+ K^-)/\Gamma_{\text{total}}$ Γ_{53}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<5	90	BARU 92	MD1	$\Upsilon(1S) \rightarrow K^+ K^-$

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$ Γ_{54}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<5	90	¹ BARU 96	MD1	$\Upsilon(1S) \rightarrow p\bar{p}$

¹Supersedes BARU 92 in this node.

$\Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ Γ_{55}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$2.14 \pm 0.72 \pm 0.34$	26 ± 9		SHEN 13	BELL	$\Upsilon(1S) \rightarrow \pi^+ \pi^- \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<18.4	90		ANASTASSOV 99	CLE2	$e^+ e^- \rightarrow \text{hadrons}$

$\Gamma(\phi K^+ K^-)/\Gamma_{\text{total}}$ Γ_{56}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$2.36 \pm 0.37 \pm 0.29$	56	SHEN 12A	BELL	$\Upsilon(1S) \rightarrow 2(K^+ K^-)$

$\Gamma(\omega\pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{57}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$4.46 \pm 0.67 \pm 0.72$	64	SHEN 12A	BELL	$\Upsilon(1S) \rightarrow 2(\pi^+ \pi^-) \pi^0$

$\Gamma(K^*(892)^0 K^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{58}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$4.42 \pm 0.50 \pm 0.58$	173	SHEN 12A	BELL	$\Upsilon(1S) \rightarrow K^+ K^- \pi^+ \pi^-$

$\Gamma(\phi f'_2(1525))/\Gamma_{\text{total}}$ Γ_{59}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<1.63	90	SHEN 12A	BELL	$\Upsilon(1S) \rightarrow 2(K^+ K^-)$

$\Gamma(\omega f_2(1270))/\Gamma_{\text{total}}$ Γ_{60}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<1.79	90	SHEN	12A	BELL $\Upsilon(1S) \rightarrow 2(\pi^+\pi^-)\pi^0$

 $\Gamma(\rho(770)a_2(1320))/\Gamma_{\text{total}}$ Γ_{61}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<2.24	90	SHEN	12A	BELL $\Upsilon(1S) \rightarrow 2(\pi^+\pi^-)\pi^0$

 $\Gamma(K^*(892)^0\bar{K}_2^*(1430)^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{62}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.02 \pm 0.68 \pm 0.34$	42	SHEN	12A	BELL $\Upsilon(1S) \rightarrow K^+K^-\pi^+\pi^-$

 $\Gamma(K_1(1270)^\pm K^\mp)/\Gamma_{\text{total}}$ Γ_{63}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<2.41	90	SHEN	12A	BELL $\Upsilon(1S) \rightarrow K^+K^-\pi^+\pi^-$

 $\Gamma(K_1(1400)^\pm K^\mp)/\Gamma_{\text{total}}$ Γ_{64}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.02 \pm 0.35 \pm 0.22$	24	SHEN	12A	BELL $\Upsilon(1S) \rightarrow K^+K^-\pi^+\pi^-$

 $\Gamma(b_1(1235)^\pm \pi^\mp)/\Gamma_{\text{total}}$ Γ_{65}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<1.25	90	SHEN	12A	BELL $\Upsilon(1S) \rightarrow 2(\pi^+\pi^-)\pi^0$

 $\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}$ Γ_{66}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$12.8 \pm 2.0 \pm 2.3$	143 ± 22	SHEN	13	BELL $\Upsilon(1S) \rightarrow \pi^+\pi^-\pi^0\pi^0$

 $\Gamma(K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{67}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$1.59 \pm 0.33 \pm 0.18$	37 ± 8		SHEN	13	BELL $\Upsilon(1S) \rightarrow K_S^0 K^- \pi^+$

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

<3.4	90	¹ DOBBS	12A	$\Upsilon(1S) \rightarrow K_S^0 K^- \pi^+$
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¹ Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.

 $\Gamma(K^*(892)^0\bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{68}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$2.92 \pm 0.85 \pm 0.37$	16 ± 5	SHEN	13	BELL $\Upsilon(1S) \rightarrow K_S^0 K^- \pi^+$

 $\Gamma(K^*(892)^- K^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{69}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<1.11	90	SHEN	13	BELL $\Upsilon(1S) \rightarrow K_S^0 K^- \pi^+$

 $\Gamma(f_1(1285) \text{ anything})/\Gamma_{\text{total}}$ Γ_{70}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$4.6 \pm 2.8 \pm 1.3$	3.1k	JIA	17A	BELL $e^+e^- \rightarrow \text{hadrons}$

$\Gamma(D^*(2010)^\pm \text{ anything})/\Gamma_{\text{total}}$ Γ_{71}/Γ

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$25.2 \pm 1.3 \pm 1.5$	$\approx 2k$	¹	AUBERT 10c	BABR	$\Upsilon(2S) \rightarrow \pi^+ \pi^- \Upsilon(1S)$

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

<19 90 ² ALBRECHT 92J ARG $e^+ e^- \rightarrow D^0 \pi^\pm X$

¹ For $x_p > 0.1$.

