

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

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 $e^+ e^- \rightarrow \text{hadrons}$
$3686.111 \pm 0.025 \pm 0.009$		AULCHENKO	03	KEDR $e^+ e^- \rightarrow \text{hadrons}$
3685.95 ± 0.10	413	² ARTAMONOV	00	OLYA $e^+ e^- \rightarrow \text{hadrons}$
$3685.98 \pm 0.09 \pm 0.04$		³ ARMSTRONG	93B	E760 $\bar{p}p \rightarrow e^+ e^-$
• • • 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⁴ Superseded by ARTAMONOV 00.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			
$589.194 \pm 0.027 \pm 0.011$	¹ AULCHENKO	03	KEDR $e^+ e^- \rightarrow \text{hadrons}$
589.7 ± 1.2	LEMOIGNE	82	GOLI $185 \pi^- \text{Be} \rightarrow \gamma \mu^+ \mu^- \text{A}$
589.07 ± 0.13	¹ 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	² BAI	98E	BES $e^+ e^-$

¹ Redundant with data in mass above.

² Systematic errors not evaluated.

$\psi(2S)$ WIDTH

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
303 ± 9 OUR FIT				
286 ± 16 OUR AVERAGE				
358 ± 88 ± 4		ABLIKIM	08B BES2	$e^+e^- \rightarrow \text{hadrons}$
290 ± 25 ± 4	2.7k	ANDREOTTI 07	E835	$\rho\bar{p} \rightarrow e^+e^-, J/\psi X$
331 ± 58 ± 2		ABLIKIM	06L BES2	$e^+e^- \rightarrow \text{hadrons}$
264 ± 27		¹ BAI	02B BES2	e^+e^-
287 ± 37 ± 16		² ARMSTRONG	93B E760	$\bar{p}p \rightarrow e^+e^-$

¹ 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.

² 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 ggg	(10.6 ± 1.6) %	
Γ_4 γgg	(1.03 ± 0.29) %	
Γ_5 light hadrons	(15.4 ± 1.5) %	
Γ_6 e^+e^-	(7.82 ± 0.17) × 10 ⁻³	
Γ_7 $\mu^+\mu^-$	(7.8 ± 0.9) × 10 ⁻³	
Γ_8 $\tau^+\tau^-$	(3.1 ± 0.4) × 10 ⁻³	

Decays into $J/\psi(1S)$ and anything

Γ_9 $J/\psi(1S)$ anything	(60.3 ± 0.7) %	
Γ_{10} $J/\psi(1S)$ neutrals	(24.9 ± 0.4) %	
Γ_{11} $J/\psi(1S)\pi^+\pi^-$	(34.0 ± 0.4) %	
Γ_{12} $J/\psi(1S)\pi^0\pi^0$	(17.93 ± 0.33) %	
Γ_{13} $J/\psi(1S)\eta$	(3.33 ± 0.05) %	
Γ_{14} $J/\psi(1S)\pi^0$	(1.268 ± 0.032) × 10 ⁻³	

Hadronic decays

Γ_{15} $\pi^0 h_c(1P)$	(8.6 ± 1.3) × 10 ⁻⁴	
Γ_{16} $3(\pi^+\pi^-)\pi^0$	(3.5 ± 1.6) × 10 ⁻³	
Γ_{17} $2(\pi^+\pi^-)\pi^0$	(2.9 ± 1.0) × 10 ⁻³	S=4.6
Γ_{18} $\rho a_2(1320)$	(2.6 ± 0.9) × 10 ⁻⁴	
Γ_{19} $\rho\bar{p}$	(2.75 ± 0.12) × 10 ⁻⁴	
Γ_{20} $\Delta^{++}\bar{\Delta}^{--}$	(1.28 ± 0.35) × 10 ⁻⁴	
Γ_{21} $\Lambda\bar{\Lambda}\pi^0$	< 2.9 × 10 ⁻⁶	CL=90%
Γ_{22} $\Lambda\bar{\Lambda}\eta$	(2.5 ± 0.4) × 10 ⁻⁵	

Γ_{23}	$\Lambda \bar{p} K^+$	$(1.00 \pm 0.14) \times 10^{-4}$	
Γ_{24}	$\Lambda \bar{p} K^+ \pi^+ \pi^-$	$(1.8 \pm 0.4) \times 10^{-4}$	
Γ_{25}	$\Lambda \bar{\Lambda} \pi^+ \pi^-$	$(2.8 \pm 0.6) \times 10^{-4}$	
Γ_{26}	$\Lambda \bar{\Lambda}$	$(2.8 \pm 0.5) \times 10^{-4}$	S=2.6
Γ_{27}	$\Sigma^0 \bar{p} K^+ + \text{c.c.}$	$(1.67 \pm 0.18) \times 10^{-5}$	
Γ_{28}	$\Sigma^+ \bar{\Sigma}^-$	$(2.6 \pm 0.8) \times 10^{-4}$	
Γ_{29}	$\Sigma^0 \bar{\Sigma}^0$	$(2.2 \pm 0.4) \times 10^{-4}$	S=1.5
Γ_{30}	$\Sigma(1385)^+ \bar{\Sigma}(1385)^-$	$(1.1 \pm 0.4) \times 10^{-4}$	
Γ_{31}	$\Xi^- \bar{\Xi}^+$	$(1.8 \pm 0.6) \times 10^{-4}$	S=2.8
Γ_{32}	$\Xi^0 \bar{\Xi}^0$	$(2.8 \pm 0.9) \times 10^{-4}$	
Γ_{33}	$\Xi(1530)^0 \bar{\Xi}(1530)^0$	$< 8.1 \times 10^{-5}$	CL=90%
Γ_{34}	$\Omega^- \bar{\Omega}^+$	$< 7.3 \times 10^{-5}$	CL=90%
Γ_{35}	$\pi^0 \rho \bar{p}$	$(1.53 \pm 0.07) \times 10^{-4}$	
Γ_{36}	$N(940) \bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p}$	$(6.4 \begin{smallmatrix} +1.8 \\ -1.3 \end{smallmatrix}) \times 10^{-5}$	
Γ_{37}	$N(1440) \bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p}$	$(7.3 \begin{smallmatrix} +1.7 \\ -1.5 \end{smallmatrix}) \times 10^{-5}$	S=2.5
Γ_{38}	$N(1520) \bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p}$	$(6.4 \begin{smallmatrix} +2.3 \\ -1.8 \end{smallmatrix}) \times 10^{-6}$	
Γ_{39}	$N(1535) \bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p}$	$(2.5 \pm 1.0) \times 10^{-5}$	
Γ_{40}	$N(1650) \bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p}$	$(3.8 \begin{smallmatrix} +1.4 \\ -1.7 \end{smallmatrix}) \times 10^{-5}$	
Γ_{41}	$N(1720) \bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p}$	$(1.79 \begin{smallmatrix} +0.26 \\ -0.70 \end{smallmatrix}) \times 10^{-5}$	
Γ_{42}	$N(2300) \bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p}$	$(2.6 \begin{smallmatrix} +1.2 \\ -0.7 \end{smallmatrix}) \times 10^{-5}$	
Γ_{43}	$N(2570) \bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p}$	$(2.13 \begin{smallmatrix} +0.40 \\ -0.31 \end{smallmatrix}) \times 10^{-5}$	
Γ_{44}	$\pi^0 f_0(2100) \rightarrow \pi^0 \rho \bar{p}$	$(1.1 \pm 0.4) \times 10^{-5}$	
Γ_{45}	$\eta \rho \bar{p}$	$(5.7 \pm 0.6) \times 10^{-5}$	
Γ_{46}	$\eta f_0(2100) \rightarrow \eta \rho \bar{p}$	$(1.2 \pm 0.4) \times 10^{-5}$	
Γ_{47}	$N(1535) \bar{p} \rightarrow \eta \rho \bar{p}$	$(4.4 \pm 0.7) \times 10^{-5}$	
Γ_{48}	$\omega \rho \bar{p}$	$(6.9 \pm 2.1) \times 10^{-5}$	
Γ_{49}	$\phi \rho \bar{p}$	$< 2.4 \times 10^{-5}$	CL=90%
Γ_{50}	$\pi^+ \pi^- \rho \bar{p}$	$(6.0 \pm 0.4) \times 10^{-4}$	
Γ_{51}	$\rho \bar{n} \pi^- \text{ or c.c.}$	$(2.48 \pm 0.17) \times 10^{-4}$	
Γ_{52}	$\rho \bar{n} \pi^- \pi^0$	$(3.2 \pm 0.7) \times 10^{-4}$	
Γ_{53}	$2(\pi^+ \pi^- \pi^0)$	$(4.7 \pm 1.5) \times 10^{-3}$	
Γ_{54}	$\eta \pi^+ \pi^-$	$< 1.6 \times 10^{-4}$	CL=90%
Γ_{55}	$\eta \pi^+ \pi^- \pi^0$	$(9.5 \pm 1.7) \times 10^{-4}$	
Γ_{56}	$2(\pi^+ \pi^-) \eta$	$(1.2 \pm 0.6) \times 10^{-3}$	
Γ_{57}	$\eta' \pi^+ \pi^- \pi^0$	$(4.5 \pm 2.1) \times 10^{-4}$	
Γ_{58}	$\omega \pi^+ \pi^-$	$(7.3 \pm 1.2) \times 10^{-4}$	S=2.1
Γ_{59}	$b_1^\pm \pi^\mp$	$(4.0 \pm 0.6) \times 10^{-4}$	S=1.1
Γ_{60}	$b_1^0 \pi^0$	$(2.4 \pm 0.6) \times 10^{-4}$	
Γ_{61}	$\omega f_2(1270)$	$(2.2 \pm 0.4) \times 10^{-4}$	
Γ_{62}	$\pi^+ \pi^- K^+ K^-$	$(7.5 \pm 0.9) \times 10^{-4}$	S=1.9

Γ_{63}	$\rho^0 K^+ K^-$	$(2.2 \pm 0.4) \times 10^{-4}$	
Γ_{64}	$K^*(892)^0 \bar{K}_2^*(1430)^0$	$(1.9 \pm 0.5) \times 10^{-4}$	
Γ_{65}	$K^+ K^- \pi^+ \pi^- \eta$	$(1.3 \pm 0.7) \times 10^{-3}$	
Γ_{66}	$K^+ K^- 2(\pi^+ \pi^-) \pi^0$	$(1.00 \pm 0.31) \times 10^{-3}$	
Γ_{67}	$K^+ K^- 2(\pi^+ \pi^-)$	$(1.9 \pm 0.9) \times 10^{-3}$	
Γ_{68}	$K_1(1270)^\pm K^\mp$	$(1.00 \pm 0.28) \times 10^{-3}$	
Γ_{69}	$K_S^0 K_S^0 \pi^+ \pi^-$	$(2.2 \pm 0.4) \times 10^{-4}$	
Γ_{70}	$\rho^0 p \bar{p}$	$(5.0 \pm 2.2) \times 10^{-5}$	
Γ_{71}	$K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.}$	$(6.7 \pm 2.5) \times 10^{-4}$	
Γ_{72}	$2(\pi^+ \pi^-)$	$(2.4 \pm 0.6) \times 10^{-4}$	S=2.2
Γ_{73}	$\rho^0 \pi^+ \pi^-$	$(2.2 \pm 0.6) \times 10^{-4}$	S=1.4
Γ_{74}	$K^+ K^- \pi^+ \pi^- \pi^0$	$(1.26 \pm 0.09) \times 10^{-3}$	
Γ_{75}	$\omega f_0(1710) \rightarrow \omega K^+ K^-$	$(5.9 \pm 2.2) \times 10^{-5}$	
Γ_{76}	$K^*(892)^0 K^- \pi^+ \pi^0 + \text{c.c.}$	$(8.6 \pm 2.2) \times 10^{-4}$	
Γ_{77}	$K^*(892)^+ K^- \pi^+ \pi^- + \text{c.c.}$	$(9.6 \pm 2.8) \times 10^{-4}$	
Γ_{78}	$K^*(892)^+ K^- \rho^0 + \text{c.c.}$	$(7.3 \pm 2.6) \times 10^{-4}$	
Γ_{79}	$K^*(892)^0 K^- \rho^+ + \text{c.c.}$	$(6.1 \pm 1.8) \times 10^{-4}$	
Γ_{80}	$\eta K^+ K^-$, no $\eta \phi$	$(3.1 \pm 0.4) \times 10^{-5}$	
Γ_{81}	$\omega K^+ K^-$	$(1.85 \pm 0.25) \times 10^{-4}$	S=1.1
Γ_{82}	$3(\pi^+ \pi^-)$	$(3.5 \pm 2.0) \times 10^{-4}$	S=2.8
Γ_{83}	$\rho \bar{p} \pi^+ \pi^- \pi^0$	$(7.3 \pm 0.7) \times 10^{-4}$	
Γ_{84}	$K^+ K^-$	$(7.1 \pm 0.5) \times 10^{-5}$	S=1.5
Γ_{85}	$K_S^0 K_L^0$	$(5.34 \pm 0.33) \times 10^{-5}$	
Γ_{86}	$\pi^+ \pi^- \pi^0$	$(2.01 \pm 0.17) \times 10^{-4}$	S=1.7
Γ_{87}	$\rho(2150) \pi \rightarrow \pi^+ \pi^- \pi^0$	$(1.9 \pm_{-0.4}^{+1.2}) \times 10^{-4}$	
Γ_{88}	$\rho(770) \pi \rightarrow \pi^+ \pi^- \pi^0$	$(3.2 \pm 1.2) \times 10^{-5}$	S=1.8
Γ_{89}	$\pi^+ \pi^-$	$(7.8 \pm 2.6) \times 10^{-6}$	
Γ_{90}	$K_1(1400)^\pm K^\mp$	$< 3.1 \times 10^{-4}$	CL=90%
Γ_{91}	$K_2^*(1430)^\pm K^\mp$	$(7.1 \pm_{-0.9}^{+1.3}) \times 10^{-5}$	
Γ_{92}	$K^+ K^- \pi^0$	$(4.07 \pm 0.31) \times 10^{-5}$	
Γ_{93}	$K^+ K^*(892)^- + \text{c.c.}$	$(2.9 \pm 0.4) \times 10^{-5}$	S=1.2
Γ_{94}	$K^*(892)^0 \bar{K}^0 + \text{c.c.}$	$(1.09 \pm 0.20) \times 10^{-4}$	
Γ_{95}	$\phi \pi^+ \pi^-$	$(1.17 \pm 0.29) \times 10^{-4}$	S=1.7
Γ_{96}	$\phi f_0(980) \rightarrow \pi^+ \pi^-$	$(6.8 \pm 2.4) \times 10^{-5}$	S=1.1
Γ_{97}	$2(K^+ K^-)$	$(6.0 \pm 1.4) \times 10^{-5}$	
Γ_{98}	$\phi K^+ K^-$	$(7.0 \pm 1.6) \times 10^{-5}$	
Γ_{99}	$2(K^+ K^-) \pi^0$	$(1.10 \pm 0.28) \times 10^{-4}$	
Γ_{100}	$\phi \eta$	$(3.10 \pm 0.31) \times 10^{-5}$	
Γ_{101}	$\phi \eta'$	$(3.1 \pm 1.6) \times 10^{-5}$	
Γ_{102}	$\omega \eta'$	$(3.2 \pm_{-2.1}^{+2.5}) \times 10^{-5}$	
Γ_{103}	$\omega \pi^0$	$(2.1 \pm 0.6) \times 10^{-5}$	
Γ_{104}	$\rho \eta'$	$(1.9 \pm_{-1.2}^{+1.7}) \times 10^{-5}$	

Γ_{105}	$\rho\eta$	$(2.2 \pm 0.6) \times 10^{-5}$	S=1.1
Γ_{106}	$\omega\eta$	< 1.1	$\times 10^{-5}$ CL=90%
Γ_{107}	$\phi\pi^0$	< 4	$\times 10^{-7}$ CL=90%
Γ_{108}	$\eta_c\pi^+\pi^-\pi^0$	< 1.0	$\times 10^{-3}$ CL=90%
Γ_{109}	$p\bar{p}K^+K^-$	$(2.7 \pm 0.7) \times 10^{-5}$	
Γ_{110}	$\bar{\Lambda}nK_S^0 + \text{c.c.}$	$(8.1 \pm 1.8) \times 10^{-5}$	
Γ_{111}	$\phi f_2'(1525)$	$(4.4 \pm 1.6) \times 10^{-5}$	
Γ_{112}	$\Theta(1540)\bar{\Theta}(1540) \rightarrow$ $K_S^0 p K^- \bar{n} + \text{c.c.}$	< 8.8	$\times 10^{-6}$ CL=90%
Γ_{113}	$\Theta(1540)K^- \bar{n} \rightarrow K_S^0 p K^- \bar{n}$	< 1.0	$\times 10^{-5}$ CL=90%
Γ_{114}	$\Theta(1540)K_S^0 \bar{p} \rightarrow K_S^0 \bar{p} K^+ n$	< 7.0	$\times 10^{-6}$ CL=90%
Γ_{115}	$\bar{\Theta}(1540)K^+ n \rightarrow K_S^0 \bar{p} K^+ n$	< 2.6	$\times 10^{-5}$ CL=90%
Γ_{116}	$\bar{\Theta}(1540)K_S^0 p \rightarrow K_S^0 p K^- \bar{n}$	< 6.0	$\times 10^{-6}$ CL=90%
Γ_{117}	$K_S^0 K_S^0$	< 4.6	$\times 10^{-6}$

