$\psi(2S)$

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

See the Review on "$\psi(2S)$ and χ_c branching ratios" before the $\chi_{c0}(1P)$ Listings.

$\psi(2S)$ MASS

OUR FIT includes measurements of $m_{\psi(2S)}$, $m_{\psi(3770)}$, and $m_{\psi(3770)} - m_{\psi(2S)}$.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
$3686.109^{+0.012}_{-0.014}$ OUR FIT					
$3686.108^{+0.011}_{-0.014}$ OUR AVERAGE					
$3686.12 \pm 0.06 \pm 0.10$	4k	AAIJ	12H	LHCB	$pp \rightarrow J/\psi \pi^+ \pi^- X$
$3686.114 \pm 0.007 ^{+0.011}_{-0.016}$		[1] ANASHIN	12	KEDR	$e^+ e^- \rightarrow$ hadrons
$3686.111 \pm 0.025 \pm 0.009$		AULCHENKO	03	KEDR	$e^+ e^- \rightarrow$ hadrons
3685.95 ± 0.10	413	[2] ARTAMONOV	00	OLYA	$e^+ e^- \rightarrow$ hadrons
$3685.98 \pm 0.09 \pm 0.04$		[3] ARMSTRONG	93B	E760	$\overline{p} p \rightarrow e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3686.00 ± 0.10	413	[4] ZHOLENTZ	80	OLYA	$e^+ e^-$

[1] From the scans in 2004 and 2006. ANASHIN 12 reports the value $3686.114 \pm 0.007 \pm 0.011 ^{+0.002}_{-0.012}$ MeV, where the third uncertainty is due to assumptions on the interference between the resonance and hadronic continuum. We combined the two systematic uncertainties.

[2] Reanalysis of ZHOLENTZ 80 using new electron mass (COHEN 87) and radiative corrections (KURAEV 85).

[3] Mass central value and systematic error recalculated by us according to Eq. (16) in ARMSTRONG 93B, using the value for the $J/\psi(1S)$ mass from AULCHENKO 03.

[4] Superseded by ARTAMONOV 00.

$m_{\psi(2S)} - m_{J/\psi(1S)}$

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
589.188 ± 0.028 OUR AVERAGE				
$589.194 \pm 0.027 \pm 0.011$	[5] AULCHENKO	03	KEDR	$e^+ e^- \rightarrow$ hadrons
589.7 ± 1.2	LEMOIGNE	82	GOLI	$185\ \pi^- \text{Be} \rightarrow \gamma \mu^+ \mu^- \text{A}$
589.07 ± 0.13	[5] ZHOLENTZ	80	OLYA	$e^+ e^-$
588.7 ± 0.8	LUTH	75	MRK1	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
588 ± 1	[6] BAI	98E	BES	$e^+ e^-$

[5] Redundant with data in mass above.
[6] Systematic errors not evaluated.

$\psi(2S)$ WIDTH

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
304± 9 OUR FIT					
286±16 OUR AVERAGE					
358±88± 4		ABLIKIM	08B	BES2	$e^+ e^- \rightarrow$ hadrons
290±25± 4	2.7k	ANDREOTTI	07	E835	$p \overline{p} \rightarrow e^+ e^-$, $J/\psi X$
331±58± 2		ABLIKIM	06L	BES2	$e^+ e^- \rightarrow$ hadrons
264±27		[7] BAI	02B	BES2	$e^+ e^-$
287±37±16		[8] ARMSTRONG	93B	E760	$\overline{p} p \rightarrow e^+ e^-$

[7] From a simultaneous fit to the hadronic and $\mu^+ \mu^-$ cross section, assuming $\Gamma = \Gamma_h + \Gamma_e + \Gamma_\mu + \Gamma_\tau$ and lepton universality. Does not include vacuum polarization correction.
[8] The initial-state radiation correction reevaluated by ANDREOTTI 07 in its Ref. [4].

$\psi(2S)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	hadrons	(97.85±0.13) %	
Γ_2	virtual $\gamma \rightarrow$ hadrons	(1.73±0.14) %	S=1.5
Γ_3	$g g g$	(10.6 ±1.6) %	
Γ_4	$\gamma g g$	(1.03±0.29) %	
Γ_5	light hadrons	(15.4 ±1.5) %	
Γ_6	$e^+ e^-$	(7.73±0.17) $\times 10^{-3}$	
Γ_7	$\mu^+ \mu^-$	(7.7 ±0.8) $\times 10^{-3}$	
Γ_8	$\tau^+ \tau^-$	(3.0 ±0.4) $\times 10^{-3}$	
	Decays into $J/\psi(1S)$ and anything		
Γ_9	$J/\psi(1S)$anything	(59.5 ±0.8) %	
Γ_{10}	$J/\psi(1S)$neutrals	(24.6 ±0.4) %	
Γ_{11}	$J/\psi(1S)\pi^+\pi^-$	(33.6 ±0.4) %	
Γ_{12}	$J/\psi(1S)\pi^0\pi^0$	(17.75±0.34) %	
Γ_{13}	$J/\psi(1S)\eta$	(3.28±0.07) %	
Γ_{14}	$J/\psi(1S)\pi^0$	(1.30±0.10) $\times 10^{-3}$	S=1.4
	Hadronic decays		
Γ_{15}	$\pi^0 h_c(1P)$	(8.6 ±1.3) $\times 10^{-4}$	
Γ_{16}	$3(\pi^+\pi^-)\pi^0$	(3.5 ±1.6) $\times 10^{-3}$	
Γ_{17}	$2(\pi^+\pi^-)\pi^0$	(2.9 ±1.0) $\times 10^{-3}$	S=4.6
Γ_{18}	$\rho a_2(1320)$	(2.6 ±0.9) $\times 10^{-4}$	
Γ_{19}	$p\overline{p}$	(2.76±0.12) $\times 10^{-4}$	
Γ_{20}	$\Delta^{++}\overline{\Delta}^{--}$	(1.28±0.35) $\times 10^{-4}$	
Γ_{21}	$\Lambda\overline{\Lambda}\pi^0$	< 1.2 $\times 10^{-4}$	CL=90%
Γ_{22}	$\Lambda\overline{\Lambda}\eta$	< 4.9 $\times 10^{-5}$	CL=90%

Γ_{23}	$\Lambda \overline{p} K^+$	$(1.00\pm0.14)\times10^{-4}$	
Γ_{24}	$\Lambda \overline{p} K^+ \pi^+ \pi^-$	$(1.8\pm0.4)\times10^{-4}$	
Γ_{25}	$\Lambda \overline{\Lambda} \pi^+ \pi^-$	$(2.8\pm0.6)\times10^{-4}$	
Γ_{26}	$\Lambda \overline{\Lambda}$	$(2.8\pm0.5)\times10^{-4}$	S=2.6
Γ_{27}	$\Sigma^+ \overline{\Sigma}^-$	$(2.6\pm0.8)\times10^{-4}$	
Γ_{28}	$\Sigma^0 \overline{\Sigma}^0$	$(2.2\pm0.4)\times10^{-4}$	S=1.5
Γ_{29}	$\Sigma(1385)^+ \overline{\Sigma}(1385)^-$	$(1.1\pm0.4)\times10^{-4}$	
Γ_{30}	$\Xi^- \overline{\Xi}^+$	$(1.8\pm0.6)\times10^{-4}$	S=2.8
Γ_{31}	$\Xi^0 \overline{\Xi}^0$	$(2.8\pm0.9)\times10^{-4}$	
Γ_{32}	$\Xi(1530)^0 \overline{\Xi}(1530)^0$	$< 8.1\times10^{-5}$	CL=90%
Γ_{33}	$\Omega^- \overline{\Omega}^+$	$< 7.3\times10^{-5}$	CL=90%
Γ_{34}	$\pi^0 p \overline{p}$	$(1.50\pm0.08)\times10^{-4}$	S=1.1
Γ_{35}	$N_1^*(1440)\overline{p} \to \pi^0 p \overline{p}$	$(8.1\pm0.8)\times10^{-5}$	
Γ_{36}	$\pi^0 f_0(2100) \to \pi^0 p \overline{p}$	$(1.1\pm0.4)\times10^{-5}$	
Γ_{37}	$\eta p \overline{p}$	$(5.7\pm0.6)\times10^{-5}$	
Γ_{38}	$\eta f_0(2100) \to \eta p \overline{p}$	$(1.2\pm0.4)\times10^{-5}$	
Γ_{39}	$N^*(1535)\overline{p} \to \eta p \overline{p}$	$(4.4\pm0.7)\times10^{-5}$	
Γ_{40}	$\omega p \overline{p}$	$(6.9\pm2.1)\times10^{-5}$	
Γ_{41}	$\phi p \overline{p}$	$< 2.4\times10^{-5}$	CL=90%
Γ_{42}	$\pi^+ \pi^- p \overline{p}$	$(6.0\pm0.4)\times10^{-4}$	
Γ_{43}	$p \overline{n} \pi^-$ or c.c.	$(2.48\pm0.17)\times10^{-4}$	
Γ_{44}	$p \overline{n} \pi^- \pi^0$	$(3.2\pm0.7)\times10^{-4}$	
Γ_{45}	$2(\pi^+ \pi^- \pi^0)$	$(4.8\pm1.5)\times10^{-3}$	
Γ_{46}	$\eta \pi^+ \pi^-$	$< 1.6\times10^{-4}$	CL=90%
Γ_{47}	$\eta \pi^+ \pi^- \pi^0$	$(9.5\pm1.7)\times10^{-4}$	
Γ_{48}	$2(\pi^+ \pi^-)\eta$	$(1.2\pm0.6)\times10^{-3}$	
Γ_{49}	$\eta' \pi^+ \pi^- \pi^0$	$(4.5\pm2.1)\times10^{-4}$	
Γ_{50}	$\omega \pi^+ \pi^-$	$(7.3\pm1.2)\times10^{-4}$	S=2.1
Γ_{51}	$b_1^{\pm} \pi^{\mp}$	$(4.0\pm0.6)\times10^{-4}$	S=1.1
Γ_{52}	$b_1^0 \pi^0$	$(2.4\pm0.6)\times10^{-4}$	
Γ_{53}	$\omega f_2(1270)$	$(2.2\pm0.4)\times10^{-4}$	
Γ_{54}	$\pi^+ \pi^- K^+ K^-$	$(7.5\pm0.9)\times10^{-4}$	S=1.9
Γ_{55}	$\rho^0 K^+ K^-$	$(2.2\pm0.4)\times10^{-4}$	
Γ_{56}	$K^*(892)^0 \overline{K}_2^*(1430)^0$	$(1.9\pm0.5)\times10^{-4}$	
Γ_{57}	$K^+ K^- \pi^+ \pi^- \eta$	$(1.3\pm0.7)\times10^{-3}$	
Γ_{58}	$K^+ K^- 2(\pi^+ \pi^-)\pi^0$	$(1.00\pm0.31)\times10^{-3}$	
Γ_{59}	$K^+ K^- 2(\pi^+ \pi^-)$	$(1.9\pm0.9)\times10^{-3}$	
Γ_{60}	$K_1(1270)^{\pm} K^{\mp}$	$(1.00\pm0.28)\times10^{-3}$	
Γ_{61}	$K_S^0 K_S^0 \pi^+ \pi^-$	$(2.2\pm0.4)\times10^{-4}$	
Γ_{62}	$\rho^0 p \overline{p}$	$(5.0\pm2.2)\times10^{-5}$	
Γ_{63}	$K^+ \overline{K}^*(892)^0 \pi^- +$ c.c.	$(6.7\pm2.5)\times10^{-4}$	
Γ_{64}	$2(\pi^+ \pi^-)$	$(2.4\pm0.6)\times10^{-4}$	S=2.2
Γ_{65}	$\rho^0 \pi^+ \pi^-$	$(2.2\pm0.6)\times10^{-4}$	S=1.4
Γ_{66}	$K^+ K^- \pi^+ \pi^- \pi^0$	$(1.26\pm0.09)\times10^{-3}$	

Γ_{67}	$\omega f_0(1710) \to \omega K^+ K^-$	$(5.9 \pm 2.2) \times 10^{-5}$	
Γ_{68}	$K^*(892)^0 K^- \pi^+ \pi^0 +$ c.c.	$(8.6 \pm 2.2) \times 10^{-4}$	
Γ_{69}	$K^*(892)^+ K^- \pi^+ \pi^- +$ c.c.	$(9.6 \pm 2.8) \times 10^{-4}$	
Γ_{70}	$K^*(892)^+ K^- \rho^0 +$ c.c.	$(7.3 \pm 2.6) \times 10^{-4}$	
Γ_{71}	$K^*(892)^0 K^- \rho^+ +$ c.c.	$(6.1 \pm 1.8) \times 10^{-4}$	
Γ_{72}	$\eta K^+ K^-$	$< 1.3 \times 10^{-4}$	CL=90%
Γ_{73}	$\omega K^+ K^-$	$(1.85 \pm 0.25) \times 10^{-4}$	S=1.1
Γ_{74}	$3(\pi^+ \pi^-)$	$(3.5 \pm 2.0) \times 10^{-4}$	S=2.8
Γ_{75}	$p \overline{p} \pi^+ \pi^- \pi^0$	$(7.3 \pm 0.7) \times 10^{-4}$	
Γ_{76}	$K^+ K^-$	$(6.3 \pm 0.7) \times 10^{-5}$	
Γ_{77}	$K^0_S K^0_L$	$(5.4 \pm 0.5) \times 10^{-5}$	
Γ_{78}	$\pi^+ \pi^- \pi^0$	$(1.68 \pm 0.26) \times 10^{-4}$	S=1.4
Γ_{79}	$\rho(2150)\pi \to \pi^+ \pi^- \pi^0$	$(1.9 {}^{+1.2}_{-0.4}) \times 10^{-4}$	
Γ_{80}	$\rho(770)\pi \to \pi^+ \pi^- \pi^0$	$(3.2 \pm 1.2) \times 10^{-5}$	S=1.8
Γ_{81}	$\pi^+ \pi^-$	$(8 \pm 5) \times 10^{-5}$	
Γ_{82}	$K_1(1400)^\pm K^\mp$	$< 3.1 \times 10^{-4}$	CL=90%
Γ_{83}	$K^+ K^- \pi^0$	$< 2.96 \times 10^{-5}$	CL=90%
Γ_{84}	$K^+ \overline{K}^*(892)^- +$ c.c.	$(1.7 {}^{+0.8}_{-0.7}) \times 10^{-5}$	
Γ_{85}	$K^*(892)^0 \overline{K}^0 +$ c.c.	$(1.09 \pm 0.20) \times 10^{-4}$	
Γ_{86}	$\phi \pi^+ \pi^-$	$(1.17 \pm 0.29) \times 10^{-4}$	S=1.7
Γ_{87}	$\phi f_0(980) \to \pi^+ \pi^-$	$(6.8 \pm 2.5) \times 10^{-5}$	S=1.1
Γ_{88}	$2(K^+ K^-)$	$(6.0 \pm 1.4) \times 10^{-5}$	
Γ_{89}	$\phi K^+ K^-$	$(7.0 \pm 1.6) \times 10^{-5}$	
Γ_{90}	$2(K^+ K^-) \pi^0$	$(1.10 \pm 0.28) \times 10^{-4}$	
Γ_{91}	$\phi \eta$	$(2.8 {}^{+1.0}_{-0.8}) \times 10^{-5}$	
Γ_{92}	$\phi \eta'$	$(3.1 \pm 1.6) \times 10^{-5}$	
Γ_{93}	$\omega \eta'$	$(3.2 {}^{+2.5}_{-2.1}) \times 10^{-5}$	
Γ_{94}	$\omega \pi^0$	$(2.1 \pm 0.6) \times 10^{-5}$	
Γ_{95}	$\rho \eta'$	$(1.9 {}^{+1.7}_{-1.2}) \times 10^{-5}$	
Γ_{96}	$\rho \eta$	$(2.2 \pm 0.6) \times 10^{-5}$	S=1.1
Γ_{97}	$\omega \eta$	$< 1.1 \times 10^{-5}$	CL=90%
Γ_{98}	$\phi \pi^0$	$< 4 \times 10^{-6}$	CL=90%
Γ_{99}	$\eta_c \pi^+ \pi^- \pi^0$	$< 1.0 \times 10^{-3}$	CL=90%
Γ_{100}	$p \overline{p} K^+ K^-$	$(2.7 \pm 0.7) \times 10^{-5}$	
Γ_{101}	$\overline{\Lambda} n K^0_S +$ c.c.	$(8.1 \pm 1.8) \times 10^{-5}$	
Γ_{102}	$\phi f'_2(1525)$	$(4.4 \pm 1.6) \times 10^{-5}$	
Γ_{103}	$\Theta(1540) \overline{\Theta}(1540) \to K^0_S p K^- \overline{n} +$ c.c.	$< 8.8 \times 10^{-6}$	CL=90%
Γ_{104}	$\Theta(1540) K^- \overline{n} \to K^0_S p K^- \overline{n}$	$< 1.0 \times 10^{-5}$	CL=90%
Γ_{105}	$\Theta(1540) K^0_S \overline{p} \to K^0_S \overline{p} K^+ n$	$< 7.0 \times 10^{-6}$	CL=90%