² For $x_p > 0.2$.

 $\Gamma(f_1(1285) X_{\text{tetra}})/\Gamma_{\text{total}}$ Γ_{72}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<62.4 \times 10^{-6}$	90	¹ JIA 17A	BELL	$e^+ e^- \rightarrow \text{hadrons}$

¹ For a tetraquark state X_{tetra} , with mass in the range 1.16–2.46 GeV and width in the range 0–0.3 GeV. Measured 90% CL limits as a function of X_{tetra} mass and width range from 4.6×10^{-6} to 62.4×10^{-6} .

 $\Gamma(\overline{2}H \text{ anything})/\Gamma_{\text{total}}$ Γ_{73}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
2.85 ± 0.25 OUR AVERAGE				
$2.81 \pm 0.49^{+0.20}_{-0.24}$		LEES 14G	BABR	$e^+ e^- \rightarrow \overline{2}H X$
$2.86 \pm 0.19 \pm 0.21$	455	ASNER 07	CLEO	$e^+ e^- \rightarrow \overline{2}H X$

 $\Gamma(\text{Sum of 100 exclusive modes})/\Gamma_{\text{total}}$ Γ_{74}/Γ

VALUE (units 10^{-2})	DOCUMENT ID	COMMENT
1.200 ± 0.017	^{1,2} DOBBS 12A	$\Upsilon(1S) \rightarrow \text{hadrons}$

¹ DOBBS 12A presents individual exclusive branching fractions or upper limits for 100 modes of four to ten pions, kaons, or protons.

² Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.

 $\Gamma(ggg, \gamma gg \rightarrow \overline{d} \text{ anything})/\Gamma(ggg, \gamma gg \rightarrow \text{anything})$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.36 \pm 0.23 \pm 0.25$	455	ASNER 07	CLEO	$e^+ e^- \rightarrow \overline{d} X$

 $\Gamma(\gamma \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{75}/Γ

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
$6.3 \pm 1.2 \pm 1.3$	¹ ANASTASSOV 99	CLE2	$e^+ e^- \rightarrow \text{hadrons}$

¹ For $m_{\pi\pi} > 1 \text{ GeV}$.

 $\Gamma(\gamma \pi^0 \pi^0)/\Gamma_{\text{total}}$ Γ_{76}/Γ

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
$1.7 \pm 0.6 \pm 0.3$	¹ ANASTASSOV 99	CLE2	$e^+ e^- \rightarrow \text{hadrons}$

¹ For $m_{\pi\pi} > 1 \text{ GeV}$.

 $\Gamma(\gamma \pi \pi (\text{S-wave}))/\Gamma_{\text{total}}$ Γ_{77}/Γ

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
$4.63 \pm 0.56 \pm 0.48$	LEES 18A	BABR	$\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$

$\Gamma(\gamma\pi^0\eta)/\Gamma_{\text{total}}$					Γ_{78}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
<2.4	90	¹ BESSON	07A	CLEO	$e^+e^- \rightarrow \Upsilon(1S)$
¹ BESSON 07A obtained this limit for $0.7 < m_{\pi^0\eta} < 3$ GeV.					

$\Gamma(\gamma K^+ K^-)/\Gamma_{\text{total}}$ ($2 < m_{K^+ K^-} < 3$ GeV)					Γ_{79}/Γ
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
1.14±0.08±0.10	90	ATHAR	06	CLE3	$\Upsilon(1S) \rightarrow \gamma K^+ K^-$

$\Gamma(\gamma p \bar{p})/\Gamma_{\text{total}}$ ($2 < m_{p \bar{p}} < 3$ GeV)					Γ_{80}/Γ
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<0.6	90	ATHAR	06	CLE3	$\Upsilon(1S) \rightarrow \gamma p \bar{p}$

$\Gamma(\gamma 2h^+ 2h^-)/\Gamma_{\text{total}}$					Γ_{81}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
7.0±1.1±1.0	80 ± 12	FULTON	90B	CLEO	$e^+e^- \rightarrow$ hadrons

$\Gamma(\gamma 3h^+ 3h^-)/\Gamma_{\text{total}}$					Γ_{82}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
5.4±1.5±1.3	39 ± 11	FULTON	90B	CLEO	$e^+e^- \rightarrow$ hadrons

