

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

See the Review on “Branching Ratios of $\psi(2S)$, $\chi_{c0,1,2}$ and $\eta_c(1S)$ ” 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
3686.097 ± 0.011 OUR FIT				Error includes scale factor of 1.1.
3686.097 ± 0.010 OUR AVERAGE				
3686.099 ± 0.004 ± 0.009		¹ ANASHIN	15 KEDR	$e^+e^- \rightarrow \text{hadrons}$
3686.12 ± 0.06 ± 0.10	4k	AAIJ	12H LHCb	$pp \rightarrow J/\psi \pi^+ \pi^- X$
3685.95 ± 0.10	413	² ARTAMONOV	00 OLYA	$e^+e^- \rightarrow \text{hadrons}$
3685.98 ± 0.09 ± 0.04		³ ARMSTRONG	93B E760	$\bar{p}p \rightarrow e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3686.08 ± 0.07	1301	⁴ AAII	23AP LHCb	$B_s^0 \rightarrow J/\psi 2(\pi^+ \pi^-)$
3686.114 ± 0.007 ^{+0.011} _{-0.016}		⁵ ANASHIN	12 KEDR	$e^+e^- \rightarrow \text{hadrons}$
3686.111 ± 0.025 ± 0.009		AULCHENKO	03 KEDR	$e^+e^- \rightarrow \text{hadrons}$
3686.00 ± 0.10	413	⁶ ZHOLENTZ	80 OLYA	e^+e^-

¹ Supersedes AULCHENKO 03 and ANASHIN 12.

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 From a fit of a relativistic S -wave Breit-Wigner convolved with the detector resolution. The width of $\psi(2S)$ is constrained to the PDG 22 value. Systematic errors not evaluated.

⁵ From the scans in 2004 and 2006. ANASHIN 12 reports the value $3686.114 \pm 0.007 \pm 0.011 \pm 0.002 \pm 0.012$ MeV, where the third uncertainty is due to assumptions on the interference between the resonance and hadronic continuum. We combined the two systematic uncertainties.

⁶ Superseded by ARTAMONOV 00.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 ± 0.027 ± 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
293 ± 9 OUR FIT	Error includes scale factor of 1.2.			
286 ± 16 OUR AVERAGE				
358 ± 88 ± 4		ABLIKIM	08B BES2	$e^+e^- \rightarrow \text{hadrons}$
290 ± 25 ± 4	2.7k	ANDREOTTI	07 E835	$\rho\bar{\rho} \rightarrow e^+e^-, J/\psi X$
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	$\bar{p}p \rightarrow e^+e^-$

¹From 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.
²The 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	(1.79 ± 0.04) %	
Γ_3 ggg	(10.6 ± 1.6) %	
Γ_4 γgg	(1.03 ± 0.29) %	
Γ_5 light hadrons	(15.4 ± 1.5) %	
Γ_6 K_S^0 anything	(16.1 ± 1.1) %	
Γ_7 e^+e^-	(7.95 ± 0.22) × 10 ⁻³	S=1.3
Γ_8 $\mu^+\mu^-$	(8.0 ± 0.6) × 10 ⁻³	
Γ_9 $\tau^+\tau^-$	(3.1 ± 0.4) × 10 ⁻³	

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

Γ_{10} $J/\psi(1S)$ anything	(61.6 ± 0.7) %	S=1.3
Γ_{11} $J/\psi(1S)$ neutrals	(25.4 ± 0.5) %	S=1.6
Γ_{12} $J/\psi(1S)\pi^+\pi^-$	(34.78 ± 0.33) %	S=1.1
Γ_{13} $J/\psi(1S)\pi^0\pi^0$	(18.3 ± 0.5) %	S=1.6
Γ_{14} $J/\psi(1S)\eta$	(3.38 ± 0.06) %	S=1.2
Γ_{15} $J/\psi(1S)\pi^0$	(1.268 ± 0.032) × 10 ⁻³	

Hadronic decays

Γ_{16} $\pi^+\pi^-$	(7.8 ± 2.6) × 10 ⁻⁶	
Γ_{17} $\pi^+\pi^-\pi^0$	(2.01 ± 0.17) × 10 ⁻⁴	S=1.7
Γ_{18} $\rho(770)\pi \rightarrow \pi^+\pi^-\pi^0$	(3.2 ± 1.2) × 10 ⁻⁵	S=1.8
Γ_{19} $\rho(2150)\pi \rightarrow \pi^+\pi^-\pi^0$	(1.9 ^{+1.2} / _{-0.4}) × 10 ⁻⁴	
Γ_{20} $2(\pi^+\pi^-)$	(2.4 ± 0.6) × 10 ⁻⁴	S=2.2
Γ_{21} $\rho^0\pi^+\pi^-$	(2.2 ± 0.6) × 10 ⁻⁴	S=1.4
Γ_{22} $2(\pi^+\pi^-)\pi^0$	(2.9 ± 1.0) × 10 ⁻³	S=4.7
Γ_{23} $\rho a_2(1320)$	(2.6 ± 0.9) × 10 ⁻⁴	
Γ_{24} $\pi^+\pi^-\pi^0\pi^0\pi^0$	(5.3 ± 1.0) × 10 ⁻³	

Γ_{25}	$\rho^\pm \pi^\mp \pi^0 \pi^0$	$< 2.7 \times 10^{-3}$	CL=90%
Γ_{26}	$\pi^+ \pi^- 4\pi^0$	$(1.4 \pm 1.0) \times 10^{-3}$	
Γ_{27}	$3(\pi^+ \pi^-)$	$(3.5 \pm 2.0) \times 10^{-4}$	S=2.8
Γ_{28}	$2(\pi^+ \pi^- \pi^0)$	$(4.8 \pm 1.5) \times 10^{-3}$	
Γ_{29}	$3(\pi^+ \pi^-) \pi^0$	$(3.5 \pm 1.6) \times 10^{-3}$	
Γ_{30}	$2(\pi^+ \pi^-) 3\pi^0$	$(1.42 \pm 0.31) \%$	
Γ_{31}	$\eta \pi^+ \pi^-$	$< 1.6 \times 10^{-4}$	CL=90%
Γ_{32}	$\eta \pi^+ \pi^- \pi^0$	$(9.5 \pm 1.7) \times 10^{-4}$	
Γ_{33}	$\eta 2(\pi^+ \pi^-)$	$(1.2 \pm 0.6) \times 10^{-3}$	
Γ_{34}	$\eta \pi^+ \pi^- \pi^0 \pi^0$	$< 4 \times 10^{-4}$	CL=90%
Γ_{35}	$\eta \pi^+ \pi^- 3\pi^0$	$< 2.1 \times 10^{-3}$	CL=90%
Γ_{36}	$\eta 2(\pi^+ \pi^- \pi^0)$	$< 2.1 \times 10^{-3}$	CL=90%
Γ_{37}	$\rho \eta$	$(2.2 \pm 0.6) \times 10^{-5}$	S=1.1
Γ_{38}	$\eta' \pi^+ \pi^- \pi^0$	$(4.5 \pm 2.1) \times 10^{-4}$	
Γ_{39}	$\eta' \rho$	$(1.9 \pm 1.7) \times 10^{-5}$	
Γ_{40}	$\omega \pi^0$	$(2.1 \pm 0.6) \times 10^{-5}$	
Γ_{41}	$\omega \pi^+ \pi^-$	$(7.3 \pm 1.2) \times 10^{-4}$	S=2.1
Γ_{42}	$\omega \pi^+ \pi^- 2\pi^0$	$(8.7 \pm 2.4) \times 10^{-3}$	
Γ_{43}	$b_1^\pm \pi^\mp$	$(4.0 \pm 0.6) \times 10^{-4}$	S=1.1
Γ_{44}	$\omega f_2(1270)$	$(2.2 \pm 0.4) \times 10^{-4}$	
Γ_{45}	$\omega \pi^0 \pi^0$	$(1.11 \pm 0.35) \times 10^{-3}$	
Γ_{46}	$\omega 3\pi^0$	$< 8 \times 10^{-4}$	CL=90%
Γ_{47}	$b_1^0 \pi^0$	$(2.4 \pm 0.6) \times 10^{-4}$	
Γ_{48}	$\omega \eta$	$< 1.1 \times 10^{-5}$	CL=90%
Γ_{49}	$\omega \eta'$	$(3.2 \pm 2.5) \times 10^{-5}$	
Γ_{50}	$\omega(782) \eta \eta$	$(1.65 \pm 0.21) \times 10^{-5}$	
Γ_{51}	$\phi \pi^0$	$< 4 \times 10^{-7}$	CL=90%
Γ_{52}	$\phi \pi^+ \pi^-$	$(1.18 \pm 0.26) \times 10^{-4}$	S=1.5
Γ_{53}	$\phi f_0(980) \rightarrow \pi^+ \pi^-$	$(7.5 \pm 3.3) \times 10^{-5}$	S=1.6
Γ_{54}	$\phi \eta$	$(3.10 \pm 0.31) \times 10^{-5}$	
Γ_{55}	$\eta \phi(2170), \phi(2170) \rightarrow$ $\phi f_0(980), f_0 \rightarrow \pi^+ \pi^-$	$< 2.2 \times 10^{-6}$	CL=90%
Γ_{56}	$\phi \eta'$	$(1.54 \pm 0.20) \times 10^{-5}$	
Γ_{57}	$\phi \eta \eta'$	$(3.14 \pm 0.29) \times 10^{-5}$	
Γ_{58}	$h_1(1900) \eta \rightarrow \phi \eta \eta'$	$(3.8 \pm 2.1) \times 10^{-6}$	
Γ_{59}	$\phi(2170) \eta \rightarrow \phi \eta \eta'$	$(3.3 \pm 1.8) \times 10^{-6}$	
Γ_{60}	$\phi(2170) \eta' \rightarrow \phi \eta \eta'$	$(3.8 \pm 1.0) \times 10^{-6}$	
Γ_{61}	$h_1(2300) \eta \rightarrow \phi \eta \eta'$	$(2.2 \pm 1.0) \times 10^{-6}$	
Γ_{62}	$h_1(2300) \eta' \rightarrow \phi \eta \eta'$	$(4.8 \pm 1.5) \times 10^{-6}$	
Γ_{63}	$\phi \phi \phi$	$(1.46 \pm 0.18) \times 10^{-5}$	
Γ_{64}	$\phi f_1(1285)$	$(3.0 \pm 1.3) \times 10^{-5}$	
Γ_{65}	$\phi \eta(1405) \rightarrow \phi \pi^+ \pi^- \eta$	$(8.5 \pm 1.7) \times 10^{-6}$	
Γ_{66}	$\phi f_2'(1525)$	$(4.4 \pm 1.6) \times 10^{-5}$	

Γ_{67}	$K^+ K^-$	$(7.5 \pm 0.5) \times 10^{-5}$	
Γ_{68}	$K^+ K^- \pi^+ \pi^-$	$(7.3 \pm 0.5) \times 10^{-4}$	
Γ_{69}	$K^+ K^- \pi^0$	$(4.07 \pm 0.31) \times 10^{-5}$	
Γ_{70}	$K_S^0 K_S^0$	$< 1.1 \times 10^{-8}$	CL=90%
Γ_{71}	$K_S^0 K_L^0$	$(5.34 \pm 0.33) \times 10^{-5}$	
Γ_{72}	$K_S^0 K_L^0 \pi^0$	$< 3.0 \times 10^{-4}$	CL=90%
Γ_{73}	$K^+ K^- \pi^0 \pi^0$	$(2.6 \pm 1.3) \times 10^{-4}$	
Γ_{74}	$K^+ K^- \pi^0 \pi^0 \pi^0$	$(6.6 \pm 2.8) \times 10^{-4}$	
Γ_{75}	$K_S^0 K^\pm \pi^\mp \pi^0 \pi^0$	$(1.7 \pm 0.6) \times 10^{-3}$	
Γ_{76}	$K_S^0 K^\pm \pi^\mp \pi^+ \pi^-$	$(2.2 \pm 0.4) \times 10^{-3}$	
Γ_{77}	$K^+ K^- \pi^+ \pi^- \pi^0$	$(1.26 \pm 0.09) \times 10^{-3}$	
Γ_{78}	$\omega f_0(1710) \rightarrow \omega K^+ K^-$	$(5.9 \pm 2.2) \times 10^{-5}$	
Γ_{79}	$K^*(892)^0 K^- \pi^+ \pi^0 + \text{c.c.}$	$(8.6 \pm 2.2) \times 10^{-4}$	
Γ_{80}	$K^*(892)^+ K^- \pi^+ \pi^- + \text{c.c.}$	$(9.6 \pm 2.8) \times 10^{-4}$	
Γ_{81}	$K^*(892)^+ K^- \rho^0 + \text{c.c.}$	$(7.3 \pm 2.6) \times 10^{-4}$	
Γ_{82}	$K^*(892)^0 K^- \rho^+ + \text{c.c.}$	$(6.1 \pm 1.8) \times 10^{-4}$	
Γ_{83}	$K_S^0 K_S^0 \pi^+ \pi^-$	$(2.2 \pm 0.4) \times 10^{-4}$	
Γ_{84}	$K_S^0 K_L^0 \pi^0 \pi^0$	$(1.3 \pm 0.6) \times 10^{-3}$	
Γ_{85}	$K_S^0 K^*(892)^0 \pi^0 \pi^0$	$(3.1 \pm 1.3) \times 10^{-4}$	
Γ_{86}	$K_S^0 K^\pm \rho(770)^\mp \pi^0$	$< 7 \times 10^{-4}$	CL=90%
Γ_{87}	$K_S^0 K^\pm \pi^\mp \rho(770)^0$	$< 7 \times 10^{-4}$	CL=90%
Γ_{88}	$K^\mp K^*(892)^\pm \pi^0 \pi^0$	$(7.0 \pm 2.9) \times 10^{-4}$	
Γ_{89}	$K^*(892)^+ K^*(892)^- \pi^0$	$(3.6 \pm 1.8) \times 10^{-3}$	
Γ_{90}	$K_S^0 K_L^0 \eta$	$(1.3 \pm 0.5) \times 10^{-3}$	
Γ_{91}	$K^+ K^- \rho^0$	$(2.2 \pm 0.4) \times 10^{-4}$	
Γ_{92}	$K^*(892)^0 \bar{K}_2^*(1430)^0$	$(1.9 \pm 0.5) \times 10^{-4}$	
Γ_{93}	$K^+ K^- \pi^+ \pi^- \eta$	$(1.3 \pm 0.7) \times 10^{-3}$	
Γ_{94}	$K^+ K^- 2(\pi^+ \pi^-)$	$(1.9 \pm 0.9) \times 10^{-3}$	
Γ_{95}	$K^+ K^- 2(\pi^+ \pi^-) \pi^0$	$(1.00 \pm 0.31) \times 10^{-3}$	
Γ_{96}	$K^+ K^*(892)^- + \text{c.c.}$	$(2.9 \pm 0.4) \times 10^{-5}$	S=1.2
Γ_{97}	$2(K^+ K^-)$	$(6.3 \pm 1.3) \times 10^{-5}$	
Γ_{98}	$2(K^+ K^-) \pi^0$	$(1.10 \pm 0.28) \times 10^{-4}$	
Γ_{99}	$K^+ K^- \phi$	$(7.0 \pm 1.6) \times 10^{-5}$	
Γ_{100}	$K_S^0 K_S^0 \phi$	$(3.53 \pm 0.29) \times 10^{-5}$	
Γ_{101}	$K_1(1270)^\pm K^\mp$	$(1.00 \pm 0.28) \times 10^{-3}$	
Γ_{102}	$K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.}$	$(6.7 \pm 2.5) \times 10^{-4}$	
Γ_{103}	$\eta K^+ K^-$, no $\eta \phi$	$(3.49 \pm 0.17) \times 10^{-5}$	
Γ_{104}	$\eta K^+ K^-$	$< 2.6 \times 10^{-4}$	CL=90%
Γ_{105}	$X(1750) \eta \rightarrow K^+ K^- \eta$	$(4.8 \pm 2.8) \times 10^{-6}$	
Γ_{106}	$K_1(1400)^\pm K^\mp$	$< 3.1 \times 10^{-4}$	CL=90%
Γ_{107}	$K_2^*(1430)^\pm K^\mp$	$(7.1 \pm_{-0.9}^{+1.3}) \times 10^{-5}$	
Γ_{108}	$K^*(892)^0 \bar{K}^0 + \text{c.c.}$	$(1.09 \pm 0.20) \times 10^{-4}$	

Γ_{109}	$\omega K^+ K^-$	$(1.62 \pm 0.11) \times 10^{-4}$	S=1.1
Γ_{110}	$\omega K_S^0 K_S^0$	$(7.0 \pm 0.5) \times 10^{-5}$	
Γ_{111}	$\omega K^*(892)^+ K^- + \text{c.c.}$	$(2.07 \pm 0.26) \times 10^{-4}$	
Γ_{112}	$\omega K_2^*(1430)^+ K^- + \text{c.c.}$	$(6.1 \pm 1.2) \times 10^{-5}$	
Γ_{113}	$\omega \bar{K}^*(892)^0 K^0$	$(1.68 \pm 0.30) \times 10^{-4}$	
Γ_{114}	$\omega \bar{K}_2^*(1430)^0 K^0$	$(5.8 \pm 2.2) \times 10^{-5}$	
Γ_{115}	$\omega X(1440) \rightarrow \omega K_S^0 K^- \pi^+ + \text{c.c.}$	$(1.6 \pm 0.4) \times 10^{-5}$	
Γ_{116}	$\omega X(1440) \rightarrow \omega K^+ K^- \pi^0$	$(1.09 \pm 0.26) \times 10^{-5}$	
Γ_{117}	$\omega f_1(1285) \rightarrow \omega K_S^0 K^- \pi^+ + \text{c.c.}$	$(3.0 \pm 1.0) \times 10^{-6}$	
Γ_{118}	$\omega f_1(1285) \rightarrow \omega K^+ K^- \pi^0$	$(1.2 \pm 0.7) \times 10^{-6}$	
Γ_{119}	$p\bar{p}$	$(2.95 \pm 0.09) \times 10^{-4}$	S=1.3
Γ_{120}	$n\bar{n}$	$(3.06 \pm 0.15) \times 10^{-4}$	
Γ_{121}	$p\bar{p}\pi^0$	$1.2 \times 10^{-4} \text{ to } 2.4 \times 10^{-4}$	
Γ_{122}	$N(940)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(1.14 \pm 0.12) \times 10^{-4}$	
Γ_{123}	$N(1440)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(7.5 \pm 1.1) \times 10^{-5}$	S=1.7
Γ_{124}	$N(1520)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(6.6 \pm 2.0) \times 10^{-6}$	
Γ_{125}	$N(1535)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(1.7 \pm 0.4) \times 10^{-5}$	
Γ_{126}	$N(1650)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(9.1 \pm 3.3) \times 10^{-6}$	
Γ_{127}	$N(1710)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(4 \pm 4) \times 10^{-6}$	
Γ_{128}	$N(1720)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(6.2 \pm 2.5) \times 10^{-6}$	
Γ_{129}	$N(2100)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(8 \pm 4) \times 10^{-6}$	
Γ_{130}	$N(2300)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(3.6 \pm 3.1) \times 10^{-6}$	
Γ_{131}	$N(2570)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\pi^0$	$(1.9 \pm 1.5) \times 10^{-5}$	
Γ_{132}	$p\bar{p}\pi^+\pi^-$	$(6.0 \pm 0.4) \times 10^{-4}$	
Γ_{133}	$p\bar{p}K^+K^-$	$(2.7 \pm 0.7) \times 10^{-5}$	
Γ_{134}	$p\bar{p}\eta$	$5.5 \times 10^{-5} \text{ to } 9.1 \times 10^{-5}$	
Γ_{135}	$N(1535)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\eta$	$(4.7 \pm 0.5) \times 10^{-5}$	
Γ_{136}	$N(1710)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\eta$	$(7.8 \pm 3.2) \times 10^{-6}$	
Γ_{137}	$p\bar{p}\pi^+\pi^-\pi^0$	$(7.3 \pm 0.7) \times 10^{-4}$	
Γ_{138}	$p\bar{p}\rho^0$	$(5.0 \pm 2.2) \times 10^{-5}$	
Γ_{139}	$p\bar{p}\omega$	$(6.9 \pm 2.1) \times 10^{-5}$	
Γ_{140}	$p\bar{p}\eta'$	$(1.10 \pm 0.13) \times 10^{-5}$	
Γ_{141}	$p\bar{p}\phi$	$(6.1 \pm 0.6) \times 10^{-6}$	
Γ_{142}	$\phi X(1835) \rightarrow p\bar{p}\phi$	$< 1.82 \times 10^{-7}$	CL=90%
Γ_{143}	$p\bar{n}\pi^- \text{ or c.c.}$	$(2.48 \pm 0.17) \times 10^{-4}$	
Γ_{144}	$p\bar{n}\pi^-\pi^0$	$(3.2 \pm 0.7) \times 10^{-4}$	
Γ_{145}	$\Lambda\bar{\Lambda}$	$(3.81 \pm 0.13) \times 10^{-4}$	S=1.4
Γ_{146}	$\Lambda\bar{\Lambda}\pi^0$	$(1.4 \pm 0.7) \times 10^{-6}$	
Γ_{147}	$\Lambda\bar{\Lambda}\eta$	$(2.43 \pm 0.32) \times 10^{-5}$	
Γ_{148}	$\Lambda(1670)\bar{\Lambda} \rightarrow \Lambda\bar{\Lambda}\eta$	$(1.3 \pm 0.7) \times 10^{-5}$	
Γ_{149}	$\Lambda\bar{\Lambda}\eta'$	$(7.3 \pm 1.0) \times 10^{-6}$	
Γ_{150}	$\Lambda\bar{\Lambda}\omega(782)$	$(3.3 \pm 0.4) \times 10^{-5}$	