Γ_{106}	$\overline{\Theta}(1540) K^+ n \to K^0_S \overline{p} K^+ n$	$<$ 2.6	$\times 10^{-5}$	CL=90%
Γ_{107}	$\overline{\Theta}(1540) K^0_S p \to K^0_S p K^- \overline{n}$	$<$ 6.0	$\times 10^{-6}$	CL=90%
Γ_{108}	$K^0_S K^0_S$	$<$ 4.6	$\times 10^{-6}$	

Radiative decays

Γ_{109}	$\gamma \chi_{c0}(1P)$	(9.68±0.31) %		
Γ_{110}	$\gamma \chi_{c1}(1P)$	(9.2 ±0.4) %		
Γ_{111}	$\gamma \chi_{c2}(1P)$	(8.72±0.34) %		
Γ_{112}	$\gamma \eta_c(1S)$	(3.4 ±0.5)	$\times 10^{-3}$	S=1.3
Γ_{113}	$\gamma \eta_c(2S)$	$<$ 8	$\times 10^{-4}$	CL=90%
Γ_{114}	$\gamma \pi^0$	(1.6 ±0.4)	$\times 10^{-6}$	
Γ_{115}	$\gamma \eta'(958)$	(1.23±0.06)	$\times 10^{-4}$	
Γ_{116}	$\gamma f_2(1270)$	(2.1 ±0.4)	$\times 10^{-4}$	
Γ_{117}	$\gamma f_0(1710)$			
Γ_{118}	$\gamma f_0(1710) \to \gamma \pi \pi$	(3.0 ±1.3)	$\times 10^{-5}$	
Γ_{119}	$\gamma f_0(1710) \to \gamma K \overline{K}$	(6.0 ±1.6)	$\times 10^{-5}$	
Γ_{120}	$\gamma \gamma$	$<$ 1.4	$\times 10^{-4}$	CL=90%
Γ_{121}	$\gamma \eta$	(1.4 ±0.5)	$\times 10^{-6}$	
Γ_{122}	$\gamma \eta \pi^+ \pi^-$	(8.7 ±2.1)	$\times 10^{-4}$	
Γ_{123}	$\gamma \eta(1405)$			
Γ_{124}	$\gamma \eta(1405) \to \gamma K \overline{K} \pi$	$<$ 9	$\times 10^{-5}$	CL=90%
Γ_{125}	$\gamma \eta(1405) \to \eta \pi^+ \pi^-$	(3.6 ±2.5)	$\times 10^{-5}$	
Γ_{126}	$\gamma \eta(1475)$			
Γ_{127}	$\gamma \eta(1475) \to K \overline{K} \pi$	$<$ 1.4	$\times 10^{-4}$	CL=90%
Γ_{128}	$\gamma \eta(1475) \to \eta \pi^+ \pi^-$	$<$ 8.8	$\times 10^{-5}$	CL=90%
Γ_{129}	$\gamma 2(\pi^+ \pi^-)$	(4.0 ±0.6)	$\times 10^{-4}$	
Γ_{130}	$\gamma K^{*0} K^+ \pi^- +$ c.c.	(3.7 ±0.9)	$\times 10^{-4}$	
Γ_{131}	$\gamma K^{*0} \overline{K}^{*0}$	(2.4 ±0.7)	$\times 10^{-4}$	
Γ_{132}	$\gamma K^0_S K^+ \pi^- +$ c.c.	(2.6 ±0.5)	$\times 10^{-4}$	
Γ_{133}	$\gamma K^+ K^- \pi^+ \pi^-$	(1.9 ±0.5)	$\times 10^{-4}$	
Γ_{134}	$\gamma p \overline{p}$	(3.9 ±0.5)	$\times 10^{-5}$	S=2.0
Γ_{135}	$\gamma f_2(1950) \to \gamma p \overline{p}$	(1.20±0.22)	$\times 10^{-5}$	
Γ_{136}	$\gamma f_2(2150) \to \gamma p \overline{p}$	(7.2 ±1.8)	$\times 10^{-6}$	
Γ_{137}	$\gamma X(1835) \to \gamma p \overline{p}$	$<$ 1.6	$\times 10^{-6}$	CL=90%
Γ_{138}	$\gamma X \to \gamma p \overline{p}$	[a] $<$ 2	$\times 10^{-6}$	CL=90%
Γ_{139}	$\gamma \pi^+ \pi^- p \overline{p}$	(2.8 ±1.4)	$\times 10^{-5}$	
Γ_{140}	$\gamma 2(\pi^+ \pi^-) K^+ K^-$	$<$ 2.2	$\times 10^{-4}$	CL=90%
Γ_{141}	$\gamma 3(\pi^+ \pi^-)$	$<$ 1.7	$\times 10^{-4}$	CL=90%
Γ_{142}	$\gamma K^+ K^- K^+ K^-$	$<$ 4	$\times 10^{-5}$	CL=90%

[a] For a narrow resonance in the range $2.2 < M(X) < 2.8$ GeV.

CONSTRAINED FIT INFORMATION

A multiparticle fit to $\chi_{c1}(1P)$, $\chi_{c0}(1P)$, $\chi_{c2}(1P)$, and $\psi(2S)$ with 4 total widths, a partial width, 25 combinations of partial widths obtained from integrated cross section, and 84 branching ratios uses 223 measurements to determine 49 parameters. The overall fit has a $\chi^2 = 312.2$ for 174 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\left\langle\delta p_i \delta p_j\right\rangle/(\delta p_i{\cdot}\delta p_j)$, in percent, from the fit to parameters p_i, including the branching fractions, $x_i \equiv \Gamma_i/\Gamma_{total}$.

x_7	5									
x_8	1	0								
x_{11}	44	12	3							
x_{12}	39	8	2	64						
x_{13}	27	7	2	57	35					
x_{19}	2	1	0	7	5	4				
x_{109}	2	1	0	4	3	2	0			
x_{110}	2	1	0	5	2	3	0	0		
x_{111}	3	1	0	6	4	4	0	0	0	
Γ	−79	−6	−2	−52	−46	−32	−10	−2	−3	−3
	x_6	x_7	x_8	x_{11}	x_{12}	x_{13}	x_{19}	x_{109}	x_{110}	x_{111}

$\psi(2S)$ PARTIAL WIDTHS

Γ(hadrons) Γ_1

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
258±26	BAI	02B	BES2	e^+e^-
224±56	LUTH	75	MRK1	e^+e^-

$\Gamma(e^+e^-)$ Γ_6

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
2.35 ±0.04 OUR FIT				
2.33 ±0.07 OUR AVERAGE				
2.338±0.037±0.096	ABLIKIM	08B	BES2	$e^+e^- \to$ hadrons
2.330±0.036±0.110	ABLIKIM	06L	BES2	$e^+e^- \to$ hadrons
2.44 ±0.21	[9] BAI	02B	BES2	e^+e^-
2.14 ±0.21	ALEXANDER	89	RVUE	See Υ mini-review
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.0 ±0.3	BRANDELIK	79C	DASP	e^+e^-
2.1 ±0.3	[10] LUTH	75	MRK1	e^+e^-

[9] From a simultaneous fit to e^+e^-, $\mu^+\mu^-$, and hadronic channel, assuming $\Gamma_e = \Gamma_\mu = \Gamma_\tau/0.38847$.

[10] From a simultaneous fit to e^+e^-, $\mu^+\mu^-$, and hadronic channels assuming $\Gamma(e^+e^-) = \Gamma(\mu^+\mu^-)$.

$\Gamma(\gamma\gamma)$ — Γ_{120}

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<43	90	BRANDELIK	79C	DASP	e^+e^-

$\psi(2S)$ $\Gamma(i)\Gamma(e^+e^-)/\Gamma(total)$

This combination of a partial width with the partial width into e^+e^- and with the total width is obtained from the integrated cross section into channel(i) in the e^+e^- annihilation. We list only data that have not been used to determine the partial width $\Gamma(i)$ or the branching ratio $\Gamma(i)$/total.

$\Gamma(\text{hadrons}) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_1\Gamma_6/\Gamma$

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
2.233±0.015±0.042	[11] ANASHIN	12	KEDR	$e^+e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.2 ±0.4	ABRAMS	75	MRK1	e^+e^-

[11] ANASHIN 12 reports the value 2.233 ± 0.015 ± 0.037 ± 0.020 keV, where the third uncertainty is due to assumptions on the interference between the resonance and hadronic continuum. We combined the two systematic uncertainties.

$\Gamma(\tau^+\tau^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_8\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
9.0±2.6	79	[12] ANASHIN	07	KEDR	$e^+e^- \rightarrow \psi(2S) \rightarrow \tau^+\tau^-$

[12] Using $\psi(2S)$ total width of 337 ± 13 keV. Systematic errors not evaluated.

$\Gamma(J/\psi(1S)\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{11}\Gamma_6/\Gamma$

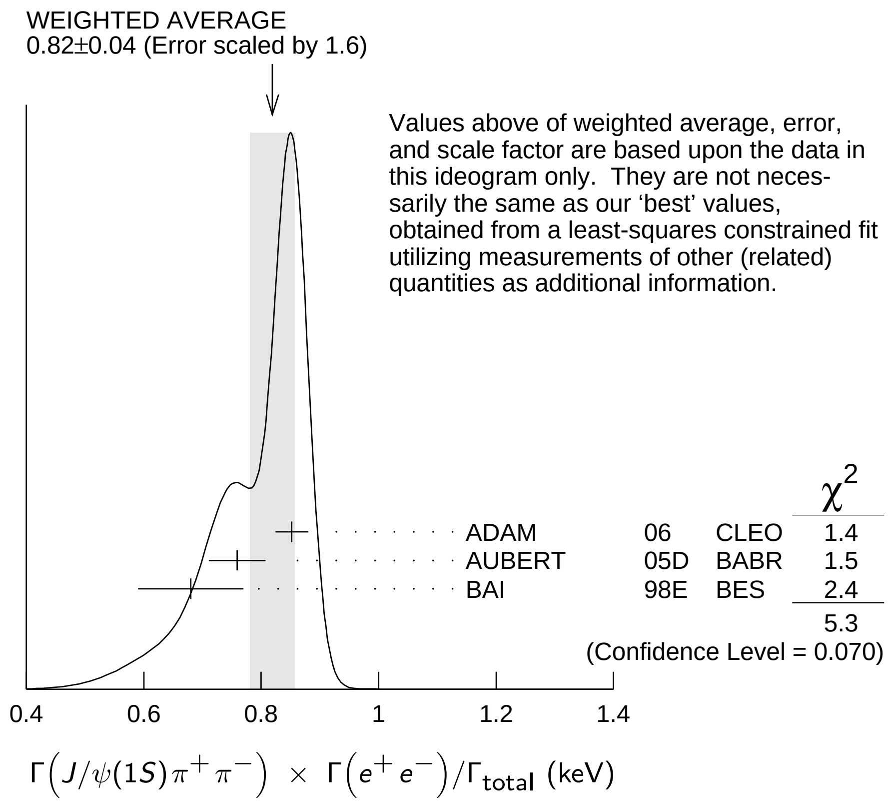
VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.789±0.015 OUR FIT					
0.82 ±0.04 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.					
0.852±0.010±0.026	19.5k±243	ADAM	06	CLEO	3.773 $e^+e^- \rightarrow \gamma\psi(2S)$
0.76 ±0.05 ±0.01	544	[13] AUBERT	05D	BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-\mu^+\mu^-\gamma$
0.68 ±0.09		[14] BAI	98E	BES	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.90 ±0.08 ±0.05	256	[15] AUBERT	07AU	BABR	10.6 $e^+e^- \rightarrow J/\psi\pi^+\pi^-\gamma$

[13] AUBERT 05D reports $[\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{total}] \times [B(J/\psi(1S) \rightarrow \mu^+\mu^-)] = 0.0450 \pm 0.0018 \pm 0.0022$ keV which we divide by our best value $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = (5.93 \pm 0.06) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[14] The value of $\Gamma(e^+e^-)$ quoted in BAI 98E is derived using $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.4 \pm 2.6) \times 10^{-2}$ and $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1203 \pm 0.0038$. Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.

[15] AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{total}] \times [B(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0)] = 0.0186 \pm 0.0012 \pm 0.0011$ keV which we divide by our best value $B(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0) = (2.07 \pm 0.12) \times 10^{-2}$. Our first error is

their experiment's error and our second error is the systematic error from using our best value.



$\Gamma(J/\psi(1S)\pi^0\pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{12}\Gamma_6/\Gamma$

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.417±0.010 OUR FIT					
0.411±0.008±0.018	3.6k±96	ADAM	06	CLEO	3.773 $e^+e^- \to \gamma\psi(2S)$

$\Gamma(J/\psi(1S)\eta) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{13}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
77.0± 1.9 OUR FIT					
87 ± 9 OUR AVERAGE					
83 ±25 ±5	14	[16] AUBERT	07AU	BABR	10.6 $e^+e^- \to J/\psi\pi^+\pi^-\pi^0\gamma$
88 ± 6 ±7	291 ± 24	ADAM	06	CLEO	3.773 $e^+e^- \to \gamma\psi(2S)$

[16] AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \to J/\psi\eta) \cdot B(J/\psi \to \mu^+\mu^-) \cdot B(\eta \to \pi^+\pi^-\pi^0) = 1.11 \pm 0.33 \pm 0.07$ eV.

$\Gamma(J/\psi(1S)\pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{14}\Gamma_6/\Gamma$

VALUE (eV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<8	90	<37	ADAM	06	CLEO	3.773 $e^+e^- \to \gamma\psi(2S)$

$\Gamma(p\overline{p}) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{19}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.647±0.028 OUR FIT					
0.59 ±0.05 OUR AVERAGE					
0.579±0.038±0.036	2.7k	ANDREOTTI	07	E835	$p\overline{p} \to e^+e^-$, $J/\psi X$
0.70 ±0.17 ±0.03	22	AUBERT	06B		$e^+e^- \to p\overline{p}\gamma$

$\Gamma(\Lambda\overline{\Lambda}) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{26}\Gamma_6/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
1.5±0.4±0.1	AUBERT	07BD	BABR	10.6 $e^+e^- \to \Lambda\overline{\Lambda}\gamma$

$\Gamma(2(\pi^+\pi^-\pi^0)) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{45}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
11.2±3.3±1.3	43	AUBERT	06D	BABR	10.6 $e^+e^- \to 2(\pi^+\pi^-\pi^0)\gamma$

$\Gamma(K^+K^-2(\pi^+\pi^-)) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{59}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
4.4±2.1±0.3	26	AUBERT	06D	BABR	10.6 $e^+e^- \to K^+K^-2(\pi^+\pi^-)\gamma$

$\Gamma(\pi^+\pi^-K^+K^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{54}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
2.56±0.42±0.16	85	AUBERT	07AK	BABR	10.6 $e^+e^- \to \pi^+\pi^-K^+K^-\gamma$

$\Gamma(\phi f_0(980) \to \pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{87}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.347±0.169±0.003	6 ± 3	[17] AUBERT	07AK	BABR	10.6 $e^+e^- \to \pi^+\pi^-K^+K^-\gamma$

[17] AUBERT 07AK reports $[\Gamma(\psi(2S) \to \phi f_0(980) \to \pi^+\pi^-) \times \Gamma(\psi(2S) \to e^+e^-)/\Gamma_{total}] \times [B(\phi(1020) \to K^+K^-)] = 0.17 \pm 0.08 \pm 0.02$ eV which we divide by our best value $B(\phi(1020) \to K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{86}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.57±0.23±0.01	10	[18] AUBERT,BE	06D	BABR	10.6 $e^+e^- \to K^+K^-\pi^+\pi^-\gamma$

[18] AUBERT,BE 06D reports $[\Gamma(\psi(2S) \to \phi\pi^+\pi^-) \times \Gamma(\psi(2S) \to e^+e^-)/\Gamma_{total}] \times [B(\phi(1020) \to K^+K^-)] = 0.28 \pm 0.11 \pm 0.02$ eV which we divide by our best value $B(\phi(1020) \to K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2(\pi^+\pi^-)\pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{17}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
29.7±2.2±1.8	410	AUBERT	07AU	BABR	10.6 $e^+e^- \to 2(\pi^+\pi^-)\pi^0\gamma$

$\Gamma(\omega\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{50}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
3.01±0.84±0.02	37	[19] AUBERT	07AU	BABR	10.6 $e^+e^- \to \omega\pi^+\pi^-\gamma$

[19] AUBERT 07AU reports $[\Gamma(\psi(2S) \to \omega\pi^+\pi^-) \times \Gamma(\psi(2S) \to e^+e^-)/\Gamma_{total}] \times [B(\omega(782) \to \pi^+\pi^-\pi^0)] = 2.69 \pm 0.73 \pm 0.16$ eV which we divide by our best value $B(\omega(782) \to \pi^+\pi^-\pi^0) = (89.2 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2(\pi^+\pi^-)\eta) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{48}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
2.87±1.41±0.01	16	[20] AUBERT	07AU	BABR	10.6 $e^+e^- \to 2(\pi^+\pi^-)\eta\gamma$

[20] AUBERT 07AU reports $[\Gamma(\psi(2S) \to 2(\pi^+\pi^-)\eta) \times \Gamma(\psi(2S) \to e^+e^-)/\Gamma_{total}] \times [B(\eta \to 2\gamma)] = 1.13 \pm 0.55 \pm 0.08$ eV which we divide by our best value $B(\eta \to 2\gamma) = (39.31 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{66}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
4.4±1.3±0.3	32	AUBERT	07AU	BABR	10.6 $e^+e^- \to K^+K^-\pi^+\pi^-\pi^0\gamma$

$\Gamma(K^+K^-\pi^+\pi^-\eta) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{57}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
3.05±1.80±0.02	7	[21] AUBERT	07AU	BABR	10.6 $e^+e^- \to K^+K^-\pi^+\pi^-\eta\gamma$

[21] AUBERT 07AU reports $[\Gamma(\psi(2S) \to K^+K^-\pi^+\pi^-\eta) \times \Gamma(\psi(2S) \to e^+e^-)/\Gamma_{total}] \times [B(\eta \to 2\gamma)] = 1.2 \pm 0.7 \pm 0.1$ eV which we divide by our best value $B(\eta \to 2\gamma) = (39.31 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\psi(2S)$ BRANCHING RATIOS

$\Gamma(\text{hadrons})/\Gamma_{total}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.9785±0.0013 OUR AVERAGE				
0.9779±0.0015	[22] BAI	02B	BES2	e^+e^-
0.981 ±0.003	[22] LUTH	75	MRK1	e^+e^-

[22] Includes cascade decay into $J/\psi(1S)$.