Radiative decays

Γ_{118}	$\gamma\chi_{c0}(1P)$	$(9.84 \pm 0.31) \%$	
Γ_{119}	$\gamma\chi_{c1}(1P)$	$(9.3 \pm 0.4) \%$	
Γ_{120}	$\gamma\chi_{c2}(1P)$	$(8.76 \pm 0.34) \%$	
Γ_{121}	$\gamma\eta_c(1S)$	$(3.4 \pm 0.5) \times 10^{-3}$	S=1.3
Γ_{122}	$\gamma\eta_c(2S)$	$(7 \pm 5) \times 10^{-4}$	
Γ_{123}	$\gamma\pi^0$	$(1.6 \pm 0.4) \times 10^{-6}$	
Γ_{124}	$\gamma\eta'(958)$	$(1.23 \pm 0.06) \times 10^{-4}$	
Γ_{125}	$\gamma f_2(1270)$	$(2.1 \pm 0.4) \times 10^{-4}$	
Γ_{126}	$\gamma f_0(1710)$		
Γ_{127}	$\gamma f_0(1710) \rightarrow \gamma\pi\pi$	$(3.0 \pm 1.3) \times 10^{-5}$	
Γ_{128}	$\gamma f_0(1710) \rightarrow \gamma K\bar{K}$	$(6.0 \pm 1.6) \times 10^{-5}$	
Γ_{129}	$\gamma\gamma$	< 1.4	$\times 10^{-4}$ CL=90%
Γ_{130}	$\gamma\eta$	$(1.4 \pm 0.5) \times 10^{-6}$	
Γ_{131}	$\gamma\eta\pi^+\pi^-$	$(8.7 \pm 2.1) \times 10^{-4}$	
Γ_{132}	$\gamma\eta(1405)$		
Γ_{133}	$\gamma\eta(1405) \rightarrow \gamma K\bar{K}\pi$	< 9	$\times 10^{-5}$ CL=90%
Γ_{134}	$\gamma\eta(1405) \rightarrow \eta\pi^+\pi^-$	$(3.6 \pm 2.5) \times 10^{-5}$	
Γ_{135}	$\gamma\eta(1475)$		
Γ_{136}	$\gamma\eta(1475) \rightarrow K\bar{K}\pi$	< 1.4	$\times 10^{-4}$ CL=90%
Γ_{137}	$\gamma\eta(1475) \rightarrow \eta\pi^+\pi^-$	< 8.8	$\times 10^{-5}$ CL=90%
Γ_{138}	$\gamma 2(\pi^+\pi^-)$	$(4.0 \pm 0.6) \times 10^{-4}$	
Γ_{139}	$\gamma K^{*0}K^+\pi^- + \text{c.c.}$	$(3.7 \pm 0.9) \times 10^{-4}$	
Γ_{140}	$\gamma K^{*0}\bar{K}^{*0}$	$(2.4 \pm 0.7) \times 10^{-4}$	
Γ_{141}	$\gamma K_S^0 K^+\pi^- + \text{c.c.}$	$(2.6 \pm 0.5) \times 10^{-4}$	
Γ_{142}	$\gamma K^+ K^-\pi^+\pi^-$	$(1.9 \pm 0.5) \times 10^{-4}$	
Γ_{143}	$\gamma p\bar{p}$	$(3.9 \pm 0.5) \times 10^{-5}$	S=2.0
Γ_{144}	$\gamma f_2(1950) \rightarrow \gamma p\bar{p}$	$(1.20 \pm 0.22) \times 10^{-5}$	

Γ_{145}	$\gamma f_2(2150) \rightarrow \gamma p \bar{p}$	$(7.2 \pm 1.8) \times 10^{-6}$	
Γ_{146}	$\gamma X(1835) \rightarrow \gamma p \bar{p}$	$(4.6 \begin{smallmatrix} +1.8 \\ -4.0 \end{smallmatrix}) \times 10^{-6}$	
Γ_{147}	$\gamma X \rightarrow \gamma p \bar{p}$	[a] < 2	$\times 10^{-6}$ CL=90%
Γ_{148}	$\gamma \pi^+ \pi^- p \bar{p}$	$(2.8 \pm 1.4) \times 10^{-5}$	
Γ_{149}	$\gamma 2(\pi^+ \pi^-) K^+ K^-$	< 2.2	$\times 10^{-4}$ CL=90%
Γ_{150}	$\gamma 3(\pi^+ \pi^-)$	< 1.7	$\times 10^{-4}$ CL=90%
Γ_{151}	$\gamma K^+ K^- K^+ K^-$	< 4	$\times 10^{-5}$ CL=90%
Γ_{152}	$\gamma \gamma J/\psi$	$(3.1 \begin{smallmatrix} +1.0 \\ -1.2 \end{smallmatrix}) \times 10^{-4}$	

[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 227 measurements to determine 49 parameters. The overall fit has a $\chi^2 = 325.4$ for 178 degrees of freedom.

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

x_7	4									
x_8	1	0								
x_{11}	39	11	3							
x_{12}	36	7	2	61						
x_{13}	21	5	1	47	27					
x_{19}	2	1	0	7	5	3				
x_{118}	1	0	0	3	2	1	0			
x_{119}	2	0	0	4	2	2	0	0		
x_{120}	2	1	0	5	3	2	0	0	0	
Γ	-80	-6	-1	-51	-44	-26	-9	-2	-2	-3
	x_6	x_7	x_8	x_{11}	x_{12}	x_{13}	x_{19}	x_{118}	x_{119}	x_{120}

$\psi(2S)$ PARTIAL WIDTHS

$\Gamma(\text{hadrons})$

Γ_1

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
258 ± 26	BAI	02B	BES2 $e^+ e^-$
224 ± 56	LUTH	75	MRK1 $e^+ e^-$

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

$\Gamma(e^+e^-)$ Γ_6

<u>VALUE (keV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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2.37 ± 0.04 OUR FIT
2.33 ± 0.07 OUR AVERAGE

2.338 ± 0.037 ± 0.096	ABLIKIM	08B	BES2 $e^+e^- \rightarrow$ hadrons
2.330 ± 0.036 ± 0.110	ABLIKIM	06L	BES2 $e^+e^- \rightarrow$ hadrons
2.44 ± 0.21	¹ 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	² LUTH	75	MRK1 e^+e^-

¹From a simultaneous fit to e^+e^- , $\mu^+\mu^-$, and hadronic channel, assuming $\Gamma_e = \Gamma_\mu = \Gamma_\tau/0.38847$.

²From a simultaneous fit to e^+e^- , $\mu^+\mu^-$, and hadronic channels assuming $\Gamma(e^+e^-) = \Gamma(\mu^+\mu^-)$.

$\Gamma(\gamma\gamma)$ Γ_{129}

<u>VALUE (eV)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<43	90	BRANDELIK	79C	DASP e^+e^-
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$\psi(2S) \Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

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 $\Gamma(i)/\text{total}$.

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

<u>VALUE (keV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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2.233 ± 0.015 ± 0.042	¹ ANASHIN	12	KEDR $e^+e^- \rightarrow$ hadrons
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• • • We do not use the following data for averages, fits, limits, etc. • • •

2.2 ± 0.4	ABRAMS	75	MRK1 e^+e^-
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¹ANASHIN 12 reports the value $2.233 \pm 0.015 \pm 0.037 \pm 0.020$ keV, where the third uncertainty is due to assumptions on the interference between the resonance and hadronic continuum. We combined the two systematic uncertainties.

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

<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

9.0 ± 2.6	79	¹ ANASHIN	07	KEDR $e^+e^- \rightarrow \psi(2S) \rightarrow \tau^+\tau^-$
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¹Using $\psi(2S)$ total width of 337 ± 13 keV. Systematic errors not evaluated.

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

VALUE (keV) EVTS DOCUMENT ID TECN COMMENT

0.807±0.014 OUR FIT

0.839±0.025 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.

0.842±0.028±0.009 ¹ LEES 12E BABR 10.6 $e^+e^- \rightarrow 2\pi^+2\pi^-\gamma$

0.852±0.010±0.026 19.5k ADAM 06 CLEO 3.773 $e^+e^- \rightarrow \gamma\psi(2S)$

0.68 ±0.09 ² BAI 98E BES e^+e^-

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

0.88 ±0.08 ±0.03 256 ³ AUBERT 07AU BABR 10.6 $e^+e^- \rightarrow J/\psi\pi^+\pi^-\gamma$

0.76 ±0.05 ±0.01 544 ⁴ AUBERT 05D BABR 10.6 $e^+e^- \rightarrow \pi^+\pi^-\mu^+\mu^-\gamma$

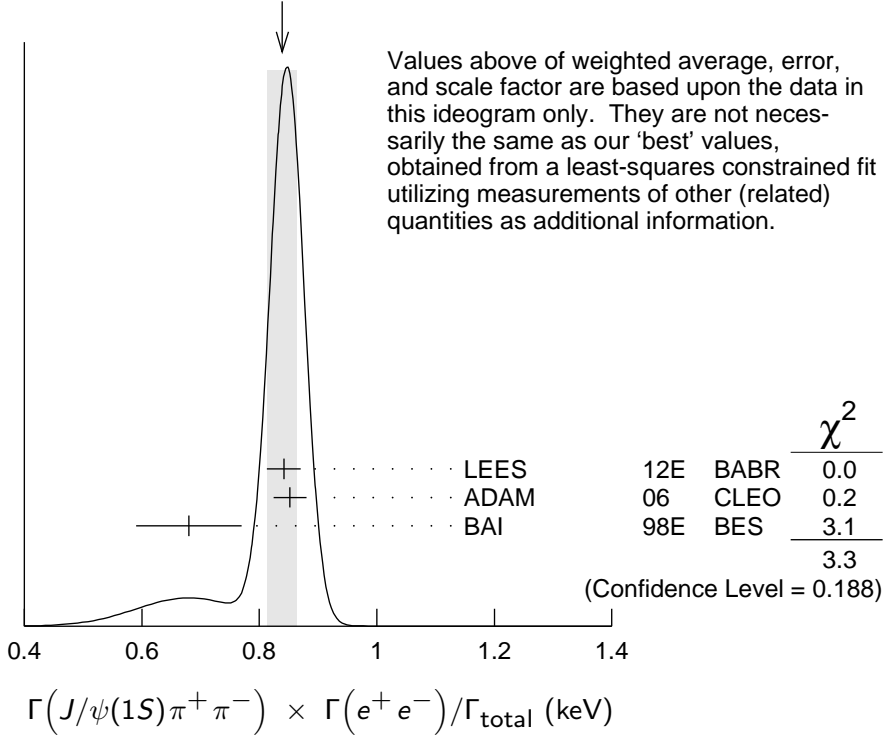
¹ LEES 12E reports $[\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \mu^+\mu^-)] = (49.9 \pm 1.3 \pm 1.0) \times 10^{-3}$ keV which we divide by our best value $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = (5.93 \pm 0.06) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² 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 $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.

³ AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0)] = 0.0186 \pm 0.0012 \pm 0.0011$ keV which we divide by our best value $B(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0) = (2.11 \pm 0.07) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ AUBERT 05D reports $[\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \mu^+\mu^-)] = 0.0450 \pm 0.0018 \pm 0.0022$ 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. Superseded by LEES 12E.

WEIGHTED AVERAGE
0.839±0.025 (Error scaled by 1.3)



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

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.425±0.009 OUR FIT				
0.411±0.008±0.018	3.6k±96	ADAM	06	CLEO 3.773 e ⁺ e ⁻ → γψ(2S)

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

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
79.0± 1.7 OUR FIT				
87 ± 9 OUR AVERAGE				
83 ±25 ±5	14	¹ AUBERT	07AU	BABR 10.6 e ⁺ e ⁻ → J/ψπ ⁺ π ⁻ π ⁰ γ
88 ± 6 ±7	291 ± 24	ADAM	06	CLEO 3.773 e ⁺ e ⁻ → γψ(2S)

¹AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \rightarrow J/\psi\eta) \cdot B(J/\psi \rightarrow \mu^+\mu^-) \cdot B(\eta \rightarrow \pi^+\pi^-\pi^0) = 1.11 \pm 0.33 \pm 0.07$ 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 ⁻ → γψ(2S)

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

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.653±0.028 OUR FIT				
0.59 ±0.05 OUR AVERAGE				
0.579±0.038±0.036	2.7k	ANDREOTTI	07	E835 p \bar{p} → e ⁺ e ⁻ , J/ψX
0.70 ±0.17 ±0.03	22	AUBERT	06B	e ⁺ e ⁻ → p \bar{p} γ

$\Gamma(\Lambda\bar{\Lambda}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{26}\Gamma_6/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.5±0.4±0.1		AUBERT	07BD BABR	10.6 e ⁺ e ⁻ → ΛΛ̄γ	

$\Gamma(2(\pi^+\pi^-\pi^0)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{53}\Gamma_6/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
11.2±3.3±1.3	43	AUBERT	06D BABR	10.6 e ⁺ e ⁻ → 2(π ⁺ π ⁻ π ⁰)γ	

$\Gamma(K^+K^-2(\pi^+\pi^-)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{67}\Gamma_6/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
4.4±2.1±0.3	26	AUBERT	06D BABR	10.6 e ⁺ e ⁻ → K ⁺ K ⁻ 2(π ⁺ π ⁻)γ	

$\Gamma(\pi^+\pi^-K^+K^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{62}\Gamma_6/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2.56±0.42±0.16	85	AUBERT	07AK BABR	10.6 e ⁺ e ⁻ → π ⁺ π ⁻ K ⁺ K ⁻ γ	

$\Gamma(\phi f_0(980) \rightarrow \pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{96}\Gamma_6/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.347±0.169±0.003	6 ± 3	¹ AUBERT	07AK BABR	10.6 e ⁺ e ⁻ → π ⁺ π ⁻ K ⁺ K ⁻ γ	

¹AUBERT 07AK reports [$\Gamma(\psi(2S) \rightarrow \phi f_0(980) \rightarrow \pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] × [B(φ(1020) → K⁺K⁻)] = 0.17 ± 0.08 ± 0.02 eV which we divide by our best value B(φ(1020) → K⁺K⁻) = (48.9 ± 0.5) × 10⁻². Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{95}\Gamma_6/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.57±0.23±0.01	10	¹ AUBERT, BE	06D BABR	10.6 e ⁺ e ⁻ → K ⁺ K ⁻ π ⁺ π ⁻ γ	

¹AUBERT, BE 06D reports [$\Gamma(\psi(2S) \rightarrow \phi\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] × [B(φ(1020) → K⁺K⁻)] = 0.28 ± 0.11 ± 0.02 eV which we divide by our best value B(φ(1020) → K⁺K⁻) = (48.9 ± 0.5) × 10⁻². Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2(\pi^+\pi^-\pi^0)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{17}\Gamma_6/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
29.7±2.2±1.8	410	AUBERT	07AU BABR	10.6 e ⁺ e ⁻ → 2(π ⁺ π ⁻)π ⁰ γ	

$\Gamma(\omega\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{58}\Gamma_6/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
3.01±0.84±0.02	37	¹ AUBERT	07AU BABR	10.6 e ⁺ e ⁻ → ωπ ⁺ π ⁻ γ	

¹AUBERT 07AU reports [$\Gamma(\psi(2S) \rightarrow \omega\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] × [B(ω(782) → π⁺π⁻π⁰)] = 2.69 ± 0.73 ± 0.16 eV which we divide by our best value B(ω(782) → π⁺π⁻π⁰) = (89.2 ± 0.7) × 10⁻². Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2(\pi^+\pi^-\eta) \times \Gamma(e^+e^-)/\Gamma_{\text{total}})$ $\Gamma_{56}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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2.87±1.41±0.01	16	¹ AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow 2(\pi^+\pi^-)\eta\gamma$
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¹ AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow 2(\pi^+\pi^-)\eta) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] = 1.13 \pm 0.55 \pm 0.08$ eV which we divide by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{74}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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4.4±1.3±0.3	32	AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow K^+K^-\pi^+\pi^-\pi^0\gamma$
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$\Gamma(K^+K^-\pi^+\pi^-\eta) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{65}\Gamma_6/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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3.04±1.79±0.02	7	¹ AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow K^+K^-\pi^+\pi^-\eta\gamma$
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¹ AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow K^+K^-\pi^+\pi^-\eta) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] = 1.2 \pm 0.7 \pm 0.1$ eV which we divide by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. 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

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

VALUE	DOCUMENT ID	TECN	COMMENT
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0.9785±0.0013 OUR AVERAGE

0.9779±0.0015	¹ BAI	02B	BES2 e^+e^-
0.981 ±0.003	¹ LUTH	75	MRK1 e^+e^-

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

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

VALUE	DOCUMENT ID	TECN	COMMENT
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0.0173±0.0014 OUR AVERAGE Error includes scale factor of 1.5.