Γ_{151}	$\Lambda\bar{\Lambda}\pi^+\pi^-$	$(2.8 \pm 0.6) \times 10^{-4}$	
Γ_{152}	$\Lambda\bar{p}K^+$	$(1.00 \pm 0.14) \times 10^{-4}$	
Γ_{153}	$\Lambda\bar{p}K^*(892)^+ + \text{c.c.}$	$(6.3 \pm 0.7) \times 10^{-5}$	
Γ_{154}	$\Lambda\bar{p}K^+\pi^+\pi^-$	$(1.8 \pm 0.4) \times 10^{-4}$	
Γ_{155}	$\bar{\Lambda}nK_S^0 + \text{c.c.}$	$(8.1 \pm 1.8) \times 10^{-5}$	
Γ_{156}	$\Delta^{++}\bar{\Delta}^{--}$	$(1.28 \pm 0.35) \times 10^{-4}$	
Γ_{157}	$\Lambda\bar{\Sigma}^+\pi^- + \text{c.c.}$	$(1.40 \pm 0.13) \times 10^{-4}$	
Γ_{158}	$\Lambda\bar{\Sigma}^-\pi^+ + \text{c.c.}$	$(1.54 \pm 0.14) \times 10^{-4}$	
Γ_{159}	$\Lambda\bar{\Sigma}^0 + \text{c.c.}$	$(1.6 \pm 0.7) \times 10^{-6}$	
Γ_{160}	$\Lambda\bar{\Sigma}^0$		
Γ_{161}	$\Lambda\bar{\Sigma}^0\pi^0 + \text{c.c.}$	$(1.54 \pm 0.07) \times 10^{-4}$	
Γ_{162}	$\Lambda(1520)\bar{\Xi}^+K^- + \text{c.c.},$ $\Lambda(1520) \rightarrow pK^-$	$(9.5 \pm 1.2) \times 10^{-7}$	
Γ_{163}	$\Sigma^0\bar{p}K^+ + \text{c.c.}$	$(1.67 \pm 0.18) \times 10^{-5}$	
Γ_{164}	$\Sigma^+\bar{\Sigma}^-$	$(2.43 \pm 0.10) \times 10^{-4}$	S=1.4
Γ_{165}	$\Sigma^0\bar{\Sigma}^0$	$(2.35 \pm 0.09) \times 10^{-4}$	S=1.1
Γ_{166}	$\Sigma^-\bar{\Sigma}^+$	$(2.82 \pm 0.09) \times 10^{-4}$	
Γ_{167}	$\Sigma^+\bar{\Sigma}^-\eta$	$(9.6 \pm 2.4) \times 10^{-6}$	
Γ_{168}	$\Sigma^+\bar{\Sigma}^-\omega$	$(1.89 \pm 0.28) \times 10^{-5}$	
Γ_{169}	$\Sigma^0\bar{\Sigma}^0\omega(782)$	$(1.24 \pm 0.19) \times 10^{-5}$	
Γ_{170}	$\Sigma^+\bar{\Sigma}^-\phi$	$(3.0 \pm 0.7) \times 10^{-6}$	
Γ_{171}	$\Sigma^0\bar{\Sigma}^0\phi$	$(2.64 \pm 0.34) \times 10^{-6}$	
Γ_{172}	$\Sigma(1385)^+\bar{\Sigma}(1385)^-$	$(8.5 \pm 0.7) \times 10^{-5}$	
Γ_{173}	$\Sigma(1385)^-\bar{\Sigma}(1385)^+$	$(8.5 \pm 0.8) \times 10^{-5}$	
Γ_{174}	$\Sigma(1385)^0\bar{\Sigma}(1385)^0$	$(6.9 \pm 0.7) \times 10^{-5}$	
Γ_{175}	$\Xi^-\bar{\Xi}^+$	$(2.87 \pm 0.11) \times 10^{-4}$	S=1.1
Γ_{176}	$\Xi^0\bar{\Xi}^0$	$(2.3 \pm 0.4) \times 10^{-4}$	S=4.2
Γ_{177}	$\Xi(1530)^0\bar{\Xi}(1530)^0$	$(6.8 \pm 0.4) \times 10^{-5}$	
Γ_{178}	$\Lambda\bar{\Xi}^+K^- + \text{c.c.}$	$(3.67 \pm 0.22) \times 10^{-5}$	
Γ_{179}	$\Xi(1690)^-\bar{\Xi}^+ \rightarrow K^-\Lambda\bar{\Xi}^+ +$ c.c.	$(6.2 \pm 2.1) \times 10^{-6}$	S=1.5
Γ_{180}	$\Xi(1820)^-\bar{\Xi}^+ \rightarrow K^-\Lambda\bar{\Xi}^+ +$ c.c.	$(1.48 \pm 0.29) \times 10^{-5}$	S=1.2
Γ_{181}	$\Xi(1530)^-\bar{\Xi}(1530)^+$	$(1.15 \pm 0.07) \times 10^{-4}$	
Γ_{182}	$\Xi(1530)^-\bar{\Xi}^+$	$(7.0 \pm 1.2) \times 10^{-6}$	
Γ_{183}	$\Xi(1530)^0\bar{\Xi}^0$	$(5.3 \pm 0.5) \times 10^{-6}$	
Γ_{184}	$\Sigma^0\bar{\Xi}^+K^- + \text{c.c.}$	$(3.7 \pm 0.4) \times 10^{-5}$	
Γ_{185}	$\Omega^-K^+\bar{\Xi}^0 + \text{c.c.}$	$(2.8 \pm 0.4) \times 10^{-6}$	
Γ_{186}	$\bar{\Omega}^+K_S^0\bar{\Xi}^- + \text{c.c.}$	$(2.9 \pm 0.6) \times 10^{-6}$	
Γ_{187}	$\Omega^-\bar{\Omega}^+$	$(5.66 \pm 0.30) \times 10^{-5}$	S=1.3
Γ_{188}	$\eta_c\pi^+\pi^-\pi^0$	$< 1.0 \times 10^{-3}$	CL=90%
Γ_{189}	$h_c(1P)\pi^0$	$(7.4 \pm 0.5) \times 10^{-4}$	
Γ_{190}	$\Lambda_c^+\bar{p}e^+e^- + \text{c.c.}$	$< 1.7 \times 10^{-6}$	CL=90%

Γ_{191}	$\Theta(1540)\bar{\Theta}(1540) \rightarrow K_S^0 p K^- \bar{n} + \text{c.c.}$	$[a] < 8.8$	$\times 10^{-6}$	CL=90%
Γ_{192}	$\Theta(1540)K^- \bar{n} \rightarrow K_S^0 p K^- \bar{n}$	$[a] < 1.0$	$\times 10^{-5}$	CL=90%
Γ_{193}	$\Theta(1540)K_S^0 \bar{p} \rightarrow K_S^0 \bar{p} K^+ n$	$[a] < 7.0$	$\times 10^{-6}$	CL=90%
Γ_{194}	$\bar{\Theta}(1540)K^+ n \rightarrow K_S^0 \bar{p} K^+ n$	$[a] < 2.6$	$\times 10^{-5}$	CL=90%
Γ_{195}	$\bar{\Theta}(1540)K_S^0 p \rightarrow K_S^0 p K^- \bar{n}$	$[a] < 6.0$	$\times 10^{-6}$	CL=90%

Radiative decays

Γ_{196}	$\gamma\chi_{c0}(1P)$	$(10.06 \pm 0.27) \%$		S=1.4
Γ_{197}	$\gamma\chi_{c1}(1P)$	$(9.85 \pm 0.26) \%$		S=1.2
Γ_{198}	$\gamma\chi_{c2}(1P)$	$(9.63 \pm 0.23) \%$		S=1.2
Γ_{199}	$\gamma\eta_c(1S)$	$(3.6 \pm 0.5) \times 10^{-3}$		S=1.3
Γ_{200}	$\gamma\eta_c(2S)$	$(5.4 \begin{smallmatrix} +3.4 \\ -2.9 \end{smallmatrix}) \times 10^{-4}$		
Γ_{201}	$\gamma\pi^0$			
Γ_{202}	$\gamma 2(\pi^+\pi^-)$	$(4.0 \pm 0.6) \times 10^{-4}$		
Γ_{203}	$\gamma 3(\pi^+\pi^-)$	< 1.7	$\times 10^{-4}$	CL=90%
Γ_{204}	$\gamma\eta'(958)$	$(1.24 \pm 0.04) \times 10^{-4}$		
Γ_{205}	$\gamma f_2(1270)$	$(2.73 \begin{smallmatrix} +0.29 \\ -0.25 \end{smallmatrix}) \times 10^{-4}$		S=1.8
Γ_{206}	$\gamma f_2(1270) \rightarrow \gamma K_S^0 K_S^0$	$(2.1 \pm 0.9) \times 10^{-6}$		
Γ_{207}	$\gamma f_0(1370) \rightarrow \gamma K\bar{K}$	$(3.1 \pm 1.7) \times 10^{-5}$		
Γ_{208}	$\gamma f_0(1370) \rightarrow \gamma K_S^0 K_S^0$	$(1.2 \begin{smallmatrix} +3.2 \\ -1.7 \end{smallmatrix}) \times 10^{-6}$		
Γ_{209}	$\gamma f_0(1500)$	$(9.3 \pm 1.9) \times 10^{-5}$		
Γ_{210}	$\gamma f_0(1500) \rightarrow \gamma K_S^0 K_S^0$	$(1.7 \begin{smallmatrix} +1.7 \\ -1.2 \end{smallmatrix}) \times 10^{-6}$		
Γ_{211}	$\gamma f_2'(1525)$	$(3.3 \pm 0.8) \times 10^{-5}$		
Γ_{212}	$\gamma f_2'(1525) \rightarrow \gamma K_S^0 K_S^0$	$(1.4 \pm 0.6) \times 10^{-6}$		
Γ_{213}	$\gamma f_0(1710)$	seen		
Γ_{214}	$\gamma f_0(1710) \rightarrow \gamma\pi\pi$	$(3.5 \pm 0.6) \times 10^{-5}$		
Γ_{215}	$\gamma f_0(1710) \rightarrow \gamma K\bar{K}$	$(6.6 \pm 0.7) \times 10^{-5}$		
Γ_{216}	$\gamma f_0(1710) \rightarrow \gamma K_S^0 K_S^0$	$(1.83 \begin{smallmatrix} +0.32 \\ -0.27 \end{smallmatrix}) \times 10^{-5}$		
Γ_{217}	$\gamma f_2(1950) \rightarrow \gamma K_S^0 K_S^0$	$(1.2 \begin{smallmatrix} +1.0 \\ -0.8 \end{smallmatrix}) \times 10^{-6}$		
Γ_{218}	$\gamma f_0(2020) \rightarrow \gamma K_S^0 K_S^0$	$(4.6 \pm 1.5) \times 10^{-6}$		
Γ_{219}	$\gamma f_0(2100) \rightarrow \gamma\pi\pi$	$(4.8 \pm 1.0) \times 10^{-6}$		
Γ_{220}	$\gamma f_0(2200) \rightarrow \gamma K\bar{K}$	$(3.2 \pm 1.0) \times 10^{-6}$		
Γ_{221}	$\gamma f_J(2220) \rightarrow \gamma\pi\pi$	< 5.8	$\times 10^{-6}$	CL=90%
Γ_{222}	$\gamma f_J(2220) \rightarrow \gamma K\bar{K}$	< 9.5	$\times 10^{-6}$	CL=90%
Γ_{223}	$\gamma\eta$	$(9.2 \pm 1.8) \times 10^{-7}$		
Γ_{224}	$\gamma\eta\pi^+\pi^-$	$(8.7 \pm 2.1) \times 10^{-4}$		
Γ_{225}	$\gamma\eta(1405)$	seen		
Γ_{226}	$\gamma\eta(1405) \rightarrow \gamma K\bar{K}\pi$	< 9	$\times 10^{-5}$	CL=90%
Γ_{227}	$\gamma\eta(1405) \rightarrow \gamma\eta\pi^+\pi^-$	$(3.6 \pm 2.5) \times 10^{-5}$		

Γ_{228}	$\gamma\eta(1405) \rightarrow \gamma f_0(980)\pi^0 \rightarrow \gamma\pi^+\pi^-\pi^0$	< 5.0	$\times 10^{-7}$	CL=90%
Γ_{229}	$\gamma\eta(1475)$	seen		
Γ_{230}	$\gamma\eta(1475) \rightarrow \gamma K\bar{K}\pi$	< 1.4	$\times 10^{-4}$	CL=90%
Γ_{231}	$\gamma\eta(1475) \rightarrow \gamma\eta\pi^+\pi^-$	< 8.8	$\times 10^{-5}$	CL=90%
Γ_{232}	$\gamma K^{*0} K^+\pi^- + \text{c.c.}$	(3.7 ± 0.9)	$\times 10^{-4}$	
Γ_{233}	$\gamma K^{*0} \bar{K}^{*0}$	(2.4 ± 0.7)	$\times 10^{-4}$	
Γ_{234}	$\gamma K_S^0 K^+\pi^- + \text{c.c.}$	(2.6 ± 0.5)	$\times 10^{-4}$	
Γ_{235}	$\gamma K^+ K^-\pi^+\pi^-$	(1.9 ± 0.5)	$\times 10^{-4}$	
Γ_{236}	$\gamma K^+ K^- 2(\pi^+\pi^-)$	< 2.2	$\times 10^{-4}$	CL=90%
Γ_{237}	$\gamma 2(K^+ K^-)$	< 4	$\times 10^{-5}$	CL=90%
Γ_{238}	$\gamma p\bar{p}$	(3.9 ± 0.5)	$\times 10^{-5}$	S=2.0
Γ_{239}	$\gamma f_2(1950) \rightarrow \gamma p\bar{p}$	(1.20 ± 0.22)	$\times 10^{-5}$	
Γ_{240}	$\gamma f_2(2150) \rightarrow \gamma p\bar{p}$	(7.2 ± 1.8)	$\times 10^{-6}$	
Γ_{241}	$\gamma X(1835) \rightarrow \gamma p\bar{p}$	(4.6 ± 1.8)	$\times 10^{-6}$	
		-4.0		
Γ_{242}	$\gamma X \rightarrow \gamma p\bar{p}$	[b] < 2	$\times 10^{-6}$	CL=90%
Γ_{243}	$\gamma p\bar{p}\pi^+\pi^-$	(2.8 ± 1.4)	$\times 10^{-5}$	
Γ_{244}	$\gamma\gamma$	< 1.5	$\times 10^{-4}$	CL=90%
Γ_{245}	$\gamma\gamma J/\psi$	(3.1 ± 1.0)	$\times 10^{-4}$	
		-1.2		
Γ_{246}	$e^+ e^- \eta'$	(1.90 ± 0.26)	$\times 10^{-6}$	
Γ_{247}	$e^+ e^- \eta_c(1S)$	(3.8 ± 0.4)	$\times 10^{-5}$	
Γ_{248}	$e^+ e^- \chi_{c0}(1P)$	(1.10 ± 0.26)	$\times 10^{-3}$	
Γ_{249}	$e^+ e^- \chi_{c1}(1P)$	(8.6 ± 0.7)	$\times 10^{-4}$	
Γ_{250}	$e^+ e^- \chi_{c2}(1P)$	(7.0 ± 0.8)	$\times 10^{-4}$	

Weak decays

Γ_{251}	$D^0 e^+ e^- + \text{c.c.}$	< 1.4	$\times 10^{-7}$	CL=90%
Γ_{252}	$\Lambda_c^+ \bar{\Sigma}^- + \text{c.c.}$	< 1.4	$\times 10^{-5}$	CL=90%

Other decays

Γ_{253}	invisible	< 1.6	%	CL=90%
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[a] $\Theta(1540)$ is a hypothetical pentaquark state of 1.54 GeV/c² mass and a width of less than 25 MeV/c².

[b] 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, 27 combinations of partial widths obtained from integrated cross section, and 87 branching ratios uses 263 measurements to determine 50 parameters. The overall fit has a $\chi^2 = 435.4$ for 213 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_8	3									
x_9	0	0								
x_{12}	20	13	2							
x_{13}	22	4	1	28						
x_{14}	10	6	1	43	11					
x_{119}	0	0	0	3	2	1				
x_{196}	0	0	0	2	0	1	0			
x_{197}	1	0	0	3	0	1	0	0		
x_{198}	1	0	0	3	0	1	0	0	0	
Γ	-85	-4	-1	-29	-31	-15	-4	-1	-1	-1
	x_7	x_8	x_9	x_{12}	x_{13}	x_{14}	x_{119}	x_{196}	x_{197}	x_{198}

FIT INFORMATION

A multiparticle fit to $\eta_c(2S)$ and $\psi(2S)$ with 4 branching ratios uses 5 measurements to determine 3 parameters. The overall fit has a $\chi^2 = 2.6$ for 2 degrees of freedom.

FIT INFORMATION

A multiparticle fit to $\eta_c(1S)$, $J/\psi(1S)$, $\psi(2S)$, $h_c(1P)$, and B^\pm with the total width, 10 combinations of partial widths obtained from integrated cross section, and 38 branching ratios uses 115 measurements to determine 19 parameters. The overall fit has a $\chi^2 = 215.4$ for 96 degrees of freedom.

$\psi(2S)$ PARTIAL WIDTHS

$\Gamma(\text{hadrons})$ Γ_1

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

$\Gamma(e^+e^-)$ Γ_7

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
2.33 ± 0.04 OUR FIT			Error includes scale factor of 1.1.
2.29 ± 0.06 OUR AVERAGE			
$2.22 \pm 0.10 \pm 0.02$	¹ ABLIKIM	15V	BES3 4.0–4.4 $e^+e^- \rightarrow \pi^+\pi^- J/\psi$
$2.338 \pm 0.037 \pm 0.096$	ABLIKIM	08B	BES2 $e^+e^- \rightarrow \text{hadrons}$
$2.330 \pm 0.036 \pm 0.110$	ABLIKIM	06L	BES2 $e^+e^- \rightarrow \text{hadrons}$
2.44 ± 0.21	² 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. • • •

$2.279 \pm 0.015 \pm 0.042$	³ ANASHIN	18	KEDR	$e^+ e^-$
$2.282 \pm 0.015 \pm 0.042$	⁴ ANASHIN	18	KEDR	$e^+ e^-$
2.0 ± 0.3	BRANDELIK	79c	DASP	$e^+ e^-$
2.1 ± 0.3	⁵ LUTH	75	MRK1	$e^+ e^-$

¹ ABLIKIM 15V reports $2.213 \pm 0.018 \pm 0.099$ keV from a measurement of $[\Gamma(\psi(2S) \rightarrow e^+ e^-)] \times [B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)]$ assuming $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (34.95 \pm 0.45) \times 10^{-2}$, which we rescale to our best (shown rounded) value $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (34.78 \pm 0.33) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

² From a simultaneous fit to $e^+ e^-$, $\mu^+ \mu^-$, and hadronic channel, assuming $\Gamma_e = \Gamma_\mu = \Gamma_\tau/0.38847$.

³ Combining $\Gamma_{e^+e^-} \cdot B(\mu^+\mu^-)$ from ANASHIN 18 with $\Gamma_{e^+e^-} \cdot B(\text{hadrons})$ from ANASHIN 12 and assuming lepton universality.