$\Gamma(\text{virtual}\gamma \to \text{hadrons})/\Gamma_{total}$ — Γ_2/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.0173±0.0014 OUR AVERAGE Error includes scale factor of 1.5.				
0.0166±0.0010	[23,24] SETH	04	RVUE	e^+e^-
0.0199±0.0019	[23] BAI	02B	BES2	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.029 ±0.004	[23] LUTH	75	MRK1	e^+e^-

[23] Included in $\Gamma(\text{hadrons})/\Gamma_{total}$.

[24] Using $B(\psi(2S) \to \ell^+\ell^-) = (0.73 \pm 0.04)\%$ from RPP-2002 and $R = 2.28 \pm 0.04$ determined by a fit to data from BAI 00 and BAI 02C.

$\Gamma(ggg)/\Gamma_{total}$ — Γ_3/Γ

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
10.58±1.62	2.9 M	[25] LIBBY	09	CLEO	$\psi(2S) \to$ hadrons

[25] Calculated using $\Gamma(\gamma g g)/\Gamma(g g g) = 0.097 \pm 0.026 \pm 0.016$ from LIBBY 09, B($\psi(2S) \to X J/\psi$) relative and absolute branching fractions from MENDEZ 08, B($\psi(2S) \to \gamma \eta_c$) from MITCHELL 09, and B($\psi(2S) \to$ virtual $\gamma \to$ hadrons), B($\psi(2S) \to \gamma \chi_{cJ}$), and B($\psi(2S) \to \ell^+ \ell^-$) from PDG 08. The statistical error is negligible and the systematic error is largely uncorrelated with that of $\Gamma(\gamma g g)/\Gamma_{total}$ LIBBY 09 measurement.

$\Gamma(\gamma g g)/\Gamma_{total}$ — Γ_4/Γ

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.025±0.288	200 k	[26] LIBBY	09	CLEO	$\psi(2S) \to \gamma +$ hadrons

[26] Calculated using $\Gamma(\gamma g g)/\Gamma(g g g) = 0.097 \pm 0.026 \pm 0.016$ from LIBBY 09. The statistical error is negligible and the systematic error is largely uncorrelated with that of $\Gamma(g g g)/\Gamma_{total}$ LIBBY 09 measurement.

$\Gamma(\gamma g g)/\Gamma(g g g)$ — Γ_4/Γ_3

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
9.7±2.6±1.6	2.9 M	LIBBY	09	CLEO	$\psi(2S) \to (\gamma +)$ hadrons

$\Gamma(\text{light hadrons})/\Gamma_{total}$ — Γ_5/Γ

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.154±0.015	[27] MENDEZ	08	CLEO	$e^+ e^- \to \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.169±0.026	[28] ADAM	05A	CLEO	$e^+ e^- \to \psi(2S)$

[27] Uses B($\psi(2S) \to J/\psi X$) from MENDEZ 08 and other branching fractions from PDG 07.

[28] Uses B($J/\psi X$) from ADAM 05A, B($\chi_{cJ} \gamma$), B($\eta_c \gamma$) from ATHAR 04 and B($\ell^+ \ell^-$) from PDG 04. Superseded by MENDEZ 08.

$\Gamma(e^+ e^-)/\Gamma_{total}$ — Γ_6/Γ

VALUE (units 10^{-4})	*DOCUMENT ID*		*TECN*	*COMMENT*
77.3± 1.7 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
88 ±13	[29] FELDMAN	77	RVUE	$e^+ e^-$

[29] From an overall fit assuming equal partial widths for $e^+ e^-$ and $\mu^+ \mu^-$. For a measurement of the ratio see the entry $\Gamma(\mu^+ \mu^-)/\Gamma(e^+ e^-)$ below. Includes LUTH 75, HILGER 75, BURMESTER 77.

$\Gamma(\mu^+ \mu^-)/\Gamma_{total}$ — Γ_7/Γ

VALUE (units 10^{-4})	*DOCUMENT ID*
77±8 OUR FIT	

$\Gamma(\mu^+ \mu^-)/\Gamma(e^+ e^-)$ — Γ_7/Γ_6

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
1.00±0.11 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.89±0.16	BOYARSKI	75C	MRK1	$e^+ e^-$

$\Gamma(\tau^+\tau^-)/\Gamma_{total}$ — Γ_8/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
30 ±4 OUR FIT				
30.8±2.1±3.8	[30] ABLIKIM	06W	BES	$e^+e^- \to \psi(2S)$

[30] Computed using PDG 02 value of B($\psi(2S) \to$ hadrons) = 0.9810 ± 0.0030 to estimate the total number of $\psi(2S)$ events.

DECAYS INTO $J/\psi(1S)$ AND ANYTHING

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

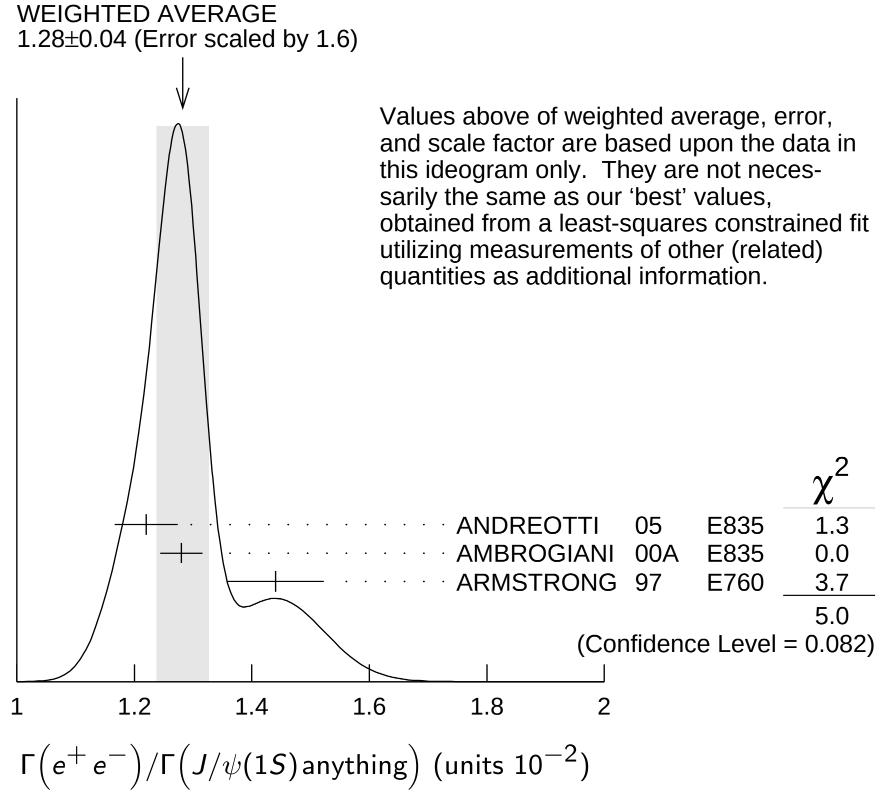
VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.595 ±0.008 OUR FIT					
0.55 ±0.07 OUR AVERAGE					
0.51 ±0.12		BRANDELIK	79C	DASP	$e^+e^- \to \mu^+\mu^- X$
0.57 ±0.08		ABRAMS	75B	MRK1	$e^+e^- \to \mu^+\mu^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.6254±0.0016±0.0155	1.1M	[31] MENDEZ	08	CLEO	$\psi(2S) \to \ell^+\ell^- X$
0.5950±0.0015±0.0190	151k	ADAM	05A	CLEO	Repl. by MENDEZ 08

[31] Not independent from other measurements of MENDEZ 08.

$\Gamma(e^+e^-)/\Gamma(J/\psi(1S)\text{anything})$
$\Gamma_6/\Gamma_9 = \Gamma_6/(\Gamma_{11}+\Gamma_{12}+\Gamma_{13}+0.344\Gamma_{110}+0.195\Gamma_{111})$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.299±0.026 OUR FIT					
1.28 ±0.04 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.					
1.22 ±0.02 ±0.05	5097 ± 73	[32] ANDREOTTI	05	E835	$p\overline{p} \to \psi(2S) \to e^+e^-$
1.28 ±0.03 ±0.02		[32] AMBROGIANI	00A	E835	$p\overline{p} \to \psi(2S)$
1.44 ±0.08 ±0.02		[32] ARMSTRONG	97	E760	$\overline{p}p \to \psi(2S)$

[32] Using B($J/\psi(1S) \to e^+e^-$) = 0.0593 ± 0.0010.



$\Gamma(\mu^+\mu^-)/\Gamma(J/\psi(1S)\text{anything})$ $\Gamma_7/\Gamma_9 = \Gamma_7/(\Gamma_{11}+\Gamma_{12}+\Gamma_{13}+0.344\Gamma_{110}+0.195\Gamma_{111})$

VALUE	DOCUMENT ID		TECN	COMMENT
0.0130±0.0014 OUR FIT				
0.014 ±0.003	HILGER	75	SPEC	e^+e^-

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

VALUE	DOCUMENT ID
0.246±0.004 OUR FIT	

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.336 ±0.004 OUR FIT					
0.343 ±0.011 OUR AVERAGE	Error includes scale factor of 1.7.				
0.3504±0.0007±0.0077	565k	MENDEZ	08	CLEO	$\psi(2S) \to \ell^+\ell^-\pi^+\pi^-$
0.323 ±0.014		BAI	02B	BES2	e^+e^-
0.32 ±0.04		ABRAMS	75B	MRK1	$e^+e^- \to J/\psi\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.3354±0.0014±0.0110	60k	[33] ADAM	05A	CLEO	Repl. by MENDEZ 08

[33] Not independent from other values reported by ADAM 05A.

$\Gamma(e^+e^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_6/Γ_{11}

VALUE	DOCUMENT ID		TECN	COMMENT
0.0230±0.0005 OUR FIT				
0.0252±0.0028±0.0011	[34] AUBERT	02B	BABR	e^+e^-

[34] Using $B(J/\psi(1S) \to e^+e^-) = 0.0593 \pm 0.0010$.

$\Gamma(\mu^+\mu^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_7/Γ_{11}

VALUE	DOCUMENT ID		TECN	COMMENT
0.0229±0.0025 OUR FIT				
0.0224±0.0029 OUR AVERAGE				
0.0216±0.0026±0.0014	[35] AUBERT	02B	BABR	e^+e^-
0.0327±0.0077±0.0072	[35] GRIBUSHIN	96	FMPS	515 π^- Be $\rightarrow$ $2\mu X$

[35] Using B($J/\psi(1S) \rightarrow \mu^+\mu^-$) = 0.0588 ± 0.0010.

$\Gamma(\tau^+\tau^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_8/Γ_{11}

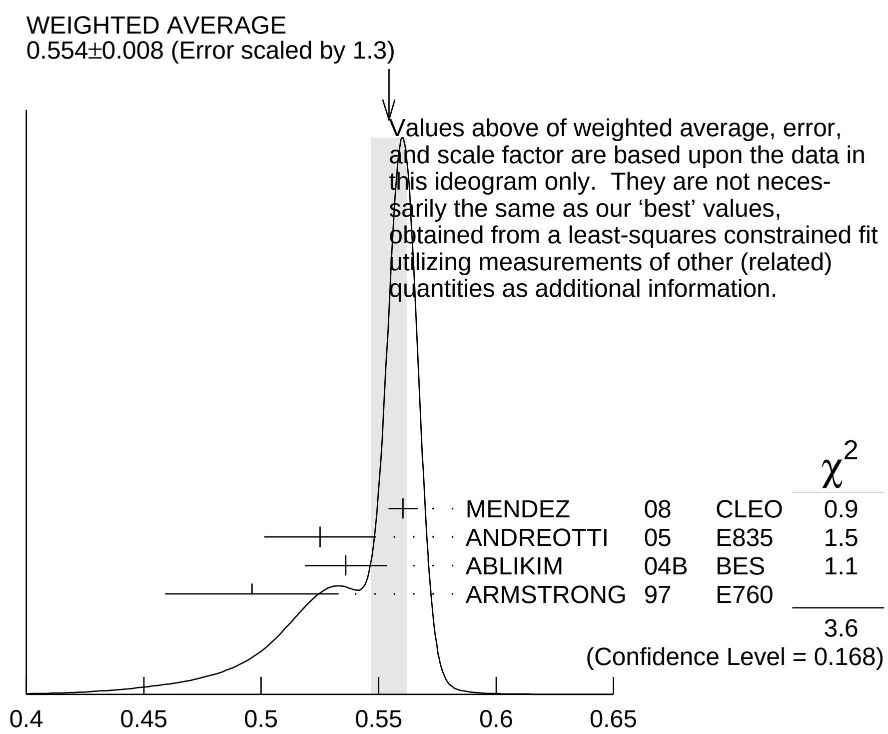
VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
9.0 ±1.1 OUR FIT				
8.73±1.39±1.57	BAI	02	BES	e^+e^-

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma(J/\psi(1S)\text{anything})$ Γ_{11}/Γ_9

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.5646±0.0026 OUR FIT					
0.554 ±0.008 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.					
0.5604±0.0009±0.0062	565k	MENDEZ	08	CLEO	$\psi(2S) \rightarrow \ell^+\ell^-\pi^+\pi^-$
0.525 ±0.009 ±0.022	4k	ANDREOTTI	05	E835	$\psi(2S) \rightarrow J/\psi X$
0.536 ±0.007 ±0.016	20k	[36,37] ABLIKIM	04B	BES	$\psi(2S) \rightarrow J/\psi X$
0.496 ±0.037		ARMSTRONG	97	E760	$\overline{p}p \rightarrow \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.5637±0.0027±0.0046	60k	ADAM	05A	CLEO	Repl. by MENDEZ 08

[36] From a fit to the J/ψ recoil mass spectra.

[37] ABLIKIM 04B quotes B($\psi(2S) \rightarrow J/\psi X$) / B($\psi(2S) \rightarrow J/\psi\pi^+\pi^-$).



$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma(J/\psi(1S)\text{anything})$ Γ_{11}/Γ_9

$\Gamma(J/\psi(1S)\text{neutrals})/\Gamma(J/\psi(1S)\pi^+\pi^-)$ $\Gamma_{10}/\Gamma_{11} = (0.9761\Gamma_{12}+0.719\Gamma_{13}+0.344\Gamma_{110}+0.195\Gamma_{111})/\Gamma_{11}$

VALUE	DOCUMENT ID		TECN	COMMENT
0.731±0.008 OUR FIT				
0.73 ±0.09	TANENBAUM	76	MRK1	e^+e^-

$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.1775±0.0034 OUR FIT					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.1769±0.0008±0.0053	61k	[38] MENDEZ	08	CLEO	$\psi(2S) \to \ell^+\ell^- 2\pi^0$
0.1652±0.0014±0.0058	13.4k	[39] ADAM	05A	CLEO	Repl. by MENDEZ 08

[38] Not independent from other measurements of MENDEZ 08.
[39] Not independent from other values reported by ADAM 05A.