0.0166±0.0010	^{1,2} SETH	04	RVUE e^+e^-
0.0199±0.0019	¹ BAI	02B	BES2 e^+e^-

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

0.029 ±0.004	¹ LUTH	75	MRK1 e^+e^-
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¹ Included in $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$.

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

$\Gamma(ggg)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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10.58±1.62	2.9 M	¹ LIBBY	09	CLEO $\psi(2S) \rightarrow \text{hadrons}$
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¹ Calculated using $\Gamma(\gamma g g)/\Gamma(g g g) = 0.097 \pm 0.026 \pm 0.016$ from LIBBY 09, $B(\psi(2S) \rightarrow XJ/\psi)$ relative and absolute branching fractions from MENDEZ 08, $B(\psi(2S) \rightarrow \gamma\eta_c)$ from MITCHELL 09, and $B(\psi(2S) \rightarrow \text{virtual } \gamma \rightarrow \text{hadrons})$, $B(\psi(2S) \rightarrow \gamma\chi_{cJ})$, and $B(\psi(2S) \rightarrow \ell^+\ell^-)$ from PDG 08. The statistical error is negligible and the systematic error is largely uncorrelated with that of $\Gamma(\gamma g g)/\Gamma_{\text{total}}$ LIBBY 09 measurement.

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

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.025 ± 0.288	200 k	¹ LIBBY	09	CLEO $\psi(2S) \rightarrow \gamma + \text{hadrons}$

¹ 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 $\Gamma(g g g)/\Gamma_{\text{total}}$ LIBBY 09 measurement.

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

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
9.7 ± 2.6 ± 1.6	2.9 M	LIBBY	09	CLEO $\psi(2S) \rightarrow (\gamma +) \text{hadrons}$

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.154 ± 0.015	¹ MENDEZ	08	CLEO $e^+ e^- \rightarrow \psi(2S)$

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

0.169 ± 0.026	² ADAM	05A	CLEO $e^+ e^- \rightarrow \psi(2S)$
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¹ Uses $B(\psi(2S) \rightarrow J/\psi X)$ from MENDEZ 08 and other branching fractions from PDG 07.

² 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.

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

<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
78.2 ± 1.7 OUR FIT			

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

88 ± 13	¹ FELDMAN	77	RVUE $e^+ e^-$
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¹ 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.

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

<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>
78 ± 9 OUR FIT	

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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 $e^+ e^-$
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$\Gamma(\tau^+ \tau^-)/\Gamma_{\text{total}}$ **Γ_8/Γ**

<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
31 ± 4 OUR FIT			
30.8 ± 2.1 ± 3.8	¹ ABLIKIM	06W	BES $e^+ e^- \rightarrow \psi(2S)$

¹ Computed using PDG 02 value of $B(\psi(2S) \rightarrow \text{hadrons}) = 0.9810 \pm 0.0030$ to estimate the total number of $\psi(2S)$ events.

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

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.603 ± 0.007				OUR FIT
0.55 ± 0.07				OUR AVERAGE
0.51 ± 0.12		BRANDELIK	79C DASP	$e^+e^- \rightarrow \mu^+\mu^-X$
0.57 ± 0.08		ABRAMS	75B MRK1	$e^+e^- \rightarrow \mu^+\mu^-X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.6254 ± 0.0016 ± 0.0155	1.1M	¹ MENDEZ	08 CLEO	$\psi(2S) \rightarrow \ell^+\ell^-X$
0.5950 ± 0.0015 ± 0.0190	151k	ADAM	05A CLEO	Repl. by MENDEZ 08

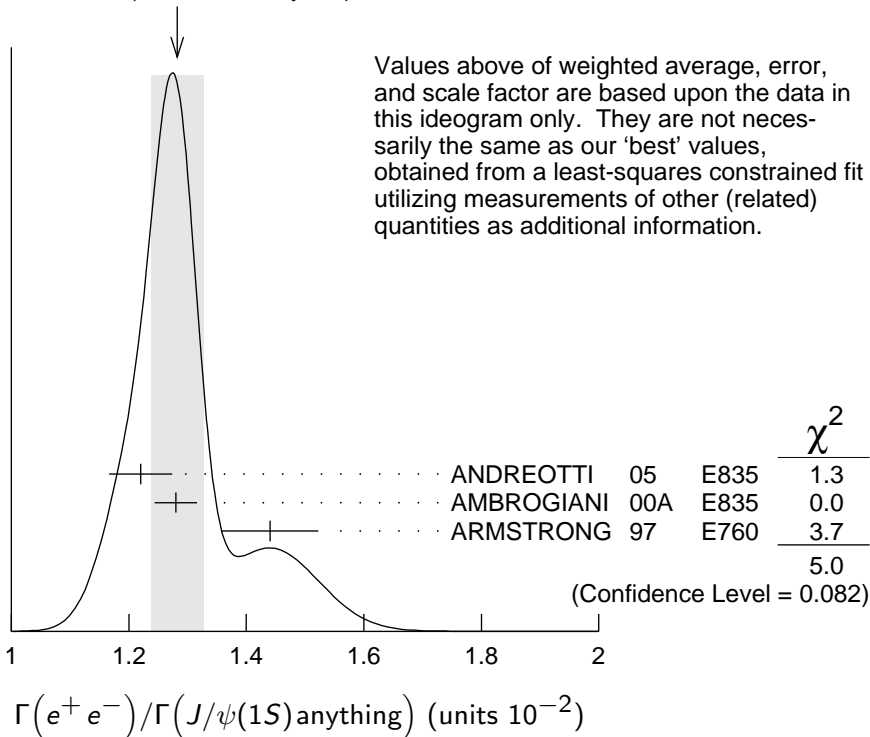
¹ Not independent from other measurements of MENDEZ 08.

$\Gamma(e^+e^-)/\Gamma(J/\psi(1S)\text{anything})$
 $\Gamma_6/\Gamma_9 = \Gamma_6/(\Gamma_{11} + \Gamma_{12} + \Gamma_{13} + 0.348\Gamma_{119} + 0.198\Gamma_{120})$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.298 ± 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	¹ ANDREOTTI	05 E835	$p\bar{p} \rightarrow \psi(2S) \rightarrow e^+e^-$
1.28 ± 0.03 ± 0.02		¹ AMBROGIANI	00A E835	$p\bar{p} \rightarrow \psi(2S)$
1.44 ± 0.08 ± 0.02		¹ ARMSTRONG	97 E760	$\bar{p}p \rightarrow \psi(2S)$

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

WEIGHTED AVERAGE
 1.28 ± 0.04 (Error scaled by 1.6)



$\Gamma(\mu^+ \mu^-)/\Gamma(J/\psi(1S)\text{anything})$

$$\Gamma_7/\Gamma_9 = \Gamma_7/(\Gamma_{11} + \Gamma_{12} + \Gamma_{13} + 0.348\Gamma_{119} + 0.198\Gamma_{120})$$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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

<u>VALUE</u>	<u>DOCUMENT ID</u>
0.249 ± 0.004 OUR FIT	

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

Γ_{11}/Γ

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.340 ± 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 $\psi(2S) \rightarrow \ell^+ \ell^- \pi^+ \pi^-$
0.323 ± 0.014		BAI	02B	BES2 $e^+ e^-$
0.32 ± 0.04		ABRAMS	75B	MRK1 $e^+ e^- \rightarrow J/\psi \pi^+ \pi^-$

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

0.3354 ± 0.0014 ± 0.0110	60k	¹ ADAM	05A	CLEO Repl. by MENDEZ 08
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¹ Not independent from other values reported by ADAM 05A.

$\Gamma(e^+ e^-)/\Gamma(J/\psi(1S)\pi^+ \pi^-)$

Γ_6/Γ_{11}

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0230 ± 0.0005 OUR FIT			

0.0252 ± 0.0028 ± 0.0011	¹ AUBERT	02B	BABR $e^+ e^-$
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¹ Using $B(J/\psi(1S) \rightarrow e^+ e^-) = 0.0593 \pm 0.0010$.

$\Gamma(\mu^+ \mu^-)/\Gamma(J/\psi(1S)\pi^+ \pi^-)$

Γ_7/Γ_{11}

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0229 ± 0.0025 OUR FIT			
0.0224 ± 0.0029 OUR AVERAGE			

0.0216 ± 0.0026 ± 0.0014	¹ AUBERT	02B	BABR $e^+ e^-$
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0.0327 ± 0.0077 ± 0.0072	¹ GRIBUSHIN	96	FMPS 515 $\pi^- \text{Be} \rightarrow 2\mu X$
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¹ Using $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.0588 \pm 0.0010$.

$\Gamma(\tau^+ \tau^-)/\Gamma(J/\psi(1S)\pi^+ \pi^-)$

Γ_8/Γ_{11}

<u>VALUE (units 10⁻³)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
9.0 ± 1.1 OUR FIT			

8.73 ± 1.39 ± 1.57	BAI	02	BES $e^+ e^-$
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$\Gamma(J/\psi(1S)\pi^+ \pi^-)/\Gamma(J/\psi(1S)\text{anything})$

Γ_{11}/Γ_9

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.5648 ± 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 $\psi(2S) \rightarrow \ell^+ \ell^- \pi^+ \pi^-$
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0.525 ± 0.009 ± 0.022	4k	ANDREOTTI	05	E835 $\psi(2S) \rightarrow J/\psi X$
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0.536 ± 0.007 ± 0.016	20k	^{1,2} ABLIKIM	04B	BES $\psi(2S) \rightarrow J/\psi X$
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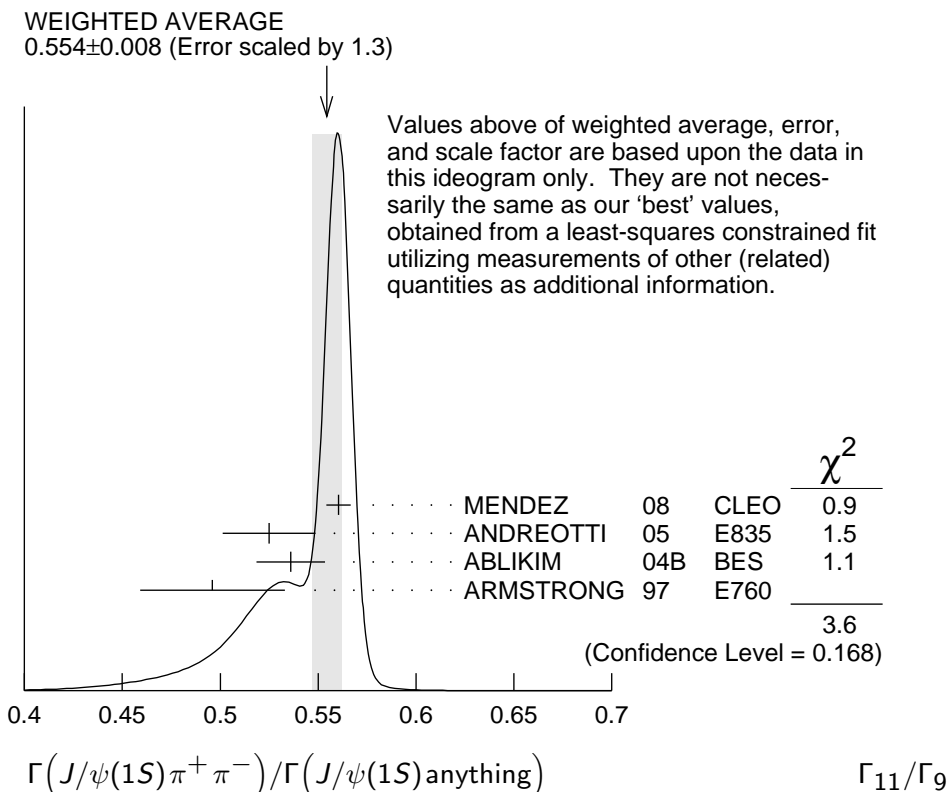
0.496 ± 0.037		ARMSTRONG	97	E760 $\bar{p}p \rightarrow \psi(2S)$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.5637 ± 0.0027 ± 0.0046	60k	ADAM	05A	CLEO Repl. by MENDEZ 08
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¹ From a fit to the J/ψ recoil mass spectra.

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



$\Gamma(J/\psi(1S)\text{neutrals})/\Gamma(J/\psi(1S)\pi^+\pi^-)$

$$\Gamma_{10}/\Gamma_{11} = (0.9761\Gamma_{12} + 0.719\Gamma_{13} + 0.348\Gamma_{119} + 0.198\Gamma_{120})/\Gamma_{11}$$

VALUE	DOCUMENT ID	TECN	COMMENT
0.730±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
0.1793±0.0033 OUR FIT				

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

0.1769±0.0008±0.0053	61k	¹ MENDEZ	08	CLEO	$\psi(2S) \rightarrow \ell^+\ell^-2\pi^0$
0.1652±0.0014±0.0058	13.4k	² ADAM	05A	CLEO	Repl. by MENDEZ 08

¹ Not independent from other measurements of MENDEZ 08.

² 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	
0.2975±0.0031 OUR FIT					
0.320 ±0.012 OUR AVERAGE					
0.300 ±0.008 ±0.022	1655 ± 44	ANDREOTTI	05	E835	$\psi(2S) \rightarrow J/\psi X$
0.328 ±0.013 ±0.008		AMBROGIANI	00A	E835	$p\bar{p} \rightarrow \psi(2S)$
0.323 ±0.033		ARMSTRONG	97	E760	$\bar{p}p \rightarrow \psi(2S)$

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

$0.2829 \pm 0.0012 \pm 0.0056$	61k	MENDEZ	08	CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- 2\pi^0$
$0.2776 \pm 0.0025 \pm 0.0043$	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

0.527 ± 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 $\psi(2S) \rightarrow \ell^+ \ell^- 2\pi^0$

0.570 ± 0.009 ± 0.026 14k ¹ ABLIKIM 04B BES $\psi(2S) \rightarrow J/\psi X$

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

0.4924 ± 0.0047 ± 0.0086 73k ^{2,3} ADAM 05A CLEO Repl. by MENDEZ 08

0.571 ± 0.018 ± 0.044 ⁴ ANDREOTTI 05 E835 $\psi(2S) \rightarrow J/\psi X$

0.53 ± 0.06 TANENBAUM 76 MRK1 $e^+ e^-$

0.64 ± 0.15 ⁵ HILGER 75 SPEC $e^+ e^-$

¹ From a fit to the J/ψ recoil mass spectra.

² Not independent from other values reported by ADAM 05A.

³ Using 13,217 $J/\psi\pi^0\pi^0$ and 60,010 $J/\psi\pi^+\pi^-$ events.

⁴ Not independent from other values reported by ANDREOTTI 05.

⁵ Ignoring the $J/\psi(1S)\eta$ and $J/\psi(1S)\gamma\gamma$ decays.

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

VALUE (units 10^{-3}) EVTS DOCUMENT ID TECN COMMENT

33.3 ± 0.5 OUR FIT

32.9 ± 1.7 OUR AVERAGE Error includes scale factor of 2.1. See the ideogram below.

33.75 ± 0.17 ± 0.86 68.2k ABLIKIM 12M BES3 $e^+ e^- \rightarrow \ell^+ \ell^- 2\gamma$

29.8 ± 0.9 ± 2.3 5.7k BAI 04I BES2 $\psi(2S) \rightarrow J/\psi\gamma\gamma$

25.5 ± 2.9 386 ¹ OREGLIA 80 CBAL $e^+ e^- \rightarrow J/\psi 2\gamma$

45 ± 12 17 ² BRANDELIK 79B DASP $e^+ e^- \rightarrow J/\psi 2\gamma$

42 ± 6 164 ² BARTEL 78B CNTR $e^+ e^-$

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

34.3 ± 0.4 ± 0.9 18.4k ³ MENDEZ 08 CLEO $\psi(2S) \rightarrow \ell^+ \ell^- \eta$

32.5 ± 0.6 ± 1.1 2.8k ⁴ ADAM 05A CLEO Repl. by MENDEZ 08

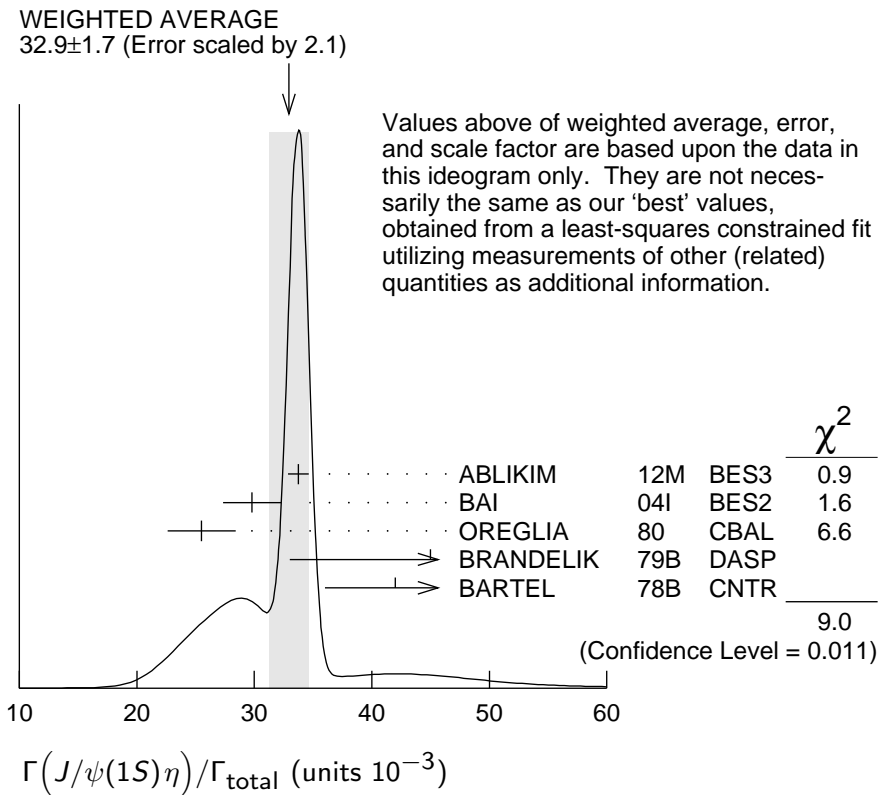
43 ± 8 44 TANENBAUM 76 MRK1 $e^+ e^-$

¹ Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$.