⁴ From the sum of $\Gamma_{e^+e^-} \cdot B(\text{hadrons})$ from ANASHIN 12, $\Gamma_{e^+e^-} \cdot B(e^+e^-)$ and $\Gamma_{e^+e^-} \cdot B(\mu^+\mu^-)$ from ANASHIN 18, and $\Gamma_{e^+e^-} \cdot B(\tau^+\tau^-)$ from ANASHIN 07.

⁵ From a simultaneous fit to $e^+ e^-$, $\mu^+ \mu^-$, and hadronic channels assuming $\Gamma(e^+ e^-) = \Gamma(\mu^+ \mu^-)$.

$\Gamma(\gamma\gamma)$					Γ_{244}
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	
<43	90	BRANDELIK	79c	DASP	$e^+ e^-$

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

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

$\Gamma(\text{hadrons}) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_1\Gamma_7/\Gamma$
VALUE (keV)		DOCUMENT ID	TECN	COMMENT	

$2.233 \pm 0.015 \pm 0.042$ ¹ ANASHIN 12 KEDR $e^+ e^- \rightarrow \text{hadrons}$

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

2.2 ± 0.4 ABRAMS 75 MRK1 $e^+ e^-$

¹ ANASHIN 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.

$\Gamma(K_S^0 \text{ anything}) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_6\Gamma_7/\Gamma$
VALUE (keV)		DOCUMENT ID	TECN	COMMENT	

$0.3738 \pm 0.0067 \pm 0.0200$ ABLIKIM 21s BES3 $e^+ e^- \rightarrow K_S^0 \text{ anything}$

$\Gamma(e^+ e^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_7\Gamma_7/\Gamma$
VALUE (eV)		DOCUMENT ID	TECN	COMMENT	

$21.2 \pm 0.7 \pm 1.2$ ¹ ANASHIN 18 KEDR $e^+ e^-$

¹ From the average of nine scans of the $\psi(2S)$.

$\Gamma(\mu^+ \mu^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$ $\Gamma_8 \Gamma_7 / \Gamma$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
19.3±0.3±0.5	¹ ANASHIN	18	KEDR $\psi(2S) \rightarrow \mu^+ \mu^-$

¹ From the average of nine scans of the $\psi(2S)$.

$\Gamma(\tau^+ \tau^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$ $\Gamma_9 \Gamma_7 / \Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9.0±2.6	79	¹ ANASHIN	07	KEDR $e^+ e^- \rightarrow \psi(2S) \rightarrow \tau^+ \tau^-$

¹ Using $\psi(2S)$ total width of 337 ± 13 keV. Systematic errors not evaluated.

$\Gamma(J/\psi(1S)\pi^+\pi^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$ $\Gamma_{12} \Gamma_7 / \Gamma$

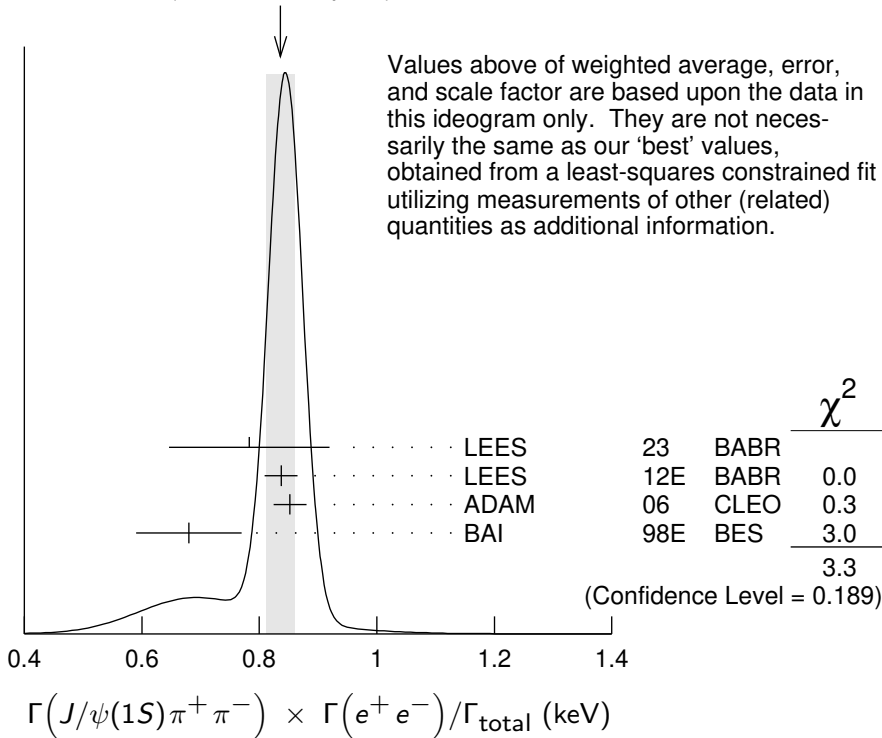
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.809±0.014 OUR FIT				Error includes scale factor of 1.1.
0.836±0.025 OUR AVERAGE				Error includes scale factor of 1.3. See the ideogram below.

0.78 ±0.12 ±0.07		¹ LEES	23	BABR	$e^+ e^- \rightarrow \gamma_{ISR} \text{hadrons}$
0.837±0.028±0.005		² 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		³ BAI	98E	BES	$e^+ e^-$

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

0.93 ±0.08 ±0.03	256	⁴ AUBERT	07AU	BABR	$10.6 e^+ e^- \rightarrow J/\psi \pi^+ \pi^- \gamma$
0.755±0.048±0.004	544	⁵ AUBERT	05D	BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- \mu^+ \mu^- \gamma$

WEIGHTED AVERAGE
0.836±0.025 (Error scaled by 1.3)



- ¹ LEES 23 reports $[\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow K_S^0 K^\pm \pi^\mp)] = (4.14 \pm 0.55 \pm 0.29) \times 10^{-3}$ keV which we divide by our best (shown rounded) value $B(J/\psi(1S) \rightarrow K_S^0 K^\pm \pi^\mp) = (5.3 \pm 0.5) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.
- ² 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 (shown rounded) value $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = (5.961 \pm 0.033) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.
- ³ 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 $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.
- ⁴ 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 (shown rounded) value $B(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0) = (2.00 \pm 0.07) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.
- ⁵ 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 (shown rounded) value $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = (5.961 \pm 0.033) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. Superseded by LEES 12E.

$\Gamma(J/\psi(1S)\pi^0\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{13}\Gamma_7/\Gamma$

<u>VALUE (keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.425±0.012 OUR FIT				Error includes scale factor of 1.4.
0.413±0.019 OUR AVERAGE				
0.45 ±0.13 ±0.02		¹ LEES	23	BABR $e^+e^- \rightarrow \gamma_{ISR}$ hadrons
0.45 ±0.12 ±0.04		² LEES	23	BABR $e^+e^- \rightarrow \gamma_{ISR}$ hadrons
0.411±0.008±0.018	3.6k	ADAM	06	CLEO $3.773 e^+e^- \rightarrow \gamma\psi(2S)$

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

0.51 ±0.09 ±0.02 142 ³ LEES 18E BABR 10.6 $e^+e^- \rightarrow J/\psi\pi^0\pi^0\gamma$

- ¹ LEES 23 reports $[\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^0\pi^0) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow K^+K^-\pi^0)] = (1.31 \pm 0.35 \pm 0.13) \times 10^{-3}$ keV which we divide by our best (shown rounded) value $B(J/\psi(1S) \rightarrow K^+K^-\pi^0) = (2.88 \pm 0.12) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.
- ² LEES 23 reports $[\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^0\pi^0) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow K_S^0 K^\pm \pi^\mp)] = (2.36 \pm 0.59 \pm 0.24) \times 10^{-3}$ keV which we divide by our best (shown rounded) value $B(J/\psi(1S) \rightarrow K_S^0 K^\pm \pi^\mp) = (5.3 \pm 0.5) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.
- ³ LEES 18E reports $[\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^0\pi^0) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0)] = 0.0101 \pm 0.0015 \pm 0.0011$ keV which we divide by our best (shown rounded) value $B(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0) = (2.00 \pm 0.07) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

$$\Gamma(J/\psi(1S)\eta) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{14}\Gamma_7/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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78.6 ± 1.8 OUR FIT Error includes scale factor of 1.1.

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)
¹ AUBERT 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.				

$$\Gamma(J/\psi(1S)\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{15}\Gamma_7/\Gamma$$

VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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<8 90 <37 ADAM 06 CLEO 3.773 e⁺e⁻ → γψ(2S)

$$\Gamma(2(\pi^+\pi^-\pi^0)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{22}\Gamma_7/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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29.7 ± 2.2 ± 1.8 410 AUBERT 07AU BABR 10.6 e⁺e⁻ → 2(π⁺π⁻)π⁰γ

$$\Gamma(\pi^+\pi^-\pi^0\pi^0\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{24}\Gamma_7/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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12.4 ± 1.8 ± 1.2 177 LEES 18E BABR 10.6 e⁺e⁻ → π⁺π⁻3π⁰γ

$$\Gamma(\pi^+\pi^-4\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{26}\Gamma_7/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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3.3 ± 2.3 ± 0.5 18 LEES 21C BABR e⁺e⁻ → γ_{ISR}(π⁺π⁻4π⁰)

$$\Gamma(\rho^\pm\pi^\mp\pi^0\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{25}\Gamma_7/\Gamma$$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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<6.2 90 LEES 18E BABR 10.6 e⁺e⁻ → π⁺π⁻3π⁰γ

$$\Gamma(2(\pi^+\pi^-\pi^0)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{28}\Gamma_7/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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11.2 ± 3.3 ± 1.3 43 AUBERT 06D BABR 10.6 e⁺e⁻ → 2(π⁺π⁻π⁰)γ

$$\Gamma(2(\pi^+\pi^-)3\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{30}\Gamma_7/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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33 ± 5 ± 5 14k LEES 21 BABR 10.6 e⁺e⁻ → 2(π⁺π⁻)3π⁰γ

$$\Gamma(\eta 2(\pi^+\pi^-)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{33}\Gamma_7/\Gamma$$

VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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2.87 ± 1.41 ± 0.01 16 ¹ AUBERT 07AU BABR 10.6 e⁺e⁻ → 2(π⁺π⁻)ηγ

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

<7 90 14k ² LEES 21 BABR 10.6 e⁺e⁻ → 2(π⁺π⁻)3π⁰γ

¹ AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow \eta 2(\pi^+\pi^-)) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] = 1.13 \pm 0.55 \pm 0.08$ eV which we divide by our best (shown rounded)

value $B(\eta \rightarrow 2\gamma) = (39.36 \pm 0.18) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

² LEES 21 reports $[\Gamma(\psi(2S) \rightarrow \eta 2(\pi^+ \pi^-)) \times \Gamma(\psi(2S) \rightarrow e^+ e^-) / \Gamma_{\text{total}}] \times [B(\eta \rightarrow 3\pi^0)] < 2.3$ eV which we divide by our best (shown rounded) value $B(\eta \rightarrow 3\pi^0) = 32.56 \times 10^{-2}$.

$$\Gamma(\eta \pi^+ \pi^- \pi^0 \pi^0) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_{34} \Gamma_7 / \Gamma$$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<0.85	90	LEES	18E BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \pi^0 \eta \gamma$

$$\Gamma(\eta \pi^+ \pi^- 3\pi^0) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_{35} \Gamma_7 / \Gamma$$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<5	90	¹ LEES	21C BABR	$e^+ e^- \rightarrow \gamma_{ISR}(\pi^+ \pi^- 3\pi^0 \gamma \gamma)$

¹ LEES 21C reports $[\Gamma(\psi(2S) \rightarrow \eta \pi^+ \pi^- 3\pi^0) \times \Gamma(\psi(2S) \rightarrow e^+ e^-) / \Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] < 1.9$ eV which we divide by our best (shown rounded) value $B(\eta \rightarrow 2\gamma) = 39.36 \times 10^{-2}$.

$$\Gamma(\eta 2(\pi^+ \pi^- \pi^0)) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_{36} \Gamma_7 / \Gamma$$

VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<5	90	14k	¹ LEES	21 BABR	$10.6 e^+ e^- \rightarrow 2(\pi^+ \pi^-) 3\pi^0 \gamma$

¹ LEES 21 reports $[\Gamma(\psi(2S) \rightarrow \eta 2(\pi^+ \pi^- \pi^0)) \times \Gamma(\psi(2S) \rightarrow e^+ e^-) / \Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] < 1.9$ eV which we divide by our best (shown rounded) value $B(\eta \rightarrow 2\gamma) = 39.36 \times 10^{-2}$.

$$\Gamma(\omega \pi^+ \pi^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_{41} \Gamma_7 / \Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
$3.01 \pm 0.84 \pm 0.02$	37	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \omega \pi^+ \pi^- \gamma$

¹ AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow \omega \pi^+ \pi^-) \times \Gamma(\psi(2S) \rightarrow e^+ e^-) / \Gamma_{\text{total}}] \times [B(\omega(782) \rightarrow \pi^+ \pi^- \pi^0)] = 2.69 \pm 0.73 \pm 0.16$ eV which we divide by our best (shown rounded) value $B(\omega(782) \rightarrow \pi^+ \pi^- \pi^0) = (89.2 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

$$\Gamma(\omega \pi^+ \pi^- 2\pi^0) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_{42} \Gamma_7 / \Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
$20.2 \pm 5.6 \pm 0.1$	14k	¹ LEES	21 BABR	$10.6 e^+ e^- \rightarrow 2(\pi^+ \pi^-) 3\pi^0 \gamma$

¹ LEES 21 reports $[\Gamma(\psi(2S) \rightarrow \omega \pi^+ \pi^- 2\pi^0) \times \Gamma(\psi(2S) \rightarrow e^+ e^-) / \Gamma_{\text{total}}] \times [B(\omega(782) \rightarrow \pi^+ \pi^- \pi^0)] = 18 \pm 4 \pm 3$ eV which we divide by our best (shown rounded) value $B(\omega(782) \rightarrow \pi^+ \pi^- \pi^0) = (89.2 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

$$\Gamma(\omega \pi^0 \pi^0) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \quad \Gamma_{45} \Gamma_7 / \Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
$2.58 \pm 0.82 \pm 0.02$	33	¹ LEES	18E BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- 3\pi^0 \gamma$

¹ LEES 18E reports [$\Gamma(\psi(2S) \rightarrow \omega\pi^0\pi^0) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] \times [$B(\omega(782) \rightarrow \pi^+\pi^-\pi^0)$] = $2.3 \pm 0.7 \pm 0.2$ eV which we divide by our best (shown rounded) value $B(\omega(782) \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

$\Gamma(\omega 3\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{46}\Gamma_7/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<1.8	90	¹ LEES	21C BABR	$e^+e^- \rightarrow \gamma_{ISR}(\pi^+\pi^-4\pi^0)$

¹ LEES 21C reports [$\Gamma(\psi(2S) \rightarrow \omega 3\pi^0) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] \times [$B(\omega(782) \rightarrow \pi^+\pi^-\pi^0)$] < 1.6 eV which we divide by our best (shown rounded) value $B(\omega(782) \rightarrow \pi^+\pi^-\pi^0) = 89.2 \times 10^{-2}$.

$\Gamma(\phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{52}\Gamma_7/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.54±0.18±0.01	19	¹ LEES	12F BABR	$10.6 e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$

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

0.56±0.22±0.01	10	² AUBERT,BE	06D BABR	$10.6 e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$
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¹ LEES 12F reports [$\Gamma(\psi(2S) \rightarrow \phi\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] \times [$B(\phi(1020) \rightarrow K^+K^-)$] = $0.27 \pm 0.09 \pm 0.02$ eV which we divide by our best (shown rounded) value $B(\phi(1020) \rightarrow K^+K^-) = (50.1 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

² Superseded by LEES 12F. AUBERT,BE 06D reports [$\Gamma(\psi(2S) \rightarrow \phi\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] \times [$B(\phi(1020) \rightarrow K^+K^-)$] = $0.28 \pm 0.11 \pm 0.02$ eV which we divide by our best (shown rounded) value $B(\phi(1020) \rightarrow K^+K^-) = (50.1 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

$\Gamma(\phi f_0(980) \rightarrow \pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{53}\Gamma_7/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.339±0.126±0.004	12	¹ LEES	12F BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$

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

0.339±0.165±0.004	6 ± 3	² AUBERT	07AK BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$
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¹ LEES 12F reports [$\Gamma(\psi(2S) \rightarrow \phi f_0(980) \rightarrow \pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] \times [$B(\phi(1020) \rightarrow K^+K^-)$] = $0.17 \pm 0.06 \pm 0.02$ eV which we divide by our best (shown rounded) value $B(\phi(1020) \rightarrow K^+K^-) = (50.1 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

² Superseded by LEES 12F. AUBERT 07AK reports [$\Gamma(\psi(2S) \rightarrow \phi f_0(980) \rightarrow \pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] \times [$B(\phi(1020) \rightarrow K^+K^-)$] = $0.17 \pm 0.08 \pm 0.02$ eV which we divide by our best (shown rounded) value $B(\phi(1020) \rightarrow K^+K^-) = (50.1 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

$$\Gamma(K^+K^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{67}\Gamma_7/\Gamma$$

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

$0.147 \pm 0.035 \pm 0.005$	66	¹ LEES	15J BABR	$e^+e^- \rightarrow K^+K^-\gamma$
$0.197 \pm 0.035 \pm 0.005$	66	² LEES	15J BABR	$e^+e^- \rightarrow K^+K^-\gamma$
$0.35 \pm 0.14 \pm 0.03$	11	³ LEES	13Q BABR	$e^+e^- \rightarrow K^+K^-\gamma$

¹ $\sin\phi > 0$.

² $\sin\phi < 0$.