$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma(J/\psi(1S)\text{anything})$ Γ_{12}/Γ_9

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.2982±0.0032 OUR FIT					
0.320 ±0.012 OUR AVERAGE					
0.300 ±0.008 ±0.022	1655 ± 44	ANDREOTTI	05	E835	$\psi(2S) \to J/\psi X$
0.328 ±0.013 ±0.008		AMBROGIANI	00A	E835	$p\overline{p} \to \psi(2S)$
0.323 ±0.033		ARMSTRONG	97	E760	$\overline{p}p \to \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.2829±0.0012±0.0056	61k	MENDEZ	08	CLEO	$\psi(2S) \to \ell^+\ell^- 2\pi^0$
0.2776±0.0025±0.0043	13.4k	ADAM	05A	CLEO	Repl. by MENDEZ 08

$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_{12}/Γ_{11}

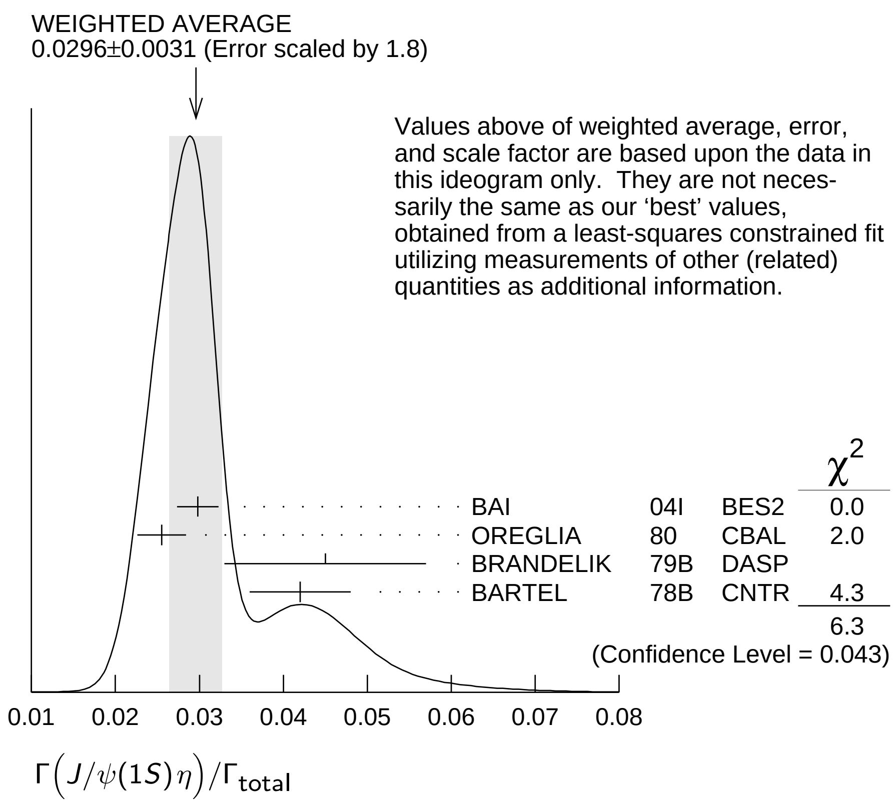
VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.528 ±0.008 OUR FIT					
0.513 ±0.022 OUR AVERAGE Error includes scale factor of 2.2.					
0.5047±0.0022±0.0102	61k	MENDEZ	08	CLEO	$\psi(2S) \to \ell^+\ell^- 2\pi^0$
0.570 ±0.009 ±0.026	14k	[40] ABLIKIM	04B	BES	$\psi(2S) \to J/\psi X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.4924±0.0047±0.0086	73k	[41,42] ADAM	05A	CLEO	Repl. by MENDEZ 08
0.571 ±0.018 ±0.044		[43] ANDREOTTI	05	E835	$\psi(2S) \to J/\psi X$
0.53 ±0.06		TANENBAUM	76	MRK1	e^+e^-
0.64 ±0.15		[44] HILGER	75	SPEC	e^+e^-

[40] From a fit to the J/ψ recoil mass spectra.
[41] Not independent from other values reported by ADAM 05A.
[42] Using 13,217 $J/\psi\pi^0\pi^0$ and 60,010 $J/\psi\pi^+\pi^-$ events.
[43] Not independent from other values reported by ANDREOTTI 05.
[44] Ignoring the $J/\psi(1S)\eta$ and $J/\psi(1S)\gamma\gamma$ decays.

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0328±0.0007 OUR FIT					
0.0296±0.0031 OUR AVERAGE	Error includes scale factor of 1.8. See the ideogram below.				
0.0298±0.0009±0.0023	5.7k	BAI	04I	BES2	$\psi(2S) \to J/\psi\gamma\gamma$
0.0255±0.0029	386	[45] OREGLIA	80	CBAL	$e^+e^- \to J/\psi 2\gamma$
0.045 ±0.012	17	[46] BRANDELIK	79B	DASP	$e^+e^- \to J/\psi 2\gamma$
0.042 ±0.006	164	[46] BARTEL	78B	CNTR	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0343±0.0004±0.0009	18.4k	[47] MENDEZ	08	CLEO	$\psi(2S) \to \ell^+\ell^-\eta$
0.0325±0.0006±0.0011	2.8k	[48] ADAM	05A	CLEO	Repl. by MENDEZ 08
0.043 ±0.008	44	TANENBAUM	76	MRK1	e^+e^-

[45] Recalculated by us using $B(J/\psi(1S) \to \ell^+\ell^-) = 0.1181 \pm 0.0020$.
[46] Recalculated by us using $B(J/\psi(1S) \to \mu^+\mu^-) = 0.0588 \pm 0.0010$.
[47] Not independent from other measurements of MENDEZ 08.
[48] Not independent from other values reported by ADAM 05A.

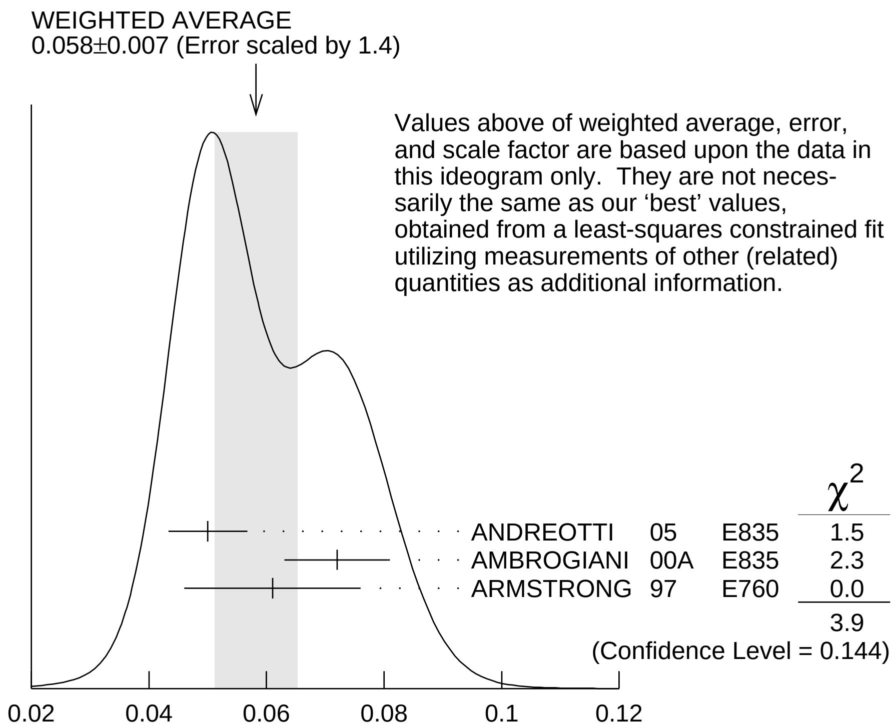


$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\text{anything})$ Γ_{13}/Γ_9

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0551±0.0009 OUR FIT					
0.058 ±0.007 OUR AVERAGE	Error includes scale factor of 1.4. See the ideogram below.				
0.050 ±0.006 ±0.003	298 ± 20	ANDREOTTI	05	E835	$\psi(2S) \to J/\psi X$
0.072 ±0.009		AMBROGIANI	00A	E835	$p\overline{p} \to \psi(2S)$
0.061 ±0.015		ARMSTRONG	97	E760	$\overline{p}p \to \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					

0.0549 ± 0.0006 ± 0.0009	18.4k	[49] MENDEZ	08 CLEO	$\psi(2S) \to \ell^+ \ell^- \eta$
0.0546 ± 0.0010 ± 0.0007	2.8k	ADAM	05A CLEO	Repl. by MENDEZ 08

[49] Not independent from other measurements of MENDEZ 08.



$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\,\text{anything})$ Γ_{13}/Γ_9

$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_{13}/Γ_{11}

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
0.0976 ± 0.0016 OUR FIT				
0.0979 ± 0.0018 OUR AVERAGE				
0.0979 ± 0.0010 ± 0.0015	18.4k	MENDEZ	08 CLEO	$\psi(2S) \to \ell^+ \ell^- \eta$
0.098 ± 0.005 ± 0.010	2k	[50] ABLIKIM	04B BES	$\psi(2S) \to J/\psi X$
0.091 ± 0.021		[51] HIMEL	80 MRK2	$e^+ e^- \to \psi(2S) X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0968 ± 0.0019 ± 0.0013	2.8k	[52] ADAM	05A CLEO	Repl. by MENDEZ 08
0.095 ± 0.007 ± 0.007		[53] ANDREOTTI	05 E835	$\psi(2S) \to J/\psi X$

[50] From a fit to the J/ψ recoil mass spectra.

[51] The value for B($\psi(2S) \to J/\psi(1s)\eta$) reported in HIMEL 80 is derived using B(ψ(2S)) $\to$ $J/\psi(1S)\pi^+\pi^-$) = (33 ± 3))% and B($J/\psi(1S) \to \ell^+\ell^-$) = 0.138 ± 0.018. Calculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = (0.1181 ± 0.0020).

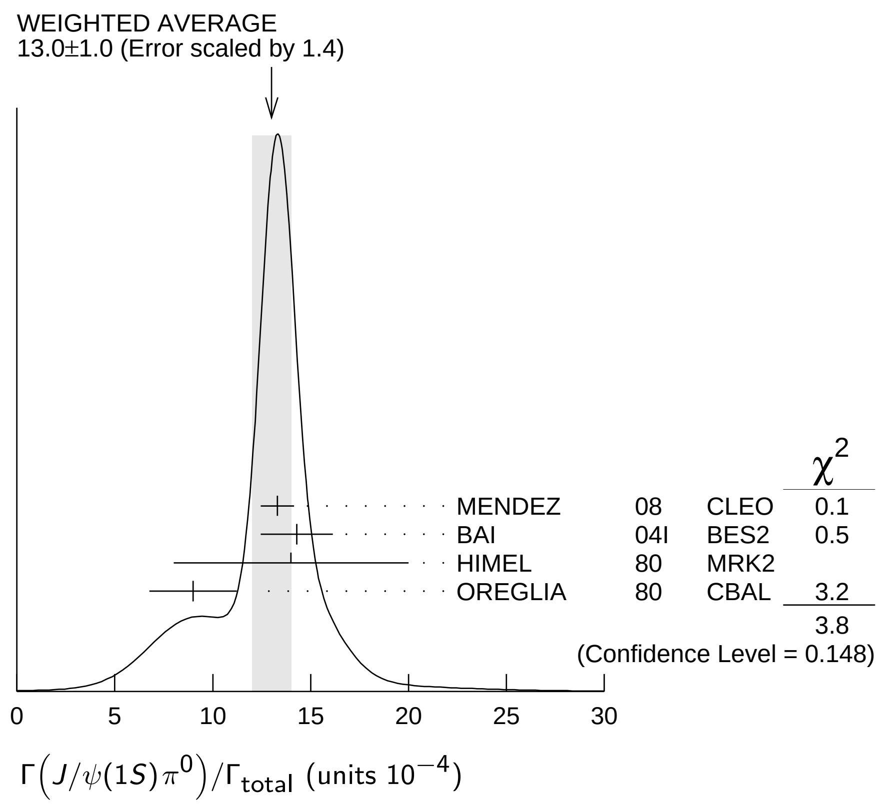
[52] Not independent from other values reported by ADAM 05A.

[53] Not independent from other values reported by ANDREOTTI 05.

$\Gamma(J/\psi(1S)\pi^0)/\Gamma_{total}$ Γ_{14}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
13.0±1.0 OUR AVERAGE	Error includes scale factor of 1.4. See the ideogram below.				
13.3±0.8±0.3	530	MENDEZ	08	CLEO	$\psi(2S) \to \ell^+\ell^- 2\gamma$
14.3±1.4±1.2	280	BAI	04I	BES2	$\psi(2S) \to J/\psi\gamma\gamma$
14 ±6	7	HIMEL	80	MRK2	e^+e^-
9 ±2 ±1	23	[54] OREGLIA	80	CBAL	$\psi(2S) \to J/\psi 2\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
13 ±1 ±1	88	ADAM	05A	CLEO	Repl. by MENDEZ 08

[54] Recalculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = 0.1181 ± 0.0020.



$\Gamma(J/\psi(1S)\pi^0)/\Gamma(J/\psi(1S)\text{anything})$
$\Gamma_{14}/\Gamma_9 = \Gamma_{14}/(\Gamma_{11}+\Gamma_{12}+\Gamma_{13}+0.344\Gamma_{110}+0.195\Gamma_{111})$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.213±0.012±0.003	527	[55] MENDEZ	08	CLEO	$e^+e^- \to J/\psi\gamma\gamma$
0.22 ±0.02 ±0.01		[56] ADAM	05A	CLEO	$e^+e^- \to \psi(2S) \to J/\psi\gamma\gamma$

[55] Not independent from other values reported by MENDEZ 08. Supersedes ADAM 05A.
[56] Not independent from other values reported by ADAM 05A.

$\Gamma(J/\psi(1S)\pi^0)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ — Γ_{14}/Γ_{11}

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.380 \pm 0.022 \pm 0.005$	527	[57] MENDEZ	08	CLEO	$e^+e^- \rightarrow J/\psi\gamma\gamma$
$0.39 \pm 0.04 \pm 0.01$		[58] ADAM	05A	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow J/\psi\gamma\gamma$

[57] Not independent from other values reported by MENDEZ 08. Supersedes ADAM 05A.
[58] Not independent from other values reported by ADAM 05A.

HADRONIC DECAYS

$\Gamma(\pi^0 h_c(1P))/\Gamma_{total}$ — Γ_{15}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
8.6±1.3 OUR AVERAGE					
$9.0 \pm 1.5 \pm 1.3$	3k	[59] GE	11	CLEO	$\Upsilon(2S) \rightarrow \pi^0$ anything
$8.4 \pm 1.3 \pm 1.0$	11k	ABLIKIM	10B	BES3	$\psi(2S) \rightarrow \pi^0 h_c$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen	92^{+23}_{-22}	ADAMS	09	CLEO	$\psi(2S) \rightarrow 2\pi^+2\pi^-2\pi^0$
seen	1282	DOBBS	08A	CLEO	$\psi(2S) \rightarrow \pi^0\eta_c\gamma$
seen	168 ± 40	ROSNER	05	CLEO	$\psi(2S) \rightarrow \pi^0\eta_c\gamma$

[59] Assuming a width $\Gamma(h_c(1P)) = 0.86$ MeV $\equiv \Gamma_0$, a measured dependence of the central value of $B = (7.6 + 1.4 \times \Gamma(h_c(1P)/\Gamma_0) \times 10^{-4}$, and with a systematic error that accounts for the width variation range 0.43–1.29 MeV.

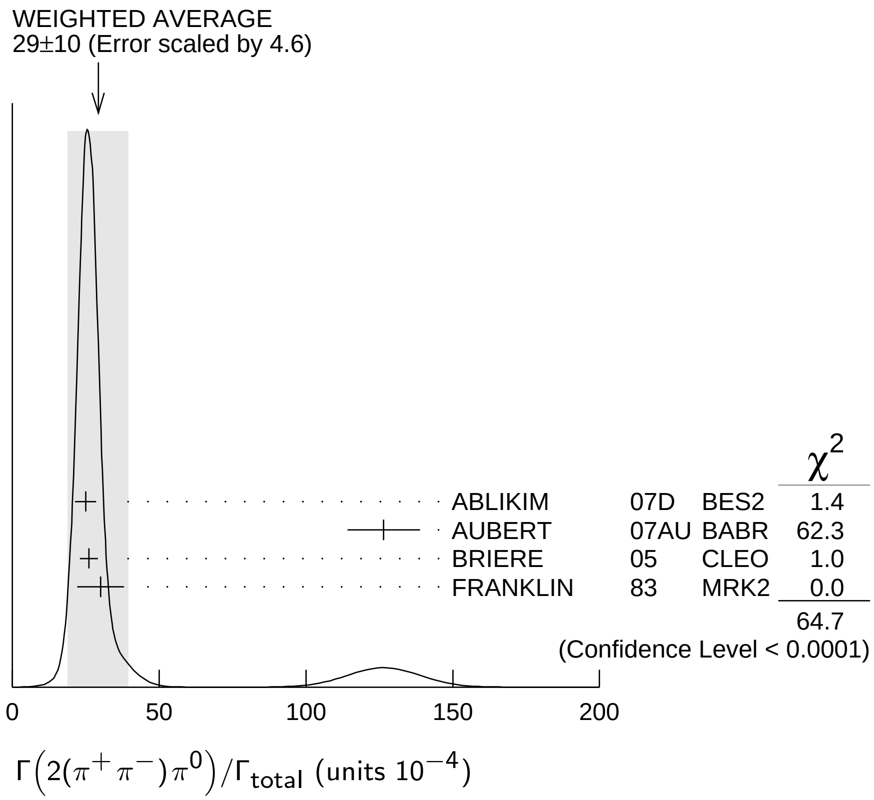
$\Gamma(3(\pi^+\pi^-)\pi^0)/\Gamma_{total}$ — Γ_{16}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
35±16	6	FRANKLIN	83	MRK2	$e^+e^- \rightarrow$ hadrons

$\Gamma(2(\pi^+\pi^-)\pi^0)/\Gamma_{total}$ — Γ_{17}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
29 ±10 OUR AVERAGE		Error includes scale factor of 4.6. See the ideogram below.			
$24.9 \pm 0.7 \pm 3.6$	2173	ABLIKIM	07D	BES2	$e^+e^- \rightarrow \psi(2S)$
$127 \pm 12 \pm 2$	410	[60] AUBERT	07AU	BABR	$10.6\ e^+e^- \rightarrow 2(\pi^+\pi^-)\pi^0\gamma$
$26.1 \pm 0.7 \pm 3.0$	1703	BRIERE	05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$
30 ± 8	42	FRANKLIN	83	MRK2	e^+e^-