² Recalculated by us using $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.0588 \pm 0.0010$.

³ Not independent from other measurements of MENDEZ 08.

⁴ Not independent from other values reported by ADAM 05A.

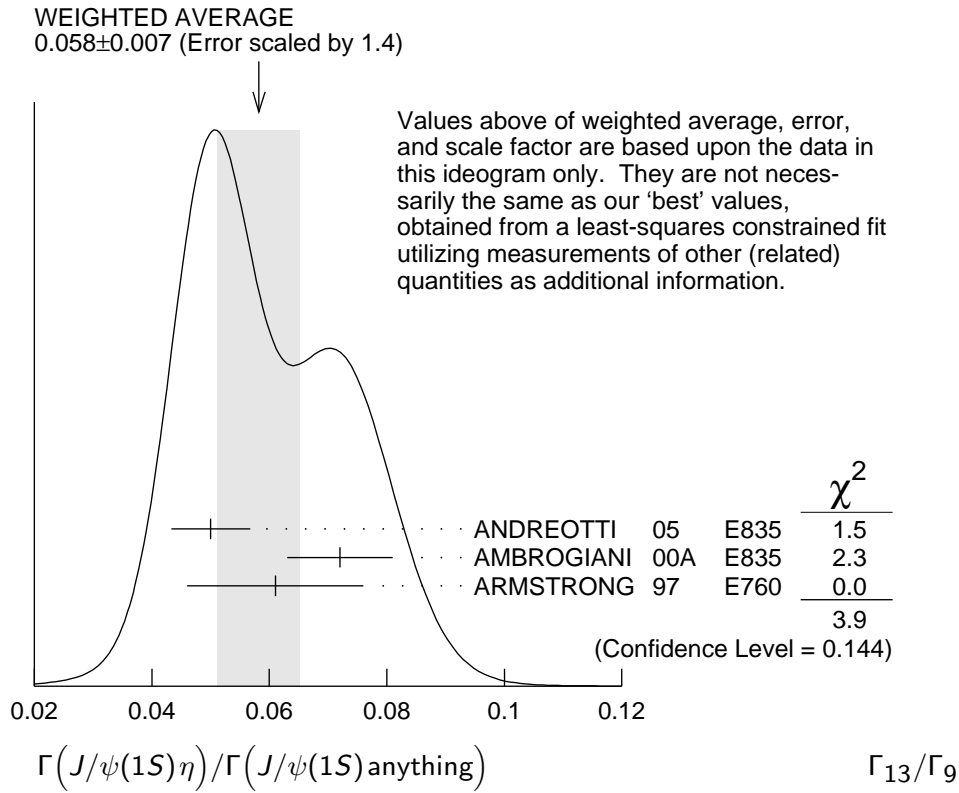


$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\text{anything})$

Γ_{13}/Γ_9

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0553 ± 0.0008				OUR FIT
0.058 ± 0.007				OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.
$0.050 \pm 0.006 \pm 0.003$	298 ± 20	ANDREOTTI 05	E835	$\psi(2S) \rightarrow J/\psi X$
0.072 ± 0.009		AMBROGIANI 00A	E835	$p\bar{p} \rightarrow \psi(2S)$
0.061 ± 0.015		ARMSTRONG 97	E760	$\bar{p}p \rightarrow \psi(2S)$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$0.0549 \pm 0.0006 \pm 0.0009$	18.4k	¹ MENDEZ 08	CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- \eta$
$0.0546 \pm 0.0010 \pm 0.0007$	2.8k	ADAM 05A	CLEO	Repl. by MENDEZ 08

¹Not independent from other measurements of MENDEZ 08.



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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0979±0.0014 OUR FIT				
0.0979±0.0018 OUR AVERAGE				
0.0979±0.0010±0.0015	18.4k	MENDEZ 08	CLEO	$\psi(2S) \rightarrow \ell^+\ell^-\eta$
0.098 ±0.005 ±0.010	2k	¹ ABLIKIM 04B	BES	$\psi(2S) \rightarrow J/\psi X$
0.091 ±0.021		² HIMEL 80	MRK2	$e^+e^- \rightarrow \psi(2S)X$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.0968±0.0019±0.0013	2.8k	³ ADAM 05A	CLEO	Repl. by MENDEZ 08
0.095 ±0.007 ±0.007		⁴ ANDREOTTI 05	E835	$\psi(2S) \rightarrow J/\psi X$

¹ From a fit to the J/ψ recoil mass spectra.

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

³ Not independent from other values reported by ADAM 05A.

⁴ Not independent from other values reported by ANDREOTTI 05.

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
12.68±0.32 OUR AVERAGE				
12.6 ±0.2 ±0.3	4.1k	ABLIKIM 12M	BES3	$e^+e^- \rightarrow \ell^+\ell^-2\gamma$
13.3 ±0.8 ±0.3	530	MENDEZ 08	CLEO	$\psi(2S) \rightarrow \ell^+\ell^-2\gamma$
14.3 ±1.4 ±1.2	280	BAI 04I	BES2	$\psi(2S) \rightarrow J/\psi\gamma\gamma$
14 ±6	7	HIMEL 80	MRK2	e^+e^-
9 ±2 ±1	23	¹ OREGLIA 80	CBAL	$\psi(2S) \rightarrow J/\psi2\gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
13 ±1 ±1	88	ADAM 05A	CLEO	Repl. by MENDEZ 08

¹ Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$.

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

$$\Gamma_{14}/\Gamma_9 = \Gamma_{14}/(\Gamma_{11} + \Gamma_{12} + \Gamma_{13} + 0.348\Gamma_{119} + 0.198\Gamma_{120})$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$0.213 \pm 0.012 \pm 0.003$	527	¹ MENDEZ	08	CLEO $e^+ e^- \rightarrow J/\psi \gamma \gamma$
$0.22 \pm 0.02 \pm 0.01$		² ADAM	05A	CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow J/\psi \gamma \gamma$

¹ Not independent from other values reported by MENDEZ 08. Supersedes ADAM 05A.

² 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	¹ MENDEZ	08	CLEO $e^+ e^- \rightarrow J/\psi \gamma \gamma$
$0.39 \pm 0.04 \pm 0.01$		² ADAM	05A	CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow J/\psi \gamma \gamma$

¹ Not independent from other values reported by MENDEZ 08. Supersedes ADAM 05A.

² Not independent from other values reported by ADAM 05A.

———— HADRONIC DECAYS ————

$\Gamma(\pi^0 h_c(1P))/\Gamma_{\text{total}}$

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	¹ GE	11	CLEO $\Upsilon(2S) \rightarrow \pi^0 \text{ anything}$
$8.4 \pm 1.3 \pm 1.0$	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 $\psi(2S) \rightarrow \pi^0 \eta_c \gamma$

¹ Assuming a width $\Gamma(h_c(1P)) = 0.86 \text{ MeV} \equiv \Gamma_0$, 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.

$\Gamma(3(\pi^+ \pi^-)\pi^0)/\Gamma_{\text{total}}$

Γ_{16}/Γ

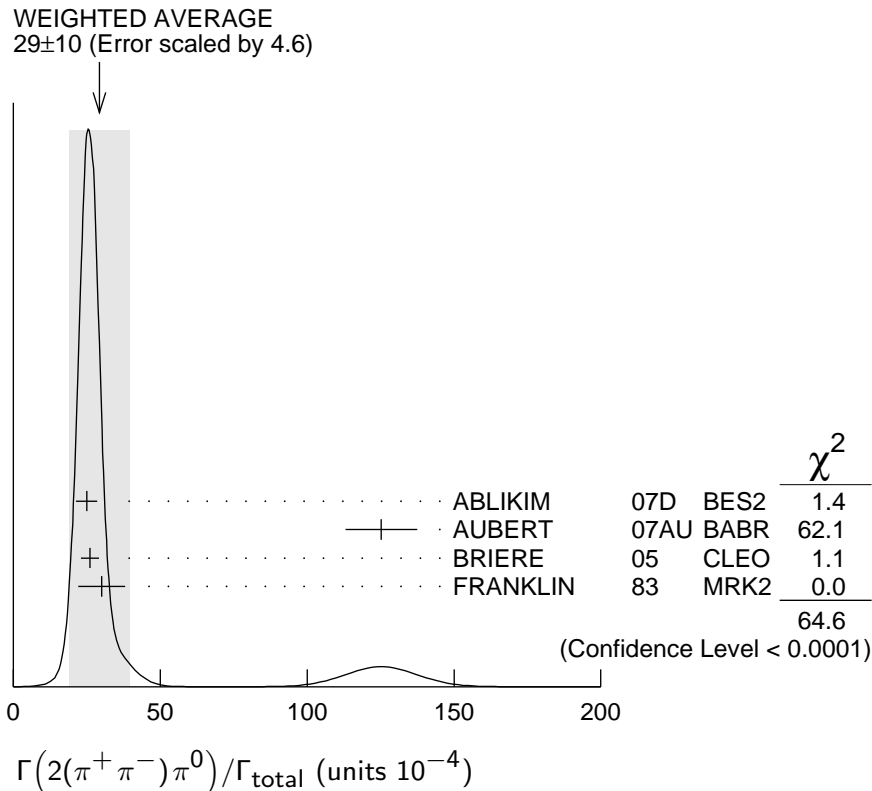
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
35 ± 16	6	FRANKLIN	83	MRK2 $e^+ e^- \rightarrow \text{hadrons}$

$\Gamma(2(\pi^+ \pi^-)\pi^0)/\Gamma_{\text{total}}$

Γ_{17}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
29 ± 10 OUR AVERAGE				
$24.9 \pm 0.7 \pm 3.6$	2173	ABLIKIM	07D	BES2 $e^+ e^- \rightarrow \psi(2S)$
$125 \pm 12 \pm 2$	410	¹ 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 $e^+ e^-$

¹ AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow 2(\pi^+ \pi^-) \pi^0) / \Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+ e^-)] = (297 \pm 22 \pm 18) \times 10^{-4}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.



$\Gamma(\rho a_2(1320)) / \Gamma_{\text{total}}$

Γ_{18} / Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
2.55±0.73±0.47		112 ± 31	BAI	04C BES2	$\psi(2S) \rightarrow 2(\pi^+ \pi^-) \pi^0$
<2.3	90		BAI	98J BES	$e^+ e^-$

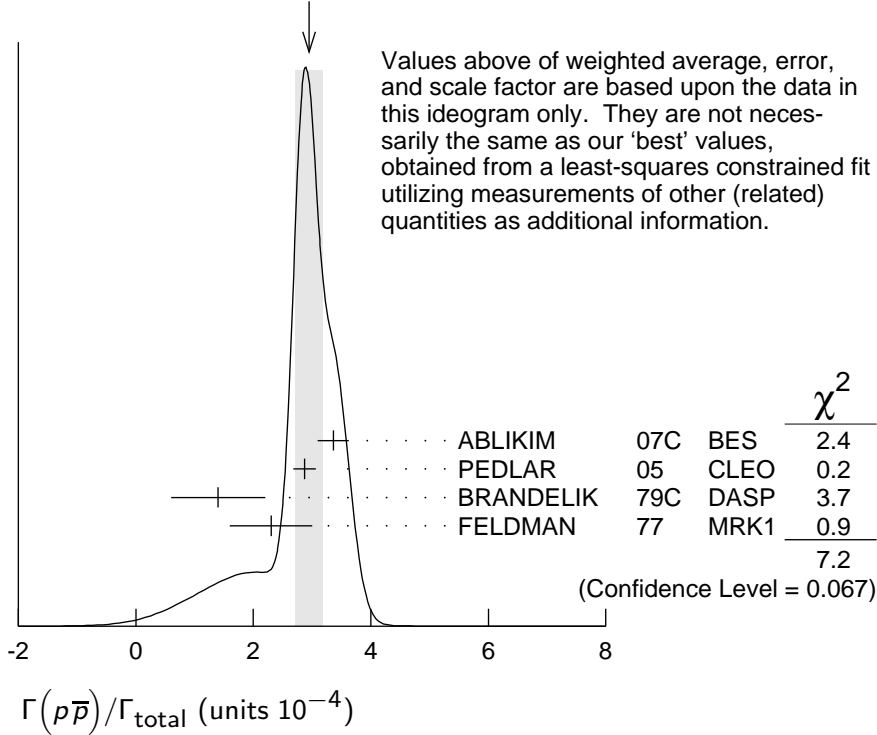
• • • We do not use the following data for averages, fits, limits, etc. • • •

$\Gamma(\rho \bar{p}) / \Gamma_{\text{total}}$

Γ_{19} / Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.75±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	$e^+ e^- \rightarrow \psi(2S) \rightarrow \rho \bar{p}$
2.87±0.12±0.15	557	PEDLAR 05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \rho \bar{p}$
1.4 ± 0.8	4	BRANDELIK 79C	DASP	$e^+ e^- \rightarrow \psi(2S) \rightarrow \rho \bar{p}$
2.3 ± 0.7		FELDMAN 77	MRK1	$e^+ e^- \rightarrow \psi(2S) \rightarrow \rho \bar{p}$

WEIGHTED AVERAGE
 2.95 ± 0.23 (Error scaled by 1.5)



$\Gamma(p\bar{p})/\Gamma(J/\psi(1S)\pi^+\pi^-)$

Γ_{19}/Γ_{11}

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
8.09 ± 0.35 OUR FIT			
$6.98 \pm 0.49 \pm 0.97$	BAI	01	BES $e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$

$\Gamma(\Delta^{++}\bar{\Delta}^{--})/\Gamma_{\text{total}}$

Γ_{20}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$12.8 \pm 1.0 \pm 3.4$	157	¹ BAI	01	BES $e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons

¹ Estimated using $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.310 \pm 0.028$.

$\Gamma(\Lambda\bar{\Lambda}\pi^0)/\Gamma_{\text{total}}$

Γ_{21}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 0.29	90	¹ ABLIKIM	13F	BES3 $\psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\gamma\gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
<12	90	² ABLIKIM	07H	BES2 $e^+e^- \rightarrow \psi(2S)$

¹ Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\pi^0 \rightarrow \gamma\gamma) = 98.8\%$.

² Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\eta \rightarrow \gamma\gamma) = 39.4\%$.

$\Gamma(\Lambda\bar{\Lambda}\eta)/\Gamma_{\text{total}}$

Γ_{22}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$2.48 \pm 0.34 \pm 0.19$		60	¹ ABLIKIM	13F	BES3 $\psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\gamma\gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<4.9	90		² ABLIKIM	07H	BES2 $e^+e^- \rightarrow \psi(2S)$

¹ Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\eta \rightarrow \gamma\gamma) = 39.31\%$.

² Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$.