$\Gamma(\gamma 4h^+ 4h^-)/\Gamma_{\text{total}}$					Γ_{83}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
7.4±2.5±2.5	36 ± 12	FULTON	90B	CLEO	$e^+e^- \rightarrow$ hadrons

$\Gamma(\gamma \pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}$					Γ_{84}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.9±0.7±0.6	29 ± 8	FULTON	90B	CLEO	$e^+e^- \rightarrow$ hadrons

$\Gamma(\gamma 2\pi^+ 2\pi^-)/\Gamma_{\text{total}}$					Γ_{85}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.5±0.7±0.5	26 ± 7	FULTON	90B	CLEO	$e^+e^- \rightarrow$ hadrons

$\Gamma(\gamma 3\pi^+ 3\pi^-)/\Gamma_{\text{total}}$					Γ_{86}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.5±0.9±0.8	17 ± 5	FULTON	90B	CLEO	$e^+e^- \rightarrow$ hadrons

$\Gamma(\gamma 2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}$					Γ_{87}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.4±0.9±0.8	18 ± 7	FULTON	90B	CLEO	$e^+e^- \rightarrow$ hadrons

$\Gamma(\gamma \pi^+ \pi^- p \bar{p})/\Gamma_{\text{total}}$					Γ_{88}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.5±0.5±0.3	22 ± 6	FULTON	90B	CLEO	$e^+e^- \rightarrow$ hadrons

$\Gamma(\gamma 2\pi^+ 2\pi^- p\bar{p})/\Gamma_{\text{total}}$ Γ_{89}/Γ

VALUE (units 10^{-4})	EVTs	DOCUMENT ID	TECN	COMMENT
$0.4 \pm 0.4 \pm 0.4$	7 ± 6	FULTON	90B	CLEO $e^+e^- \rightarrow \text{hadrons}$

$\Gamma(\gamma 2K^+ 2K^-)/\Gamma_{\text{total}}$ Γ_{90}/Γ

VALUE (units 10^{-4})	EVTs	DOCUMENT ID	TECN	COMMENT
0.2 ± 0.2	2 ± 2	FULTON	90B	CLEO $e^+e^- \rightarrow \text{hadrons}$

$\Gamma(\gamma\eta'(958))/\Gamma_{\text{total}}$ Γ_{91}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
< 1.9	90	ATHAR	07A	CLEO $\Upsilon(1S) \rightarrow \gamma\eta' \rightarrow \gamma\pi^+\pi^-\eta, \gamma\rho$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 16	90	RICHICHI	01B	CLE2 $\Upsilon(1S) \rightarrow \gamma\eta' \rightarrow \gamma\eta\pi^+\pi^-$

$\Gamma(\gamma\eta)/\Gamma_{\text{total}}$ Γ_{92}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
< 1.0	90	ATHAR	07A	CLEO $\Upsilon(1S) \rightarrow \gamma\eta \rightarrow \gamma\gamma\gamma, \gamma\pi^+\pi^-\pi^0, \gamma 3\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 21	90	MASEK	02	CLEO $\Upsilon(1S) \rightarrow \gamma\eta$

$\Gamma(\gamma f_0(980))/\Gamma_{\text{total}}$ Γ_{93}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 3	90	¹ ATHAR	06	CLE3 $\Upsilon(1S) \rightarrow \gamma\pi^+\pi^-$

¹ Assuming $B(f_0(980) \rightarrow \pi\pi) = 1$.

$\Gamma(\gamma f'_2(1525))/\Gamma_{\text{total}}$ Γ_{94}/Γ

VALUE (units 10^{-5})	CL%	EVTs	DOCUMENT ID	TECN	COMMENT
2.9 ± 0.6 OUR AVERAGE					
$2.13 \pm 0.28 \pm 0.72$			¹ LEES	18A	BABR $\Upsilon(1S) \rightarrow \gamma K^+ K^-$
$4.0 \pm 1.4 \pm 0.1$		17	² BESSION	11	CLEO $\Upsilon(1S) \rightarrow K_S^0 K_S^0$
$3.7^{+0.9}_{-0.7} \pm 0.8$			ATHAR	06	CLE3 $\Upsilon(1S) \rightarrow \gamma K^+ K^-$

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

< 14	90	³ FULTON	90B	CLEO $\Upsilon(1S) \rightarrow \gamma K^+ K^-$
< 19.4	90	³ ALBRECHT	89	ARG $\Upsilon(1S) \rightarrow \gamma K^+ K^-$

¹ Using $B(f'_2(1525) \rightarrow K\bar{K}) = 0.887 \pm 0.022$ and $B(K^0\bar{K}^0) = 1/2 B(K\bar{K})$.