[60] AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0)/\Gamma_{total}] \times [\Gamma(\psi(2S) \rightarrow e^+e^-)] = (297 \pm 22 \pm 18) \times 10^{-4}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+e^-) = 2.35 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

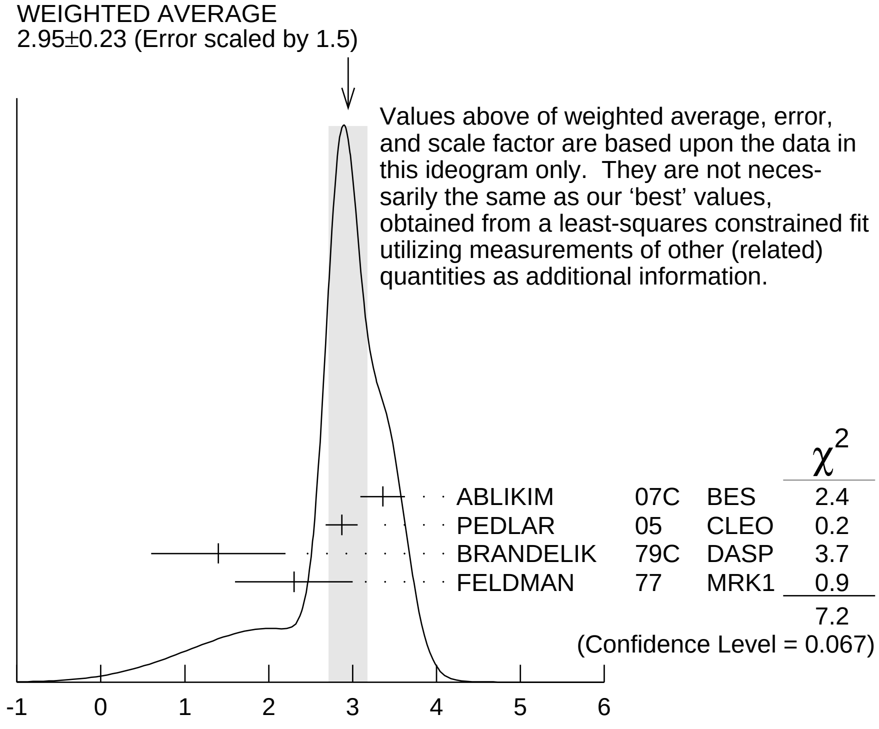


$\Gamma\big(\rho a_2(1320)\big)/\Gamma_{total}$ Γ_{18}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
2.55±0.73±0.47		112 ± 31	BAI	04C	BES2	$\psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<2.3	90		BAI	98J	BES	e^+e^-

$\Gamma(p\overline{p})/\Gamma_{total}$ Γ_{19}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.76±0.12 OUR FIT					
2.95±0.23 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.				
3.36±0.09±0.25	1618	ABLIKIM	07C	BES	$e^+e^- \rightarrow \psi(2S) \rightarrow p\overline{p}$
2.87±0.12±0.15	557	PEDLAR	05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow p\overline{p}$
1.4 ±0.8	4	BRANDELIK	79C	DASP	$e^+e^- \rightarrow \psi(2S) \rightarrow p\overline{p}$
2.3 ±0.7		FELDMAN	77	MRK1	$e^+e^- \rightarrow \psi(2S) \rightarrow p\overline{p}$



$\Gamma(p\overline{p})/\Gamma(J/\psi(1S)\pi^+\pi^-)$ — Γ_{19}/Γ_{11}

VALUE (units 10^{-4})	*DOCUMENT ID*		*TECN*	*COMMENT*
8.2 ±0.4 OUR FIT				
6.98±0.49±0.97	BAI	01	BES	$e^+e^- \to \psi(2S) \to p\overline{p}$

$\Gamma(\Delta^{++}\overline{\Delta}^{--})/\Gamma_{\text{total}}$ — Γ_{20}/Γ

VALUE (units 10^{-5})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
12.8±1.0±3.4	157	[61] BAI	01	BES	$e^+e^- \to \psi(2S) \to$ hadrons

[61] Estimated using B($\psi(2S) \to J/\psi\pi^+\pi^-$)= 0.310 ± 0.028.

$\Gamma(\Lambda\overline{\Lambda}\pi^0)/\Gamma_{\text{total}}$ — Γ_{21}/Γ

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<1.2	90	[62] ABLIKIM	07H	BES2	$e^+e^- \to \psi(2S)$

[62] Using B($\Lambda \to \pi^- p$) = 63.9% and B($\eta \to \gamma\gamma$) = 39.4%.

$\Gamma(\Lambda\overline{\Lambda}\eta)/\Gamma_{\text{total}}$ — Γ_{22}/Γ

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.49	90	[63] ABLIKIM	07H	BES2	$e^+e^- \to \psi(2S)$

[63] Using B($\Lambda \to \pi^- p$) = 63.9%.

$\Gamma(\Lambda\overline{p}K^+)/\Gamma_{\text{total}}$ — Γ_{23}/Γ

VALUE (units 10^{-4})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.0±0.1±0.1	74.0	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to p\overline{p}K^+\pi^-$

$\Gamma(\Lambda\overline{p}K^+\pi^+\pi^-)/\Gamma_{total}$ — Γ_{24}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.8±0.3±0.3	45.8	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to p\overline{p}K^+\pi^+\pi^-\pi^-$

$\Gamma(\Lambda\overline{\Lambda}\pi^+\pi^-)/\Gamma_{total}$ — Γ_{25}/Γ

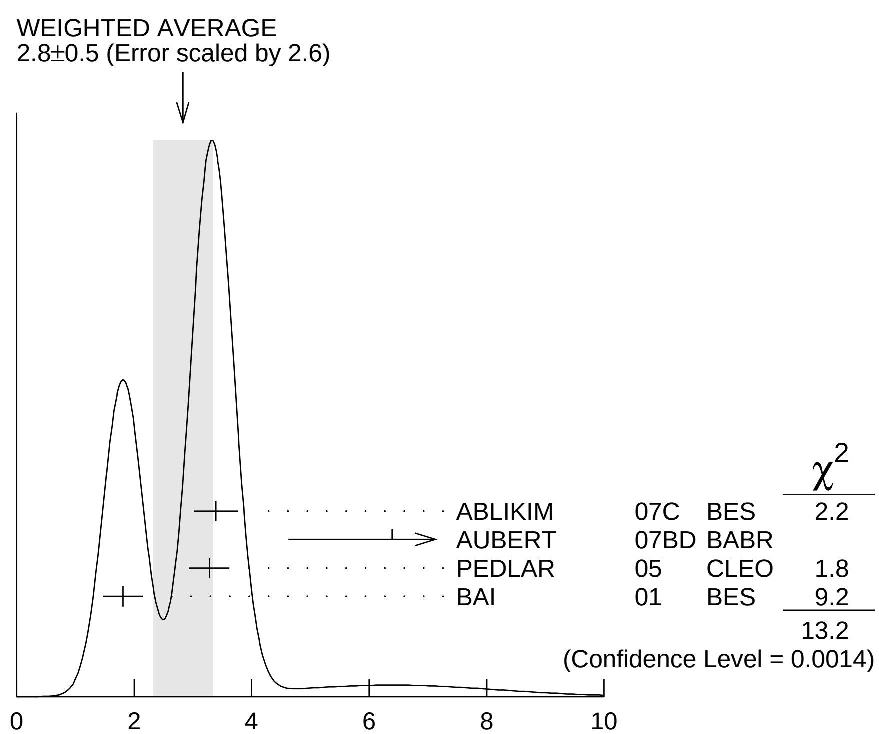
VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.8±0.4±0.5	73.4	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to p\overline{p}2(\pi^+\pi^-)$

$\Gamma(\Lambda\overline{\Lambda})/\Gamma_{total}$ — Γ_{26}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
2.8 ±0.5 OUR AVERAGE			Error includes scale factor of 2.6. See the ideogram below.			
3.39±0.20±0.32		337	ABLIKIM	07C	BES	$e^+e^- \to \psi(2S) \to$ hadrons
6.4 ±1.8 ±0.1			[64] AUBERT	07BD	BABR	10.6 $e^+e^- \to \Lambda\overline{\Lambda}\gamma$
3.28±0.23±0.25		208	PEDLAR	05	CLEO	$e^+e^- \to \psi(2S) \to$ hadrons
1.81±0.20±0.27		80	[65] BAI	01	BES	$e^+e^- \to \psi(2S) \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<4	90		FELDMAN	77	MRK1	$e^+e^- \to \psi(2S) \to$ hadrons

[64] AUBERT 07BD reports $[\Gamma(\psi(2S) \to \Lambda\overline{\Lambda})/\Gamma_{total}] \times [\Gamma(\psi(2S) \to e^+e^-)] = (15 \pm 4 \pm 1) \times 10^{-4}$ keV which we divide by our best value $\Gamma(\psi(2S) \to e^+e^-) = 2.35 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[65] Estimated using $B(\psi(2S) \to J/\psi\pi^+\pi^-) = 0.310 \pm 0.028$.



$\Gamma(\Lambda\overline{\Lambda})/\Gamma_{total}$ (units 10^{-4})

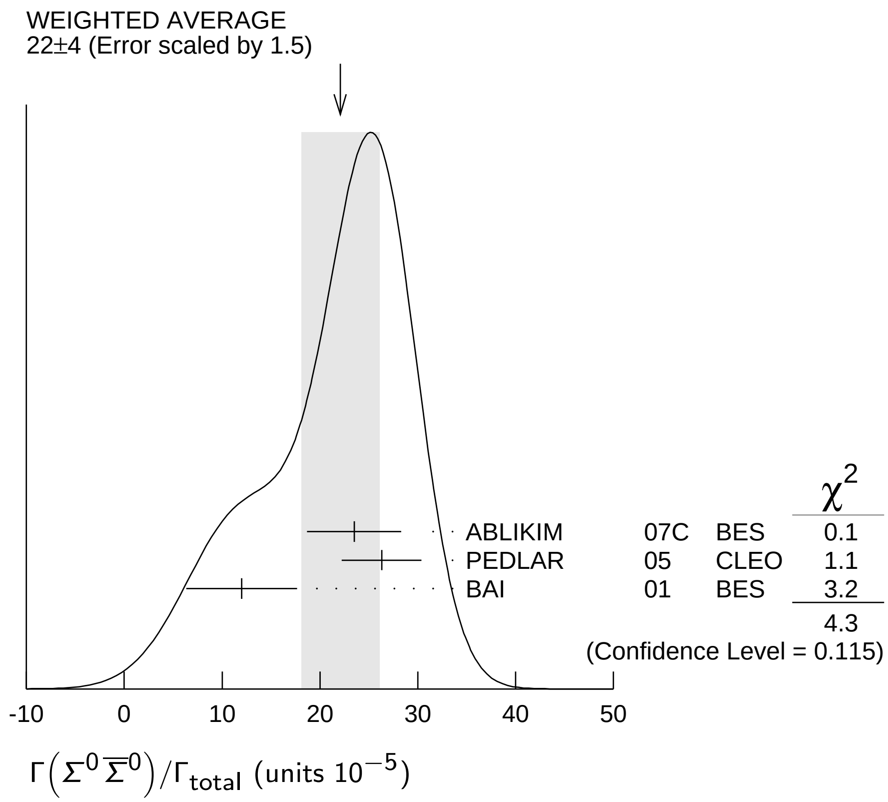
$\Gamma(\Sigma^+\overline{\Sigma}^-)/\Gamma_{total}$ — Γ_{27}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
25.7±4.4±6.8	35	PEDLAR	05	CLEO	$e^+e^- \to \psi(2S) \to$ hadrons

$\Gamma(\Sigma^0\overline{\Sigma}^0)/\Gamma_{total}$ — Γ_{28}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
22 ±4 OUR AVERAGE		Error includes scale factor of 1.5. See the ideogram below.			
23.5±3.6±3.2	59	ABLIKIM	07C	BES	$e^+e^- \to \psi(2S) \to$ hadrons
26.3±3.5±2.1	58	PEDLAR	05	CLEO	$e^+e^- \to \psi(2S) \to$ hadrons
12 ±4 ±4	8	[66] BAI	01	BES	$e^+e^- \to \psi(2S) \to$ hadrons

[66] Estimated using B($\psi(2S) \to J/\psi\pi^+\pi^-$)= 0.310 ± 0.028.



$\Gamma(\Sigma(1385)^+\overline{\Sigma}(1385)^-)/\Gamma_{total}$ — Γ_{29}/Γ

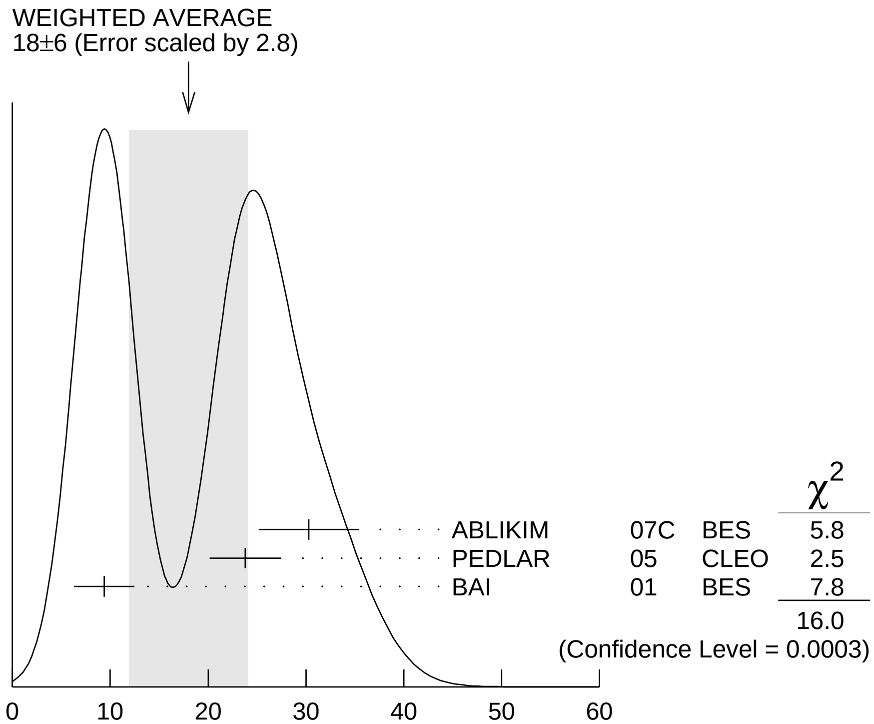
VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
11±3±3	14	[67] BAI	01	BES	$e^+e^- \to \psi(2S) \to$ hadrons

[67] Estimated using B($\psi(2S) \to J/\psi\pi^+\pi^-$)= 0.310 ± 0.028.

$\Gamma(\Xi^- \overline{\Xi}^+)/\Gamma_{total}$ — Γ_{30}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
18 ±6		**OUR AVERAGE**	Error includes scale factor of 2.8. See the ideogram below.			
30.3±4.0±3.2		67	ABLIKIM	07C	BES	$e^+e^- \to \psi(2S) \to$ hadrons
23.8±3.0±2.1		63	PEDLAR	05	CLEO	$e^+e^- \to \psi(2S) \to$ hadrons
9.4±2.7±1.5		12	[68] BAI	01	BES	$e^+e^- \to \psi(2S) \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<20	90		FELDMAN	77	MRK1	$e^+e^- \to \psi(2S) \to$ hadrons

[68] Estimated using B($\psi(2S) \to J/\psi \pi^+ \pi^-$)= 0.310 ± 0.028.



$\Gamma(\Xi^0 \overline{\Xi}^0)/\Gamma_{total}$ — Γ_{31}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
27.5±6.4±6.1	19	PEDLAR	05	CLEO	$e^+e^- \to \psi(2S) \to$ hadrons

$\Gamma(\Xi(1530)^0 \overline{\Xi}(1530)^0)/\Gamma_{total}$ — Γ_{32}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
< 8.1	90	[69] BAI	01	BES	$e^+e^- \to \psi(2S) \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<32	90	PEDLAR	05	CLEO	$e^+e^- \to \psi(2S) \to$ hadrons

[69] Estimated using B($\psi(2S) \to J/\psi \pi^+ \pi^-$)= 0.310 ± 0.028.

$\Gamma(\Omega^-\overline{\Omega}^+)/\Gamma_{total}$ — Γ_{33}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
< 7.3	90	[70] BAI	01	BES	$e^+e^- \to \psi(2S) \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<16	90	PEDLAR	05	CLEO	$e^+e^- \to \psi(2S) \to$ hadrons

[70] Estimated using B($\psi(2S) \to J/\psi\pi^+\pi^-$)= 0.310 ± 0.028.

$\Gamma(\pi^0 p\overline{p})/\Gamma_{total}$ — Γ_{34}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.50±0.08 OUR AVERAGE	Error includes scale factor of 1.1.				
1.54±0.06±0.06	948	ALEXANDER	10	CLEO	$\psi(2S) \to \pi^0 p\overline{p}$
1.32±0.10±0.15	256 ± 18	[71] ABLIKIM	05E	BES2	$e^+e^- \to \psi(2S) \to p\overline{p}\gamma\gamma$
1.4 ±0.5	9	FRANKLIN	83	MRK2	e^+e^-

[71] Computed using B($\pi^0 \to \gamma\gamma$) = (98.80 ± 0.03)%.