³ Interference with non-resonant K^+K^- production not taken into account.

$$\Gamma(K^+K^-\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{68}\Gamma_7/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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1.92 ± 0.30 ± 0.06 133 LEES 12F BABR 10.6 $e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$

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

$2.56 \pm 0.42 \pm 0.16$ 85 ¹ AUBERT 07AK BABR 10.6 $e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$

¹ Superseded by LEES 12F.

$$\Gamma(K_S^0 K_L^0 \pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{72}\Gamma_7/\Gamma$$

VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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<0.7 90 8 LEES 17A BABR $e^+e^- \rightarrow K_S^0 K_L^0 \pi^0 \gamma$

$$\Gamma(K^+K^-\pi^0\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{73}\Gamma_7/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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0.60 ± 0.31 ± 0.03 17 LEES 12F BABR $10.6 e^+e^- \rightarrow \pi^0\pi^0 K^+K^-\gamma$

$$\Gamma(K^+K^-\pi^0\pi^0\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{74}\Gamma_7/\Gamma$$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
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1.54 ± 0.63 ± 0.15 LEES 23 BABR $e^+e^- \rightarrow \gamma_{ISR} \text{hadrons}$

$$\Gamma(K_S^0 K^\pm \pi^\mp \pi^0 \pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{75}\Gamma_7/\Gamma$$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
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4.0 ± 1.4 ± 0.4 LEES 23 BABR $e^+e^- \rightarrow \gamma_{ISR} \text{hadrons}$

$$\Gamma(K_S^0 K^\pm \pi^\mp \pi^+ \pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{76}\Gamma_7/\Gamma$$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
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5.1 ± 0.7 ± 0.4 LEES 23 BABR $e^+e^- \rightarrow \gamma_{ISR} \text{hadrons}$

$$\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{77}\Gamma_7/\Gamma$$

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

$$\Gamma(K_S^0 K_L^0 \pi^0 \pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{84}\Gamma_7/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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2.92 ± 1.27 ± 0.15 14 LEES 17A BABR $e^+e^- \rightarrow K_S^0 K_L^0 \pi^0 \pi^0 \gamma$

$\Gamma(K_S^0 K^*(892)^0 \pi^0 \pi^0) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{85}\Gamma_7/\Gamma$
<u>VALUE (eV)</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.71±0.29±0.07		LEES	23	BABR	$e^+ e^- \rightarrow \gamma_{ISR} \text{ hadrons}$
$\Gamma(K_S^0 K^\pm \rho(770)^\mp \pi^0) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{86}\Gamma_7/\Gamma$
<u>VALUE (eV)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.6	90	LEES	23	BABR	$e^+ e^- \rightarrow \gamma_{ISR} \text{ hadrons}$
$\Gamma(K_S^0 K^\pm \pi^\mp \rho(770)^0) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{87}\Gamma_7/\Gamma$
<u>VALUE (eV)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.6	90	LEES	23	BABR	$e^+ e^- \rightarrow \gamma_{ISR} \text{ hadrons}$
$\Gamma(K^*(892)^+ K^*(892)^- \pi^0) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{89}\Gamma_7/\Gamma$
<u>VALUE (eV)</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
8.46±4.05±0.90		LEES	23	BABR	$e^+ e^- \rightarrow \gamma_{ISR} \text{ hadrons}$
$\Gamma(K^\mp K^*(892)^\pm \pi^0 \pi^0) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{88}\Gamma_7/\Gamma$
<u>VALUE (eV)</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.62±0.66±0.15		LEES	23	BABR	$e^+ e^- \rightarrow \gamma_{ISR} \text{ hadrons}$
$\Gamma(K_S^0 K_L^0 \eta) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{90}\Gamma_7/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
3.14±1.08±0.16	16	LEES	17A	BABR	$e^+ e^- \rightarrow K_S^0 K_L^0 \eta \gamma$
$\Gamma(K^+ K^- \pi^+ \pi^- \eta) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{93}\Gamma_7/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
3.05±1.80±0.01	7	¹ AUBERT 07AU	BABR	10.6	$e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \eta \gamma$
¹ AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \eta) \times \Gamma(\psi(2S) \rightarrow e^+ e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] = 1.2 \pm 0.7 \pm 0.1 \text{ eV}$ which we divide by our best (shown rounded) value $B(\eta \rightarrow 2\gamma) = (39.36 \pm 0.18) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.					
$\Gamma(K^+ K^- 2(\pi^+ \pi^-)) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{94}\Gamma_7/\Gamma$
<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	$10.6 e^+ e^- \rightarrow K^+ K^- 2(\pi^+ \pi^-) \gamma$
$\Gamma(2(K^+ K^-)) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{97}\Gamma_7/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.22±0.10±0.02	13	LEES	12F	BABR	$10.6 e^+ e^- \rightarrow K^+ K^- K^+ K^- \gamma$
$\Gamma(p\bar{p}) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{119}\Gamma_7/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.685±0.024 OUR FIT	Error includes scale factor of 1.2.				
0.63 ±0.05 OUR AVERAGE	Error includes scale factor of 1.2.				
0.67 ±0.12 ±0.02	43	¹ LEES	130	BABR	$e^+ e^- \rightarrow p\bar{p}\gamma$
0.74 ±0.07 ±0.04	142	² LEES	13Y	BABR	$e^+ e^- \rightarrow p\bar{p}\gamma$
0.579±0.038±0.036	2.7k	ANDREOTTI	07	E835	$p\bar{p} \rightarrow e^+ e^-, J/\psi X$

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

0.70 ± 0.17 ± 0.03 22 ³ AUBERT 06B BABR $e^+e^- \rightarrow p\bar{p}\gamma$

¹ ISR photon reconstructed in the detector

² ISR photon undetected

³ Superseded by LEES 130

$\Gamma(\Lambda\bar{\Lambda}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{145}\Gamma_7/\Gamma$			
VALUE (eV)	DOCUMENT ID	TECN	COMMENT	
1.5 ± 0.4 ± 0.1	AUBERT	07BD	BABR	10.6 $e^+e^- \rightarrow \Lambda\bar{\Lambda}\gamma$

$\psi(2S)$ BRANCHING RATIOS

$\Gamma(\text{hadrons})/\Gamma_{\text{total}}$	Γ_1/Γ			
VALUE	DOCUMENT ID	TECN	COMMENT	
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	
0.0179 ± 0.0004	¹ LIAO	23	RVUE	e^+e^-

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

0.0166 ± 0.0010 ^{2,3} SETH 04 RVUE e^+e^-

0.0199 ± 0.0019 ² BAI 02B BES2 e^+e^-

0.029 ± 0.004 ² LUTH 75 MRK1 e^+e^-

¹ Using $B(\psi(2S) \rightarrow \ell^+\ell^-) = (0.794 \pm 0.017)\%$ and $R = 2.26 \pm 0.01$ determined by a fit to data from Mark-I, DM2, BESII, KEDR, and BESIII.

² Included in $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$.

³ 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. Superseded by LIAO 23.

$\Gamma(g g g)/\Gamma_{\text{total}}$	Γ_3/Γ			
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
10.58 ± 1.62	2.9 M	¹ LIBBY	09	CLEO $\psi(2S) \rightarrow \text{hadrons}$

¹ Calculated using $\Gamma(\gamma g g)/\Gamma(g g g) = 0.097 \pm 0.026 \pm 0.016$ from LIBBY 09, $B(\psi(2S) \rightarrow X J/\psi)$ 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			
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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	$\psi(2S) \rightarrow (\gamma +)$ 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	$e^+e^- \rightarrow \psi(2S)$
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_7/Γ
<u>VALUE (units 10^{-4})</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
79.5± 2.2 OUR FIT	Error includes scale factor of 1.3.				
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
88 ±13		¹ FELDMAN	77	RVUE	e^+e^-
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_8/Γ
<u>VALUE (units 10^{-4})</u>		<u>DOCUMENT ID</u>			
80±6 OUR FIT					

$\Gamma(\mu^+\mu^-)/\Gamma(e^+e^-)$					Γ_8/Γ_7
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.00±0.08 OUR FIT	● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.89±0.16		BOYARSKI	75C	MRK1	e^+e^-

$\Gamma(\tau^+\tau^-)/\Gamma_{\text{total}}$					Γ_9/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** —————

$\Gamma(J/\psi(1S)\text{anything})/\Gamma_{\text{total}}$					
$\Gamma_{10}/\Gamma = (\Gamma_{12}+\Gamma_{13}+\Gamma_{14}+0.339\Gamma_{197}+0.190\Gamma_{198})/\Gamma$					
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.616 ±0.007 OUR FIT	Error includes scale factor of 1.3.				
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. • • •

0.644 ± 0.006 ± 0.016		¹ ABLIKIM	21Z	BES3	$e^+e^- \rightarrow \ell^+\ell^-X$
0.6254 ± 0.0016 ± 0.0155	1.1M	² MENDEZ	08	CLEO	$\psi(2S) \rightarrow \ell^+\ell^-X$
0.5950 ± 0.0015 ± 0.0190	151k	ADAM	05A	CLEO	Repl. by MENDEZ 08

¹ From a fit to the $e^+e^- \rightarrow J/\psi X$ cross section between 3.645 and 3.891 GeV, with $\Gamma(ee)$ and Γ fixed to the PDG 20 values of the cross particle fit which are correlated to "OUR FIT" value for $B(\psi(2S) \rightarrow J/\psi X)$.

² Not independent from other measurements of MENDEZ 08.

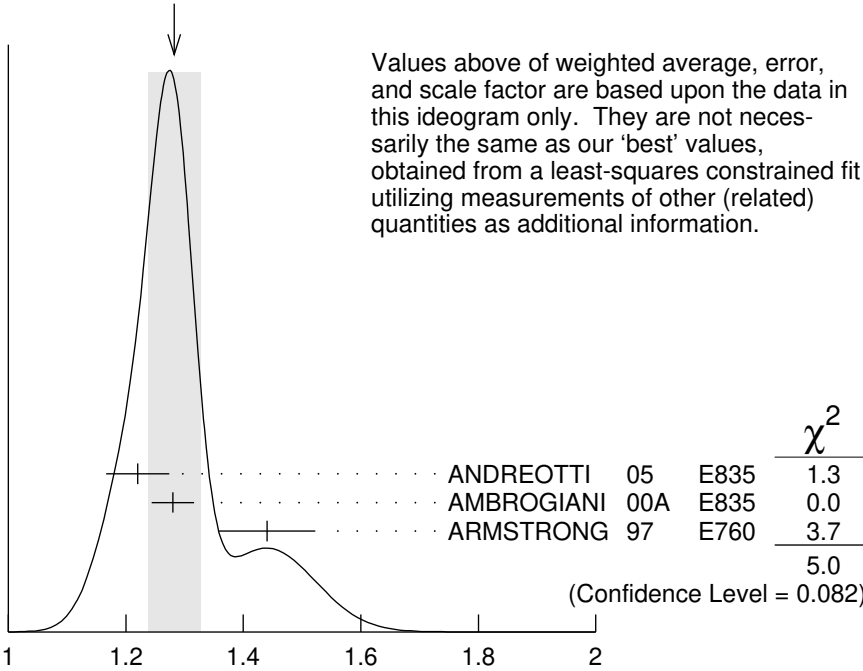
$\Gamma(e^+e^-)/\Gamma(J/\psi(1S)\text{anything})$

Γ_7/Γ_{10}

<u>VALUE (units 10⁻²)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.291 ± 0.035 OUR FIT				Error includes scale factor of 1.3.
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)



$\Gamma(e^+e^-)/\Gamma(J/\psi(1S)\text{anything})$
(units 10⁻²)

Γ_7/Γ_{10}

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

Γ_8/Γ_{10}

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0130 ± 0.0010 OUR FIT			
0.014 ± 0.003	HILGER	75 SPEC	e^+e^-

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

Γ_{11}/Γ

VALUE DOCUMENT ID
0.254 ± 0.005 OUR FIT Error includes scale factor of 1.6.

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

Γ_{12}/Γ

VALUE EVTS DOCUMENT ID TECN COMMENT

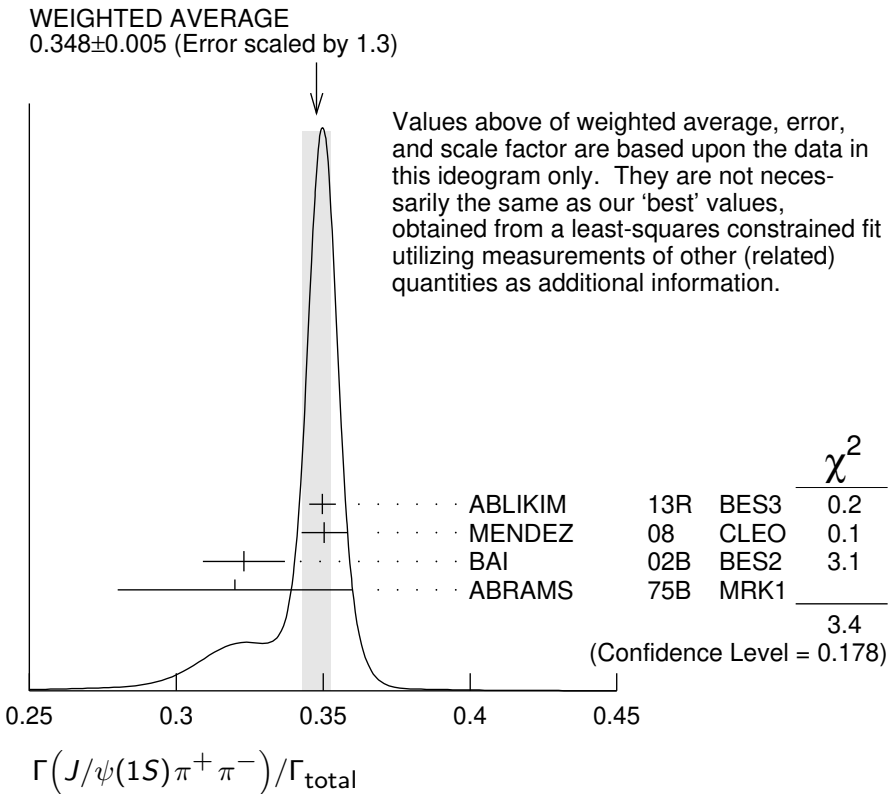
0.3478 ± 0.0033 OUR FIT Error includes scale factor of 1.1.
0.348 ± 0.005 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.

0.3498 ± 0.0002 ± 0.0045	20M	ABLIKIM	13R	BES3	$\psi(2S) \rightarrow J/\psi\pi^+\pi^-$
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 ¹ADAM 05A CLEO Repl. by MENDEZ 08

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



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

Γ_7/Γ_{12}

VALUE DOCUMENT ID TECN COMMENT

0.0229 ± 0.0006 OUR FIT Error includes scale factor of 1.3.
0.0252 ± 0.0028 ± 0.0011 ¹AUBERT 02B BABR e^+e^-

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

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

Γ_8/Γ_{12}

VALUE	DOCUMENT ID	TECN	COMMENT
0.0230 ± 0.0017 OUR FIT			
0.0228 ± 0.0018 OUR AVERAGE			
0.0230 ± 0.0020 ± 0.0012	¹ AAIJ	16Y	LHCB $\Lambda_b^0 \rightarrow \psi(2S) X$
0.0216 ± 0.0026 ± 0.0014	² AUBERT	02B	BABR $e^+ e^-$
0.0327 ± 0.0077 ± 0.0072	² GRIBUSHIN	96	FMP5 515 $\pi^- \text{Be} \rightarrow 2\mu X$
¹ Using $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = (5.961 \pm 0.033) \times 10^{-2}$.			
² Using $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = (5.88 \pm 0.10) \times 10^{-2}$.			

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

Γ_9/Γ_{12}

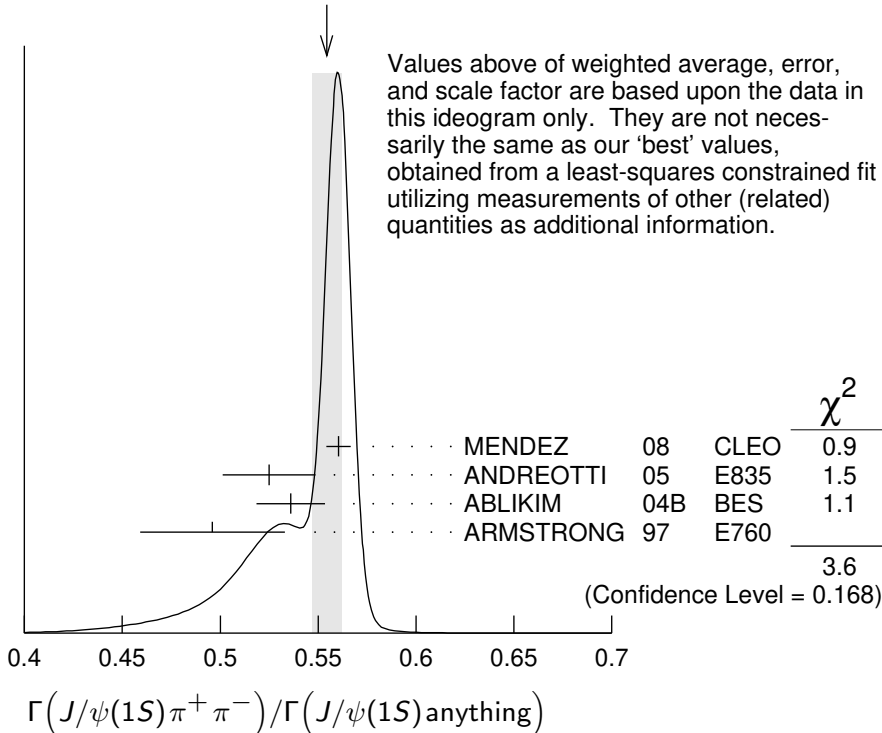
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
8.8 ± 1.1 OUR FIT			
8.73 ± 1.39 ± 1.57	BAI	02	BES $e^+ e^-$

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

Γ_{12}/Γ_{10}

VALUE	EVTs	DOCUMENT ID	TECN	COMMENT
0.565 ± 0.004 OUR FIT				Error includes scale factor of 1.7.
0.554 ± 0.008 OUR AVERAGE				Error includes scale factor of 1.3. See the ideogram below.
0.5604 ± 0.0009 ± 0.0062	565k	MENDEZ	08	CLEO $\psi(2S) \rightarrow \ell^+ \ell^- \pi^+ \pi^-$
0.525 ± 0.009 ± 0.022	4k	ANDREOTTI	05	E835 $\psi(2S) \rightarrow J/\psi X$
0.536 ± 0.007 ± 0.016	20k	^{1,2} ABLIKIM	04B	BES $\psi(2S) \rightarrow J/\psi X$
0.496 ± 0.037		ARMSTRONG	97	E760 $\bar{p} p \rightarrow \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.5637 ± 0.0027 ± 0.0046	60k	ADAM	05A	CLEO Repl. by MENDEZ 08

WEIGHTED AVERAGE
0.554 ± 0.008 (Error scaled by 1.3)



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

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

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

$$\Gamma_{11}/\Gamma_{12} = (0.9761\Gamma_{13} + 0.719\Gamma_{14} + 0.339\Gamma_{197} + 0.190\Gamma_{198})/\Gamma_{12}$$

VALUE	DOCUMENT ID	TECN	COMMENT
0.732 ± 0.014 OUR FIT			Error includes scale factor of 1.7.
0.73 ± 0.09	TANENBAUM 76	MRK1	$e^+ e^-$

$$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma(J/\psi(1S)\text{anything}) \quad \Gamma_{13}/\Gamma_{10}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.297 ± 0.005 OUR FIT				Error includes scale factor of 1.7.
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 ± 0.0012 ± 0.0056	61k	MENDEZ 08	CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- 2\pi^0$
0.2776 ± 0.0025 ± 0.0043	13.4k	ADAM 05A	CLEO	Repl. by MENDEZ 08

$$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma(J/\psi(1S)\pi^+\pi^-) \quad \Gamma_{13}/\Gamma_{12}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.526 ± 0.013 OUR FIT				Error includes scale factor of 1.7.
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.

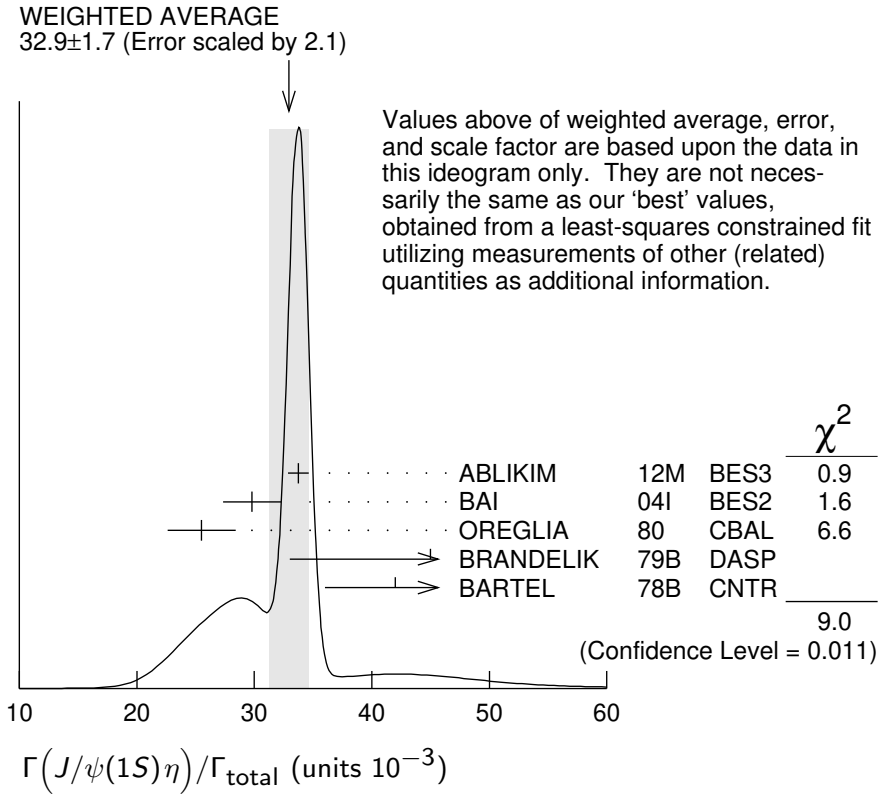
⁴ Not independent from other values reported by ANDREOTTI 05.

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

$$\Gamma(J/\psi(1S)\eta)/\Gamma_{\text{total}} \quad \Gamma_{14}/\Gamma$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
33.8 ± 0.6 OUR FIT				Error includes scale factor of 1.2.
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.