² BESSION 11 reports $(4.0 \pm 1.3 \pm 0.6) \times 10^{-5}$ from a measurement of $[\Gamma(\Upsilon(1S) \rightarrow \gamma f'_2(1525))/\Gamma_{\text{total}}] \times [B(f'_2(1525) \rightarrow K\bar{K})]$ assuming $B(f'_2(1525) \rightarrow K\bar{K}) = (88.8 \pm 3.1) \times 10^{-2}$, which we rescale to our best value $B(f'_2(1525) \rightarrow K\bar{K}) = (88.8 \pm 2.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. The result also assumes $B(K_S^0 \rightarrow \pi^+\pi^-) = (69.20 \pm 0.05)\%$ and $B(f'_2(1525) \rightarrow K\bar{K}) = 4 B(f'_2(1525) \rightarrow K_S^0 K_S^0)$.

³ Assuming $B(f'_2(1525) \rightarrow K\bar{K}) = 0.71$.

$\Gamma(\gamma f_2(1270))/\Gamma_{\text{total}}$ Γ_{95}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
10.1 ± 0.6	OUR AVERAGE			
$10.15 \pm 0.59^{+0.54}_{-0.43}$		¹ LEES	18A	BABR $\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$
$10.5 \pm 1.6^{+1.9}_{-1.8}$		² BESSON	07A	CLE3 $\Upsilon(1S) \rightarrow \gamma \pi^0 \pi^0$
$10.2 \pm 0.8 \pm 0.7$		ATHAR	06	CLE3 $\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$
$8.1 \pm 2.3^{+2.9}_{-2.7}$		³ ANASTASSOV	99	CLE2 $e^+ e^- \rightarrow \text{hadrons}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 21	90	³ FULTON	90B	CLEO $\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$
< 13	90	³ ALBRECHT	89	ARG $\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$
< 81	90	SCHMITT	88	CBAL $\Upsilon(1S) \rightarrow \gamma X$
¹ Using $B(f_2(1270) \rightarrow \pi^0 \pi^0) = 1/3 B(f_2(1270) \rightarrow \pi \pi)$ and $B(f_2(1270) \rightarrow \pi \pi) = (84.2^{+2.9}_{-0.9})\%$.				
² Using $B(f_2(1270) \rightarrow \pi^0 \pi^0) = B(f_2(1270) \rightarrow \pi \pi)/3$ and $B(f_2(1270) \rightarrow \pi \pi) = (84.7^{+2.5}_{-1.2})\%$.				
³ Using $B(f_2(1270) \rightarrow \pi \pi) = 0.84$.				

$\Gamma(\gamma \eta(1405))/\Gamma_{\text{total}}$ Γ_{96}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 8.2	90	¹ FULTON	90B	CLEO $\Upsilon(1S) \rightarrow \gamma K^\pm \pi^\mp K_S^0$
¹ Includes unknown branching ratio of $\eta(1405) \rightarrow K^\pm \pi^\mp K_S^0$.				

$\Gamma(\gamma f_0(1500))/\Gamma_{\text{total}}$ Γ_{97}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 1.5	90	¹ BESSON	07A	CLEO $e^+ e^- \rightarrow \Upsilon(1S) \rightarrow \gamma \pi^0 \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 6.1	90	² BESSON	07A	CLEO $e^+ e^- \rightarrow \Upsilon(1S) \rightarrow \gamma \eta \eta$
¹ Using $B(f_0(1500) \rightarrow \pi^0 \pi^0) = B(f_0(1500) \rightarrow \pi \pi)/3$ and $B(f_0(1500) \rightarrow \pi \pi) = (0.349 \pm 0.023)\%$.				
² Calculated by us using $B(f_0(1500) \rightarrow \eta \eta) = (5.1 \pm 0.9)\%$.				

$\Gamma(\gamma f_0(1500) \rightarrow \gamma K^+ K^-)/\Gamma_{\text{total}}$ Γ_{98}/Γ

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
$1.04 \pm 0.14 \pm 0.33$	¹ LEES	18A	BABR $e^+ e^- \rightarrow \Upsilon(1S) \rightarrow \gamma K^+ K^-$
¹ LEES 18A quotes $B(\Upsilon(1S) \rightarrow \gamma f_0(1500) \rightarrow \gamma K \bar{K}) = (2.08 \pm 0.27 \pm 0.65) \times 10^{-5}$ assuming $B(K^0 \bar{K}^0) = 1/2 B(K \bar{K})$.			