$\Gamma(N_1^*(1440)\overline{p} \to \pi^0 p\overline{p})/\Gamma_{total}$ — Γ_{35}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
8.1±0.7±0.3	474	[72] ALEXANDER	10	CLEO	$\psi(2S) \to \pi^0 p\overline{p}$

[72] From a fit of the $p\overline{p}$ and $p\pi^0$ mass distributions to a combination of $N_1^*(1440)\overline{p}$, $\pi^0 f_0(2100)$, and two other broad, unestablished resonances.

$\Gamma(\pi^0 f_0(2100) \to \pi^0 p\overline{p})/\Gamma_{total}$ — Γ_{36}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
1.1±0.4±0.1	76	[73] ALEXANDER	10	CLEO	$\psi(2S) \to \pi^0 p\overline{p}$

[73] From a fit of the $p\overline{p}$ and $p\pi^0$ mass distributions to a combination of $N_1^*(1440)\overline{p}$, $\pi^0 f_0(2100)$, and two other broad, unestablished resonances.

$\Gamma(\eta p\overline{p})/\Gamma_{total}$ — Γ_{37}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
5.7±0.6 OUR AVERAGE					
5.6±0.6±0.3	154	ALEXANDER	10	CLEO	$\psi(2S) \to \eta p\overline{p}$
5.8±1.1±0.7	44.8 ± 8.5	[74] ABLIKIM	05E	BES2	$e^+e^- \to \psi(2S) \to p\overline{p}\gamma\gamma$
8 ±3 ±3	9.8	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to p\overline{p}\pi^+\pi^-\pi^0$

[74] Computed using B($\eta \to \gamma\gamma$) = (39.43 ± 0.26)%.

$\Gamma(\eta f_0(2100) \to \eta p\overline{p})/\Gamma_{total}$ — Γ_{38}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
1.2±0.4±0.1	31	[75] ALEXANDER	10	CLEO	$\psi(2S) \to \eta p\overline{p}$

[75] From a fit of the $p\overline{p}$ and $p\eta$ distributions to a combination of $N^*(1535)\overline{p}$ and $\eta f_0(2100)$.

$\Gamma(N^*(1535)\overline{p} \to \eta p\overline{p})/\Gamma_{total}$ — Γ_{39}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
4.4±0.6±0.3	123	[76] ALEXANDER	10	CLEO	$\psi(2S) \to \eta p\overline{p}$

[76] From a fit of the $p\overline{p}$ and $p\eta$ distributions to a combination of $N^*(1535)\overline{p}$ and $\eta f_0(2100)$.

$\Gamma(\omega p\overline{p})/\Gamma_{total}$ — Γ_{40}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.69±0.21 OUR AVERAGE					
0.6 ±0.2 ±0.2	21.2	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to p\overline{p}\pi^+\pi^-\pi^0$
0.8 ±0.3 ±0.1	14.9 ± 0.1	[77] BAI	03B	BES	$\psi(2S) \to p\overline{p}\pi^+\pi^-\pi^0$

[77] Normalized to B($\psi(2S) \to J/\psi\pi^+\pi^-$) = 0.305 ± 0.016.

$\Gamma(\phi p\overline{p})/\Gamma_{total}$ — Γ_{41}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.24	90	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to p\overline{p}K^+K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.26	90	[78] BAI	03B	BES	$\psi(2S) \to K^+K^-p\overline{p}$

[78] Normalized to B($\psi(2S) \to J/\psi\pi^+\pi^-$) = 0.305 ± 0.016.

$\Gamma(\pi^+\pi^-p\overline{p})/\Gamma_{total}$ — Γ_{42}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
6.0±0.4 OUR AVERAGE					
5.9±0.2±0.4	904.5	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to p\overline{p}\pi^+\pi^-$
8 ±2		[79] TANENBAUM	78	MRK1	e^+e^-

[79] Assuming entirely strong decay.

$\Gamma(p\overline{n}\pi^- \text{ or c.c.})/\Gamma_{total}$ — Γ_{43}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.48±0.17 OUR AVERAGE					
2.45±0.11±0.21	851	ABLIKIM	06I	BES2	$e^+e^- \to p\pi^-X$
2.52±0.12±0.22	849	ABLIKIM	06I	BES2	$e^+e^- \to \overline{p}\pi^+X$

$\Gamma(p\overline{n}\pi^-\pi^0)/\Gamma_{total}$ — Γ_{44}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
3.18±0.50±0.50	135 ± 21	ABLIKIM	06I	BES2	$e^+e^- \to p\pi^-\pi^0X$

$\Gamma(\eta\pi^+\pi^-)/\Gamma_{total}$ — Γ_{46}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.6	90	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to 2(\pi^+\pi^-)\pi^0$

$\Gamma(\eta\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{47}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
9.5±0.7±1.5		[80] BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to$ hadr
• • • We do not use the following data for averages, fits, limits, etc. • • •					
10.3±0.8±1.4	201.7	[81] BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to \eta 3\pi(\eta \to \gamma\gamma)$
8.1±1.4±1.6	50.0	[81] BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to \eta 3\pi(\eta \to 3\pi)$

[80] Average of $\eta \to \gamma\gamma$ and $\eta \to 3\pi$.
[81] Not independent from other values reported by BRIERE 05.

$\Gamma(2(\pi^+\pi^-)\eta)/\Gamma_{total}$ — Γ_{48}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.2±0.6±0.1	16	[82] AUBERT	07AU	BABR	10.6 $e^+e^- \to 2(\pi^+\pi^-)\eta\gamma$

[82] AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \to 2(\pi^+\pi)\eta) \cdot B(\eta \to \gamma\gamma) = 1.2 \pm 0.7 \pm 0.1$ eV.

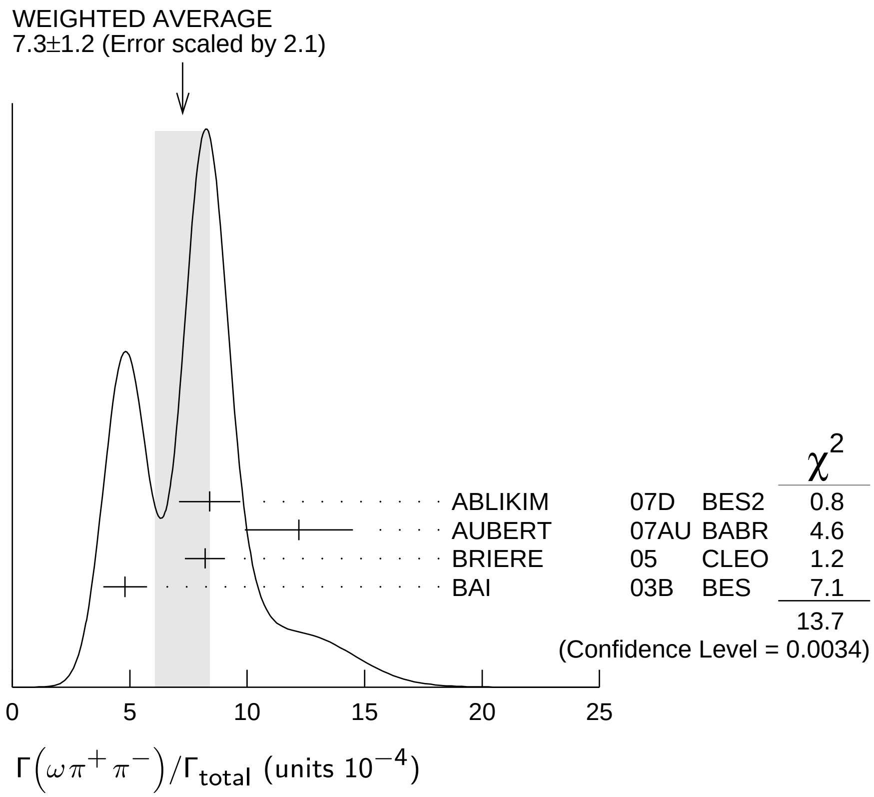
$\Gamma(\eta'\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{49}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
4.5±1.6±1.3	12.8	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to$ hadr

$\Gamma(\omega\pi^+\pi^-)/\Gamma_{total}$ — Γ_{50}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.3±1.2 OUR AVERAGE	Error includes scale factor of 2.1. See the ideogram below.				
8.4±0.5±1.2	386	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$
12.2±2.2±0.7	37	[83] AUBERT	07AU	BABR	10.6 $e^+e^- \to \omega\pi^+\pi^-\gamma$
8.2±0.5±0.7	391	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to 2(\pi^+\pi^-)\pi^0$
4.8±0.6±0.7	100 ± 22	[84] BAI	03B	BES	$\psi(2S) \to 2(\pi^+\pi^-)\pi^0$

[83] AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \to \omega\pi^+\pi^-) \cdot B(\omega \to 3\pi) = 2.69 \pm 0.73 \pm 0.16$ eV.
[84] Normalized to $B(\psi(2S) \to J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.



$\Gamma\left(b_1^{\pm}\pi^{\mp}\right)/\Gamma_{total}$ — Γ_{51}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
4.0 ±0.6 OUR AVERAGE	Error includes scale factor of 1.1.			
5.1 ±0.6 ±0.8	202	ABLIKIM 07D	BES2	$e^+e^- \to \psi(2S)$
$4.18^{+0.43}_{-0.42}\pm0.92$	170	ADAM 05	CLEO	$e^+e^- \to \psi(2S)$
3.2 ±0.6 ±0.5	61 ± 11	[85,86] BAI 03B	BES	$\psi(2S) \to 2(\pi^+\pi^-)\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.2 ±0.8 ±1.0		[85] BAI 99C	BES	Repl. by BAI 03B

[85] Assuming B($b_1 \to \omega\pi$)=1.

[86] Normalized to B($\psi(2S) \to J/\psi\pi^+\pi^-$) = 0.305 ± 0.016.

$\Gamma\left(b_1^0\pi^0\right)/\Gamma_{total}$ — Γ_{52}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$\mathbf{2.35^{+0.47}_{-0.42}\pm0.40}$	45	ADAM 05	CLEO	$e^+e^- \to \psi(2S)$

$\Gamma\left(\omega f_2(1270)\right)/\Gamma_{total}$ — Γ_{53}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
2.2 ±0.4 OUR AVERAGE					
2.3 ±0.5 ±0.4		57	ABLIKIM 07D	BES2	$e^+e^- \to \psi(2S)$
2.05±0.41±0.38		62±12	BAI 04C	BES2	$\psi(2S) \to 2(\pi^+\pi^-)\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.5	90		[87] BAI 03B	BES	$\psi(2S) \to 2(\pi^+\pi^-)\pi^0$
<1.7	90		BAI 98J	BES	Repl. by BAI 03B

[87] Normalized to B($\psi(2S) \to J/\psi\pi^+\pi^-$) = 0.305 ± 0.016.

$\Gamma(\pi^+\pi^- K^+ K^-)/\Gamma_{total}$ — Γ_{54}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.5±0.9 OUR AVERAGE		Error includes scale factor of 1.9.			
10.9±1.9±0.2	85	[88] AUBERT	07AK	BABR	10.6 $e^+e^- \to \pi^+\pi^- K^+ K^- \gamma$
7.1±0.3±0.4	817.2	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to K^+ K^- \pi^+\pi^-$
16 ±4		[89] TANENBAUM	78	MRK1	e^+e^-

[88] AUBERT 07AK reports $[\Gamma(\psi(2S) \to \pi^+\pi^- K^+ K^-)/\Gamma_{total}] \times [\Gamma(\psi(2S) \to e^+e^-)] = (2.56 \pm 0.42 \pm 0.16) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \to e^+e^-) = 2.35 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[89] Assuming entirely strong decay.

$\Gamma(\rho^0 K^+ K^-)/\Gamma_{total}$ — Γ_{55}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.2±0.2±0.4	223.8	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to K^+ K^- \pi^+\pi^-$

$\Gamma(K^*(892)^0 \overline{K}{}^*_2(1430)^0)/\Gamma_{total}$ — Γ_{56}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.86±0.32±0.43		93 ± 16	BAI	04C		$\psi(2S) \to K^+ K^- \pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<1.2	90		BAI	98J	BES	e^+e^-

$\Gamma(K^+ K^- \pi^+\pi^- \eta)/\Gamma_{total}$ — Γ_{57}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.3±0.7±0.1	7	[90] AUBERT	07AU	BABR	10.6 $e^+e^- \to K^+ K^- \pi^+\pi^- \eta\gamma$

[90] AUBERT 07AU quotes $\Gamma^{\psi(2S)}_{ee} \cdot B(\psi(2S) \to 2(\pi^+\pi)\eta) \cdot B(\eta \to \gamma\gamma) = 1.2 \pm 0.7 \pm 0.1$ eV.

$\Gamma(K^+ K^- 2(\pi^+\pi^-)\pi^0)/\Gamma_{total}$ — Γ_{58}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
10.0±2.5±1.8	65	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(K_1(1270)^\pm K^\mp)/\Gamma_{total}$ — Γ_{60}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
10.0±1.8±2.1	[91] BAI	99C	BES	e^+e^-

[91] Assuming $B(K_1(1270) \to K\rho) = 0.42 \pm 0.06$

$\Gamma(K^0_S K^0_S \pi^+\pi^-)/\Gamma_{total}$ — Γ_{61}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.20±0.25±0.37	83 ± 9	ABLIKIM	05O	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(\rho^0 p\overline{p})/\Gamma_{total}$ — Γ_{62}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.5±0.1±0.2	61.1	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to p\overline{p}\pi^+\pi^-$

$\Gamma(K^+ \overline{K}^*(892)^0 \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{63}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
6.7±2.5	TANENBAUM	78	MRK1	$e^+ e^-$

$\Gamma(2(\pi^+ \pi^-))/\Gamma_{\text{total}}$ — Γ_{64}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.4±0.6 OUR AVERAGE Error includes scale factor of 2.2.					
2.2±0.2±0.2	308	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+ \pi^-)$
4.5±1.0		TANENBAUM	78	MRK1	$e^+ e^-$

$\Gamma(\rho^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$ — Γ_{65}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.2±0.6 OUR AVERAGE Error includes scale factor of 1.4.					
2.0±0.2±0.4	285.5	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+ \pi^-)$
4.2±1.5		TANENBAUM	78	MRK1	$e^+ e^-$

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
12.6±0.9 OUR AVERAGE					
18.7±5.7±0.3	32	[92] AUBERT	07AU	BABR	10.6 $e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \pi^0 \gamma$
11.7±1.0±1.5	597	ABLIKIM	06G	BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
12.7±0.5±1.0	711.6	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

[92] AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+ e^-)] = (44 \pm 13 \pm 3) \times 10^{-4}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.35 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\omega f_0(1710) \rightarrow \omega K^+ K^-)/\Gamma_{\text{total}}$ — Γ_{67}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
5.9±2.0±0.9	19	ABLIKIM	06G	BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
8.6±1.3±1.8	238	ABLIKIM	06G	BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
9.6±2.2±1.7	133	ABLIKIM	06G	BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

$\Gamma(K^*(892)^+ K^- \rho^0 + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{70}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.3±2.2±1.4	78	ABLIKIM	06G	BES2	$\psi(2S) \to K^+ K^- \pi^+ \pi^- \pi^0$

$\Gamma(K^*(892)^0 K^- \rho^+ + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{71}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
6.1±1.3±1.2	125	ABLIKIM	06G	BES2	$\psi(2S) \to K^+ K^- \pi^+ \pi^- \pi^0$

$\Gamma(\eta K^+ K^-)/\Gamma_{\text{total}}$ — Γ_{72}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.3	90	BRIERE	05	CLEO	$e^+ e^- \to \psi(2S) \to K^+ K^- \pi^+ \pi^- \pi^0$

$\Gamma(\omega K^+ K^-)/\Gamma_{\text{total}}$ — Γ_{73}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.85±0.25 OUR AVERAGE Error includes scale factor of 1.1.					
2.38±0.37±0.29	78	ABLIKIM	06G	BES2	$\psi(2S) \to K^+ K^- \pi^+ \pi^- \pi^0$
1.9 ±0.3 ±0.3	76.8	BRIERE	05	CLEO	$e^+ e^- \to \psi(2S) \to K^+ K^- \pi^+ \pi^- \pi^0$
1.5 ±0.3 ±0.2	23.0 ± 5.2	[93] BAI	03B	BES	$\psi(2S) \to K^+ K^- \pi^+ \pi^- \pi^0$

[93] Normalized to $B(\psi(2S) \to J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(3(\pi^+ \pi^-))/\Gamma_{\text{total}}$ — Γ_{74}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
3.5 ±2.0 OUR AVERAGE Error includes scale factor of 2.8.					
5.45±0.42±0.87	671	ABLIKIM	05H	BES2	$e^+ e^- \to \psi(2S) \to 3(\pi^+ \pi^-)$
1.5 ±1.0		[94] TANENBAUM	78	MRK1	$e^+ e^-$

[94] Assuming entirely strong decay.