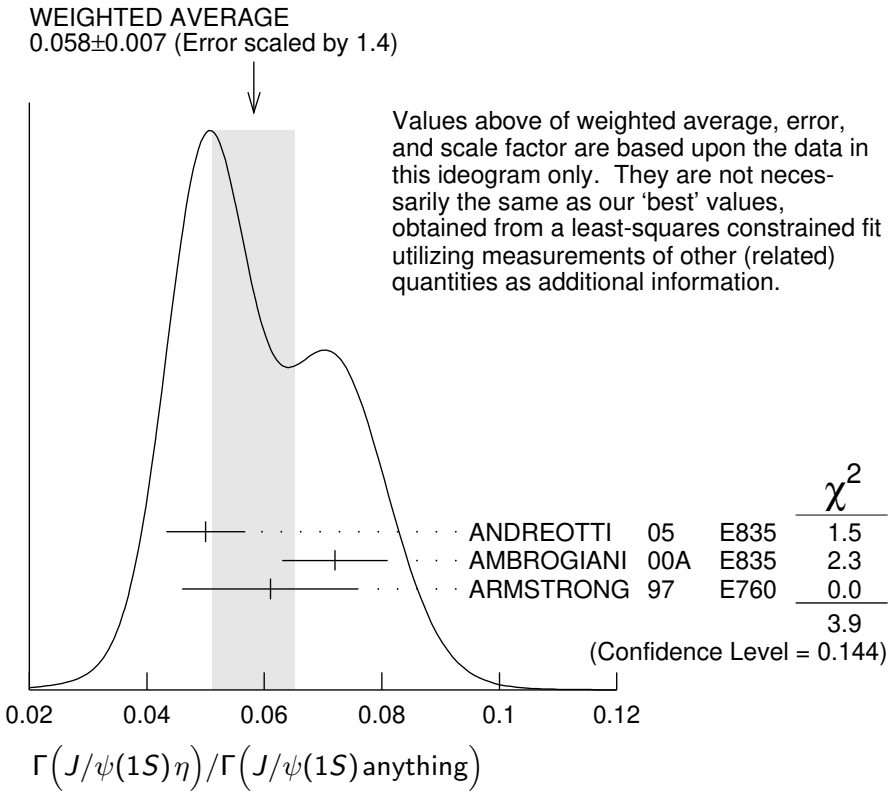


$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\text{anything})$

Γ_{14}/Γ_{10}

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0548±0.0009 OUR FIT				Error includes scale factor of 1.2.
0.058 ±0.007 OUR AVERAGE				Error includes scale factor of 1.4. See the ideogram below.
0.050 ±0.006 ±0.003	298 ± 20	ANDREOTTI 05	E835	$\psi(2S) \rightarrow J/\psi X$
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±0.0006±0.0009	18.4k	¹ MENDEZ	08 CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- \eta$
0.0546±0.0010±0.0007	2.8k	ADAM	05A CLEO	Repl. by MENDEZ 08

¹ Not independent from other measurements of MENDEZ 08.



$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_{14}/Γ_{12}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0971 ± 0.0016 OUR FIT				Error includes scale factor of 1.1.
0.0979 ± 0.0018 OUR AVERAGE				
$0.0979 \pm 0.0010 \pm 0.0015$	18.4k	MENDEZ 08	CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- \eta$
$0.098 \pm 0.005 \pm 0.010$	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. ● ● ●				
$0.0968 \pm 0.0019 \pm 0.0013$	2.8k	³ ADAM 05A	CLEO	Repl. by MENDEZ 08
$0.095 \pm 0.007 \pm 0.007$		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_{15}/Γ

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

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

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

$$\Gamma_{15}/\Gamma_{10} = \Gamma_{15}/(\Gamma_{12} + \Gamma_{13} + \Gamma_{14} + 0.339\Gamma_{197} + 0.190\Gamma_{198})$$

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.

$$\Gamma(J/\psi(1S)\pi^0)/\Gamma(J/\psi(1S)\pi^+ \pi^-) \quad \Gamma_{15}/\Gamma_{12}$$

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 ————

$$\Gamma(\pi^+ \pi^-)/\Gamma_{\text{total}} \quad \Gamma_{16}/\Gamma$$

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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	$e^+ e^-$

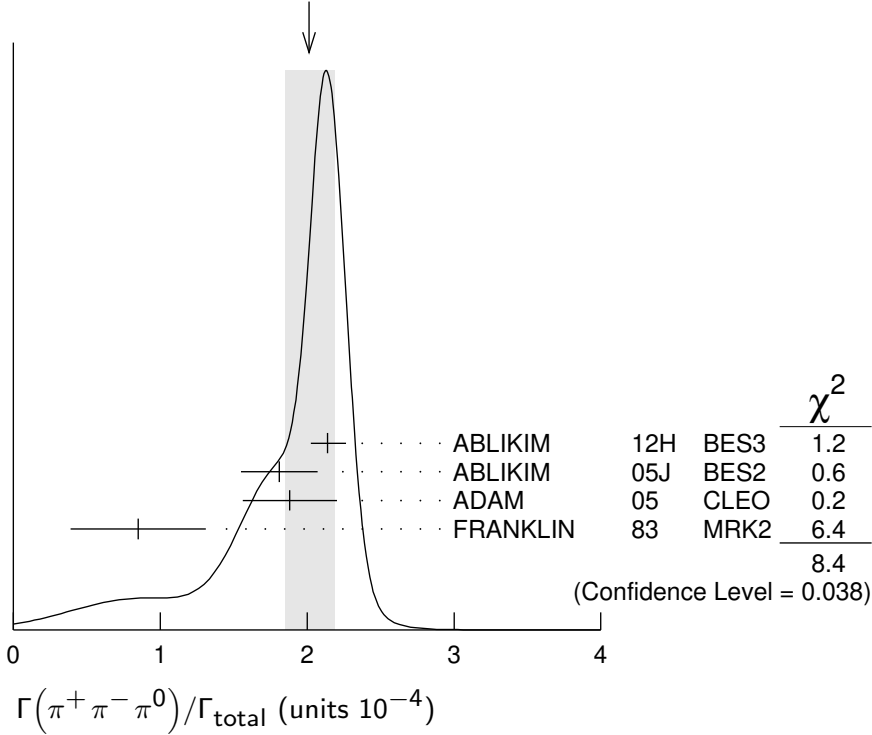
¹ Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration. Using $\psi(3770) \rightarrow \pi^+ \pi^-$ for continuum subtraction.

$$\Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}} \quad \Gamma_{17}/\Gamma$$

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.				
$2.14 \pm 0.03^{+0.12}_{-0.11}$	7k	¹ ABLIKIM	12H BES3	$e^+ e^- \rightarrow \psi(2S)$
$1.81 \pm 0.18 \pm 0.19$	260 ± 19	² ABLIKIM	05J BES2	$e^+ e^- \rightarrow \psi(2S)$
$1.88^{+0.16}_{-0.15} \pm 0.28$	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)



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

Γ_{18} / Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.32 ± 0.12					OUR AVERAGE Error includes scale factor of 1.8.
$0.51 \pm 0.07 \pm 0.11$			¹ ABLIKIM	05J BES2	$\psi(2S) \rightarrow \rho(770)\pi \rightarrow \pi^+ \pi^- \pi^0$
$0.24^{+0.08}_{-0.07} \pm 0.02$		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 $\rho^0 \pi^0$.

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

Γ_{19} / Γ

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

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

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

Γ_{20} / Γ

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

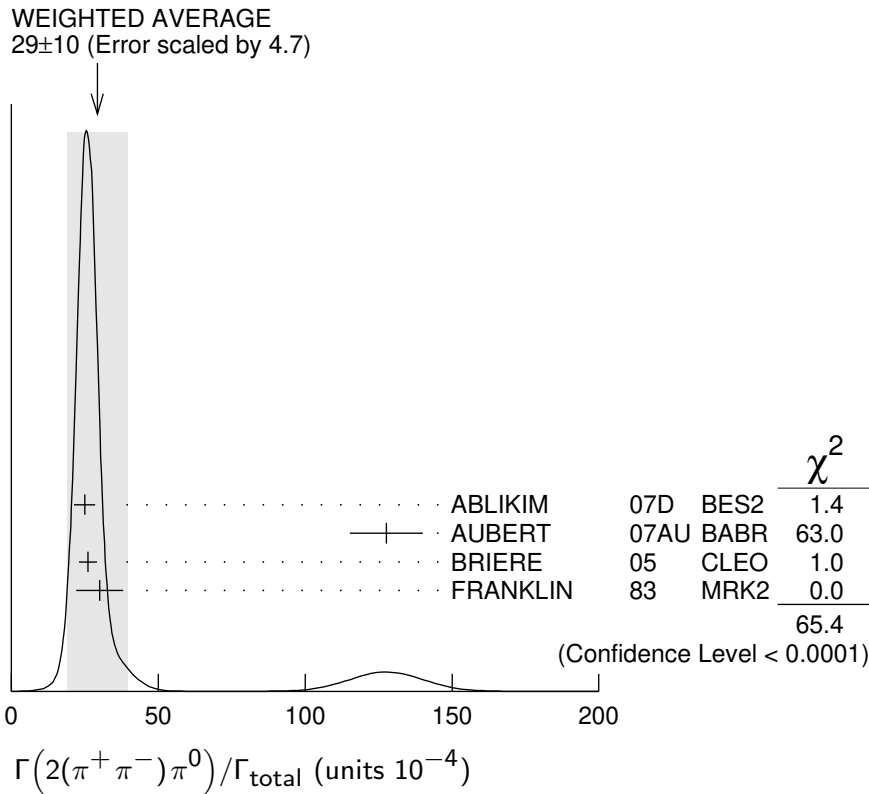
$\Gamma(\rho^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$ **Γ_{21}/Γ**

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

$\Gamma(2(\pi^+ \pi^-)\pi^0)/\Gamma_{\text{total}}$ **Γ_{22}/Γ**

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
29 ± 10	OUR AVERAGE	Error includes scale factor of 4.7. See the ideogram below.		
$24.9 \pm 0.7 \pm 3.6$	2173	ABLIKIM	07D BES2	$e^+ e^- \rightarrow \psi(2S)$
$128 \pm 12 \pm 2$	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	$e^+ e^-$

¹AUBERT 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 (shown rounded) value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.33 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.



$\Gamma(\rho a_2(1320))/\Gamma_{\text{total}}$ **Γ_{23}/Γ**

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

$\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}}$ **Γ_{27}/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.

$\Gamma(3(\pi^+\pi^-\pi^0))/\Gamma_{\text{total}}$ **Γ_{29}/Γ**

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

$\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$ **Γ_{31}/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_{32}/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.

$\Gamma(\rho\eta)/\Gamma_{\text{total}}$ **Γ_{37}/Γ**

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

$\Gamma(\eta'\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ **Γ_{38}/Γ**

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

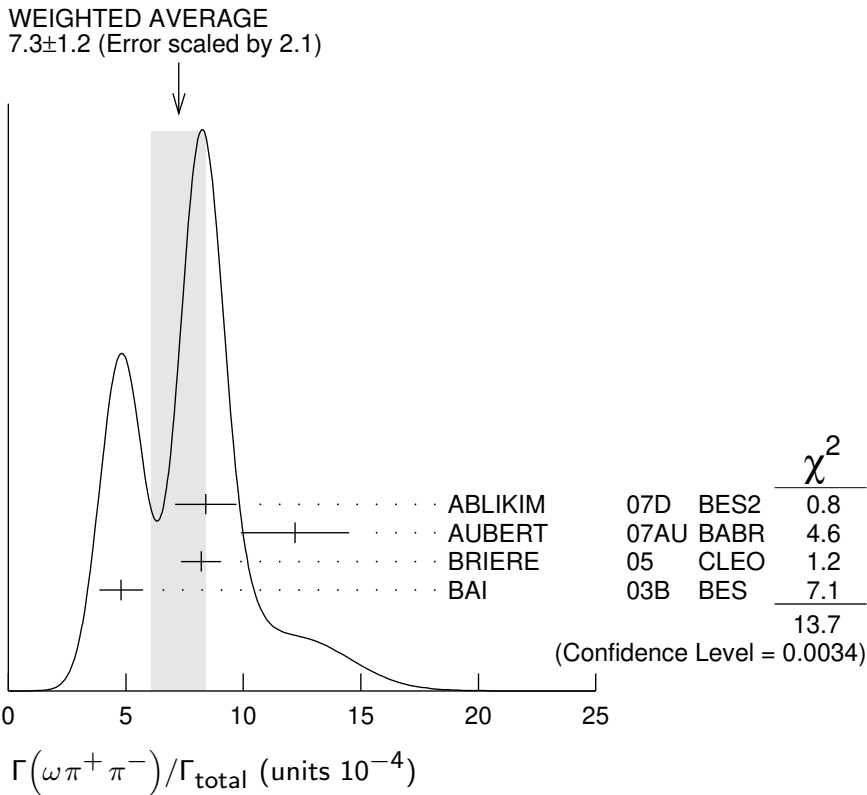
$\Gamma(\eta'\rho)/\Gamma_{\text{total}}$ **Γ_{39}/Γ**

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.87 ^{+1.64}/_{-1.11} ± 0.33	2	ABLIKIM	04L BES	$e^+e^- \rightarrow \psi(2S)$
• • •				We do not use the following data for averages, fits, limits, etc. • • •
1.02 ± 0.11 ± 0.24	143	¹ ABLIKIM	17AK BES3	$e^+e^- \rightarrow \psi(2S)$
0.569 ± 0.128 ± 0.236	80	² ABLIKIM	17AK BES3	$e^+e^- \rightarrow \psi(2S)$

- ¹ Destructive-interference solution of a partial wave analysis of the decay $\psi(2S) \rightarrow \pi^+ \pi^- \eta'$.
² Constructive-interference solution of a partial wave analysis of the decay $\psi(2S) \rightarrow \pi^+ \pi^- \eta'$.

$\Gamma(\omega\pi^0)/\Gamma_{\text{total}}$		Γ_{40}/Γ				
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT		
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	$e^+ e^- \rightarrow \psi(2S)$	

$\Gamma(\omega\pi^+\pi^-)/\Gamma_{\text{total}}$		Γ_{41}/Γ				
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT		
7.3 ± 1.2 OUR AVERAGE		Error includes scale factor of 2.1. See the ideogram below.				
8.4 ± 0.5 ± 1.2	386	ABLIKIM	07D	BES2	$e^+ e^- \rightarrow \psi(2S)$	
12.2 ± 2.2 ± 0.7	37	¹ AUBERT	07AU	BABR	10.6 $e^+ e^- \rightarrow \omega\pi^+\pi^-\gamma$	
8.2 ± 0.5 ± 0.7	391	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$	
4.8 ± 0.6 ± 0.7	100 ± 22	² BAI	03B	BES	$\psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$	
¹ AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \rightarrow \omega\pi^+\pi^-) \cdot B(\omega \rightarrow 3\pi) = 2.69 \pm 0.73 \pm 0.16$ eV.						
² Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.						



$\Gamma(b_1^\pm \pi^\mp)/\Gamma_{\text{total}}$ Γ_{43}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
4.0 ± 0.6	OUR AVERAGE	Error includes scale factor of 1.1.		
5.1 $\pm 0.6 \pm 0.8$	202	ABLIKIM	07D BES2	$e^+ e^- \rightarrow \psi(2S)$
4.18 $^{+0.43}_{-0.42} \pm 0.92$	170	ADAM	05 CLEO	$e^+ e^- \rightarrow \psi(2S)$
3.2 $\pm 0.6 \pm 0.5$	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 $\pm 0.8 \pm 1.0$		¹ BAI	99C BES	Repl. by BAI 03B

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

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

$\Gamma(\omega f_2(1270))/\Gamma_{\text{total}}$ Γ_{44}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
2.2 ± 0.4	OUR AVERAGE				
2.3 $\pm 0.5 \pm 0.4$		57	ABLIKIM	07D BES2	$e^+ e^- \rightarrow \psi(2S)$
2.05 $\pm 0.41 \pm 0.38$		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 $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(b_1^0 \pi^0)/\Gamma_{\text{total}}$ Γ_{47}/Γ

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

$\Gamma(\omega \eta)/\Gamma_{\text{total}}$ Γ_{48}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<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	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\omega \eta')/\Gamma_{\text{total}}$ Γ_{49}/Γ

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

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

$\Gamma(\omega(782) \eta \eta)/\Gamma_{\text{total}}$ Γ_{50}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.65 \pm 0.02 \pm 0.21$	1251	ABLIKIM	25BY	

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

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<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	$e^+ e^- \rightarrow \psi(2S)$

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

Γ_{52}/Γ

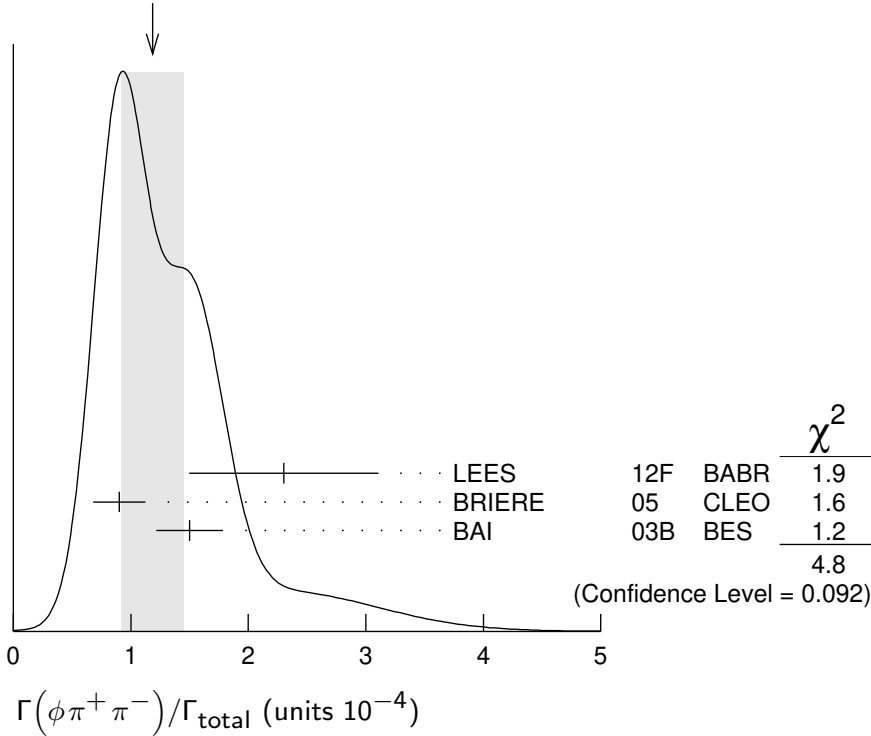
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.18±0.26 OUR AVERAGE		Error includes scale factor of 1.5.		See the ideogram below.
2.3 ±0.8 ±0.1	19 ± 6	LEES	12F BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$
0.9 ±0.2 ±0.1	47.6	BRIERE	05 CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow K^+K^-\pi^+\pi^-$
1.5 ±0.2 ±0.2	51.5 ± 8.3	¹ BAI	03B BES	$\psi(2S) \rightarrow K^+K^-\pi^+\pi^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
2.45±0.96±0.04	10 ± 4	^{2,3} AUBERT	07AK BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$

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

² Superseded by LEES 12F. 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 (shown rounded) value $\Gamma(\psi(2S) \rightarrow e^+e^-) = 2.33 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

³ Using $B(\phi \rightarrow K^+K^-) = (49.3 \pm 0.6)\%$.

WEIGHTED AVERAGE
1.18±0.26 (Error scaled by 1.5)



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

Γ_{53}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
0.75±0.33 OUR AVERAGE		Error includes scale factor of 1.6.		
1.5 ±0.5 ±0.1	12 ± 4	LEES	12F BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$
0.6 ±0.2 ±0.1	18.4 ± 6.4	¹ BAI	03B BES	$\psi(2S) \rightarrow K^+K^-\pi^+\pi^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				

$$1.46 \pm 0.71 \pm 0.02 \quad 6 \pm 3 \quad {}^{2,3} \text{AUBERT} \quad 07\text{AK BABR} \quad 10.6 \frac{e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma}{\pi^+ \pi^- K^+ K^- \gamma}$$

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

² Superseded by LEES 12F. AUBERT 07AK reports $[\Gamma(\psi(2S) \rightarrow \phi f_0(980) \rightarrow \pi^+ \pi^-) / \Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+ e^-)] = (0.34 \pm 0.16 \pm 0.04) \times 10^{-3} \text{ keV}$ which we divide by our best (shown rounded) value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.33 \pm 0.04 \text{ keV}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

³ Using $B(\phi \rightarrow K^+ K^-) = (49.3 \pm 0.6)\%$.

$\Gamma(\phi\eta)/\Gamma_{\text{total}}$ Γ_{54}/Γ

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

$\Gamma(\eta\phi(2170), \phi(2170) \rightarrow \phi f_0(980), f_0 \rightarrow \pi^+ \pi^-) / \Gamma_{\text{total}}$ Γ_{55}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 2.2 × 10⁻⁶	90	ABLIKIM	19i BES3	$e^+ e^- \rightarrow \eta\phi f_0(980)$

$\Gamma(\phi\eta')/\Gamma_{\text{total}}$ Γ_{56}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
1.54 ± 0.20 OUR AVERAGE				
1.51 ± 0.16 ± 0.12	201	ABLIKIM	19BA BES3	$e^+ e^- \rightarrow \psi(2S)$
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.