$\Gamma(\gamma f_0(1710))/\Gamma_{\text{total}}$ Γ_{99}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
< 2.6	90	¹ ALBRECHT	89	ARG $\Upsilon(1S) \rightarrow \gamma K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 6.3	90	¹ FULTON	90B	CLEO $\Upsilon(1S) \rightarrow \gamma K^+ K^-$
< 19	90	¹ FULTON	90B	CLEO $\Upsilon(1S) \rightarrow \gamma K_S^0 K_S^0$
< 8	90	² ALBRECHT	89	ARG $\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$
< 24	90	³ SCHMITT	88	CBAL $\Upsilon(1S) \rightarrow \gamma X$

¹ Assuming $B(f_0(1710) \rightarrow K\bar{K}) = 0.38$.² Assuming $B(f_0(1710) \rightarrow \pi\pi) = 0.04$.³ Assuming $B(f_0(1710) \rightarrow \eta\eta) = 0.18$. **$\Gamma(\gamma f_0(1710) \rightarrow \gamma K^+ K^-)/\Gamma_{\text{total}}$ Γ_{100}/Γ**

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
$1.01 \pm 0.26 \pm 0.18$		¹ LEES 18A	BABR	$e^+e^- \rightarrow \Upsilon(1S) \rightarrow \gamma K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 0.7	90	ATHAR 06	CLEO	$e^+e^- \rightarrow \Upsilon(1S) \rightarrow \gamma K^+ K^-$
¹ LEES 18A quotes $B(\Upsilon(1S) \rightarrow \gamma f_0(1710) \rightarrow \gamma K\bar{K}) = (2.02 \pm 0.51 \pm 0.35) \times 10^{-5}$ assuming $B(K^0\bar{K}^0) = 1/2 B(K\bar{K})$.				

 $\Gamma(\gamma f_0(1710) \rightarrow \gamma \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{101}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
$0.53 \pm 0.17 \pm 0.11$		¹ LEES 18A	BABR	$\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$
¹ LEES 18A quotes $B(\Upsilon(1S) \rightarrow \gamma f_0(1710) \rightarrow \gamma \pi\pi) = (0.79 \pm 0.26 \pm 0.17) \times 10^{-5}$ assuming $B(\pi^0\pi^0) = 1/3 B(\pi\pi)$.				

 $\Gamma(\gamma f_0(1710) \rightarrow \gamma \pi^0 \pi^0)/\Gamma_{\text{total}}$ Γ_{102}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
< 1.4	90	BESSION 07A	CLEO	$e^+e^- \rightarrow \Upsilon(1S) \rightarrow \gamma \pi^0 \pi^0$

 $\Gamma(\gamma f_0(1710) \rightarrow \gamma \eta \eta)/\Gamma_{\text{total}}$ Γ_{103}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
< 1.8	90	BESSION 07A	CLEO	$e^+e^- \rightarrow \Upsilon(1S) \rightarrow \gamma \eta \eta$

 $\Gamma(\gamma f_4(2050))/\Gamma_{\text{total}}$ Γ_{104}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 5.3	90	¹ ATHAR 06	CLE3	$\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$
¹ Assuming $B(f_4(2050) \rightarrow \pi\pi) = 0.17$.				

 $\Gamma(\gamma f_0(2200) \rightarrow \gamma K^+ K^-)/\Gamma_{\text{total}}$ Γ_{105}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 0.0002	90	BARU 89	MD1	$\Upsilon(1S) \rightarrow \gamma K^+ K^-$

 $\Gamma(\gamma f_J(2220) \rightarrow \gamma K^+ K^-)/\Gamma_{\text{total}}$ Γ_{106}/Γ

VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT
< 8	90	ATHAR 06	CLE3	$\Upsilon(1S) \rightarrow \gamma K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 160	90	MASEK 02	CLEO	$\Upsilon(1S) \rightarrow \gamma K^+ K^-$
< 150	90	FULTON 90B	CLEO	$\Upsilon(1S) \rightarrow \gamma K^+ K^-$
< 290	90	ALBRECHT 89	ARG	$\Upsilon(1S) \rightarrow \gamma K^+ K^-$
< 2000	90	BARU 89	MD1	$\Upsilon(1S) \rightarrow \gamma K^+ K^-$

 $\Gamma(\gamma f_J(2220) \rightarrow \gamma \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{107}/Γ

VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT
< 6	90	ATHAR 06	CLE3	$\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$

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

<120 90 MASEK 02 CLEO $\Upsilon(1S) \rightarrow \gamma \pi^+ \pi^-$

$\Gamma(\gamma f_J(2220) \rightarrow \gamma p \bar{p})/\Gamma_{\text{total}}$ Γ_{108}/Γ

VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT
< 11	90	ATHAR	06	CLE3 $\Upsilon(1S) \rightarrow \gamma p \bar{p}$

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

<160 90 MASEK 02 CLEO $\Upsilon(1S) \rightarrow \gamma p \bar{p}$

$\Gamma(\gamma \eta(2225) \rightarrow \gamma \phi \phi)/\Gamma_{\text{total}}$ Γ_{109}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.003	90	BARU	89	MD1 $\Upsilon(1S) \rightarrow \gamma K^+ K^- K^+ K^-$

$\Gamma(\gamma \eta_c(1S))/\Gamma_{\text{total}}$ Γ_{110}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 2.9×10^{-5}	90	¹ KATRENKO	20	BELL $e^+ e^- \rightarrow \gamma + \text{hadrons}$

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

< 5.7×10^{-5} 90 SHEN 10A BELL $\Upsilon(1S) \rightarrow \gamma X$

¹Using $\Upsilon(2S) \rightarrow \Upsilon(1S) \pi^+ \pi^-$ decays.

$\Gamma(\gamma \eta_c(2S))/\Gamma_{\text{total}}$ Γ_{111}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 4×10^{-4}	90	¹ KATRENKO	20	BELL $e^+ e^- \rightarrow \gamma + \text{hadrons}$

¹Using $\Upsilon(2S) \rightarrow \Upsilon(1S) \pi^+ \pi^-$ decays.

$\Gamma(\gamma \chi_{c0})/\Gamma_{\text{total}}$ Γ_{112}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 6.6×10^{-5}	90	¹ KATRENKO	20	BELL $\Upsilon(1S) \rightarrow \gamma + \text{hadrons}$

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

< 6.5×10^{-4} 90 SHEN 10A BELL $\Upsilon(1S) \rightarrow \gamma X$

¹Using $\Upsilon(2S) \rightarrow \Upsilon(1S) \pi^+ \pi^-$ decays.

$\Gamma(\gamma \chi_{c1})/\Gamma_{\text{total}}$ Γ_{113}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$4.7^{+2.4+0.4}_{-1.8-0.5}$	5		¹ KATRENKO	20	BELL $\Upsilon(1S) \rightarrow \gamma + \text{hadrons}$

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

<2.3 90 SHEN 10A BELL $\Upsilon(1S) \rightarrow \gamma X$

¹Using $\Upsilon(2S) \rightarrow \Upsilon(1S) \pi^+ \pi^-$ decays.

$\Gamma(\gamma \chi_{c2})/\Gamma_{\text{total}}$ Γ_{114}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 7.6×10^{-6}	90	SHEN	10A	BELL $\Upsilon(1S) \rightarrow \gamma X$

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

< 3.3×10^{-5} 90 ¹ KATRENKO 20 BELL $\Upsilon(1S) \rightarrow \gamma + \text{hadrons}$

¹Using $\Upsilon(2S) \rightarrow \Upsilon(1S) \pi^+ \pi^-$ decays.

$\Gamma(\gamma\chi_{c1}(3872))/\Gamma_{\text{total}}$ Γ_{115}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<4 \times 10^{-5}$	90	¹ SHEN 10A	BELL	$\Upsilon(1S) \rightarrow \gamma X$
¹ SHEN 10A reports $[\Gamma(\Upsilon(1S) \rightarrow \gamma\chi_{c1}(3872))/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))] < 1.6 \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S)) = 4.3 \times 10^{-2}$.				

 $\Gamma(\gamma\chi_{c1}(3872), \chi_{c1} \rightarrow \pi^+\pi^-\pi^0 J/\psi)/\Gamma_{\text{total}}$ Γ_{116}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.8 \times 10^{-6}$	90	SHEN 10A	BELL	$\Upsilon(1S) \rightarrow \gamma X$

 $\Gamma(\gamma\chi_{c0}(3915) \rightarrow \omega J/\psi)/\Gamma_{\text{total}}$ Γ_{117}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<3.0	90	SHEN 10A	BELL	$\Upsilon(1S) \rightarrow \gamma X$

 $\Gamma(\gamma\chi_{c1}(4140) \rightarrow \phi J/\psi)/\Gamma_{\text{total}}$ Γ_{118}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<2.2	90	SHEN 10A	BELL	$\Upsilon(1S) \rightarrow \gamma X$

 $\Gamma(\gamma X \bar{X} (m_X < 3.1 \text{ GeV}))/\Gamma_{\text{total}}$ Γ_{119}/Γ
(X $\bar{X}$ = vectors with $m < 3.1$ GeV)