$\Gamma(p \overline{p} \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ — Γ_{75}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.3±0.4±0.6	434.9	BRIERE	05	CLEO	$e^+ e^- \to \psi(2S) \to p \overline{p} \pi^+ \pi^- \pi^0$

$\Gamma(K^+ K^-)/\Gamma_{\text{total}}$ — Γ_{76}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
6.3±0.7 OUR AVERAGE					
6.3±0.6±0.3		DOBBS	06A	CLEO	$e^+ e^-$
10 ±7		BRANDELIK	79C	DASP	$e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 5	90	FELDMAN	77	MRK1	$e^+ e^-$

$\Gamma(K^0_S K^0_L)/\Gamma_{total}$ — Γ_{77}/Γ

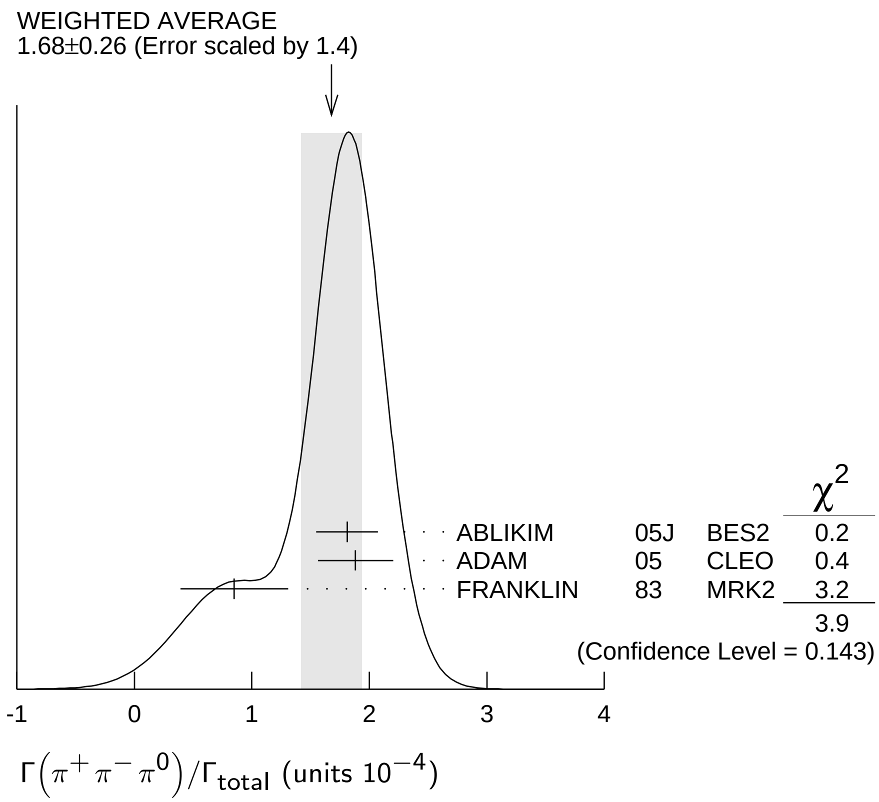
VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
5.4 ±0.5 OUR AVERAGE					
5.8 ±0.8 ±0.4		DOBBS	06A	CLEO	e^+e^-
5.24±0.47±0.48	156 ± 14	[95] BAI	04B	BES2	$\psi(2S) \to K^0_S K^0_L \to \pi^+\pi^- X$

[95] Using B($K^0_S \to \pi^+\pi^-$) = 0.6860 ± 0.0027.

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{78}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.68±0.26 OUR AVERAGE	Error includes scale factor of 1.4. See the ideogram below.				
1.81±0.18±0.19	260 ± 19	[96] ABLIKIM	05J	BES2	$e^+e^- \to \psi(2S)$
$1.88^{+0.16}_{-0.15}$±0.28	194	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
0.85±0.46	4	FRANKLIN	83	MRK2	$e^+e^- \to$ hadrons

[96] From a PW analysis of $\psi(2S) \to \pi^+\pi^-\pi^0$.



$\Gamma(\rho(2150)\pi \to \pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{79}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$1.94\pm0.25^{+1.15}_{-0.34}$	[97] ABLIKIM	05J	BES2	$\psi(2S) \to \rho(2150)\pi \to \pi^+\pi^-\pi^0$

[97] From a PW analysis of $\psi(2S) \to \pi^+\pi^-\pi^0$.

$\Gamma(\rho(770)\pi \to \pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{80}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.32±0.12 OUR AVERAGE Error includes scale factor of 1.8.						
$0.51\pm0.07\pm0.11$			[98] ABLIKIM	05J	BES2	$\psi(2S) \to \rho(770)\pi \to \pi^+\pi^-\pi^0$
$0.24^{+0.08}_{-0.07}\pm0.02$		22	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.83	90	1	FRANKLIN	83	MRK2	e^+e^-
<10	90		BARTEL	76	CNTR	e^+e^-
<10	90		[99] ABRAMS	75	MRK1	e^+e^-

[98] From a PW analysis of $\psi(2S) \to \pi^+\pi^-\pi^0$.
[99] Final state $\rho^0\pi^0$.

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ Γ_{81}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
8 ±5		BRANDELIK	79C	DASP	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<2.1	90	DOBBS	06A	CLEO	$e^+e^- \to \psi(2S)$
<5	90	FELDMAN	77	MRK1	e^+e^-

$\Gamma(K_1(1400)^\pm K^\mp)/\Gamma_{total}$ Γ_{82}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<3.1	90	[100] BAI	99C	BES	e^+e^-

[100] Assuming B($K_1(1400) \to K^*\pi$)=0.94 ± 0.06

$\Gamma(K^+K^-\pi^0)/\Gamma_{total}$ Γ_{83}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<2.96	90	1	FRANKLIN	83	MRK2	$e^+e^- \to$ hadrons

$\Gamma(K^+\overline{K}^*(892)^- + \text{c.c.})/\Gamma_{total}$ Γ_{84}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$1.7^{+0.8}_{-0.7}$ OUR AVERAGE						
$2.9^{+1.3}_{-1.7}\pm0.4$		9.6 ± 4.2	ABLIKIM	05I	BES2	$e^+e^- \to \psi(2S)$
$1.3^{+1.0}_{-0.7}\pm0.3$		7	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<5.4	90		FRANKLIN	83	MRK2	$e^+e^- \to$ hadrons

$\Gamma(K^*(892)^0\overline{K}^0 + \text{c.c.})/\Gamma_{total}$ Γ_{85}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
10.9±2.0 OUR AVERAGE					
$13.3^{+2.4}_{-2.8}\pm1.7$	65.6 ± 9.0	ABLIKIM	05I	BES2	$e^+e^- \to \psi(2S)$
$9.2^{+2.7}_{-2.2}\pm0.9$	25	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$

$\Gamma(K^+ \overline{K}^*(892)^- + \text{c.c.})/\Gamma(K^*(892)^0 \overline{K}^0 + \text{c.c.})$ — Γ_{84}/Γ_{85}

VALUE	DOCUMENT ID		TECN	COMMENT
0.16±0.06 OUR AVERAGE				
$0.22^{+0.10}_{-0.14}$	ABLIKIM	05I	BES2	$e^+e^- \to \psi(2S)$
$0.14^{+0.08}_{-0.06}$	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$

$\Gamma(\phi\pi^+\pi^-)/\Gamma_{total}$ — Γ_{86}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.17±0.29 OUR AVERAGE	Error includes scale factor of 1.7.				
2.43±0.95±0.04	10 ± 4	[101,102] AUBERT	07AK	BABR	10.6 $e^+e^- \to \pi^+\pi^-K^+K^-\gamma$
0.9 ±0.2 ±0.1	47.6	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to K^+K^-\pi^+\pi^-$
1.5 ±0.2 ±0.2	51.5±8.3	[103] BAI	03B	BES	$\psi(2S) \to K^+K^-\pi^+\pi^-$

[101] AUBERT 07AK reports $[\Gamma(\psi(2S) \to \phi\pi^+\pi^-)/\Gamma_{total}] \times [\Gamma(\psi(2S) \to e^+e^-)] = (0.57 \pm 0.22 \pm 0.04) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \to e^+e^-) = 2.35 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[102] Using $B(\phi \to K^+K^-) = (49.3 \pm 0.6)\%$.

[103] Normalized to $B(\psi(2S) \to J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(\phi f_0(980) \to \pi^+\pi^-)/\Gamma_{total}$ — Γ_{87}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.68±0.25 OUR AVERAGE	Error includes scale factor of 1.1.				
1.45±0.70±0.03	6 ± 3	[104,105] AUBERT	07AK	BABR	10.6 $e^+e^- \to \pi^+\pi^-K^+K^-\gamma$
0.6 ±0.2 ±0.1	18.4±6.4	[106] BAI	03B	BES	$\psi(2S) \to K^+K^-\pi^+\pi^-$

[104] AUBERT 07AK reports $[\Gamma(\psi(2S) \to \phi f_0(980) \to \pi^+\pi^-)/\Gamma_{total}] \times [\Gamma(\psi(2S) \to e^+e^-)] = (0.34 \pm 0.16 \pm 0.04) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \to e^+e^-) = 2.35 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[105] Using $B(\phi \to K^+K^-) = (49.3 \pm 0.6)\%$.

[106] Normalized to $B(\psi(2S) \to J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(2(K^+K^-))/\Gamma_{total}$ — Γ_{88}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.6±0.1±0.1	59.2	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to 2(K^+K^-)$

$\Gamma(\phi K^+K^-)/\Gamma_{total}$ — Γ_{89}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.70±0.16 OUR AVERAGE					
0.8 ±0.2 ±0.1	36.8	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to 2(K^+K^-)$
0.6 ±0.2 ±0.1	16.1 ± 5.0	[107] BAI	03B	BES	$\psi(2S) \to 2(K^+K^-)$

[107] Normalized to $B(\psi(2S) \to J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(2(K^+K^-)\pi^0)/\Gamma_{total}$ — Γ_{90}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.1±0.2±0.2	44.7	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to 2(K^+K^-)\pi^0$

$\Gamma(\phi\eta)/\Gamma_{total}$ — Γ_{91}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{2.8^{+1.0}_{-0.8}}$ **OUR AVERAGE**					
$2.0^{+1.5}_{-1.1}\pm0.4$	6	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
$3.3\pm1.1\pm0.5$	17	ABLIKIM	04K	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\phi\eta')/\Gamma_{total}$ — Γ_{92}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
3.1±1.4±0.7	8	[108] ABLIKIM	04K	BES	$e^+e^- \to \psi(2S)$

[108] Calculated combining $\eta' \to \gamma\rho$ and $\eta\pi^+\pi^-$ channels.

$\Gamma(\omega\eta')/\Gamma_{total}$ — Γ_{93}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{3.2^{+2.4}_{-2.0}\pm0.7}$	4	[109] ABLIKIM	04K	BES	$e^+e^- \to \psi(2S)$

[109] Calculated combining $\eta' \to \gamma\rho$ and $\eta\pi^+\pi^-$ channels.

$\Gamma(\omega\pi^0)/\Gamma_{total}$ — Γ_{94}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
2.1 ±0.6 OUR AVERAGE					
$2.5\ ^{+1.2}_{-1.0}\ \pm0.2$	14	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
$1.87^{+0.68}_{-0.62}\pm0.28$	14	ABLIKIM	04L	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\rho\eta')/\Gamma_{total}$ — Γ_{95}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.87^{+1.64}_{-1.11}\pm0.33}$	2	ABLIKIM	04L	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\rho\eta)/\Gamma_{total}$ — Γ_{96}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
2.2 ±0.6 OUR AVERAGE Error includes scale factor of 1.1.					
$3.0\ ^{+1.1}_{-0.9}\ \pm0.2$	18	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
$1.78^{+0.67}_{-0.62}\pm0.17$	13	ABLIKIM	04L	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\omega\eta)/\Gamma_{total}$ — Γ_{97}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<1.1	90	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.1	90	ABLIKIM	04K	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\phi\pi^0)/\Gamma_{total}$ — Γ_{98}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<0.4	90	ABLIKIM	04K	BES	$e^+e^- \to \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.7	90	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$

$\Gamma(\eta_c\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{99}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<1.0	90	PEDLAR	07	CLEO	$e^+e^- \to \psi(2S)$

$\Gamma(p\overline{p}K^+K^-)/\Gamma_{total}$ — Γ_{100}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
2.7±0.6±0.4	30.1	BRIERE	05	CLEO	$e^+e^- \to \psi(2S) \to p\overline{p}K^+K^-$

$\Gamma(\overline{\Lambda}nK^0_S+\text{c.c.})/\Gamma_{total}$ — Γ_{101}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.81±0.11±0.14	50	[110] ABLIKIM	08C	BES2	$e^+e^- \to J/\psi$

[110] Using B($\overline{\Lambda} \to \overline{p}\pi^+$) = 63.9% and B($K^0_S \to \pi^+\pi^-$) = 69.2%.

$\Gamma(\phi f'_2(1525))/\Gamma_{total}$ — Γ_{102}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.44±0.12±0.11		20 ± 6	BAI	04C		$\psi(2S) \to 2(K^+K^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.45	90		BAI	98J	BES	$e^+e^- \to 2(K^+K^-)$

$\Gamma(\Theta(1540)\overline{\Theta}(1540) \to K^0_S pK^-\overline{n}+\text{c.c.})/\Gamma_{total}$ — Γ_{103}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<0.88	90	BAI	04G	BES2	e^+e^-

$\Gamma(\Theta(1540)K^-\overline{n} \to K^0_S pK^-\overline{n})/\Gamma_{total}$ — Γ_{104}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<1.0	90	BAI	04G	BES2	e^+e^-

$\Gamma(\Theta(1540)K^0_S\overline{p} \to K^0_S\overline{p}K^+n)/\Gamma_{total}$ — Γ_{105}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<0.70	90	BAI	04G	BES2	e^+e^-

$\Gamma(\overline{\Theta}(1540)K^+n \to K^0_S\overline{p}K^+n)/\Gamma_{total}$ — Γ_{106}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<2.6	90	BAI	04G	BES2	e^+e^-

$\Gamma(\overline{\Theta}(1540)K^0_S p \to K^0_S pK^-\overline{n})/\Gamma_{total}$ — Γ_{107}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<0.60	90	BAI	04G	BES2	e^+e^-

$\Gamma(K^0_S K^0_S)/\Gamma_{total}$ — Γ_{108}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
<0.046	[111] BAI	04D	BES	e^+e^-

[111] Forbidden by CP.

RADIATIVE DECAYS

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma_{total}$ — Γ_{109}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
9.68±0.31 OUR FIT					
9.2 ±0.4 OUR AVERAGE					
9.22±0.11±0.46	72600	ATHAR	04	CLEO	$e^+e^- \to \gamma X$
9.9 ±0.5 ±0.8		[112] GAISER	86	CBAL	$e^+e^- \to \gamma X$
7.2 ±2.3		[112] BIDDICK	77	CNTR	$e^+e^- \to \gamma X$
7.5 ±2.6		[112] WHITAKER	76	MRK1	e^+e^-

[112] Angular distribution $(1+\cos^2\theta)$ assumed.

$\Gamma(\gamma\chi_{c1}(1P))/\Gamma_{total}$ — Γ_{110}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
9.2 ±0.4 OUR FIT					
8.9 ±0.5 OUR AVERAGE					
9.07±0.11±0.54	76700	ATHAR	04	CLEO	$e^+e^- \to \gamma X$
9.0 ±0.5 ±0.7		[113] GAISER	86	CBAL	$e^+e^- \to \gamma X$
7.1 ±1.9		[114] BIDDICK	77	CNTR	$e^+e^- \to \gamma X$

[113] Angular distribution $(1-0.189\cos^2\theta)$ assumed.
[114] Valid for isotropic distribution of the photon.

$\Gamma(\gamma\chi_{c2}(1P))/\Gamma_{total}$ — Γ_{111}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
8.72±0.34 OUR FIT					
8.8 ±0.5 OUR AVERAGE Error includes scale factor of 1.1.					
9.33±0.14±0.61	79300	ATHAR	04	CLEO	$e^+e^- \to \gamma X$
8.0 ±0.5 ±0.7		[115] GAISER	86	CBAL	$e^+e^- \to \gamma X$
7.0 ±2.0		[116] BIDDICK	77	CNTR	$e^+e^- \to \gamma X$

[115] Angular distribution $(1-0.052\cos^2\theta)$ assumed.
[116] Valid for isotropic distribution of the photon.