$\Gamma(\Lambda\bar{p}K^+)/\Gamma_{\text{total}}$

Γ_{23}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.0±0.1±0.1	74.0	BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}K^+\pi^-$

$\Gamma(\Lambda\bar{p}K^+\pi^+\pi^-)/\Gamma_{\text{total}}$

Γ_{24}/Γ

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

$\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$

Γ_{25}/Γ

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

$\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$

Γ_{26}/Γ

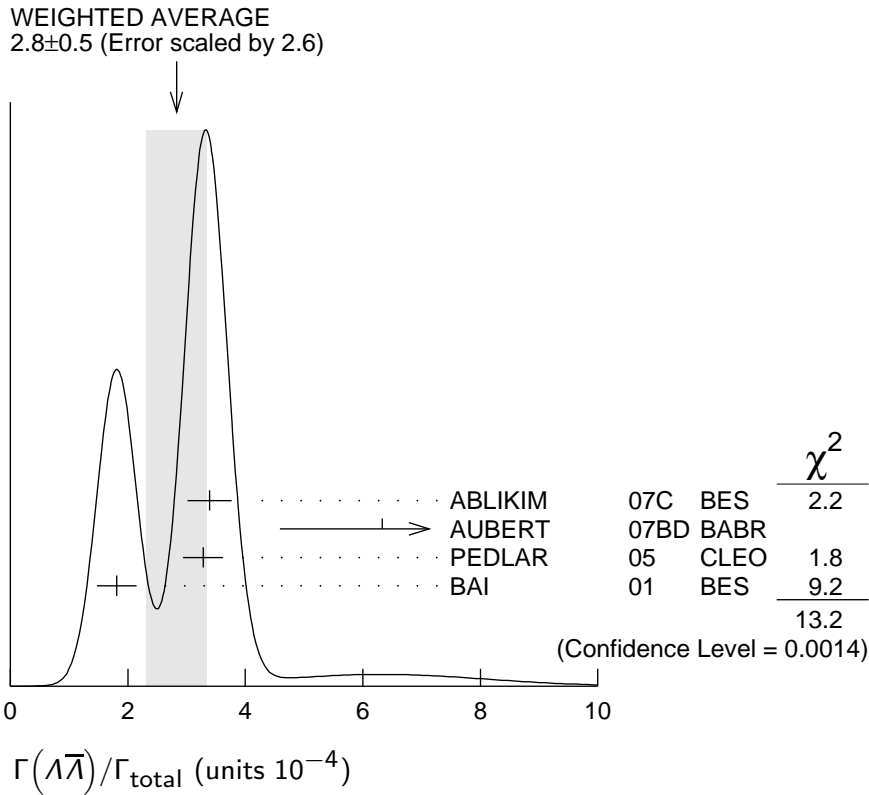
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.8 ±0.5 OUR AVERAGE			Error includes scale factor of 2.6. See the ideogram below.		
3.39±0.20±0.32		337	ABLIKIM	07C	BES $e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons
6.3 ±1.7 ±0.1			¹ AUBERT	07BD	BABR $10.6 e^+e^- \rightarrow \Lambda\bar{\Lambda}\gamma$
3.28±0.23±0.25		208	PEDLAR	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons
1.81±0.20±0.27		80	² BAI	01	BES $e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons

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

< 4 90 FELDMAN 77 MRK1 $e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons

¹AUBERT 07BD reports $[\Gamma(\psi(2S) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+e^-)] = (15 \pm 4 \pm 1) \times 10^{-4}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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



$\Gamma(\Sigma^0 \bar{p} K^+ + \text{c.c.})/\Gamma_{\text{total}}$ **Γ_{27}/Γ**

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.67 \pm 0.13 \pm 0.12$	276	¹ ABLIKIM	13D BES3	$\psi(2S) \rightarrow \gamma \Lambda \bar{p} K^+$

¹ Using $B(\Lambda \rightarrow p \pi^-) = 63.9\%$, and $B(\Sigma^0 \rightarrow \Lambda \gamma) = 100\%$.

$\Gamma(\Sigma^+ \bar{\Sigma}^-)/\Gamma_{\text{total}}$ **Γ_{28}/Γ**

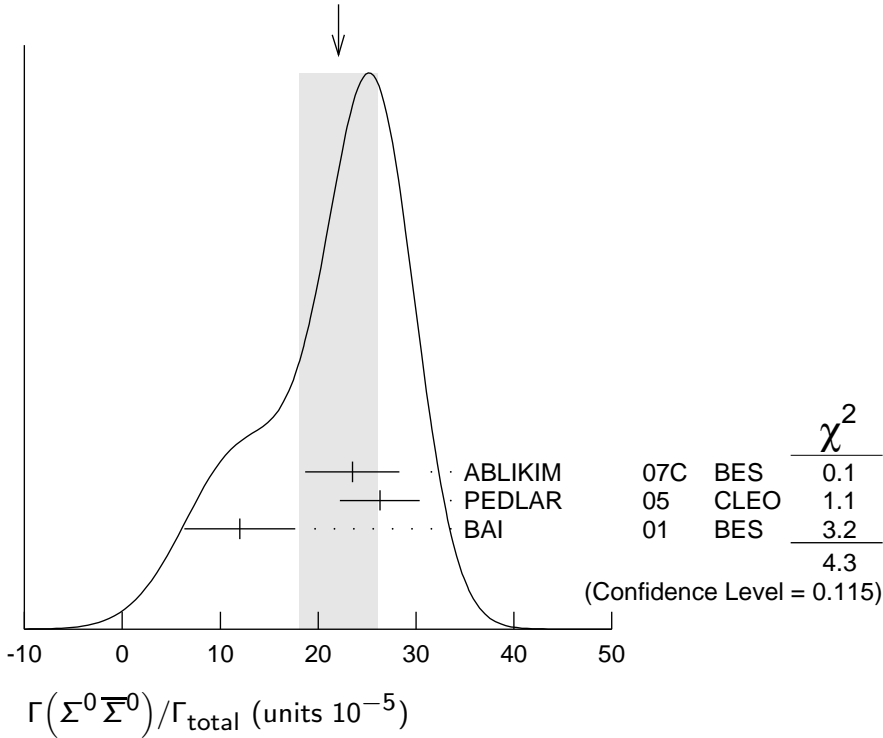
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$25.7 \pm 4.4 \pm 6.8$	35	PEDLAR	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow$ hadrons

$\Gamma(\Sigma^0 \bar{\Sigma}^0)/\Gamma_{\text{total}}$ **Γ_{29}/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.		
$23.5 \pm 3.6 \pm 3.2$	59	ABLIKIM	07C BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow$ hadrons
$26.3 \pm 3.5 \pm 2.1$	58	PEDLAR	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow$ hadrons
$12 \pm 4 \pm 4$	8	¹ BAI	01 BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow$ hadrons

¹ Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

WEIGHTED AVERAGE
 22 ± 4 (Error scaled by 1.5)



$\Gamma(\Sigma(1385)^+ \bar{\Sigma}(1385)^-)/\Gamma_{\text{total}}$

Γ_{30}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$11 \pm 3 \pm 3$	14	¹ BAI	01	BES $e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons

¹ Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

$\Gamma(\Xi^- \bar{\Xi}^+)/\Gamma_{\text{total}}$

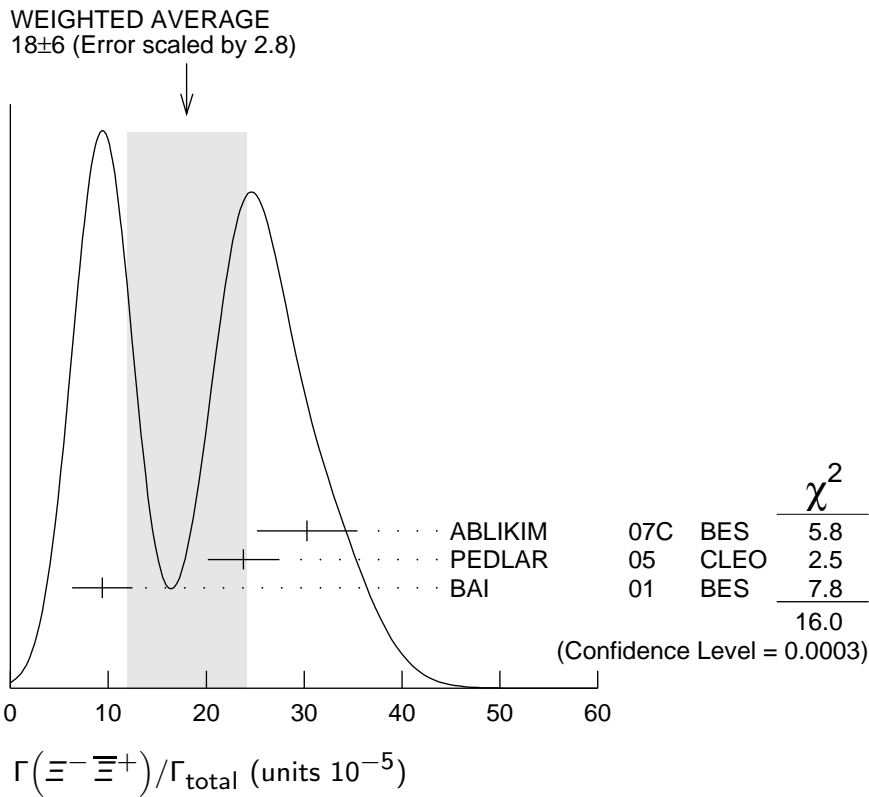
Γ_{31}/Γ

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.
$30.3 \pm 4.0 \pm 3.2$		67	ABLIKIM	07C	BES $e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons
$23.8 \pm 3.0 \pm 2.1$		63	PEDLAR	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons
$9.4 \pm 2.7 \pm 1.5$		12	¹ BAI	01	BES $e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons

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

<20	90	FELDMAN	77	MRK1	$e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons
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¹ Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.



$\Gamma(\Xi^0 \Xi^0)/\Gamma_{\text{total}}$ **Γ_{32}/Γ**

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

$\Gamma(\Xi(1530)^0 \Xi(1530)^0)/\Gamma_{\text{total}}$ **Γ_{33}/Γ**

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 8.1	90	¹ BAI	01	BES $e^+ e^- \rightarrow \psi(2S) \rightarrow$ hadrons
<32	90	PEDLAR	05	CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow$ hadrons

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

¹ Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

$\Gamma(\Omega^- \bar{\Omega}^+)/\Gamma_{\text{total}}$ **Γ_{34}/Γ**

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 7.3	90	¹ BAI	01	BES $e^+ e^- \rightarrow \psi(2S) \rightarrow$ hadrons
<16	90	PEDLAR	05	CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow$ hadrons

¹ Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

$\Gamma(\pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ Γ_{35}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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1.53±0.07 OUR AVERAGE

1.65±0.03±0.15	4.5k	ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho \bar{p} \pi^0$
1.54±0.06±0.06	948	ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \pi^0 \rho \bar{p}$
1.32±0.10±0.15	256 ± 18	¹ ABLIKIM	05E BES2	$e^+ e^- \rightarrow \psi(2S) \rightarrow \rho \bar{p} \gamma \gamma$
1.4 ± 0.5	9	FRANKLIN	83 MRK2	$e^+ e^-$

¹ Computed using $B(\pi^0 \rightarrow \gamma \gamma) = (98.80 \pm 0.03)\%$.

$\Gamma(N(940)\bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ Γ_{36}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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6.42±0.20^{+1.78}_{-1.28} 1.9k ¹ ABLIKIM 13A BES3 $\psi(2S) \rightarrow \rho \bar{p} \pi^0$

¹ From a fit of $\pi^0 \rho \bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(N(1440)\bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ Γ_{37}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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7.3^{+1.7}_{-1.5} OUR AVERAGE Error includes scale factor of 2.5.

3.58±0.25 ^{+1.59} _{-0.84}	1.1k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho \bar{p} \pi^0$
8.1 ± 0.7 ± 0.3	474	² ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \pi^0 \rho \bar{p}$

¹ From a fit of $\pi^0 \rho \bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

² From a fit of the $\rho \bar{p}$ and $\rho \pi^0$ mass distributions to a combination of $N(1440)\bar{p}$, $\pi^0 f_0(2100)$, and two other broad, unestablished resonances.

$\Gamma(N(1520)\bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ Γ_{38}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.64±0.05^{+0.22}_{-0.17} 0.2k ¹ ABLIKIM 13A BES3 $\psi(2S) \rightarrow \rho \bar{p} \pi^0$

¹ From a fit of $\pi^0 \rho \bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(N(1535)\bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ Γ_{39}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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2.47±0.28^{+0.99}_{-0.97} 0.7k ¹ ABLIKIM 13A BES3 $\psi(2S) \rightarrow \rho \bar{p} \pi^0$

¹ From a fit of $\pi^0 \rho \bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(N(1650)\bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ Γ_{40}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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3.76±0.28^{+1.37}_{-1.66} 1.1k ¹ ABLIKIM 13A BES3 $\psi(2S) \rightarrow \rho \bar{p} \pi^0$

¹ From a fit of $\pi^0 \rho \bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(N(1720)\bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ **Γ_{41}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$1.79 \pm 0.10^{+0.24}_{-0.71}$	0.5k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho \bar{p} \pi^0$

¹ From a fit of $\pi^0 \rho \bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(N(2300)\bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ **Γ_{42}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$2.62 \pm 0.28^{+1.12}_{-0.64}$	0.9k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho \bar{p} \pi^0$

¹ From a fit of $\pi^0 \rho \bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(N(2570)\bar{p} + \text{c.c.} \rightarrow \pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ **Γ_{43}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$2.13 \pm 0.08^{+0.40}_{-0.30}$	0.8k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho \bar{p} \pi^0$

¹ From a fit of $\pi^0 \rho \bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(\pi^0 f_0(2100) \rightarrow \pi^0 \rho \bar{p})/\Gamma_{\text{total}}$ **Γ_{44}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$1.1 \pm 0.4 \pm 0.1$	76	¹ ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \pi^0 \rho \bar{p}$

¹ From a fit of the $\rho \bar{p}$ and $p\pi^0$ mass distributions to a combination of $N_1^*(1440)\bar{p}$, $\pi^0 f_0(2100)$, and two other broad, unestablished resonances.

$\Gamma(\eta \rho \bar{p})/\Gamma_{\text{total}}$ **Γ_{45}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
5.7 ± 0.6 OUR AVERAGE				
$5.6 \pm 0.6 \pm 0.3$	154	ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \eta \rho \bar{p}$
$5.8 \pm 1.1 \pm 0.7$	44.8 ± 8.5	¹ ABLIKIM	05E BES2	$e^+ e^- \rightarrow \psi(2S) \rightarrow \rho \bar{p} \gamma \gamma$
$8 \pm 3 \pm 3$	9.8	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \rho \bar{p} \pi^+ \pi^- \pi^0$

¹ Computed using $B(\eta \rightarrow \gamma \gamma) = (39.43 \pm 0.26)\%$.

$\Gamma(\eta f_0(2100) \rightarrow \eta \rho \bar{p})/\Gamma_{\text{total}}$ **Γ_{46}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$1.2 \pm 0.4 \pm 0.1$	31	¹ ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \eta \rho \bar{p}$

¹ From a fit of the $\rho \bar{p}$ and $p\eta$ distributions to a combination of $N^*(1535)\bar{p}$ and $\eta f_0(2100)$.

$\Gamma(N(1535)\bar{p} \rightarrow \eta \rho \bar{p})/\Gamma_{\text{total}}$ **Γ_{47}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$4.4 \pm 0.6 \pm 0.3$	123	¹ ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \eta \rho \bar{p}$

¹ From a fit of the $\rho \bar{p}$ and $p\eta$ distributions to a combination of $N^*(1535)\bar{p}$ and $\eta f_0(2100)$.

$\Gamma(\omega p\bar{p})/\Gamma_{\text{total}}$ **Γ_{48}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.69±0.21 OUR AVERAGE				
0.6 ±0.2 ±0.2	21.2	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\pi^0$

0.8 ±0.3 ±0.1	14.9 ± 0.1	¹ BAI	03B BES	$\psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\pi^0$
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¹ Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(\phi p\bar{p})/\Gamma_{\text{total}}$ **Γ_{49}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.24	90	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}K^+K^-$

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

<0.26	90	¹ BAI	03B BES	$\psi(2S) \rightarrow K^+K^-p\bar{p}$
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¹ Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(\pi^+\pi^-\rho\bar{p})/\Gamma_{\text{total}}$ **Γ_{50}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
6.0±0.4 OUR AVERAGE				
5.9±0.2±0.4	904.5	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\pi^+\pi^-$

8 ±2		¹ TANENBAUM	78 MRK1	$e^+ e^-$
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¹ Assuming entirely strong decay.

$\Gamma(p\bar{n}\pi^- \text{ or c.c.})/\Gamma_{\text{total}}$ **Γ_{51}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.48±0.17 OUR AVERAGE				
2.45±0.11±0.21	851	ABLIKIM	06i BES2	$e^+ e^- \rightarrow p\pi^- X$
2.52±0.12±0.22	849	ABLIKIM	06i BES2	$e^+ e^- \rightarrow \bar{p}\pi^+ X$

$\Gamma(p\bar{n}\pi^-\pi^0)/\Gamma_{\text{total}}$ **Γ_{52}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.18±0.50±0.50	135 ± 21	ABLIKIM	06i BES2	$e^+ e^- \rightarrow p\pi^-\pi^0 X$

$\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$ **Γ_{54}/Γ**

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

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

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
9.5±0.7±1.5		¹ BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadr}$

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

10.3±0.8±1.4	201.7	² BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \eta 3\pi(\eta \rightarrow \gamma\gamma)$
8.1±1.4±1.6	50.0	² BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \eta 3\pi(\eta \rightarrow 3\pi)$

¹ Average of $\eta \rightarrow \gamma\gamma$ and $\eta \rightarrow 3\pi$.

² Not independent from other values reported by BRIERE 05.

$\Gamma(2(\pi^+\pi^-\eta))/\Gamma_{\text{total}}$ **Γ_{56}/Γ**

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.2 \pm 0.6 \pm 0.1$	16	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow 2(\pi^+\pi^-)\eta\gamma$

¹ AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \rightarrow 2(\pi^+\pi^-)\eta) \cdot B(\eta \rightarrow \gamma\gamma) = 1.2 \pm 0.7 \pm 0.1 \text{ eV}$.