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<1	90	¹ BALEST 95	CLEO	$e^+e^- \rightarrow \gamma + X \bar{X}$

¹ For a noninteracting vector X with mass < 3.1 GeV.
 $\Gamma(\gamma X \bar{X} (m_X < 4.5 \text{ GeV}))/\Gamma_{\text{total}}$ Γ_{120}/Γ
X and $\bar{X}$ = zero spin with $m < 4.5$ GeV

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<24	90	¹ DEL-AMO-SA...11J	BABR	$e^+e^- \rightarrow \gamma + X \bar{X}$

¹ For a noninteracting scalar X with mass $m < 4.5$ GeV.
 $\Gamma(\gamma X \rightarrow \gamma + \geq 4 \text{ prongs})/\Gamma_{\text{total}}$ Γ_{121}/Γ
(1.5 GeV $< m_X < 5.0$ GeV)

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<1.78	95	ROSNER 07A	CLEO	$e^+e^- \rightarrow \gamma X$

 $\Gamma(\gamma A^0)/\Gamma_{\text{total}}$ Γ_{122}/Γ
(A⁰ = scalar with $m < 8.0$ GeV)

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

$<4.5 \times 10^{-6}$	90	¹ DEL-AMO-SA...11J	BABR	$e^+e^- \rightarrow \gamma + X$
$<3 \times 10^{-5}$	90	² BALEST 95	CLEO	$e^+e^- \rightarrow \gamma + X$
$<5.6 \times 10^{-5}$	90	² ANTREASYAN 90C	CBAL	$e^+e^- \rightarrow \gamma + X$

¹ For a non-interacting scalar or pseudoscalar, A⁰, with mass $m_{A^0} < 8.0$ GeV. 90% CL upper limits range from 1.9×10^{-6} to 4.5×10^{-6} .² For any non-interacting long-lived particle with mass < 7.2 GeV.

$$\Gamma(\gamma A^0 \rightarrow \gamma \mu^+ \mu^-)/\Gamma_{\text{total}} \quad \Gamma_{123}/\Gamma$$

($201 < M(\mu^+ \mu^-) < 3565$ MeV)

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
< 9	90	¹ LOVE	08	CLEO $e^+ e^- \rightarrow \gamma A^0 \rightarrow \gamma \mu^+ \mu^-$
• • •		We do not use the following data for averages, fits, limits, etc. • • •		
<16	90	² JIA	22	BELL $\Upsilon(2S) \rightarrow \gamma \mu^+ \mu^- \pi^+ \pi^-$
< 9.7	90	³ LEES	13c	BABR $e^+ e^- \rightarrow \gamma A^0 \rightarrow \gamma \mu^+ \mu^-$

¹ For a narrow scalar or pseudoscalar, A^0 , with $201 < M(\mu^+ \mu^-) < 3565$ MeV, excluding J/ψ . Measured 90% CL limits as a function of $M(\mu^+ \mu^-)$ range from $1-9 \times 10^{-6}$.

² For a narrow scalar or pseudoscalar, A^0 , with $0.22 < M(A^0) < 9.2$ GeV, resulting in 90% CL upper limits ranging from 3.1×10^{-7} at $M(A^0) = 0.22$ GeV to 1.6×10^{-5} at $M(A^0) = 9.2$ GeV.

³ For a narrow scalar or pseudoscalar, A^0 , with mass in the range 0.212–9.2 GeV, excluding J/ψ and $\psi(2S)$. Measured 90% CL limits as a function of m_{A^0} are in the range $0.28-9.7 \times 10^{-6}$.

$$\Gamma(\gamma A^0 \rightarrow \gamma \tau^+ \tau^-)/\Gamma_{\text{total}} \quad \Gamma_{124}/\Gamma$$

($2m_\tau < M(\tau^+ \tau^-) < 9.2$ GeV)

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<130	90	¹ LEES	13R	BABR $\Upsilon(2S) \rightarrow \gamma \tau^+ \tau^- \pi^+ \pi^-$
• • •		We do not use the following data for averages, fits, limits, etc. • • •		
<150	90	² JIA	22	BELL $\Upsilon(2S) \rightarrow \gamma \tau^+ \tau^- \pi^+ \pi^-$
< 50	90	³ LOVE	08	CLEO $e^+ e^- \rightarrow \gamma A^0 \rightarrow \gamma \tau^+ \tau^-$

¹ For a narrow scalar or pseudoscalar, A^0 , with $2m_\tau < M(A^0) < 9.2$ GeV, resulting in 90% CL upper limits of 0.9×10^{-5} at $M(A^0) = 2m_\tau$, $\approx 1.5 \times 10^{-5}$ at $M(A^0) = 7.5$ GeV, and 13×10^{-5} at $M(A^0) = 9.2$ GeV.