$\Gamma(\phi\eta\eta')/\Gamma_{\text{total}}$ Γ_{57}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
3.14 ± 0.17 ± 0.24	480	¹ ABLIKIM	25E BES3	$e^+ e^- \rightarrow \psi(2S)$

¹ The continuum is subtracted using data at 3.773 GeV. No interference between the $\psi(2S)$ and continuum amplitudes is assumed.

$\Gamma(h_1(1900)\eta \rightarrow \phi\eta\eta')/\Gamma_{\text{total}}$ Γ_{58}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
3.8 ± 1.4 ± 1.5	ABLIKIM	25E BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\phi(2170)\eta \rightarrow \phi\eta\eta')/\Gamma_{\text{total}}$ Γ_{59}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
3.3 ± 1.4 ± 1.2	ABLIKIM	25E BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\phi(2170)\eta' \rightarrow \phi\eta\eta')/\Gamma_{\text{total}}$ Γ_{60}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
3.8 ± 0.9 ± 0.5	ABLIKIM	25E BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(h_1(2300)\eta \rightarrow \phi\eta\eta')/\Gamma_{\text{total}}$ Γ_{61}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
$2.2 \pm 0.7 \pm 0.7$	ABLIKIM	25E	BES3 $e^+e^- \rightarrow \psi(2S)$

 $\Gamma(h_1(2300)\eta' \rightarrow \phi\eta\eta')/\Gamma_{\text{total}}$ Γ_{62}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
$4.8 \pm 1.3 \pm 0.7$	ABLIKIM	25E	BES3 $e^+e^- \rightarrow \psi(2S)$

 $\Gamma(\phi\phi\phi)/\Gamma_{\text{total}}$ Γ_{63}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.46 \pm 0.05 \pm 0.17$	1.3k	¹ ABLIKIM	24O	BES3 $e^+e^- \rightarrow \psi(2S)$

¹ Data at 3.773 GeV assumed to be $e^+e^- (3.773) \rightarrow 3\phi$ events yield an estimate for the continuum amplitude at the $\psi(2S)$. No interference between the $\psi(2S)$ and continuum amplitudes is assumed.

 $\Gamma(\phi f_1(1285))/\Gamma_{\text{total}}$ Γ_{64}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.0 \pm 0.4 \pm 1.3$	234	¹ ABLIKIM	19BA	BES3 $e^+e^- \rightarrow \psi(2S)$

¹ ABLIKIM 19BA reports $[\Gamma(\psi(2S) \rightarrow \phi f_1(1285))/\Gamma_{\text{total}}] \times [B(f_1(1285) \rightarrow \eta\pi^+\pi^-)] = (1.03 \pm 0.10 \pm 0.09) \times 10^{-5}$ which we divide by our best (shown rounded) value $B(f_1(1285) \rightarrow \eta\pi^+\pi^-) = (35 \pm 15) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

 $\Gamma(\phi\eta(1405) \rightarrow \phi\pi^+\pi^-\eta)/\Gamma_{\text{total}}$ Γ_{65}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$8.46 \pm 1.37 \pm 0.92$	195	ABLIKIM	19BA	BES3 $e^+e^- \rightarrow \psi(2S)$

 $\Gamma(\phi f_2'(1525))/\Gamma_{\text{total}}$ Γ_{66}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$0.44 \pm 0.12 \pm 0.11$		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	$e^+e^- \rightarrow 2(K^+K^-)$
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 $\Gamma(K^+K^-)/\Gamma_{\text{total}}$ Γ_{67}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$7.48 \pm 0.23 \pm 0.39$		1.3k	¹ METREVELI	12	$\psi(2S) \rightarrow K^+K^-$

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

$6.2 \pm 1.5 \pm 0.2$	66	^{2,3} LEES	15J	BABR	$e^+e^- \rightarrow K^+K^-\gamma$
$8.3 \pm 1.5 \pm 0.2$	66	^{3,4} LEES	15J	BABR	$e^+e^- \rightarrow K^+K^-\gamma$
$6.3 \pm 0.6 \pm 0.3$		⁵ DOBBS	06A	CLEO	e^+e^-
10 ± 7		⁵ BRANDELIK	79C	DASP	e^+e^-
< 5	90	FELDMAN	77	MRK1	e^+e^-

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

² $\sin\phi > 0$.

³ Using $\Gamma(\psi(2S) \rightarrow e^+e^-) = (2.37 \pm 0.04) \text{ keV}$.

⁴ $\sin\phi < 0$.

⁵ Interference with non-resonant K^+K^- production not taken into account.

$\Gamma(K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{68}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
7.3±0.5 OUR AVERAGE				
8.1±1.3±0.3	133	LEES	12F 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		¹ TANENBAUM	78 MRK1	e^+e^-
••• We do not use the following data for averages, fits, limits, etc. •••				
11.0±1.9±0.2	85	² AUBERT	07AK BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$

¹ Assuming entirely strong decay.

² Superseded by LEES 12F. AUBERT 07AK reports $[\Gamma(\psi(2S) \rightarrow K^+K^-\pi^+\pi^-)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+e^-)] = (2.56 \pm 0.42 \pm 0.16) \times 10^{-3}$ keV which we divide by our best (shown rounded) value $\Gamma(\psi(2S) \rightarrow e^+e^-) = 2.33 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

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

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
4.07±0.16±0.26					
		0.9k	ABLIKIM	12L BES3	$e^+e^- \rightarrow \psi(2S)$
••• We do not use the following data for averages, fits, limits, etc. •••					
<8.9	90	1	FRANKLIN	83 MRK2	$e^+e^- \rightarrow \text{hadrons}$

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<1.1 × 10⁻⁸				
	90	ABLIKIM	25CC BES3	$\psi(2S) \rightarrow K_S^0 K_S^0 \rightarrow \pi^+\pi^-\pi^+\pi^-$
••• We do not use the following data for averages, fits, limits, etc. •••				
<4.6 × 10 ⁻⁶	95	¹ BAI	04D BES	$e^+e^- \rightarrow \psi(2S) \rightarrow K_S^0 K_S^0$

¹ Forbidden by CP.

$\Gamma(K_S^0 K_L^0)/\Gamma_{\text{total}}$ Γ_{71}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
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 $B(K_S^0 \rightarrow \pi^+\pi^-) = 0.6860 \pm 0.0027$.

$\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ Γ_{77}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
12.6±0.9 OUR AVERAGE				
18.9±5.7±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 (shown rounded) value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.33 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

$\Gamma(\omega f_0(1710) \rightarrow \omega K^+ K^-)/\Gamma_{\text{total}}$ **Γ_{78}/Γ**

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

$\Gamma(K^*(892)^0 K^- \pi^+ \pi^0 + \text{c.c.})/\Gamma_{\text{total}}$ **Γ_{79}/Γ**

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

$\Gamma(K^*(892)^+ K^- \pi^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ **Γ_{80}/Γ**

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

$\Gamma(K^*(892)^+ K^- \rho^0 + \text{c.c.})/\Gamma_{\text{total}}$ **Γ_{81}/Γ**

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

$\Gamma(K^*(892)^0 K^- \rho^+ + \text{c.c.})/\Gamma_{\text{total}}$ **Γ_{82}/Γ**

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

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

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

$\Gamma(K^+ K^- \rho^0)/\Gamma_{\text{total}}$ **Γ_{91}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$2.2 \pm 0.2 \pm 0.4$	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_{92}/Γ**

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$1.86 \pm 0.32 \pm 0.43$	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_{93}/Γ**

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$1.3 \pm 0.7 \pm 0.1$	7	¹ AUBERT 07AU	BABR	10.6 $e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \eta \gamma$

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

$\Gamma(K^+ K^- 2(\pi^+ \pi^-) \pi^0) / \Gamma_{\text{total}}$ Γ_{95} / Γ

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

$\Gamma(K^+ K^*(892)^- + \text{c.c.}) / \Gamma_{\text{total}}$ Γ_{96} / Γ

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

3.18 ± 0.30^{+0.26}_{-0.31} 0.2k ABLIKIM 12L BES3 $e^+ e^- \rightarrow \psi(2S)$

2.9^{+1.3}_{-1.7} ± 0.4 9.6 ± 4.2 ABLIKIM 05I BES2 $e^+ e^- \rightarrow \psi(2S)$

1.3^{+1.0}_{-0.7} ± 0.3 7 ADAM 05 CLEO $e^+ e^- \rightarrow \psi(2S)$

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

<5.4 90 FRANKLIN 83 MRK2 $e^+ e^- \rightarrow \text{hadrons}$

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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0.63 ± 0.13 OUR AVERAGE

0.9 ± 0.4 ± 0.1 13 LEES 12F BABR 10.6 $e^+ e^- \rightarrow 2(K^+ K^-) \gamma$

0.6 ± 0.1 ± 0.1 59.2 BRIERE 05 CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow 2(K^+ K^-)$

$\Gamma(2(K^+ K^-) \pi^0) / \Gamma_{\text{total}}$ Γ_{98} / Γ

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

$\Gamma(K^+ K^- \phi) / \Gamma_{\text{total}}$ Γ_{99} / Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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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 $\psi(2S) \rightarrow 2(K^+ K^-)$

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

$\Gamma(K_S^0 K_S^0 \phi) / \Gamma_{\text{total}}$ Γ_{100} / Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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0.353 ± 0.020 ± 0.021 687 ¹ ABLIKIM 23BA BES3 $e^+ e^- \rightarrow \psi(2S) \rightarrow K_S^0 K_S^0 K^+ K^-$

¹ Solution with a constructive interference of the signal with the continuum background.

$\Gamma(K_1(1270)^\pm K^\mp) / \Gamma_{\text{total}}$ Γ_{101} / Γ

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
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10.0 ± 1.8 ± 2.1 ¹ BAI 99C BES $e^+ e^-$

¹ Assuming $B(K_1(1270) \rightarrow K \rho) = 0.42 \pm 0.06$

$\Gamma(K^+\bar{K}^*(892)^0\pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{102}/Γ

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

$\Gamma(\eta K^+ K^-, \text{ no } \eta\phi)/\Gamma_{\text{total}}$ Γ_{103}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
3.49±0.09±0.15		1.8k	¹ ABLIKIM	20F BES3	$\psi(2S) \rightarrow K^+ K^- \gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3.08±0.29±0.25		0.3k	^{1,2} ABLIKIM	12L BES3	$\psi(2S) \rightarrow K^+ K^- \gamma\gamma$
<13	90		BRIERE	05 CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

¹ Excluding $\eta\phi$.

² Superseded by ABLIKIM 20F.

$\Gamma(\eta K^+ K^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{104}\Gamma_7/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<0.6	90	¹ LEES	23 BABR	$e^+e^- \rightarrow \gamma_{ISR} \text{ hadrons}$

¹ LEES 23 reports $[\Gamma(\psi(2S) \rightarrow \eta K^+ K^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow 3\pi^0)] < 0.2 \text{ eV}$ which we divide by our best (shown rounded) value $B(\eta \rightarrow 3\pi^0) = 32.56 \times 10^{-2}$.

$\Gamma(X(1750)\eta \rightarrow K^+ K^- \eta)/\Gamma_{\text{total}}$ Γ_{105}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
4.8±1.0±2.6	ABLIKIM	20F BES3	$\psi(2S) \rightarrow K^+ K^- \eta$

$\Gamma(K_1(1400)^\pm K^\mp)/\Gamma_{\text{total}}$ Γ_{106}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<3.1	90	¹ BAI	99C BES	e^+e^-

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_{107}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
7.12±0.62^{+1.13}_{-0.61}	251 ± 22	ABLIKIM	12L BES3	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(K^*(892)^0\bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{108}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
10.9±2.0 OUR AVERAGE				
13.3 ^{+2.4} _{-2.8} ± 1.7	65.6 ± 9.0	ABLIKIM	05i BES2	$e^+e^- \rightarrow \psi(2S)$
9.2 ^{+2.7} _{-2.2} ± 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_{96}/Γ_{108}

VALUE	DOCUMENT ID	TECN	COMMENT
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	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(\omega K^+ K^-)/\Gamma_{\text{total}}$ Γ_{109}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.62±0.11 OUR AVERAGE		Error includes scale factor of 1.1.		
1.56±0.04±0.11	2.8k	ABLIKIM	14G BES3	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
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	¹ BAI	03B BES	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

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

 $\Gamma(\omega K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{110}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
7.04±0.39±0.36	1.5k	ABLIKIM	21AL BES3	$\psi(2S) \rightarrow \pi^+ \pi^- \pi^0 K_S^0 K_S^0$

 $\Gamma(\omega K^*(892)^+ K^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{111}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
20.7±2.6 OUR AVERAGE				
18.9±2.9±2.2	396	ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K_S^0 K^- \pi^+$
22.6±3.0±2.4	535	ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K^+ K^- \pi^0$

 $\Gamma(\omega K_2^*(1430)^+ K^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{112}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
6.1 ±1.2 OUR AVERAGE				
6.39±1.50±0.78	128	ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K_S^0 K^- \pi^+$
5.86±1.61±0.83	143	ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K^+ K^- \pi^0$

 $\Gamma(\omega \bar{K}^*(892)^0 K^0)/\Gamma_{\text{total}}$ Γ_{113}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
16.8±2.5±1.6	356	ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K_S^0 K^- \pi^+$

 $\Gamma(\omega \bar{K}_2^*(1430)^0 K^0)/\Gamma_{\text{total}}$ Γ_{114}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
5.82±2.08±0.72	116	ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K_S^0 K^- \pi^+$

 $\Gamma(\omega X(1440) \rightarrow \omega K_S^0 K^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{115}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
1.60±0.27±0.24	109	¹ ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K_S^0 K^- \pi^+$

¹ $X(1440)$ compatible with $\eta(1405)$ and $\eta(1475)$. A $f_1(1420)$ is also possible.

 $\Gamma(\omega X(1440) \rightarrow \omega K^+ K^- \pi^0)/\Gamma_{\text{total}}$ Γ_{116}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
1.09±0.20±0.16	82	¹ ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K^+ K^- \pi^0$

¹ $X(1440)$ compatible with $\eta(1405)$ and $\eta(1475)$. A $f_1(1420)$ is also possible.

 $\Gamma(\omega f_1(1285) \rightarrow \omega K_S^0 K^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{117}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
0.302±0.098±0.027	22	¹ ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K_S^0 K^- \pi^+$

¹ Statistical significance 4.5σ . This measurement is equivalent to a limit of $< 0.478 \times 10^{-5}$ at 90% C.L.

$\Gamma(\omega f_1(1285) \rightarrow \omega K^+ K^- \pi^0) / \Gamma_{\text{total}}$ Γ_{118} / Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
0.125 ± 0.070 ± 0.013	10	¹ ABLIKIM	13M BES3	$\psi(2S) \rightarrow \omega K^+ K^- \pi^0$

¹ Statistical significance 3.2σ . This measurement is equivalent to a limit of $< 0.221 \times 10^{-5}$ at 90% C.L.

$\Gamma(p\bar{p}) / \Gamma_{\text{total}}$ Γ_{119} / Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.95 ± 0.09 OUR FIT				Error includes scale factor of 1.3.
3.02 ± 0.08 OUR AVERAGE				

3.05 ± 0.02 ± 0.12	19k	ABLIKIM	18T BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$
3.08 ± 0.05 ± 0.18	4.5k	¹ DOBBS	14	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$
3.36 ± 0.09 ± 0.25	1.6k	ABLIKIM	07C BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$
2.87 ± 0.12 ± 0.15	557	PEDLAR	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$
1.4 ± 0.8	4	BRANDELIK	79C DASP	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$
2.3 ± 0.7		FELDMAN	77 MRK1	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$

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

$\Gamma(p\bar{p}) / \Gamma(J/\psi(1S)\pi^+\pi^-)$ $\Gamma_{119} / \Gamma_{12}$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
8.47 ± 0.28 OUR FIT			Error includes scale factor of 1.3.
6.98 ± 0.49 ± 0.97	BAI	01 BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$

$\Gamma(n\bar{n}) / \Gamma_{\text{total}}$ Γ_{120} / Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
3.06 ± 0.06 ± 0.14	6k	ABLIKIM	18T BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow n\bar{n}$

$\Gamma(p\bar{p}\pi^0) / \Gamma_{\text{total}}$ Γ_{121} / Γ

The two different fit values of ABLIKIM 25M cannot be distinguished. Previous measurements did not consider the large uncertainty due to interference with the $e^+ e^-$ continuum.

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.2 to 2.4 OUR EVALUATION				

1.339 ± 0.112 ± 0.023	188k	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$
1.837 ± 0.137 ± 0.032	188k	² ABLIKIM	25M BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1.65 ± 0.03 ± 0.15	4.5k	ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$
1.54 ± 0.06 ± 0.06	948	ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \pi^0 p\bar{p}$
1.32 ± 0.10 ± 0.15	256	³ ABLIKIM	05E BES2	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\gamma\gamma$
1.4 ± 0.5	9	FRANKLIN	83 MRK2	$e^+ e^-$

¹ Constructive-interference solution of a partial wave analysis of the decay $\psi(2S) \rightarrow p\bar{p}\pi^0$.

² Destructive-interference solution of a partial wave analysis of the decay $\psi(2S) \rightarrow p\bar{p}\pi^0$.

³ Computed using $B(\pi^0 \rightarrow \gamma\gamma) = (98.80 \pm 0.03)\%$.

$\Gamma(N(940)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{122}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
11.39±0.31±1.19	121k	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$6.42 \pm 0.20^{+1.78}_{-1.28}$	1.9k	² ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

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

² From a fit of $\pi^0 \rho\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states. Superseded by ABLIKIM 25M.

 $\Gamma(N(1440)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{123}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
7.5 ± 1.1 OUR AVERAGE	Error includes scale factor of 1.7.			
$5.42 \pm 0.14 \pm 1.41$	56k	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$
$8.1 \pm 0.7 \pm 0.3$	474	² ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \pi^0 \rho\bar{p}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$3.58 \pm 0.25^{+1.59}_{-0.84}$	1.1k	³ ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

¹ From a fit (PWA) of $\pi^0 \rho\bar{p}$ data to ten 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 $N(1440)\bar{p}$, a broad $\rho\bar{p}$ enhancement around 2100 MeV, and two other broad, unestablished resonances.

³ From a fit of $\pi^0 \rho\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states. Superseded by ABLIKIM 25M.

 $\Gamma(N(1520)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{124}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
0.66±0.04±0.20	6749	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.64 \pm 0.05^{+0.22}_{-0.17}$	0.2k	² ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

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

² From a fit of $\pi^0 \rho\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states. Superseded by ABLIKIM 25M.

 $\Gamma(N(1535)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{125}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
1.75±0.07±0.36	19k	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$2.47 \pm 0.28^{+0.99}_{-0.97}$	0.7k	² ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

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

² From a fit of $\pi^0 \rho\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states. Superseded by ABLIKIM 25M.

 $\Gamma(N(1650)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{126}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
0.91±0.07±0.32	11k	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$3.76 \pm 0.28^{+1.37}_{-1.66}$	1.1k	² ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

¹ From a fit (PWA) of $\pi^0 p\bar{p}$ data to ten distinct intermediate $N\bar{p}$ resonant states. Superseded by ABLIKIM 25M.

² From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(N(1710)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{127}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
4.2±0.5±4.0	4466	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

¹ From a fit (PWA) of $\pi^0 p\bar{p}$ data to ten distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(N(1720)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{128}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
0.62±0.05±0.24	6644	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

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

1.79±0.10 ^{+0.24} _{-0.71}	0.5k	² ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$
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¹ From a fit (PWA) of $\pi^0 p\bar{p}$ data to ten distinct intermediate $N\bar{p}$ resonant states.

² From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states. Superseded by ABLIKIM 25M.

$\Gamma(N(2100)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{129}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
8.5±0.9±3.8	10k	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

¹ From a fit (PWA) of $\pi^0 p\bar{p}$ data to ten distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(N(2300)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{130}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
0.36±0.06±0.30	4235	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

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

2.62±0.28 ^{+1.12} _{-0.64}	0.9k	² ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$
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¹ From a fit (PWA) of $\pi^0 p\bar{p}$ data to ten distinct intermediate $N\bar{p}$ resonant states.

² From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states. Superseded by ABLIKIM 25M.

$\Gamma(N(2570)\bar{p} + \text{c.c.} \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{131}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
1.95±0.09±1.45	24k	¹ ABLIKIM	25M BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$

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

2.13±0.08 ^{+0.40} _{-0.30}	0.8k	² ABLIKIM	13A BES3	$\psi(2S) \rightarrow \rho\bar{p}\pi^0$
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¹ From a fit (PWA) of $\pi^0 p\bar{p}$ data to ten distinct intermediate $N\bar{p}$ resonant states.

² From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states. Superseded by ABLIKIM 25M.