$\Gamma(\eta'\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ **Γ_{57}/Γ**

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

$\Gamma(\omega\pi^+\pi^-)/\Gamma_{\text{total}}$ **Γ_{58}/Γ**

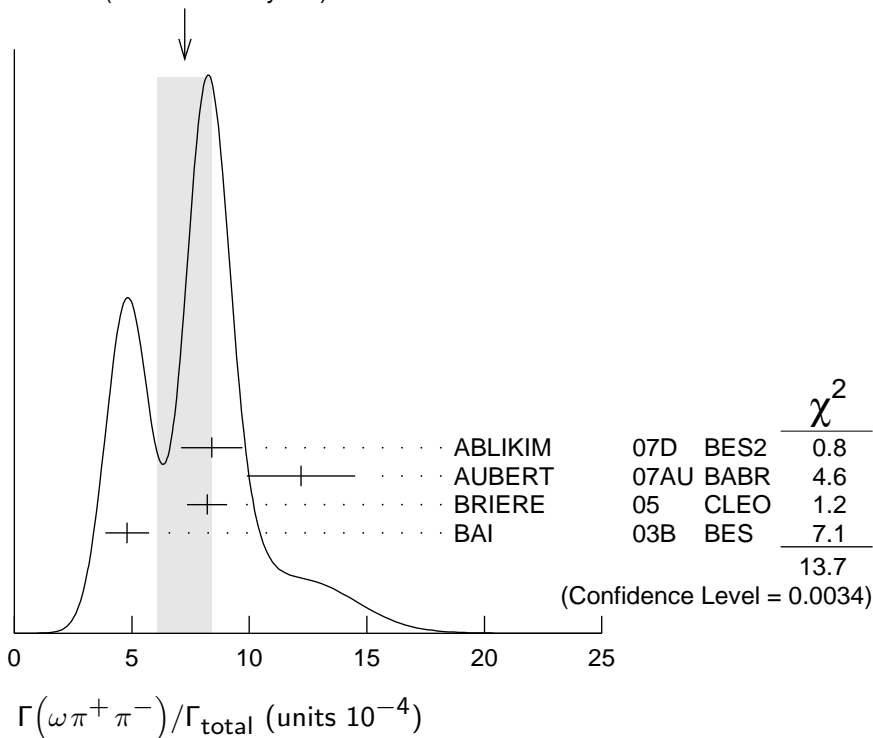
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
7.3 ± 1.2 OUR AVERAGE		Error includes scale factor of 2.1. See the ideogram below.		

$8.4 \pm 0.5 \pm 1.2$	386	ABLIKIM	07D BES2	$e^+ e^- \rightarrow \psi(2S)$
$12.2 \pm 2.2 \pm 0.7$	37	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \omega\pi^+\pi^-\gamma$
$8.2 \pm 0.5 \pm 0.7$	391	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$
$4.8 \pm 0.6 \pm 0.7$	100 ± 22	² BAI	03B BES	$\psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$

¹ AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \rightarrow \omega\pi^+\pi^-) \cdot B(\omega \rightarrow 3\pi) = 2.69 \pm 0.73 \pm 0.16 \text{ eV}$.

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

WEIGHTED AVERAGE
 7.3 ± 1.2 (Error scaled by 2.1)



$\Gamma(b_1^\pm \pi^\mp)/\Gamma_{\text{total}}$ **Γ_{59}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
4.0 ± 0.6 OUR AVERAGE Error includes scale factor of 1.1.				
5.1 ± 0.6 ± 0.8	202	ABLIKIM	07D BES2	$e^+ e^- \rightarrow \psi(2S)$
4.18 ^{+0.43} _{-0.42} ± 0.92	170	ADAM	05 CLEO	$e^+ e^- \rightarrow \psi(2S)$
3.2 ± 0.6 ± 0.5	61 ± 11	^{1,2} BAI	03B BES	$\psi(2S) \rightarrow 2(\pi^+ \pi^-) \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.2 ± 0.8 ± 1.0		¹ BAI	99C BES	Repl. by BAI 03B

¹ Assuming $B(b_1 \rightarrow \omega \pi) = 1$.

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

$\Gamma(b_1^0 \pi^0)/\Gamma_{\text{total}}$ **Γ_{60}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.35^{+0.47}_{-0.42} ± 0.40	45	ADAM	05 CLEO	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\omega f_2(1270))/\Gamma_{\text{total}}$ **Γ_{61}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.2 ± 0.4 OUR AVERAGE					
2.3 ± 0.5 ± 0.4		57	ABLIKIM	07D BES2	$e^+ e^- \rightarrow \psi(2S)$
2.05 ± 0.41 ± 0.38		62 ± 12	BAI	04C BES2	$\psi(2S) \rightarrow 2(\pi^+ \pi^-) \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.5	90		¹ BAI	03B BES	$\psi(2S) \rightarrow 2(\pi^+ \pi^-) \pi^0$
<1.7	90		BAI	98J BES	Repl. by BAI 03B

¹ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(\pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}$ **Γ_{62}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
7.5 ± 0.9 OUR AVERAGE Error includes scale factor of 1.9.				
10.8 ± 1.9 ± 0.2	85	¹ AUBERT	07AK BABR	10.6 $e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$
7.1 ± 0.3 ± 0.4	817.2	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^+ K^- \pi^+ \pi^-$
16 ± 4		² TANENBAUM	78 MRK1	$e^+ e^-$

¹ AUBERT 07AK reports $[\Gamma(\psi(2S) \rightarrow \pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+ e^-)] = (2.56 \pm 0.42 \pm 0.16) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Assuming entirely strong decay.

$\Gamma(\rho^0 K^+ K^-)/\Gamma_{\text{total}}$ **Γ_{63}/Γ**

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

$\Gamma(K^*(892)^0 \bar{K}_2^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{64}/Γ

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

$\Gamma(K^+ K^- \pi^+ \pi^- \eta)/\Gamma_{\text{total}}$ Γ_{65}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.3±0.7±0.1	7	¹ AUBERT 07AU BABR	10.6	$e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \eta \gamma$
¹ AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \rightarrow 2(\pi^+ \pi^-) \eta) \cdot B(\eta \rightarrow \gamma \gamma) = 1.2 \pm 0.7 \pm 0.1 \text{ eV}$.				

$\Gamma(K^+ K^- 2(\pi^+ \pi^-) \pi^0)/\Gamma_{\text{total}}$ Γ_{66}/Γ

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

$\Gamma(K_1(1270)^\pm K^\mp)/\Gamma_{\text{total}}$ Γ_{68}/Γ

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
10.0±1.8±2.1	¹ BAI	99C BES	$e^+ e^-$
¹ Assuming $B(K_1(1270) \rightarrow K \rho) = 0.42 \pm 0.06$			

$\Gamma(K_S^0 K_S^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{69}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.20±0.25±0.37	83 ± 9	ABLIKIM	050 BES2	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\rho^0 \rho \bar{\rho})/\Gamma_{\text{total}}$ Γ_{70}/Γ

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

$\Gamma(K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{71}/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_{72}/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_{73}/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_{74}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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12.6±0.9 OUR AVERAGE

18.6±5.6±0.3	32	¹ 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	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

¹ 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 $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.37 \pm 0.04$ 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_{75}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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5.9±2.0±0.9	19	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
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$\Gamma(K^*(892)^0 K^- \pi^+ \pi^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{76}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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8.6±1.3±1.8	238	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
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$\Gamma(K^*(892)^+ K^- \pi^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{77}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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9.6±2.2±1.7	133	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
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$\Gamma(K^*(892)^+ K^- \rho^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{78}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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7.3±2.2±1.4	78	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
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$\Gamma(K^*(892)^0 K^- \rho^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{79}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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6.1±1.3±1.2	125	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
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$\Gamma(\eta K^+ K^- , \text{no } \eta\phi)/\Gamma_{\text{total}}$ Γ_{80}/Γ

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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3.08±0.29±0.25		0.3k	¹ ABLIKIM	12L BES3	$\psi(2S) \rightarrow K^+ K^- \gamma\gamma$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<13		90	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
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¹ Excluding $\eta\phi$.

$\Gamma(\omega K^+ K^-)/\Gamma_{\text{total}}$ **Γ_{81}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.85 ± 0.25 OUR AVERAGE Error includes scale factor of 1.1.				
2.38 ± 0.37 ± 0.29	78	ABLIKIM	06G BES2	$\psi(2S) \rightarrow$ $K^+ K^- \pi^+ \pi^- \pi^0$
1.9 ± 0.3 ± 0.3	76.8	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow$ $K^+ K^- \pi^+ \pi^- \pi^0$
1.5 ± 0.3 ± 0.2	23.0 ± 5.2	¹ BAI	03B BES	$\psi(2S) \rightarrow$ $K^+ K^- \pi^+ \pi^- \pi^0$

¹ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(3(\pi^+ \pi^-))/\Gamma_{\text{total}}$ **Γ_{82}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.5 ± 2.0 OUR AVERAGE Error includes scale factor of 2.8.				
5.45 ± 0.42 ± 0.87	671	ABLIKIM	05H BES2	$e^+ e^- \rightarrow \psi(2S) \rightarrow$ $3(\pi^+ \pi^-)$
1.5 ± 1.0		¹ TANENBAUM	78 MRK1	$e^+ e^-$

¹ Assuming entirely strong decay.

$\Gamma(p\bar{p}\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ **Γ_{83}/Γ**

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

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

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
7.1 ± 0.5 OUR AVERAGE Error includes scale factor of 1.5.					
7.48 ± 0.23 ± 0.39		1.3k	¹ METREVELI	12	$\psi(2S) \rightarrow K^+ K^-$
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	$e^+ e^-$

¹ Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration.

$\Gamma(K_S^0 K_L^0)/\Gamma_{\text{total}}$ **Γ_{85}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
5.34 ± 0.33 OUR AVERAGE				
5.28 ± 0.25 ± 0.34	478 ± 23	¹ METREVELI	12	$\psi(2S) \rightarrow K_S^0 K_L^0$
5.8 ± 0.8 ± 0.4		DOBBS	06A CLEO	$e^+ e^-$
5.24 ± 0.47 ± 0.48	156 ± 14	² BAI	04B BES2	$\psi(2S) \rightarrow K_S^0 K_L^0 \rightarrow$ $\pi^+ \pi^- X$

¹ Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration.

² Using $B(K_S^0 \rightarrow \pi^+ \pi^-) = 0.6860 \pm 0.0027$.

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

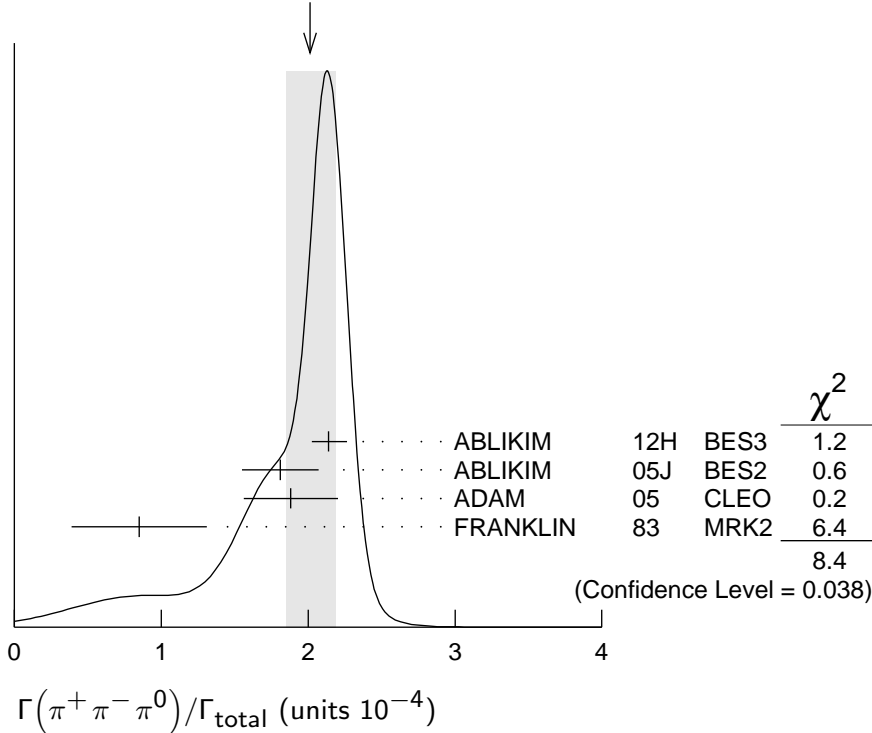
Γ_{86}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.01±0.17 OUR AVERAGE		Error includes scale factor of 1.7. See the ideogram below.		
2.14±0.03 ^{+0.12} _{-0.11}	7k	¹ ABLIKIM	12H BES3	$e^+e^- \rightarrow \psi(2S)$
1.81±0.18±0.19	260 ± 19	² ABLIKIM	05J BES2	$e^+e^- \rightarrow \psi(2S)$
1.88 ^{+0.16} _{-0.15} ±0.28	194	ADAM	05 CLEO	$e^+e^- \rightarrow \psi(2S)$
0.85±0.46	4	FRANKLIN	83 MRK2	$e^+e^- \rightarrow \text{hadrons}$

¹ From $\psi(2S) \rightarrow \pi^+\pi^-\pi^0$ events directly. The quoted systematic error includes a contribution of 4% (added in quadrature) from the uncertainty on the number of $\psi(2S)$ events.

² From a PW analysis of $\psi(2S) \rightarrow \pi^+\pi^-\pi^0$.

WEIGHTED AVERAGE
2.01±0.17 (Error scaled by 1.7)



$\Gamma(\rho(2150)\pi \rightarrow \pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

Γ_{87}/Γ

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
1.94±0.25^{+1.15}_{-0.34}	¹ ABLIKIM	05J BES2	$\psi(2S) \rightarrow \rho(2150)\pi \rightarrow \pi^+\pi^-\pi^0$

¹ From a PW analysis of $\psi(2S) \rightarrow \pi^+\pi^-\pi^0$.

$\Gamma(\rho(770)\pi \rightarrow \pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

Γ_{88}/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±0.07±0.11			¹ ABLIKIM	05J BES2	$\psi(2S) \rightarrow \rho(770)\pi \rightarrow \pi^+\pi^-\pi^0$
0.24 ^{+0.08} _{-0.07} ±0.02		22	ADAM	05 CLEO	$e^+e^- \rightarrow \psi(2S)$

• • • 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		² ABRAMS	75	MRK1	e^+e^-

¹ From a PW analysis of $\psi(2S) \rightarrow \pi^+\pi^-\pi^0$.

² Final state $\rho^0\pi^0$.

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

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.78 ± 0.26 OUR AVERAGE

$0.76 \pm 0.25 \pm 0.06$		30	¹ METREVELI	12		$\psi(2S) \rightarrow \pi^+\pi^-$
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	$e^+e^- \rightarrow \psi(2S)$
<5	90		FELDMAN	77	MRK1	e^+e^-

¹ Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration. Using $\psi(3770) \rightarrow \pi^+\pi^-$ for continuum subtraction.

$\Gamma(K_1(1400)^\pm K^\mp)/\Gamma_{\text{total}}$ Γ_{90}/Γ

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<3.1	90	¹ BAI	99C	BES e^+e^-
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¹ Assuming $B(K_1(1400) \rightarrow K^*\pi) = 0.94 \pm 0.06$

$\Gamma(K_2^*(1430)^\pm K^\mp)/\Gamma_{\text{total}}$ Γ_{91}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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$7.12 \pm 0.62 \pm_{-0.61}^{+1.13}$	251 ± 22	ABLIKIM	12L	BES3 $e^+e^- \rightarrow \psi(2S)$
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$\Gamma(K^+K^-\pi^0)/\Gamma_{\text{total}}$ Γ_{92}/Γ

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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4.07 ± 0.16 ± 0.26		0.9k	ABLIKIM	12L	BES3 $e^+e^- \rightarrow \psi(2S)$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<8.9	90	1	FRANKLIN	83	MRK2	$e^+e^- \rightarrow \text{hadrons}$
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$\Gamma(K^+K^*(892)^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{93}/Γ

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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2.9 ± 0.4 OUR AVERAGE Error includes scale factor of 1.2.