$[\Gamma(\gamma\chi_{c0}(1P))+\Gamma(\gamma\chi_{c1}(1P))+\Gamma(\gamma\chi_{c2}(1P))]/\Gamma_{total}$ — $(\Gamma_{109}+\Gamma_{110}+\Gamma_{111})/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
27.6±0.3±2.0	[117] ATHAR	04	CLEO	$e^+e^- \to \gamma X$

[117] Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c1}(1P))$ — $\Gamma_{109}/\Gamma_{110}$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.02±0.01±0.07	[118] ATHAR	04	CLEO	$e^+e^- \to \gamma X$

[118] Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c2}(1P))/\Gamma(\gamma\chi_{c1}(1P))$ $\Gamma_{111}/\Gamma_{110}$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.03±0.02±0.03	[119] ATHAR	04	CLEO	$e^+e^- \to \gamma X$

[119] Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c2}(1P))$ $\Gamma_{109}/\Gamma_{111}$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.99±0.02±0.08	[120] ATHAR	04	CLEO	$e^+e^- \to \gamma X$

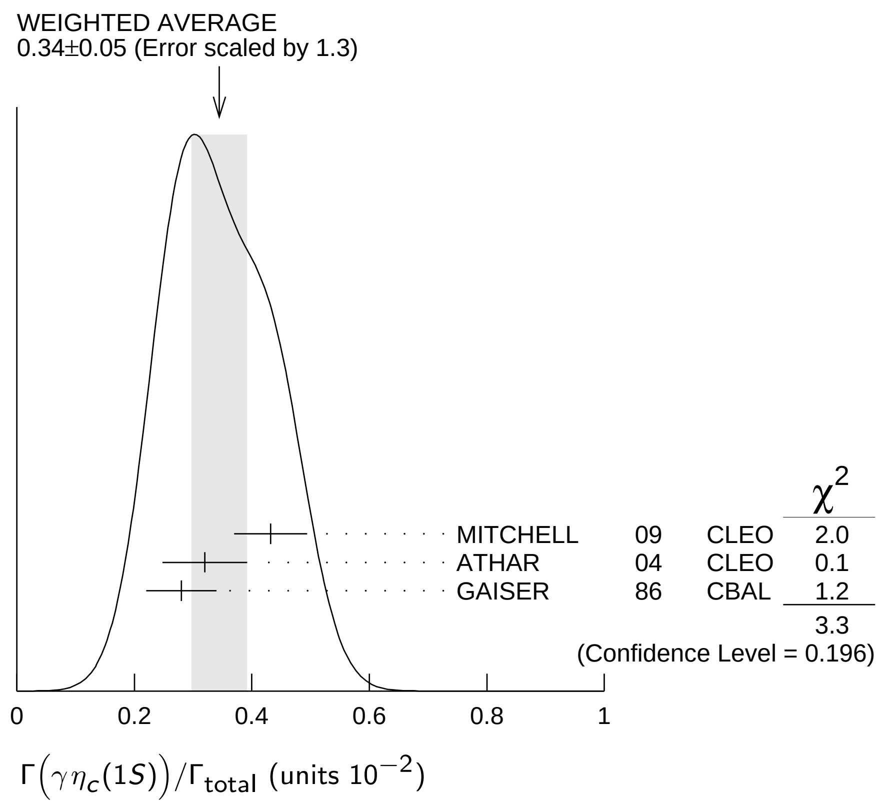
[120] Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\eta_c(1S))/\Gamma_{total}$ Γ_{112}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.34 ±0.05 OUR AVERAGE		Error includes scale factor of 1.3. See the ideogram below.			
0.432±0.016±0.060		MITCHELL	09	CLEO	$e^+e^- \to \gamma X$
0.32 ±0.04 ±0.06	2560	[121] ATHAR	04	CLEO	$e^+e^- \to \gamma X$
0.28 ±0.06		[122] GAISER	86	CBAL	$e^+e^- \to \gamma X$

[121] ATHAR 04 used $\Gamma_{\eta_c(1S)} = 24.8 \pm 4.9$ MeV to obtain this result.

[122] GAISER 86 used $\Gamma_{\eta_c(1S)} = 11.5 \pm 4.5$ MeV to obtain this result.



$\Gamma(\gamma\eta_c(2S))/\Gamma_{total}$ — Γ_{113}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<8 × 10^{-4}	90	[123] CRONIN-HEN..10		CLEO	$\psi(2S) \to \gamma K \overline{K} \pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2 \times 10^{-3}$	90	ATHAR	04	CLEO	$e^+e^- \to \gamma X$
0.2–1.3 × 10^{-2}	95	EDWARDS	82C	CBAL	$e^+e^- \to \gamma X$

[123] CRONIN-HENNESSY 10 reports $[\Gamma(\psi(2S) \to \gamma\eta_c(2S))/\Gamma_{total}] \times [B(\eta_c(2S) \to K\overline{K}\pi)] < 14.5 \times 10^{-6}$ which we divide by our best value $B(\eta_c(2S) \to K\overline{K}\pi) = 1.9 \times 10^{-2}$. This measurement assumes $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$\Gamma(\gamma\pi^0)/\Gamma_{total}$ — Γ_{114}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.58±0.40±0.13		37	ABLIKIM	10F	BES3	$\psi(2S) \to \gamma\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 5	90		PEDLAR	09	CLE3	$\psi(2S) \to \gamma X$
<5400	95		[124] LIBERMAN	75	SPEC	e^+e^-
$< 1 \times 10^4$	90		WIIK	75	DASP	e^+e^-

[124] Restated by us using $B(\psi(2S) \to \mu^+\mu^-) = 0.0077$.

$\Gamma(\gamma\eta'(958))/\Gamma_{total}$ — Γ_{115}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.23±0.06 OUR AVERAGE						
1.26±0.03±0.08		2226	[125] ABLIKIM	10F	BES3	$\psi(2S) \to 3\gamma\pi^+\pi^-$, $2\gamma\pi^+\pi^-$
1.19±0.08±0.03			PEDLAR	09	CLE3	$\psi(2S) \to \gamma X$
1.24±0.27±0.15		23	ABLIKIM	06R	BES2	$e^+e^- \to \psi(2S)$
1.54±0.31±0.20		~ 43	BAI	98F	BES	$\psi(2S) \to \pi^+\pi^- 2\gamma$, $\pi^+\pi^- 3\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 60	90		[126] BRAUNSCH...	77	DASP	e^+e^-
< 11	90		[127] BARTEL	76	CNTR	e^+e^-

[125] Combining the results from $\eta' \to \pi^+\pi^-\eta$ and $\eta' \to \pi^+\pi^-\gamma$ decay modes.
[126] Restated by us using total decay width 228 keV.
[127] The value is normalized to the branching ratio for $\Gamma(J/\psi(1S)\eta)/\Gamma_{total}$.

$\Gamma(\gamma f_2(1270))/\Gamma_{total}$ — Γ_{116}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.12±0.19±0.32		[128,129] BAI	03C	BES	$\psi(2S) \to \gamma\pi\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.08±0.19±0.33	200.6 ± 18.8	[128] BAI	03C	BES	$\psi(2S) \to \gamma\pi^+\pi^-$
2.90±1.08±1.07	29.9 ± 11.1	[128] BAI	03C	BES	$\psi(2S) \to \gamma\pi^0\pi^0$

[128] Normalized to $B(\psi(2S) \to J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.
[129] Combining the results from $\pi^+\pi^-$ and $\pi^0\pi^0$ decay modes.

$\Gamma(\gamma f_0(1710) \to \gamma\pi\pi)/\Gamma_{total}$ — Γ_{118}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.301±0.041±0.124	35.6 ± 4.8	[130] BAI	03C	BES	$\psi(2S) \to \gamma\pi^+\pi^-$

[130] Normalized to B($\psi(2S) \to J/\psi\pi^+\pi^-$) = 0.305 ± 0.016.

$\Gamma(\gamma f_0(1710) \to \gamma K\overline{K})/\Gamma_{total}$ — Γ_{119}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.604±0.090±0.132		39.6 ± 5.9	[131,132] BAI	03C	BES	$\psi(2S) \to \gamma K^+K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 1.56	90	6.8 ± 3.1	[131,132] BAI	03C	BES	$\psi(2S) \to \gamma K^0_S K^0_S$

[131] Includes unknown branching fractions to K^+K^- or $K^0_S K^0_S$. We have multiplied the K^+K^- result by a factor of 2 and the $K^0_S K^0_S$ result by a factor of 4 to obtain the $K\overline{K}$ result.

[132] Normalized to B($\psi(2S) \to J/\psi\pi^+\pi^-$) = 0.305 ± 0.016.

$\Gamma(\gamma\eta)/\Gamma_{total}$ — Γ_{121}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.38±0.48±0.09		13	[133] ABLIKIM	10F	BES3	$\psi(2S) \to \gamma\pi^+\pi^-\pi^0$, $\gamma 3\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 2	90		PEDLAR	09	CLE3	$\psi(2S) \to \gamma X$
< 90	90		BAI	98F	BES	$\psi(2S) \to \pi^+\pi^- 3\gamma$
<200	90		YAMADA	77	DASP	$e^+e^- \to 3\gamma$

[133] Combining the results from $\eta \to \pi^+\pi^-\pi^0$ and $\eta \to 3\pi^0$ decay modes.

$\Gamma(\gamma\eta\pi^+\pi^-)/\Gamma_{total}$ — Γ_{122}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
8.71±1.25±1.64	418	ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\eta\pi^+\pi^-$

$\Gamma(\gamma\eta(1405) \to \gamma K\overline{K}\pi)/\Gamma_{total}$ — Γ_{124}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.9	90	ABLIKIM	06R	BES2	$\psi(2S) \to \gamma K^0_S K^+\pi^-$ + c.c.
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.3	90	ABLIKIM	06R	BES2	$\psi(2S) \to \gamma K^+K^-\pi^0$
<1.2	90	[134] SCHARRE	80	MRK1	e^+e^-

[134] Includes unknown branching fraction $\eta(1405) \to K\overline{K}\pi$.

$\Gamma(\gamma\eta(1405) \to \eta\pi^+\pi^-)/\Gamma_{total}$ — Γ_{125}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.36±0.25±0.05	10	ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\eta\pi^+\pi^-$

$\Gamma(\gamma\eta(1475) \to K\overline{K}\pi)/\Gamma_{total}$ — Γ_{127}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.4	90	ABLIKIM	06R	BES2	$\psi(2S) \to \gamma K^+K^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.5	90	ABLIKIM	06R	BES2	$\psi(2S) \to \gamma K^0_S K^+\pi^-$ + c.c.

$\Gamma(\gamma\eta(1475) \to \eta\pi^+\pi^-)/\Gamma_{total}$ — Γ_{128}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.88	90	ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\eta\pi^+\pi^-$

$\Gamma(\gamma 2(\pi^+\pi^-))/\Gamma_{total}$ — Γ_{129}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
39.6±2.8±5.0	583	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(\gamma K^{*0} K^+\pi^- + c.c.)/\Gamma_{total}$ — Γ_{130}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
37.0±6.1±7.2	237	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(\gamma K^{*0}\overline{K}^{*0})/\Gamma_{total}$ — Γ_{131}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
24.0±4.5±5.0	41	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(\gamma K^0_S K^+\pi^- + c.c.)/\Gamma_{total}$ — Γ_{132}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
25.6±3.6±3.6	115	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(\gamma K^+K^-\pi^+\pi^-)/\Gamma_{total}$ — Γ_{133}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
19.1±2.7±4.3	132	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(\gamma p\overline{p})/\Gamma_{total}$ — Γ_{134}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
3.9 ±0.5 OUR AVERAGE	Error includes scale factor of 2.0.				
4.18±0.26±0.18	348	[135] ALEXANDER	10	CLEO	$\psi(2S) \to \gamma p\overline{p}$
2.9 ±0.4 ±0.4	142	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

[135] From a fit of the $p\overline{p}$ mass distribution to a combination of $\gamma f_2(1950)$, $\gamma f_2(2150)$, and $\gamma p\overline{p}$ phase space, for $M(p\overline{p} < 2.85$ GeV, and accounting for backgrounds from $\psi(2S) \to \pi^0 p\overline{p}$ and continuum.

$\Gamma(\gamma f_2(1950) \to \gamma p\overline{p})/\Gamma_{total}$ — Γ_{135}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
1.2±0.2±0.1	111	[136] ALEXANDER	10	CLEO	$\psi(2S) \to \gamma p\overline{p}$

[136] From a fit of the $p\overline{p}$ mass distribution to a combination of $\gamma f_2(1950)$, $\gamma f_2(2150)$, and $\gamma p\overline{p}$ phase space, for $M(p\overline{p} < 2.85$ GeV, and accounting for backgrounds from $\psi(2S) \to \pi^0 p\overline{p}$ and continuum.

$\Gamma(\gamma f_2(2150) \to \gamma p\overline{p})/\Gamma_{total}$ — Γ_{136}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
0.72±0.18±0.03	73	[137] ALEXANDER	10	CLEO	$\psi(2S) \to \gamma p\overline{p}$

[137] From a fit of the $p\overline{p}$ mass distribution to a combination of $\gamma f_2(1950)$, $\gamma f_2(2150)$, and $\gamma p\overline{p}$ phase space, for $M(p\overline{p} < 2.85$ GeV, and accounting for backgrounds from $\psi(2S) \to \pi^0 p\overline{p}$ and continuum.

$\Gamma(\gamma X(1835) \to \gamma p\bar{p})/\Gamma_{total}$ Γ_{137}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
<1.6	90	ALEXANDER	10	CLEO	$\psi(2S) \to \gamma p\bar{p}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<5.4	90	ABLIKIM	07D	BES	$\psi(2S) \to \gamma p\bar{p}$

$\Gamma(\gamma X \to \gamma p\bar{p})/\Gamma_{total}$ Γ_{138}/Γ

For a narrow resonance in the range $2.2 < M(X) < 2.8$ GeV.

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
<2	90	ALEXANDER	10	CLEO	$\psi(2S) \to \gamma p\bar{p}$

$\Gamma(\gamma\pi^+\pi^- p\bar{p})/\Gamma_{total}$ Γ_{139}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
2.8±1.2±0.7	17	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(\gamma 2(\pi^+\pi^-)K^+K^-)/\Gamma_{total}$ Γ_{140}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<22	90	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(\gamma 3(\pi^+\pi^-))/\Gamma_{total}$ Γ_{141}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<17	90	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\Gamma(\gamma K^+K^-K^+K^-)/\Gamma_{total}$ Γ_{142}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<4	90	ABLIKIM	07D	BES2	$e^+e^- \to \psi(2S)$

$\psi(2S)$ CROSS-PARTICLE BRANCHING RATIOS

For measurements involving $B(\psi(2S) \to \gamma\chi_{cJ}(1P)) \times B(\chi_{cJ}(1P) \to X)$ see the corresponding entries in the $\chi_{cJ}(1P)$ sections.

MULTIPOLE AMPLITUDE RATIOS IN RADIATIVE DECAYS $\psi(2S) \to \gamma\chi_{cJ}(1P)$ and $\chi_{cJ} \to \gamma J/\psi(1S)$

$a_2(\chi_{c1})/a_2(\chi_{c2})$ Magnetic quadrupole transition amplitude ratio

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{67^{+19}_{-13}}$	59k	[138] ARTUSO	09	CLEO	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$

[138] Statistical and systematic errors combined. Using values from fits with floating $M2$ amplitudes $a_2(\chi_{c1})$, $a_2(\chi_{c2})$, $b_2(\chi_{c1})$, $b_2(\chi_{c2})$ and fixed $E3$ amplitudes of $a_3(\chi_{c2}) = b_3(\chi_{c2}) = 0$. Not independent of values for $a_2(\chi_{c1}(1P))$ and $a_2(\chi_{c2}(1P))$ from ARTUSO 09.

$b_2(\chi_{c2})/b_2(\chi_{c1})$ Magnetic quadrupole transition amplitude ratio

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
37^{+53}_{-47}	59k	[139] ARTUSO	09	CLEO	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$

[139] Statistical and systematic errors combined. Using values from fits with floating *M2* amplitudes $a_2(\chi_{c1})$, $a_2(\chi_{c2})$, $b_2(\chi_{c1})$, $b_2(\chi_{c2})$ and fixed *E3* amplitudes of $a_3(\chi_{c2}) = b_3(\chi_{c2}) = 0$. Not independent of values for $b_2(\chi_{c1}(1P))$ and $b_2(\chi_{c2}(1P))$ from ARTUSO 09.

$\psi(2S)$ REFERENCES

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ALEXANDER	10	PR D82 092002	J.P. Alexander *et al.*	(CLEO Collab.)
CRONIN-HEN...	10	PR D81 052002	D. Cronin-Hennessey *et al.*	(CLEO Collab.)
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LIBBY	09	PR D80 072002	J. Libby *et al.*	(CLEO Collab.)
MITCHELL	09	PRL 102 011801	R.E. Mitchell *et al.*	(CLEO Collab.)
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ABLIKIM	08B	PL B659 74	M. Ablikim *et al.*	(BES Collab.)
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ABLIKIM	07C	PL B648 149	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	07D	PRL 99 011802	M. Ablikim *et al.*	(BES II Collab.)
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ABLIKIM	06G	PR D73 052004	M. Ablikim *et al.*	(BES Collab.)
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AUBERT	06D	PR D73 052003	B. Aubert *et al.*	(BABAR Collab.)
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DOBBS	06A	PR D74 011105R	S. Dobbs *et al.*	(CLEO Collab.)
ABLIKIM	05E	PR D71 072006	M. Ablikim *et al.*	(BES Collab.)
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ABLIKIM	05I	PL B614 37	M. Ablikim *et al.*	(BES Collab.)
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ADAM	05	PRL 94 012005	N.E. Adam *et al.*	(CLEO Collab.)
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ABLIKIM	04B	PR D70 012003	M. Ablikim *et al.*	(BES Collab.)
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BAI	02	PR D65 052004	J.Z. Bai *et al.*	(BES Collab.)
BAI	02B	PL B550 24	J.Z. Bai *et al.*	(BES Collab.)
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AMBROGIANI	00A	PR D62 032004	M. Ambrogiani *et al.*	(FNAL E835 Collab.)
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BAI	00	PRL 84 594	J.Z. Bai *et al.*	(BES Collab.)
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COHEN	87	RMP 59 1121	E.R. Cohen, B.N. Taylor	(RISC, NBS)
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HIMEL	80	PRL 44 920	T. Himel *et al.*	(LBL, SLAC)
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SCHARRE	80	PL 97B 329	D.L. Scharre *et al.*	(SLAC, LBL)
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