$\Gamma(\rho\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{132}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
6.0±0.4 OUR AVERAGE				

5.9±0.2±0.4	904.5	BRIERE	05 CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow \rho\bar{p}\pi^+\pi^-$
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8 ± 2 ¹ TANENBAUM 78 MRK1 e^+e^-

¹ Assuming entirely strong decay.

$\Gamma(p\bar{p}K^+K^-)/\Gamma_{\text{total}}$ **Γ_{133}/Γ**

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
2.7\pm0.6\pm0.4	30.1	BRIERE 05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}K^+K^-$

$\Gamma(p\bar{p}\eta)/\Gamma_{\text{total}}$ **Γ_{134}/Γ**

The two different fit values of ABLIKIM 25M cannot be distinguished. Previous measurements did not consider the large uncertainty due to interference with the e^+e^- continuum.

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
5.5 to 9.1 OUR EVALUATION				
6.15 \pm 0.65 \pm 0.11	31k	¹ ABLIKIM 25M	BES3	$\psi(2S) \rightarrow p\bar{p}\eta$
8.44 \pm 0.69 \pm 0.14	31k	² ABLIKIM 25M	BES3	$\psi(2S) \rightarrow p\bar{p}\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6.4 \pm 0.2 \pm 0.6	679	³ ABLIKIM 13S	BES3	$\psi(2S) \rightarrow p\bar{p}\eta$
5.6 \pm 0.6 \pm 0.3	154	³ ALEXANDER 10	CLEO	$\psi(2S) \rightarrow p\bar{p}\eta$
5.8 \pm 1.1 \pm 0.7	45	⁴ ABLIKIM 05E	BES2	$e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\gamma\gamma$
8 \pm 3 \pm 3	9.8	BRIERE 05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\pi^0$

¹ Constructive-interference solution of a partial wave analysis of the decay $\psi(2S) \rightarrow p\bar{p}\eta$.

² Destructive-interference solution of a partial wave analysis of the decay $\psi(2S) \rightarrow p\bar{p}\eta$.

³ With $N(1535)$ decaying to $p\eta$.

⁴ Computed using $B(\eta \rightarrow \gamma\gamma) = (39.43 \pm 0.26)\%$.

$\Gamma(N(1535)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}$ **Γ_{135}/Γ**

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
4.7 \pm0.5 OUR AVERAGE				
5.05 \pm 0.13 \pm 0.71	19k	¹ ABLIKIM 25M	BES3	$\psi(2S) \rightarrow p\bar{p}\eta$
4.4 \pm 0.6 \pm 0.3	123	² ALEXANDER 10	CLEO	$\psi(2S) \rightarrow \eta p\bar{p}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.2 \pm 0.3 ^{+3.2} / _{-1.2}	527	³ ABLIKIM 13S	BES3	$\psi(2S) \rightarrow \eta p\bar{p}$

¹ From a fit (PWA) of $\eta p\bar{p}$ data to four distinct intermediate $N\bar{p}$ resonant states.

² From a fit of the $p\bar{p}$ and $p\eta$ distributions to a combination of $N^*(1535)\bar{p}$ and a broad $p\bar{p}$ enhancement around 2100 MeV.

³ With $N(1535)$ decaying to $p\eta$. Superseded by ABLIKIM 25P.

$\Gamma(N(1710)\bar{p} + \text{c.c.} \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}$ **Γ_{136}/Γ**

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
7.8\pm0.7\pm3.1	3250	¹ ABLIKIM 25M	BES3	$\psi(2S) \rightarrow p\bar{p}\eta$

¹ From a fit (PWA) of $\eta p\bar{p}$ data to four distinct intermediate $N\bar{p}$ resonant states.

$\Gamma(p\bar{p}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ **Γ_{137}/Γ**

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
7.3\pm0.4\pm0.6	434.9	BRIERE 05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\pi^0$

$\Gamma(\rho\bar{p}\rho^0)/\Gamma_{\text{total}}$ Γ_{138}/Γ

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

 $\Gamma(\rho\bar{p}\omega)/\Gamma_{\text{total}}$ Γ_{139}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
0.69 ± 0.21 OUR AVERAGE				
$0.6 \pm 0.2 \pm 0.2$	21.2	BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow \rho\bar{p}\pi^+\pi^-\pi^0$
$0.8 \pm 0.3 \pm 0.1$	14.9 ± 0.1	¹ BAI	03B	BES $\psi(2S) \rightarrow \rho\bar{p}\pi^+\pi^-\pi^0$

¹Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$. $\Gamma(\rho\bar{p}\eta')/\Gamma_{\text{total}}$ Γ_{140}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.10 \pm 0.10 \pm 0.08$	491	¹ ABLIKIM	19N	BES3 $\psi(2S) \rightarrow \eta' p\bar{p}$

¹From the combination of $\rho\bar{p}\eta' \rightarrow \rho\bar{p}\pi^+\pi^-\eta$ and $\rho\bar{p}\eta' \rightarrow \rho\bar{p}\pi^+\pi^-\gamma$ channels. $\Gamma(\rho\bar{p}\phi)/\Gamma_{\text{total}}$ Γ_{141}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$6.06 \pm 0.38 \pm 0.48$		753	ABLIKIM	19AO	BES3 $e^+e^- \rightarrow \psi(2S) \rightarrow \rho\bar{p}K^+K^-$

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

<24	90	BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow \rho\bar{p}K^+K^-$
<26	90	¹ BAI	03B	BES $\psi(2S) \rightarrow K^+K^-p\bar{p}$

¹Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$. $\Gamma(\phi X(1835) \rightarrow \rho\bar{p}\phi)/\Gamma_{\text{total}}$ Γ_{142}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.82 \times 10^{-7}$	90	ABLIKIM	19AO	BES3 $e^+e^- \rightarrow \psi(2S) \rightarrow \rho\bar{p}K^+K^-$

 $\Gamma(\rho\bar{n}\pi^- \text{ or c.c.})/\Gamma_{\text{total}}$ Γ_{143}/Γ

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

 $\Gamma(\rho\bar{n}\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_{144}/Γ

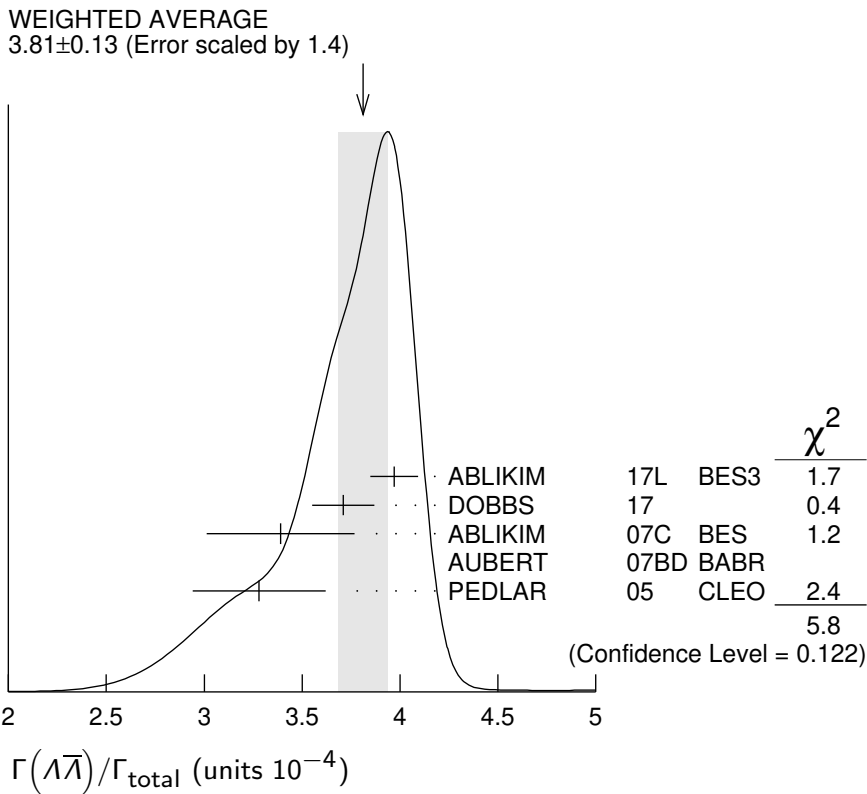
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.18 \pm 0.50 \pm 0.50$	135 ± 21	ABLIKIM	06i	BES2 $e^+e^- \rightarrow p\pi^-\pi^0X$

 $\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$ Γ_{145}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
3.81 ± 0.13 OUR AVERAGE					Error includes scale factor of 1.4. See the ideogram below.
$3.97 \pm 0.02 \pm 0.12$		31k	ABLIKIM	17L	BES3 $e^+e^- \rightarrow \Lambda\bar{\Lambda}$

$3.71 \pm 0.05 \pm 0.15$	6.5k	¹ DOBBS	17		$e^+e^- \rightarrow \Lambda\bar{\Lambda}$
$3.39 \pm 0.20 \pm 0.32$	337	ABLIKIM	07C	BES	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
$6.4 \pm 1.8 \pm 0.1$		² AUBERT	07BD	BABR	$10.6 e^+e^- \rightarrow \Lambda\bar{\Lambda}\gamma$
$3.28 \pm 0.23 \pm 0.25$	208	PEDLAR	05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
$3.75 \pm 0.09 \pm 0.23$	1.9k	^{1,3} DOBBS	14		$e^+e^- \rightarrow \Lambda\bar{\Lambda}$
$1.81 \pm 0.20 \pm 0.27$	80	⁴ BAI	01	BES	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
< 4	90	FELDMAN	77	MRK1	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

¹ Using CLEO-c data but not authored by the CLEO Collaboration.
² AUBERT 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 (shown rounded) value $\Gamma(\psi(2S) \rightarrow e^+e^-) = 2.33 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.
³ Superseded by DOBBS 17.
⁴ 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_{146}/Γ
VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$1.42 \pm 0.39 \pm 0.59$		23	¹ ABLIKIM 22AP	BES3	$\psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\gamma\gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
< 2.9	90		² ABLIKIM 13F	BES3	$\psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\gamma\gamma$
<120	90		³ ABLIKIM 07H	BES2	$e^+e^- \rightarrow \psi(2S)$

¹ With a significance of 3.7 σ . The corresponding 90% CL upper limit is 2.47×10^{-6} .
² Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\pi^0 \rightarrow \gamma\gamma) = 98.8\%$.
³ 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_{147}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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2.43±0.32 OUR AVERAGE2.34±0.18±0.52 218 ABLIKIM 22AP BES3 $\psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\gamma\gamma$ 2.48±0.34±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 $B(\Lambda \rightarrow \pi^- p) = 63.9\%$. $\Gamma(\Lambda\bar{\Lambda}\eta')/\Gamma_{\text{total}}$ Γ_{149}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
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7.34±0.94±0.43 218 ABLIKIM 23BV BES3 $\psi(2S) \rightarrow p\bar{p}2(\pi^+\pi^-)\gamma(\gamma)$ $\Gamma(\Lambda\bar{\Lambda}\omega(782))/\Gamma_{\text{total}}$ Γ_{150}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
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3.30±0.34±0.29 207 ¹ ABLIKIM 22AZ BES3 $e^+e^- \rightarrow \psi(2S)$ ¹ Using $B(\Lambda \rightarrow \pi^- p) = 0.639$ and $B(\omega \rightarrow \pi^+\pi^-\pi^0) = 0.893$. $\Gamma(\Lambda(1670)\bar{\Lambda} \rightarrow \Lambda\bar{\Lambda}\eta)/\Gamma_{\text{total}}$ Γ_{148}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
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1.29±0.31±0.62 116 ¹ ABLIKIM 22AP BES3 $\psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\gamma\gamma$ ¹ From a partial wave analysis of the $\Lambda\eta$ system. $\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{151}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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2.8±0.4±0.5 73.4 BRIERE 05 CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}2(\pi^+\pi^-)$ $\Gamma(\Lambda\bar{p}K^+)/\Gamma_{\text{total}}$ Γ_{152}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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1.0±0.1±0.1 74.0 BRIERE 05 CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}K^+\pi^-$ $\Gamma(\Lambda\bar{p}K^*(892)^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{153}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
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6.3±0.5±0.5 1011 ABLIKIM 19AU BES3 $e^+e^- \rightarrow \psi(2S)$ $\Gamma(\Lambda\bar{p}K^+\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{154}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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1.8±0.3±0.3 45.8 BRIERE 05 CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow p\bar{p}K^+\pi^+\pi^-\pi^-$ $\Gamma(\bar{\Lambda}nK_S^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{155}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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0.81±0.11±0.14 50 ¹ ABLIKIM 08C BES2 $e^+e^- \rightarrow J/\psi$ ¹ Using $B(\bar{\Lambda} \rightarrow \bar{p}\pi^+) = 63.9\%$ and $B(K_S^0 \rightarrow \pi^+\pi^-) = 69.2\%$.

$$\Gamma(\Delta^{++}\bar{\Delta}^{--})/\Gamma_{\text{total}} \quad \Gamma_{156}/\Gamma$$

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

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

$$\Gamma(\Lambda\bar{\Sigma}^+\pi^- + \text{c.c.})/\Gamma_{\text{total}} \quad \Gamma_{157}/\Gamma$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.40±0.03±0.13	2.8k	ABLIKIM	13W BES3	$\psi(2S) \rightarrow$ hadrons

$$\Gamma(\Lambda\bar{\Sigma}^-\pi^+ + \text{c.c.})/\Gamma_{\text{total}} \quad \Gamma_{158}/\Gamma$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.54±0.04±0.13	2.8k	ABLIKIM	13W BES3	$\psi(2S) \rightarrow$ hadrons

$$\Gamma(\Lambda\bar{\Sigma}^0 + \text{c.c.})/\Gamma_{\text{total}} \quad \Gamma_{159}/\Gamma$$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
1.60±0.31±0.59	60	ABLIKIM	21L BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons

$$\Gamma(\Lambda\bar{\Sigma}^0)/\Gamma_{\text{total}} \quad \Gamma_{160}/\Gamma$$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1.23±0.23±0.08	30	¹ DOBBS	17	$e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons
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¹ Using CLEO-c data but not authored by the CLEO Collaboration.

$$\Gamma(\Lambda\bar{\Sigma}^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}} \quad \Gamma_{161}/\Gamma$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.544±0.013±0.071	15.5k	¹ ABLIKIM	25AF BES3	$e^+e^- \rightarrow \psi(2S)$

¹ Using $B(\Lambda \rightarrow pK^-)$, $B(\Sigma^0 \rightarrow \Lambda\gamma)$ and $B(\pi^0 \rightarrow \gamma\gamma)$ from PDG 22, together with a partial wave analysis of the intermediate $\Lambda\pi^0$ and $\Sigma^0\pi^0$ resonances, $\Lambda(1405, 1520, 1600, 1670, 1690, 1800, 1890, 2325)$ and $\Sigma^0(1385, 1660, 1670, 1750, 1910)$.

$$\Gamma(\Lambda(1520)\bar{\Xi}^+K^- + \text{c.c.}, \Lambda(1520) \rightarrow pK^-)/\Gamma_{\text{total}} \quad \Gamma_{162}/\Gamma$$

VALUE (units 10^{-7})	EVTS	DOCUMENT ID	TECN	COMMENT
9.47±0.75±0.97	190	ABLIKIM	25AG BES3	$e^+e^- \rightarrow \psi(2S)$

$$\Gamma(\Sigma^0\bar{p}K^+ + \text{c.c.})/\Gamma_{\text{total}} \quad \Gamma_{163}/\Gamma$$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
1.67±0.13±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 $B(\Sigma^0 \rightarrow \Lambda\gamma) = 100\%$.

$$\Gamma(\Sigma^+\bar{\Sigma}^-)/\Gamma_{\text{total}} \quad \Gamma_{164}/\Gamma$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.43±0.10 OUR AVERAGE		Error includes scale factor of 1.4.		
2.52±0.04±0.09	5.4k	ABLIKIM	21AT BES3	$\psi(2S) \rightarrow p\pi^0\bar{p}\pi^0$
2.31±0.06±0.10	1.9k	¹ DOBBS	17	$e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons
2.57±0.44±0.68	35	PEDLAR	05 CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow$ hadrons

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

2.51±0.15±0.16 281 ^{1,2} DOBBS 14 $e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

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

² Superseded by DOBBS 17.

$\Gamma(\Sigma^0 \bar{\Sigma}^0)/\Gamma_{\text{total}}$ Γ_{165}/Γ

<u>VALUE (units 10⁻⁴)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.35±0.09 OUR AVERAGE		Error includes scale factor of 1.1.		
2.44±0.03±0.11	7k	ABLIKIM	17L BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
2.22±0.05±0.11	2.6k	¹ DOBBS	17	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
2.35±0.36±0.32	59	ABLIKIM	07C BES	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
2.63±0.35±0.21	58	PEDLAR	05 CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

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

2.25±0.11±0.16 439 ^{1,2} DOBBS 14 $e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
 1.2 ±0.4 ±0.4 8 ³ BAI 01 BES $e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

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

² Superseded by DOBBS 17.

³ Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

$\Gamma(\Sigma^- \bar{\Sigma}^+)/\Gamma_{\text{total}}$ Γ_{166}/Γ

<u>VALUE (units 10⁻⁴)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.82±0.04±0.08	6.6k	ABLIKIM	22AV BES3	$\psi(2S) \rightarrow n \pi^- \bar{n} \pi^+$

$\Gamma(\Sigma^+ \bar{\Sigma}^- \eta)/\Gamma_{\text{total}}$ Γ_{167}/Γ

<u>VALUE (units 10⁻⁶)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
9.59±2.37±0.61	21	ABLIKIM	22AY BES3	$\psi(2S) \rightarrow \Sigma^+ \bar{\Sigma}^- \eta$

$\Gamma(\Sigma^+ \bar{\Sigma}^- \omega)/\Gamma_{\text{total}}$ Γ_{168}/Γ

<u>VALUE (units 10⁻⁵)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.89±0.18±0.21	199	ABLIKIM	23BE BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

$\Gamma(\Sigma^0 \bar{\Sigma}^0 \omega(782))/\Gamma_{\text{total}}$ Γ_{169}/Γ

<u>VALUE (units 10⁻⁵)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.24±0.16±0.11	172	ABLIKIM	25W BES3	$e^+e^- \rightarrow \psi(2S)$

$\Gamma(\Sigma^+ \bar{\Sigma}^- \phi)/\Gamma_{\text{total}}$ Γ_{170}/Γ

<u>VALUE (units 10⁻⁶)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.96±0.54±0.41	55	ABLIKIM	23BE BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

$\Gamma(\Sigma^0 \bar{\Sigma}^0 \phi)/\Gamma_{\text{total}}$ Γ_{171}/Γ

<u>VALUE (units 10⁻⁶)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.64±0.32±0.12	108	¹ ABLIKIM	25Q BES3	$e^+e^- \rightarrow \psi(2S)$

¹ ABLIKIM 25Q result is the first observation of this decay.