$3.18 \pm 0.30 \pm_{-0.31}^{+0.26}$		0.2k	ABLIKIM	12L	BES3 $e^+e^- \rightarrow \psi(2S)$
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$2.9 \pm_{-1.7}^{+1.3} \pm 0.4$		9.6 ± 4.2	ABLIKIM	05I	BES2 $e^+e^- \rightarrow \psi(2S)$
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$1.3 \pm_{-0.7}^{+1.0} \pm 0.3$		7	ADAM	05	CLEO $e^+e^- \rightarrow \psi(2S)$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<5.4	90		FRANKLIN	83	MRK2	$e^+e^- \rightarrow \text{hadrons}$
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$\Gamma(K^*(892)^0 \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{94}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
10.9 ± 2.0 OUR AVERAGE				
$13.3^{+2.4}_{-2.8} \pm 1.7$	65.6 ± 9.0	ABLIKIM	05i BES2	$e^+ e^- \rightarrow \psi(2S)$
$9.2^{+2.7}_{-2.2} \pm 0.9$	25	ADAM	05 CLEO	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(K^+ K^*(892)^- + \text{c.c.})/\Gamma(K^*(892)^0 \bar{K}^0 + \text{c.c.})$ Γ_{93}/Γ_{94}

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

$\Gamma(\phi \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{95}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.17 ± 0.29 OUR AVERAGE Error includes scale factor of 1.7.				
$2.40 \pm 0.94 \pm 0.04$	10 ± 4	^{1,2} AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$
$0.9 \pm 0.2 \pm 0.1$	47.6	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^+ K^- \pi^+ \pi^-$
$1.5 \pm 0.2 \pm 0.2$	51.5 ± 8.3	³ BAI	03B BES	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^-$

¹ AUBERT 07AK reports $[\Gamma(\psi(2S) \rightarrow \phi \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+ e^-)] = (0.57 \pm 0.22 \pm 0.04) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.
² Using $B(\phi \rightarrow K^+ K^-) = (49.3 \pm 0.6)\%$.
³ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(\phi f_0(980) \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{96}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.68 ± 0.24 OUR AVERAGE Error includes scale factor of 1.1.				
$1.43 \pm 0.70 \pm 0.02$	6 ± 3	^{1,2} AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$
$0.6 \pm 0.2 \pm 0.1$	18.4 ± 6.4	³ BAI	03B BES	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^-$

¹ AUBERT 07AK reports $[\Gamma(\psi(2S) \rightarrow \phi f_0(980) \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+ e^-)] = (0.34 \pm 0.16 \pm 0.04) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.
² Using $B(\phi \rightarrow K^+ K^-) = (49.3 \pm 0.6)\%$.
³ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(2(K^+ K^-))/\Gamma_{\text{total}}$ Γ_{97}/Γ

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

$\Gamma(\phi K^+ K^-)/\Gamma_{\text{total}}$ **Γ_{98}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.70 ± 0.16 OUR AVERAGE				
0.8 ± 0.2 ± 0.1	36.8	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(K^+ K^-)$

0.6 ± 0.2 ± 0.1	16.1 ± 5.0	¹ BAI	03B BES	$\psi(2S) \rightarrow 2(K^+ K^-)$
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¹ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(2(K^+ K^-)\pi^0)/\Gamma_{\text{total}}$ **Γ_{99}/Γ**

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

$\Gamma(\phi\eta)/\Gamma_{\text{total}}$ **Γ_{100}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.10 ± 0.31 OUR AVERAGE				
3.14 ± 0.23 ± 0.23	0.2k	ABLIKIM	12L BES3	$e^+ e^- \rightarrow \psi(2S)$
2.0 ^{+1.5} _{-1.1} ± 0.4	6	ADAM	05 CLEO	$e^+ e^- \rightarrow \psi(2S)$
3.3 ± 1.1 ± 0.5	17	ABLIKIM	04K BES	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\phi\eta')/\Gamma_{\text{total}}$ **Γ_{101}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.1 ± 1.4 ± 0.7	8	¹ ABLIKIM	04K BES	$e^+ e^- \rightarrow \psi(2S)$

¹ Calculated combining $\eta' \rightarrow \gamma\rho$ and $\eta\pi^+\pi^-$ channels.

$\Gamma(\omega\eta')/\Gamma_{\text{total}}$ **Γ_{102}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.2 ^{+2.4} _{-2.0} ± 0.7	4	¹ ABLIKIM	04K BES	$e^+ e^- \rightarrow \psi(2S)$

¹ Calculated combining $\eta' \rightarrow \gamma\rho$ and $\eta\pi^+\pi^-$ channels.

$\Gamma(\omega\pi^0)/\Gamma_{\text{total}}$ **Γ_{103}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.1 ± 0.6 OUR AVERAGE				
2.5 ^{+1.2} _{-1.0} ± 0.2	14	ADAM	05 CLEO	$e^+ e^- \rightarrow \psi(2S)$
1.87 ^{+0.68} _{-0.62} ± 0.28	14	ABLIKIM	04L BES	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\rho\eta')/\Gamma_{\text{total}}$ **Γ_{104}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.87 ^{+1.64} _{-1.11} ± 0.33	2	ABLIKIM	04L BES	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\rho\eta)/\Gamma_{\text{total}}$					Γ_{105}/Γ
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2.2 ± 0.6	OUR AVERAGE	Error includes scale factor of 1.1.			
$3.0^{+1.1}_{-0.9} \pm 0.2$	18	ADAM	05	CLEO	$e^+e^- \rightarrow \psi(2S)$
$1.78^{+0.67}_{-0.62} \pm 0.17$	13	ABLIKIM	04L	BES	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(\omega\eta)/\Gamma_{\text{total}}$					Γ_{106}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.1	90	ADAM	05	CLEO	$e^+e^- \rightarrow \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.1	90	ABLIKIM	04K	BES	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(\phi\pi^0)/\Gamma_{\text{total}}$					Γ_{107}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.04	90	ABLIKIM	12L	BES3	$e^+e^- \rightarrow \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.7	90	ADAM	05	CLEO	$e^+e^- \rightarrow \psi(2S)$
<0.4	90	ABLIKIM	04K	BES	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(\eta_c\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_{108}/Γ
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.0	90	PEDLAR	07	CLEO	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(p\bar{p}K^+K^-)/\Gamma_{\text{total}}$					Γ_{109}/Γ
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$2.7 \pm 0.6 \pm 0.4$	30.1	BRIERE	05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}K^+K^-$

$\Gamma(\bar{\Lambda}nK_S^0 + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{110}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$0.81 \pm 0.11 \pm 0.14$	50	¹ ABLIKIM	08C	BES2	$e^+e^- \rightarrow J/\psi$
¹ Using $B(\bar{\Lambda} \rightarrow \bar{p}\pi^+) = 63.9\%$ and $B(K_S^0 \rightarrow \pi^+\pi^-) = 69.2\%$.					

$\Gamma(\phi f'_2(1525))/\Gamma_{\text{total}}$					Γ_{111}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$0.44 \pm 0.12 \pm 0.11$		20 ± 6	BAI	04C	$\psi(2S) \rightarrow 2(K^+K^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.45	90		BAI	98J	BES $e^+e^- \rightarrow 2(K^+K^-)$

$\Gamma(\Theta(1540)\bar{\Theta}(1540) \rightarrow K_S^0 p K^- \bar{n} + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{112}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.88	90	BAI	04G	BES2	e^+e^-

$\Gamma(\Theta(1540)K^-\bar{n} \rightarrow K_S^0 p K^-\bar{n})/\Gamma_{\text{total}}$ Γ_{113}/Γ

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

$\Gamma(\Theta(1540)K_S^0\bar{p} \rightarrow K_S^0\bar{p}K^+n)/\Gamma_{\text{total}}$ Γ_{114}/Γ

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

$\Gamma(\bar{\Theta}(1540)K^+n \rightarrow K_S^0\bar{p}K^+n)/\Gamma_{\text{total}}$ Γ_{115}/Γ

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

$\Gamma(\bar{\Theta}(1540)K_S^0p \rightarrow K_S^0pK^-\bar{n})/\Gamma_{\text{total}}$ Γ_{116}/Γ

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

$\Gamma(K_S^0K_S^0)/\Gamma_{\text{total}}$ Γ_{117}/Γ

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
<0.046	¹ BAI	04D	BES e^+e^-

¹Forbidden by CP.

————— RADIATIVE DECAYS —————

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma_{\text{total}}$ Γ_{118}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
9.84±0.31 OUR FIT				
9.2 ±0.4 OUR AVERAGE				
9.22±0.11±0.46	72600	ATHAR	04	CLEO $e^+e^- \rightarrow \gamma X$
9.9 ±0.5 ±0.8		¹ GAISER	86	CBAL $e^+e^- \rightarrow \gamma X$
7.2 ±2.3		¹ BIDDICK	77	CNTR $e^+e^- \rightarrow \gamma X$
7.5 ±2.6		¹ WHITAKER	76	MRK1 e^+e^-

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

$\Gamma(\gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$ Γ_{119}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
9.3 ±0.4 OUR FIT				
8.9 ±0.5 OUR AVERAGE				
9.07±0.11±0.54	76700	ATHAR	04	CLEO $e^+e^- \rightarrow \gamma X$
9.0 ±0.5 ±0.7		¹ GAISER	86	CBAL $e^+e^- \rightarrow \gamma X$
7.1 ±1.9		² BIDDICK	77	CNTR $e^+e^- \rightarrow \gamma X$

¹Angular distribution $(1-0.189\cos^2\theta)$ assumed.

²Valid for isotropic distribution of the photon.

$\Gamma(\gamma\chi_{c2}(1P))/\Gamma_{\text{total}}$ Γ_{120}/Γ

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

8.76 ± 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	$e^+e^- \rightarrow \gamma X$
8.0 ± 0.5 ± 0.7		¹ GAISER	86	CBAL	$e^+e^- \rightarrow \gamma X$
7.0 ± 2.0		² BIDDICK	77	CNTR	$e^+e^- \rightarrow \gamma X$

¹ Angular distribution $(1 - 0.052 \cos^2\theta)$ assumed.

² Valid for isotropic distribution of the photon.

$[\Gamma(\gamma\chi_{c0}(1P)) + \Gamma(\gamma\chi_{c1}(1P)) + \Gamma(\gamma\chi_{c2}(1P))]/\Gamma_{\text{total}}$ ($\Gamma_{118} + \Gamma_{119} + \Gamma_{120}$)/ Γ

VALUE DOCUMENT ID TECN COMMENT

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

27.6 ± 0.3 ± 2.0		¹ ATHAR	04	CLEO	$e^+e^- \rightarrow \gamma X$
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¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c1}(1P))$ $\Gamma_{118}/\Gamma_{119}$

VALUE DOCUMENT ID TECN COMMENT

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

1.02 ± 0.01 ± 0.07		¹ ATHAR	04	CLEO	$e^+e^- \rightarrow \gamma X$
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¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c2}(1P))/\Gamma(\gamma\chi_{c1}(1P))$ $\Gamma_{120}/\Gamma_{119}$

VALUE DOCUMENT ID TECN COMMENT

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

1.03 ± 0.02 ± 0.03		¹ ATHAR	04	CLEO	$e^+e^- \rightarrow \gamma X$
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¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c2}(1P))$ $\Gamma_{118}/\Gamma_{120}$

VALUE DOCUMENT ID TECN COMMENT

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

0.99 ± 0.02 ± 0.08		¹ ATHAR	04	CLEO	$e^+e^- \rightarrow \gamma X$
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¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\eta_c(1S))/\Gamma_{\text{total}}$ Γ_{121}/Γ

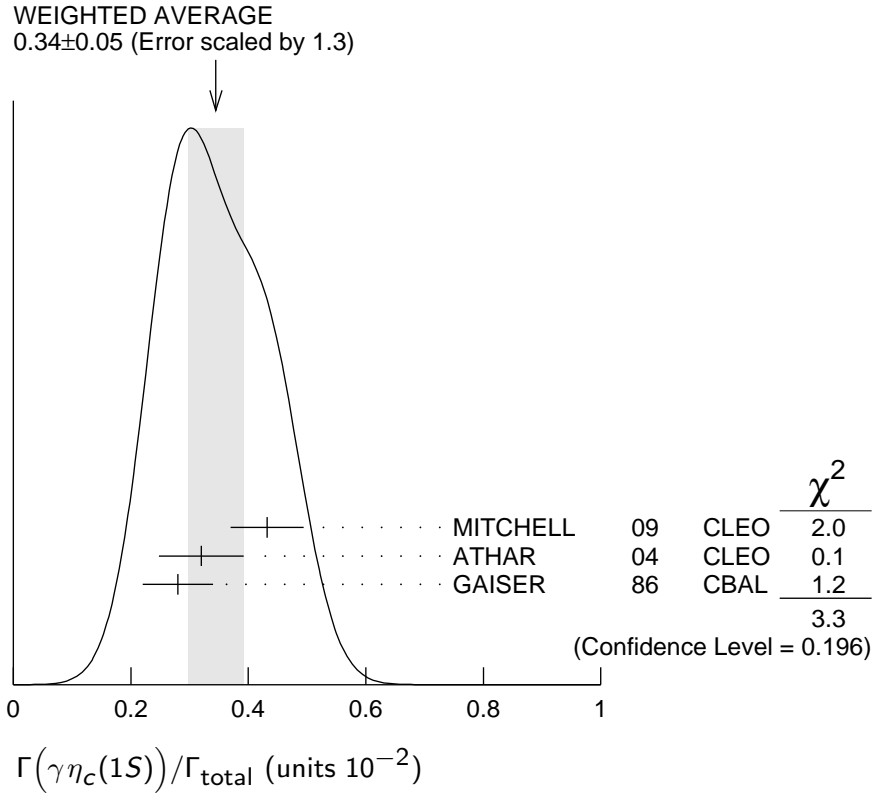
VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

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	$e^+e^- \rightarrow \gamma X$
0.32 ± 0.04 ± 0.06	2560	¹ ATHAR	04	CLEO	$e^+e^- \rightarrow \gamma X$
0.28 ± 0.06		² GAISER	86	CBAL	$e^+e^- \rightarrow \gamma X$

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

² GAISER 86 used $\Gamma_{\eta_c(1S)} = 11.5 \pm 4.5$ MeV to obtain this result.



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

Γ_{122}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
7±2±4		¹ ABLIKIM	12G	BES3 $\psi(2S) \rightarrow \gamma K^0 K\pi, K K\pi^0$
••• We do not use the following data for averages, fits, limits, etc. •••				
< 8	90	² CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma K\bar{K}\pi$
<20	90	ATHAR	04	CLEO $e^+e^- \rightarrow \gamma X$
20–130	95	EDWARDS	82C	CBAL $e^+e^- \rightarrow \gamma X$

¹ ABLIKIM 12G reports $[\Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}] \times [B(\eta_c(2S) \rightarrow K\bar{K}\pi)] = (1.30 \pm 0.20 \pm 0.30) \times 10^{-5}$ which we divide by our best value $B(\eta_c(2S) \rightarrow K\bar{K}\pi) = (1.9 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

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

Γ_{123}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.58±0.40±0.13		37	ABLIKIM	10F	BES3 $\psi(2S) \rightarrow \gamma\pi^0$

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

< 5	90	PEDLAR	09	CLE3	$\psi(2S) \rightarrow \gamma X$
< 5400	95	¹ LIBERMAN	75	SPEC	$e^+ e^-$
< 1×10^4	90	WIJK	75	DASP	$e^+ e^-$

¹ Restated by us using $B(\psi(2S) \rightarrow \mu^+ \mu^-) = 0.0077$.

$\Gamma(\gamma\eta'(958))/\Gamma_{\text{total}}$ Γ_{124}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.23 ± 0.06 OUR AVERAGE					
1.26 ± 0.03 ± 0.08		2226	¹ ABLIKIM	10F BES3	$\psi(2S) \rightarrow 3\gamma\pi^+\pi^-$, $2\gamma\pi^+\pi^-$
1.19 ± 0.08 ± 0.03			PEDLAR	09 CLE3	$\psi(2S) \rightarrow \gamma X$
1.24 ± 0.27 ± 0.15		23	ABLIKIM	06R BES2	$e^+ e^- \rightarrow \psi(2S)$
1.54 ± 0.31 ± 0.20		~ 43	BAI	98F BES	$\psi(2S) \rightarrow \pi^+\pi^-2\gamma$, $\pi^+\pi^-3\gamma$

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

< 60	90	² BRAUNSCH...	77	DASP	$e^+ e^-$
< 11	90	³ BARTEL	76	CNTR	$e^+ e^-$

¹ Combining the results from $\eta' \rightarrow \pi^+\pi^-\eta$ and $\eta' \rightarrow \pi^+\pi^-\gamma$ decay modes.

² Restated by us using total decay width 228 keV.

³ The value is normalized to the branching ratio for $\Gamma(J/\psi(1S)\eta)/\Gamma_{\text{total}}$.

$\Gamma(\gamma f_2(1270))/\Gamma_{\text{total}}$ Γ_{125}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.12 ± 0.19 ± 0.32				
		^{1,2} BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi\pi$

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

2.08 ± 0.19 ± 0.33	200.6 ± 18.8	¹ BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$
2.90 ± 1.08 ± 1.07	29.9 ± 11.1	¹ BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi^0\pi^0$

¹ Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

² Combining the results from $\pi^+\pi^-$ and $\pi^0\pi^0$ decay modes.

$\Gamma(\gamma f_0(1710) \rightarrow \gamma\pi\pi)/\Gamma_{\text{total}}$ Γ_{127}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
0.301 ± 0.041 ± 0.124				
	35.6 ± 4.8	¹ BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$

¹ Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(\gamma f_0(1710) \rightarrow \gamma K\bar{K})/\Gamma_{\text{total}}$ Γ_{128}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.604 ± 0.090 ± 0.132					
	39.6 ± 5.9	^{1,2} BAI	03C BES		$\psi(2S) \rightarrow \gamma K^+ K^-$

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

< 1.56	90	6.8 ± 3.1	^{1,2} BAI	03C BES	$\psi(2S) \rightarrow \gamma K_S^0 K_S^0$
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¹ Includes unknown branching fractions to $K^+ K^-$ or $K_S^0 K_S^0$. We have multiplied the $K^+ K^-$ result by a factor of 2 and the $K_S^0 K_S^0$ result by a factor of 4 to obtain the $K\bar{K}$ result.