² For a narrow scalar or pseudoscalar, A^0 , with $2m_\tau < M(A^0) < 9.2$ GeV, resulting in 90% CL upper limits ranging from 3.8×10^{-6} at $M(A^0) = 2m_\tau$ to 1.5×10^{-4} at $M(A^0) = 9.2$ GeV.

³ For a narrow scalar or pseudoscalar, A^0 , with $2m_\tau < M(A^0) < 7.5$ GeV, resulting in 90% CL limits ranging from 1×10^{-5} at $M(A^0)=2m_\tau$ to 5×10^{-5} at $M(A^0)=7.5$ GeV.

$$\Gamma(\gamma A^0 \rightarrow \gamma g g)/\Gamma_{\text{total}} \quad \Gamma_{125}/\Gamma$$

($0.5 \text{ GeV} < m < 9.0 \text{ GeV}$)

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 1×10^{-2}	90	¹ LEES	13L	BABR $\Upsilon(1S) \rightarrow \gamma X$

¹ For a narrow, CP -odd pseudoscalar, A^0 , searched for in 26 hadronic decay modes with invariant mass $0.5 \text{ GeV} < m_{A^0} < 9.0 \text{ GeV}$. Measured 90% CL limits as a function of m_{A^0} range from 10^{-6} to 10^{-2} .

$$\Gamma(\gamma A^0 \rightarrow \gamma s \bar{s})/\Gamma_{\text{total}} \quad \Gamma_{126}/\Gamma$$

($0.5 \text{ GeV} < m < 9.0 \text{ GeV}$)

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 1×10^{-3}	90	¹ LEES	13L	BABR $\Upsilon(1S) \rightarrow \gamma X$

¹ For a narrow, CP -odd pseudoscalar, A^0 , searched for in 14 hadronic decay modes with invariant mass $1.5 \text{ GeV} < m_{A^0} < 9.0 \text{ GeV}$. Measured 90% CL limits as a function of m_{A^0} range from 10^{-5} to 10^{-3} .

LEPTON FAMILY NUMBER (LF) VIOLATING MODES $\Gamma(e^\pm \mu^\mp)/\Gamma_{\text{total}}$ Γ_{127}/Γ

VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT
<3.9	90	PATRA	22	BELL $\Upsilon(2S) \rightarrow \pi^+ \pi^- e^\pm \mu^\mp$

 $\Gamma(\mu^\pm \tau^\mp)/\Gamma_{\text{total}}$ Γ_{128}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<2.7 $\times 10^{-6}$	90	PATRA	22	BELL $\Upsilon(2S) \rightarrow \pi^+ \pi^- \mu^\pm \tau^\mp$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<6.0 $\times 10^{-6}$	95	LOVE	08A	CLEO $e^+ e^- \rightarrow \mu^\pm \tau^\mp$

 $\Gamma(e^\pm \tau^\mp)/\Gamma_{\text{total}}$ Γ_{129}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<2.7	90	PATRA	22	BELL $\Upsilon(2S) \rightarrow \pi^+ \pi^- e^\pm \tau^\mp$

 $\Gamma(\gamma e^\pm \mu^\mp)/\Gamma_{\text{total}}$ Γ_{130}/Γ

VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT
<4.2	90	PATRA	22	BELL $\Upsilon(2S) \rightarrow \pi^+ \pi^- \gamma e^\pm \mu^\mp$

 $\Gamma(\gamma \mu^\pm \tau^\mp)/\Gamma_{\text{total}}$ Γ_{131}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<6.1	90	PATRA	22	BELL $\Upsilon(2S) \rightarrow \pi^+ \pi^- \gamma \mu^\pm \tau^\mp$

 $\Gamma(\gamma e^\pm \tau^\mp)/\Gamma_{\text{total}}$ Γ_{132}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<6.5	90	PATRA	22	BELL $\Upsilon(2S) \rightarrow \pi^+ \pi^- \gamma e^\pm \tau^\mp$

OTHER DECAYS

 $\Gamma(\text{invisible})/\Gamma_{\text{total}}$ Γ_{133}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
< 3.0	90	AUBERT	09AX	BABR $\Upsilon(3S) \rightarrow \pi^+ \pi^- \Upsilon(1S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<39	90	RUBIN	07	CLEO $\Upsilon(2S) \rightarrow \pi^+ \pi^- \Upsilon(1S)$
<25	90	TAJIMA	07	BELL $\Upsilon(3S) \rightarrow \pi^+ \pi^- \Upsilon(1S)$

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