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

$\Gamma(\gamma\eta)/\Gamma_{\text{total}}$ Γ_{130}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$1.38 \pm 0.48 \pm 0.09$		13	¹ ABLIKIM	10F	BES3 $\psi(2S) \rightarrow \gamma\pi^+\pi^-\pi^0,$ $\gamma 3\pi^0$

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

< 2	90		PEDLAR	09	CLE3 $\psi(2S) \rightarrow \gamma X$
< 90	90		BAI	98F	BES $\psi(2S) \rightarrow \pi^+\pi^-3\gamma$
< 200	90		YAMADA	77	DASP $e^+e^- \rightarrow 3\gamma$

¹ Combining the results from $\eta \rightarrow \pi^+\pi^-\pi^0$ and $\eta \rightarrow 3\pi^0$ decay modes.

$\Gamma(\gamma\eta\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{131}/Γ

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

$\Gamma(\gamma\eta(1405) \rightarrow \gamma K\bar{K}\pi)/\Gamma_{\text{total}}$ Γ_{133}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
< 0.9	90	ABLIKIM	06R	BES2 $\psi(2S) \rightarrow \gamma K_S^0 K^+\pi^- + \text{c.c.}$

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

< 1.3	90	ABLIKIM	06R	BES2 $\psi(2S) \rightarrow \gamma K^+ K^- \pi^0$
< 1.2	90	¹ SCHARRE	80	MRK1 e^+e^-

¹ Includes unknown branching fraction $\eta(1405) \rightarrow K\bar{K}\pi$.

$\Gamma(\gamma\eta(1405) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{134}/Γ

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

$\Gamma(\gamma\eta(1475) \rightarrow K\bar{K}\pi)/\Gamma_{\text{total}}$ Γ_{136}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
< 1.4	90	ABLIKIM	06R	BES2 $\psi(2S) \rightarrow \gamma K^+ K^- \pi^0$

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

< 1.5	90	ABLIKIM	06R	BES2 $\psi(2S) \rightarrow \gamma K_S^0 K^+\pi^- + \text{c.c.}$
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$\Gamma(\gamma\eta(1475) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{137}/Γ

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

$\Gamma(\gamma 2(\pi^+\pi^-))/\Gamma_{\text{total}}$ Γ_{138}/Γ

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

$\Gamma(\gamma K^{*0} K^+\pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{139}/Γ

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

$\Gamma(\gamma K^*0 \bar{K}^*0)/\Gamma_{\text{total}}$ Γ_{140}/Γ

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

$\Gamma(\gamma K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{141}/Γ

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

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

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

$\Gamma(\gamma p \bar{p})/\Gamma_{\text{total}}$ Γ_{143}/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	¹ ALEXANDER	10	CLEO $\psi(2S) \rightarrow \gamma p \bar{p}$
2.9 ± 0.4 ± 0.4	142	ABLIKIM	07D	BES2 $e^+ e^- \rightarrow \psi(2S)$

¹ From a fit of the $p\bar{p}$ mass distribution to a combination of $\gamma f_2(1950)$, $\gamma f_2(2150)$, and $\gamma p\bar{p}$ phase space, for $M(p\bar{p}) < 2.85$ GeV, and accounting for backgrounds from $\psi(2S) \rightarrow \pi^0 p\bar{p}$ and continuum.

$\Gamma(\gamma f_2(1950) \rightarrow \gamma p \bar{p})/\Gamma_{\text{total}}$ Γ_{144}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
1.2 ± 0.2 ± 0.1	111	¹ ALEXANDER	10	CLEO $\psi(2S) \rightarrow \gamma p \bar{p}$

¹ From a fit of the $p\bar{p}$ mass distribution to a combination of $\gamma f_2(1950)$, $\gamma f_2(2150)$, and $\gamma p\bar{p}$ phase space, for $M(p\bar{p}) < 2.85$ GeV, and accounting for backgrounds from $\psi(2S) \rightarrow \pi^0 p\bar{p}$ and continuum.

$\Gamma(\gamma f_2(2150) \rightarrow \gamma p \bar{p})/\Gamma_{\text{total}}$ Γ_{145}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
0.72 ± 0.18 ± 0.03	73	¹ ALEXANDER	10	CLEO $\psi(2S) \rightarrow \gamma p \bar{p}$

¹ From a fit of the $p\bar{p}$ mass distribution to a combination of $\gamma f_2(1950)$, $\gamma f_2(2150)$, and $\gamma p\bar{p}$ phase space, for $M(p\bar{p}) < 2.85$ GeV, and accounting for backgrounds from $\psi(2S) \rightarrow \pi^0 p\bar{p}$ and continuum.

$\Gamma(\gamma X(1835) \rightarrow \gamma p \bar{p})/\Gamma_{\text{total}}$ Γ_{146}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
4.57 ± 0.36 ^{+1.77}_{-4.26}		ABLIKIM	12D	BES3 $J/\psi \rightarrow \gamma p \bar{p}$

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

<1.6	90	ALEXANDER	10	CLEO $\psi(2S) \rightarrow \gamma p \bar{p}$
<5.4	90	ABLIKIM	07D	BES $\psi(2S) \rightarrow \gamma p \bar{p}$

$\Gamma(\gamma X \rightarrow \gamma p \bar{p})/\Gamma_{\text{total}}$ Γ_{147}/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 $\psi(2S) \rightarrow \gamma p \bar{p}$

$\Gamma(\gamma\pi^+\pi^-\rho\bar{\rho})/\Gamma_{\text{total}}$					Γ_{148}/Γ
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
$2.8 \pm 1.2 \pm 0.7$	17	ABLIKIM	07D	BES2	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(\gamma 2(\pi^+\pi^-)K^+K^-)/\Gamma_{\text{total}}$					Γ_{149}/Γ
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<22	90	ABLIKIM	07D	BES2	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(\gamma 3(\pi^+\pi^-))/\Gamma_{\text{total}}$					Γ_{150}/Γ
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<17	90	ABLIKIM	07D	BES2	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(\gamma K^+K^-K^+K^-)/\Gamma_{\text{total}}$					Γ_{151}/Γ
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<4	90	ABLIKIM	07D	BES2	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(\gamma\gamma J/\psi)/\Gamma_{\text{total}}$					Γ_{152}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
$3.1 \pm 0.6^{+0.8}_{-1.0}$	1.1k	ABLIKIM	120	BES3	$e^+e^- \rightarrow \psi(2S)$

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

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

MULTIPOLE AMPLITUDE RATIOS IN RADIATIVE DECAYS

$\psi(2S) \rightarrow \gamma\chi_{cJ}(1P)$ and $\chi_{cJ} \rightarrow \gamma J/\psi(1S)$

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
67^{+19}_{-13}	59k	¹ ARTUSO	09	CLEO $\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

¹Statistical 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	¹ ARTUSO	09	CLEO $\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

¹Statistical 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

ABLIKIM	13A	PRL 110 022001	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	13D	PR D87 012007	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	13F	arXiv:1211.4682 (PR D)	M. Ablikim <i>et al.</i>	(BES III Collab.)
AAIJ	12H	EPJ C72 1972	R. Aaij <i>et al.</i>	(LHCb Collab.)
ABLIKIM	12D	PRL 108 112003	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12G	PRL 109 042003	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12H	PL B710 594	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12L	PR D86 072011	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12M	PR D86 092008	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12O	PRL 109 172002	M. Ablikim <i>et al.</i>	(BES III Collab.)
ANASHIN	12	PL B711 280	V.V. Anashin <i>et al.</i>	(KEDR Collab.)
LEES	12E	PR D85 112009	J.P. Lees <i>et al.</i>	(BABAR Collab.)
METREVELI	12	PR D85 092007	Z. Metreveli <i>et al.</i>	(NWES, FLOR, WAYN+)
GE	11	PR D84 032008	J.Y. Ge <i>et al.</i>	(CLEO Collab.)
ABLIKIM	10B	PRL 104 132002	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	10F	PRL 105 261801	M. Ablikim <i>et al.</i>	(BES III Collab.)
ALEXANDER	10	PR D82 092002	J.P. Alexander <i>et al.</i>	(CLEO Collab.)
CRONIN-HEN...	10	PR D81 052002	D. Cronin-Hennessey <i>et al.</i>	(CLEO Collab.)
ADAMS	09	PR D80 051106	G.S. Adams <i>et al.</i>	(CLEO Collab.)
ARTUSO	09	PR D80 112003	M. Artuso <i>et al.</i>	(CLEO Collab.)
LIBBY	09	PR D80 072002	J. Libby <i>et al.</i>	(CLEO Collab.)
MITCHELL	09	PRL 102 011801	R.E. Mitchell <i>et al.</i>	(CLEO Collab.)
PEDLAR	09	PR D79 111101	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)
ABLIKIM	08B	PL B659 74	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	08C	PL B659 789	M. Ablikim <i>et al.</i>	(BES Collab.)
DOBBS	08A	PRL 101 182003	S. Dobbs <i>et al.</i>	(CLEO Collab.)
MENDEZ	08	PR D78 011102	H. Mendez <i>et al.</i>	(CLEO Collab.)
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)
ABLIKIM	07C	PL B648 149	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	07D	PRL 99 011802	M. Ablikim <i>et al.</i>	(BES II Collab.)
ABLIKIM	07H	PR D76 092003	M. Ablikim <i>et al.</i>	(BES Collab.)
ANASHIN	07	JETPL 85 347	V.V. Anashin <i>et al.</i>	(KEDR Collab.)
		Translated from ZETFP 85 429.		
ANDREOTTI	07	PL B654 74	M. Andreotti <i>et al.</i>	(Femilab E835 Collab.)
AUBERT	07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	07AU	PR D76 092005	B. Aubert <i>et al.</i>	(BABAR Collab.)
Also		PR D77 119902E (errat.)	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	07BD	PR D76 092006	B. Aubert <i>et al.</i>	(BABAR Collab.)
PDG	07	Unofficial 2007 WWW edition		(PDG Collab.)
PEDLAR	07	PR D75 011102	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)
ABLIKIM	06G	PR D73 052004	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06I	PR D74 012004	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06L	PRL 97 121801	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06R	PR D74 072001	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06W	PR D74 112003	M. Ablikim <i>et al.</i>	(BES Collab.)
ADAM	06	PRL 96 082004	N.E. Adam <i>et al.</i>	(CLEO Collab.)
AUBERT	06B	PR D73 012005	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	06D	PR D73 052003	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT, BE	06D	PR D74 091103	B. Aubert <i>et al.</i>	(BABAR Collab.)
DOBBS	06A	PR D74 011105	S. Dobbs <i>et al.</i>	(CLEO Collab.)
ABLIKIM	05E	PR D71 072006	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05H	PR D72 012002	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05I	PL B614 37	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05J	PL B619 247	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05O	PL B630 21	M. Ablikim <i>et al.</i>	(BES Collab.)
ADAM	05	PRL 94 012005	N.E. Adam <i>et al.</i>	(CLEO Collab.)
ADAM	05A	PRL 94 232002	N.E. Adam <i>et al.</i>	(CLEO Collab.)
ANDREOTTI	05	PR D71 032006	M. Andreotti <i>et al.</i>	(FNAL E835 Collab.)
AUBERT	05D	PR D71 052001	B. Aubert <i>et al.</i>	(BABAR Collab.)
BRIERE	05	PRL 95 062001	R.A. Briere <i>et al.</i>	(CLEO Collab.)
PEDLAR	05	PR D72 051108	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)
ROSNER	05	PRL 95 102003	J.L. Rosner <i>et al.</i>	(CLEO Collab.)
ABLIKIM	04B	PR D70 012003	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	04K	PR D70 112003	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	04L	PR D70 112007	M. Ablikim <i>et al.</i>	(BES Collab.)
ATHAR	04	PR D70 112002	S.B. Athar <i>et al.</i>	(CLEO Collab.)
BAI	04B	PRL 92 052001	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	04C	PR D69 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	04D	PL B589 7	J.Z. Bai <i>et al.</i>	(BES Collab.)

BAI	04G	PR D70 012004	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	04I	PR D70 012006	J.Z. Bai <i>et al.</i>	(BES Collab.)
PDG	04	PL B592 1	S. Eidelman <i>et al.</i>	(PDG Collab.)
SETH	04	PR D69 097503	K.K. Seth	
AULCHENKO	03	PL B573 63	V.M. Aulchenko <i>et al.</i>	(KEDR Collab.)
BAI	03B	PR D67 052002	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	03C	PR D67 032004	J.Z. Bai <i>et al.</i>	(BES Collab.)
AUBERT	02B	PR D65 031101	B. Aubert <i>et al.</i>	(BaBar Collab.)
BAI	02	PR D65 052004	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	02B	PL B550 24	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	02C	PRL 88 101802	J.Z. Bai <i>et al.</i>	(BES Collab.)
PDG	02	PR D66 010001	K. Hagiwara <i>et al.</i>	
BAI	01	PR D63 032002	J.Z. Bai <i>et al.</i>	(BES Collab.)
AMBROGIANI	00A	PR D62 032004	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)
ARTAMONOV	00	PL B474 427	A.S. Artamonov <i>et al.</i>	
BAI	00	PRL 84 594	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	99C	PRL 83 1918	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	98E	PR D57 3854	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	98F	PR D58 097101	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	98J	PRL 81 5080	J.Z. Bai <i>et al.</i>	(BES Collab.)
ARMSTRONG	97	PR D55 1153	T.A. Armstrong <i>et al.</i>	(E760 Collab.)
GRIBUSHIN	96	PR D53 4723	A. Gribushin <i>et al.</i>	(E672 Collab., E706 Collab.)
ARMSTRONG	93B	PR D47 772	T.A. Armstrong <i>et al.</i>	(FNAL E760 Collab.)
ALEXANDER	89	NP B320 45	J.P. Alexander <i>et al.</i>	(LBL, MICH, SLAC)
COHEN	87	RMP 59 1121	E.R. Cohen, B.N. Taylor	(RISC, NBS)
GAISER	86	PR D34 711	J. Gaiser <i>et al.</i>	(Crystal Ball Collab.)
KURAEV	85	SJNP 41 466	E.A. Kuraev, V.S. Fadin	(NOVO)
FRANKLIN	83	Translated from YAF 41 733. PRL 51 963	M.E.B. Franklin <i>et al.</i>	(LBL, SLAC)
EDWARDS	82C	PRL 48 70	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)
LEMOIGNE	82	PL 113B 509	Y. Lemoigne <i>et al.</i>	(SACL, LOIC, SHMP+)
HIMEL	80	PRL 44 920	T. Himel <i>et al.</i>	(LBL, SLAC)
OREGLIA	80	PRL 45 959	M.J. Oreglia <i>et al.</i>	(SLAC, CIT, HARV+)
SCHARRE	80	PL 97B 329	D.L. Scharre <i>et al.</i>	(SLAC, LBL)
ZHOLENTZ	80	PL 96B 214	A.A. Zholents <i>et al.</i>	(NOVO)
Also		SJNP 34 814	A.A. Zholents <i>et al.</i>	(NOVO)
BRANDELIK	79B	NP B160 426	R. Brandelik <i>et al.</i>	(DASP Collab.)
BRANDELIK	79C	ZPHY C1 233	R. Brandelik <i>et al.</i>	(DASP Collab.)
BARTEL	78B	PL 79B 492	W. Bartel <i>et al.</i>	(DESY, HEIDP)
TANENBAUM	78	PR D17 1731	W.M. Tanenbaum <i>et al.</i>	(SLAC, LBL)
BIDDICK	77	PRL 38 1324	C.J. Biddick <i>et al.</i>	(UCSD, UMD, PAVI+)
BRAUNSCH...	77	PL 67B 249	W. Braunschweig <i>et al.</i>	(DASP Collab.)
BURMESTER	77	PL 66B 395	J. Burmester <i>et al.</i>	(DESY, HAMB, SIEG+)
FELDMAN	77	PRPL 33C 285	G.J. Feldman, M.L. Perl	(LBL, SLAC)
YAMADA	77	Hamburg Conf. 69	S. Yamada	(DASP Collab.)
BARTEL	76	PL 64B 483	W. Bartel <i>et al.</i>	(DESY, HEIDP)
TANENBAUM	76	PRL 36 402	W.M. Tanenbaum <i>et al.</i>	(SLAC, LBL) IG
WHITAKER	76	PRL 37 1596	J.S. Whitaker <i>et al.</i>	(SLAC, LBL)
ABRAMS	75	Stanford Symp. 25	G.S. Abrams	(LBL)
ABRAMS	75B	PRL 34 1181	G.S. Abrams <i>et al.</i>	(LBL, SLAC)
BOYARSKI	75C	Palermo Conf. 54	A.M. Boyarski <i>et al.</i>	(SLAC, LBL)
HILGER	75	PRL 35 625	E. Hilger <i>et al.</i>	(STAN, PENN)
LIBERMAN	75	Stanford Symp. 55	A.D. Liberman	(STAN)
LUTH	75	PRL 35 1124	V. Luth <i>et al.</i>	(SLAC, LBL) JPC
WIIK	75	Stanford Symp. 69	B.H. Wiik	(DESY)