$\Gamma(\Sigma(1385)^+\bar{\Sigma}(1385)^-)/\Gamma_{\text{total}}$ Γ_{172}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
8.5±0.7 OUR AVERAGE				
8.4±0.5±0.5	1.5k	ABLIKIM 16L	BES3	$\psi(2S) \rightarrow \Sigma(1385)^+\bar{\Sigma}(1385)^-$
11 ±3 ±3	14	¹ BAI 01	BES	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

¹ Estimated using $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.310 \pm 0.028$. $\Gamma(\Sigma(1385)^-\bar{\Sigma}(1385)^+)/\Gamma_{\text{total}}$ Γ_{173}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
8.5±0.6±0.6	1.4k	ABLIKIM 16L	BES3	$\psi(2S) \rightarrow \Sigma(1385)^-\bar{\Sigma}(1385)^+$

 $\Gamma(\Sigma(1385)^0\bar{\Sigma}(1385)^0)/\Gamma_{\text{total}}$ Γ_{174}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
0.69±0.05±0.05	2.2k	ABLIKIM 17E	BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

 $\Gamma(\Xi^-\bar{\Xi}^+)/\Gamma_{\text{total}}$ Γ_{175}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
2.87±0.11 OUR AVERAGE					Error includes scale factor of 1.1.
3.03±0.05±0.14		3.6k	¹ DOBBS 17		$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
2.78±0.05±0.14		5k	ABLIKIM 16L	BES3	$\psi(2S) \rightarrow \Xi^-\bar{\Xi}^+$
3.03±0.40±0.32		67	ABLIKIM 07C	BES	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
2.38±0.30±0.21		63	PEDLAR 05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

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

2.66±0.12±0.20		548	^{1,2} DOBBS 14		$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
0.94±0.27±0.15		12	³ BAI 01	BES	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
<2		90	FELDMAN 77	MRK1	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

¹ Using CLEO-c data but not authored by the CLEO Collaboration.² Superseded by DOBBS 17.³ Estimated using $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.310 \pm 0.028$. $\Gamma(\Xi^0\bar{\Xi}^0)/\Gamma_{\text{total}}$ Γ_{176}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.3 ±0.4 OUR AVERAGE				Error includes scale factor of 4.2.
2.73±0.03±0.13	11k	ABLIKIM 17E	BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
1.97±0.06±0.11	1.2k	¹ DOBBS 17		$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
2.75±0.64±0.61	19	PEDLAR 05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

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

2.02±0.19±0.15	112	^{1,2} DOBBS 14		$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
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¹ Using CLEO-c data but not authored by the CLEO Collaboration.² Superseded by DOBBS 17. $\Gamma(\Xi(1530)^0\bar{\Xi}(1530)^0)/\Gamma_{\text{total}}$ Γ_{177}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
6.77±0.14±0.39		2951	ABLIKIM 21AO	BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

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

<32	90	PEDLAR 05	CLEO	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
< 8.1	90	¹ BAI 01	BES	$e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

¹ Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$. $\Gamma(\Lambda_{\Xi}^+ K^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{178}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.67±0.22 OUR AVERAGE				
3.60±0.10±0.24	1572	ABLIKIM	24N BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^- \Lambda_{\Xi}^+ + \text{c.c.}$
3.86±0.27±0.32	236	ABLIKIM	15I BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^- \Lambda_{\Xi}^+ + \text{c.c.}$

 $\Gamma(\Xi(1530)^- \Xi(1530)^+)/\Gamma_{\text{total}}$ Γ_{181}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
11.45±0.40±0.59	5k	ABLIKIM	19AT BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

 $\Gamma(\Xi(1530)^- \Xi^+)/\Gamma_{\text{total}}$ Γ_{182}/Γ

<u>VALUE (units 10^{-6})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
7.0±1.1±0.4	399	ABLIKIM	19AT BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

 $\Gamma(\Xi(1530)^0 \Xi^0)/\Gamma_{\text{total}}$ Γ_{183}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.53±0.04±0.03	278	ABLIKIM	21AO BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

 $\Gamma(\Xi(1690)^- \Xi^+ \rightarrow K^- \Lambda_{\Xi}^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{179}/Γ

<u>VALUE (units 10^{-6})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
6.2 ±2.1 OUR AVERAGE	Error	includes scale factor of 1.5.		
10.6 ±1.0 ±3.1	464	ABLIKIM	24N BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^- \Lambda_{\Xi}^+ + \text{c.c.}$
5.21±1.48±0.57	74	ABLIKIM	15I BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^- \Lambda_{\Xi}^+ + \text{c.c.}$

 $\Gamma(\Xi(1820)^- \Xi^+ \rightarrow K^- \Lambda_{\Xi}^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{180}/Γ

<u>VALUE (units 10^{-6})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
14.8 ±2.9 OUR AVERAGE	Error	includes scale factor of 1.2.		
17.8 ±1.0 ±3.2	776	ABLIKIM	24N BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^- \Lambda_{\Xi}^+ + \text{c.c.}$
12.03±2.94±1.22	136	ABLIKIM	15I BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^- \Lambda_{\Xi}^+ + \text{c.c.}$

 $\Gamma(\Sigma^0 \Xi^+ K^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{184}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.67±0.33±0.28	142	ABLIKIM	15I BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^- \Sigma^0 \Xi^+ + \text{c.c.}$

 $\Gamma(\Omega^- K^+ \Xi^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{185}/Γ

<u>VALUE (units 10^{-6})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.78±0.40±0.18	242	ABLIKIM	24AG BES3	$e^+ e^- \rightarrow \psi(2S)$

$$\Gamma(\bar{\Omega}^+ K_S^0 \Xi^- + \text{c.c.})/\Gamma_{\text{total}} \quad \Gamma_{186}/\Gamma$$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$2.91 \pm 0.47 \pm 0.33$	224	ABLIKIM	25AJ BES3	$e^+ e^- \rightarrow \psi(2S)$

$$\Gamma(\Omega^- \bar{\Omega}^+)/\Gamma_{\text{total}} \quad \Gamma_{187}/\Gamma$$

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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5.66 ± 0.30 OUR AVERAGE Error includes scale factor of 1.3.

$5.85 \pm 0.12 \pm 0.25$	4k	¹ ABLIKIM	21E BES3	$\psi(2S) \rightarrow \Omega^- \bar{\Omega}^+ \rightarrow \Lambda K^- \bar{\Lambda} K^+$
$5.2 \pm 0.3 \pm 0.3$	326	^{1,2} DOBBS	17	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

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

$4.7 \pm 0.9 \pm 0.5$	27	^{1,2,3} DOBBS	14	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
<15	90	ABLIKIM	12Q BES2	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
<16	90	PEDLAR	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
< 7.3	90	⁴ BAI	01 BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

¹ Using $B(\Omega^- \rightarrow \Lambda K^-) = (67.8 \pm 0.7)\%$ and $B(\Lambda \rightarrow p \pi^-) = (63.9 \pm 0.5)\%$.

² Using CLEO-c data but not authored by the CLEO Collaboration.

³ Superseded by DOBBS 17.

⁴ Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

$$\Gamma(\eta_c \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}} \quad \Gamma_{188}/\Gamma$$

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

$$\Gamma(h_c(1P) \pi^0)/\Gamma_{\text{total}} \quad \Gamma_{189}/\Gamma$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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7.4 ± 0.5 OUR AVERAGE

$7.32 \pm 0.34 \pm 0.41$	46k	ABLIKIM	22AQ BES3	$\psi(2S) \rightarrow \pi^0 \text{ hadrons}$
$9.0 \pm 1.5 \pm 1.3$	3k	¹ GE	11 CLEO	$\psi(2S) \rightarrow \pi^0 \text{ anything}$

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

$8.4 \pm 1.3 \pm 1.0$	11k	² ABLIKIM	10B BES3	$\psi(2S) \rightarrow \pi^0 h_c$
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.

² Superseded by ABLIKIM 22AQ

$$\Gamma(\Lambda_c^+ \bar{p} e^+ e^- + \text{c.c.})/\Gamma_{\text{total}} \quad \Gamma_{190}/\Gamma$$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<1.7 × 10 ⁻⁶	90	450M	ABLIKIM	18Q BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\Theta(1540)\bar{\Theta}(1540) \rightarrow K_S^0 p K^- \bar{n} + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{191}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<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_{192}/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_{193}/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_{194}/Γ

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

$\Gamma(\bar{\Theta}(1540)K_S^0 p \rightarrow K_S^0 p K^- \bar{n})/\Gamma_{\text{total}}$ Γ_{195}/Γ

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

————— RADIATIVE DECAYS —————

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma_{\text{total}}$ Γ_{196}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
10.06 ± 0.27 OUR FIT				Error includes scale factor of 1.4.
9.33 ± 0.26 OUR AVERAGE				
9.389 ± 0.014 ± 0.332	4.7M	ABLIKIM	17U BES3	$e^+ e^- \rightarrow \gamma X$
9.22 ± 0.11 ± 0.46	72k	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	$e^+ e^-$

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

$\Gamma(\gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$ Γ_{197}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
9.85 ± 0.26 OUR FIT				Error includes scale factor of 1.2.
9.54 ± 0.29 OUR AVERAGE				
9.905 ± 0.011 ± 0.353	5.0M	ABLIKIM	17U BES3	$e^+ e^- \rightarrow \gamma X$
9.07 ± 0.11 ± 0.54	76k	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	$e^+ e^- \rightarrow \gamma X$

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

² Valid for isotropic distribution of the photon.

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c1}(1P))$ $\Gamma_{196}/\Gamma_{197}$

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	$e^+ e^- \rightarrow \gamma X$

¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

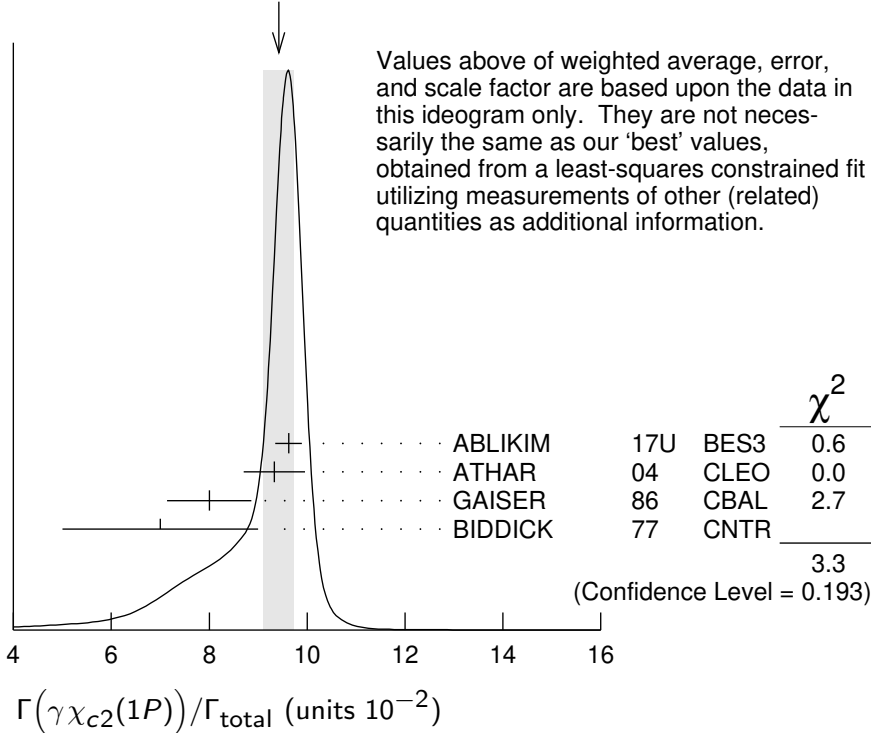
$\Gamma(\gamma\chi_{c2}(1P))/\Gamma_{\text{total}}$ Γ_{198}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
9.63 ± 0.23 OUR FIT				Error includes scale factor of 1.2.
9.42 ± 0.31 OUR AVERAGE				Error includes scale factor of 1.3. See the ideogram below.
9.621 ± 0.013 ± 0.272	4.2M	ABLIKIM	17U BES3	$e^+e^- \rightarrow \gamma X$
9.33 ± 0.14 ± 0.61	79k	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.

WEIGHTED AVERAGE
9.42 ± 0.31 (Error scaled by 1.3)



$[\Gamma(\gamma\chi_{c0}(1P)) + \Gamma(\gamma\chi_{c1}(1P)) + \Gamma(\gamma\chi_{c2}(1P))]/\Gamma_{\text{total}}$ ($\Gamma_{196} + \Gamma_{197} + \Gamma_{198}$)/ Γ

VALUE	DOCUMENT ID	TECN	COMMENT
27.6 ± 0.3 ± 2.0	¹ ATHAR	04 CLEO	$e^+e^- \rightarrow \gamma X$

¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c2}(1P))$ $\Gamma_{196}/\Gamma_{198}$

VALUE	DOCUMENT ID	TECN	COMMENT
0.99 ± 0.02 ± 0.08	¹ ATHAR	04 CLEO	$e^+e^- \rightarrow \gamma X$

¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

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

$\Gamma_{198}/\Gamma_{197}$

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 $e^+e^- \rightarrow \gamma X$

¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

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

Γ_{199}/Γ

VALUE (units 10⁻²) EVTS DOCUMENT ID TECN COMMENT

0.36 ±0.05 OUR FIT Error includes scale factor of 1.3.

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 $e^+e^- \rightarrow \gamma X$

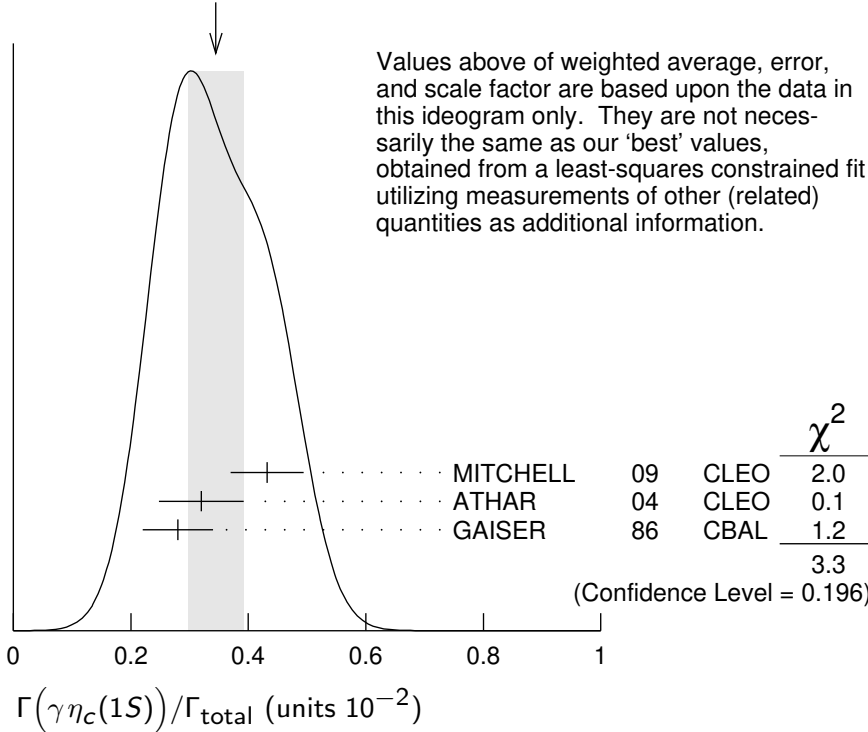
0.32 ±0.04 ±0.06 2.5k ¹ ATHAR 04 CLEO $e^+e^- \rightarrow \gamma X$

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.

WEIGHTED AVERAGE
0.34±0.05 (Error scaled by 1.3)



Values above of weighted average, error, and scale factor are based upon the data in this ideogram only. They are not necessarily the same as our 'best' values, obtained from a least-squares constrained fit utilizing measurements of other (related) quantities as additional information.

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

Γ_{200}/Γ

VALUE (units 10⁻⁴) CL% EVTS DOCUMENT ID TECN COMMENT

5.4^{+3.4}_{-2.9} OUR FIT

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

5.1±0.6^{+2.7}_{-3.1} 1.6k ¹ ABLIKIM 24J BES3 $\psi(2S) \rightarrow \gamma\eta_c \rightarrow \gamma K \bar{K} \pi$

7 ±2 ±4 ² ABLIKIM 12G BES3 $\psi(2S) \rightarrow \gamma K^0 K \pi, K K \pi^0$

< 8	90	³ 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 24J reports $[\Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S))/\Gamma_{\text{total}}] \times [B(\eta_c(2S) \rightarrow K \bar{K} \pi)] = (0.97 \pm 0.06 \pm 0.09) \times 10^{-5}$ which we divide by our best (shown rounded) value $B(\eta_c(2S) \rightarrow K \bar{K} \pi) = (1.9^{+1.2}_{-1.0}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

² 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 (shown rounded) value $B(\eta_c(2S) \rightarrow K \bar{K} \pi) = (1.9^{+1.2}_{-1.0}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

³ 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 (shown rounded) 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_{201}/Γ

<u>VALUE (units 10^{-7})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.7 to 9.7	68		¹ ABLIKIM	24BS BES3	$\psi(2S) \rightarrow \gamma \pi^0$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
$9.5 \pm 1.6 \pm 0.5$		423	² ABLIKIM	17X BES3	$\psi(2S) \rightarrow \gamma \pi^0$
$15.8 \pm 4.0 \pm 1.3$		37	² ABLIKIM	10F BES3	$\psi(2S) \rightarrow \gamma \pi^0$
< 50	90		PEDLAR	09 CLE3	$\psi(2S) \rightarrow \gamma X$
< 54000	95		³ LIBERMAN	75 SPEC	$e^+ e^-$
< 100000	90		WIJK	75 DASP	$e^+ e^-$

¹ Taking into account interference between $\psi(2S)$ and continuum amplitudes. Range of the 1σ contour in the plane of $B(\psi(2S) \rightarrow \gamma \pi^0)$ versus ϕ , the relative phase of the amplitudes. The fit provides two solutions for $B(\psi(2S) \rightarrow \gamma \pi^0)$: 3.74×10^{-7} ($\phi = 3.93$ rad) and 7.87×10^{-7} ($\phi = 2.08$ rad).

² Interference between $\psi(2S)$ and the continuum is not taken into account.

³ Restated by us using $B(\psi(2S) \rightarrow \mu^+ \mu^-) = 0.0077$.

$\Gamma(\gamma 2(\pi^+ \pi^-))/\Gamma_{\text{total}}$ Γ_{202}/Γ

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

$\Gamma(\gamma 3(\pi^+ \pi^-))/\Gamma_{\text{total}}$ Γ_{203}/Γ

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

$\Gamma(\gamma \eta'(958))/\Gamma_{\text{total}}$ Γ_{204}/Γ

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.24 ± 0.04 OUR AVERAGE					
$1.251 \pm 0.022 \pm 0.062$		56k	ABLIKIM	17X BES3	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- \eta,$ $\gamma \pi^0 \pi^0 \eta$
$1.26 \pm 0.03 \pm 0.08$		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_{205}/Γ

VALUE (units 10⁻⁴) EVTS DOCUMENT ID TECN COMMENT

2.73^{+0.29}_{-0.25} OUR AVERAGE Error includes scale factor of 1.8.

2.84 ±0.15 ^{+0.03} _{-0.10}	1.9k	1,2 DOBBS	15		$\psi(2S) \rightarrow \gamma \pi \pi$
2.12 ±0.19 ±0.32		3,4 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	³ BAI	03C	BES	$\psi(2S) \rightarrow \gamma \pi^+ \pi^-$
2.90 ±1.08 ±1.07	29.9 ± 11.1	³ BAI	03C	BES	$\psi(2S) \rightarrow \gamma \pi^0 \pi^0$

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

² DOBBS 15 reports $[\Gamma(\psi(2S) \rightarrow \gamma f_2(1270))/\Gamma_{\text{total}}] \times [B(f_2(1270) \rightarrow \pi\pi)] = (2.39 \pm 0.09 \pm 0.09) \times 10^{-4}$ which we divide by our best (shown rounded) value $B(f_2(1270) \rightarrow \pi\pi) = (84.3^{+2.8}_{-1.0}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

³ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

⁴ Combining the results from $\pi^+ \pi^-$ and $\pi^0 \pi^0$ decay modes.

$\Gamma(\gamma f_2(1270) \rightarrow \gamma K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{206}/Γ

VALUE (units 10⁻⁶) DOCUMENT ID TECN COMMENT

2.1^{+0.4}_{-0.5} ±0.8 ABLIKIM 25CD BES3 $e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\gamma f_0(1370) \rightarrow \gamma K \bar{K})/\Gamma_{\text{total}}$ Γ_{207}/Γ

VALUE (units 10⁻⁵) EVTS DOCUMENT ID COMMENT

3.1 ±1.0 ±1.4 175 ¹ DOBBS 15 $\psi(2S) \rightarrow \gamma K \bar{K}$

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

$\Gamma(\gamma f_0(1370) \rightarrow \gamma K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{208}/Γ

VALUE (units 10⁻⁶) DOCUMENT ID TECN COMMENT

1.2^{+2.8}_{-0.7} ±1.6 ABLIKIM 25CD BES3 $e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\gamma f_0(1500))/\Gamma_{\text{total}}$ Γ_{209}/Γ

VALUE (units 10⁻⁵) EVTS DOCUMENT ID COMMENT

9.3 ±1.8 ±0.6 274 ^{1,2} DOBBS 15 $\psi(2S) \rightarrow \gamma \pi \pi$

¹ DOBBS 15 reports $[\Gamma(\psi(2S) \rightarrow \gamma f_0(1500))/\Gamma_{\text{total}}] \times [B(f_0(1500) \rightarrow \pi\pi)] = (3.2 \pm 0.6 \pm 0.2) \times 10^{-5}$ which we divide by our best (shown rounded) value $B(f_0(1500) \rightarrow \pi\pi) = (34.5 \pm 2.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

² Using CLEO-c data but not authored by the CLEO Collaboration.

$\Gamma(\gamma f_0(1500) \rightarrow \gamma K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{210}/Γ

<u>VALUE (units 10^{-6})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$1.7^{+1.4}_{-0.7} \pm 1.0$	ABLIKIM	25CD BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\gamma f'_2(1525))/\Gamma_{\text{total}}$ Γ_{211}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>COMMENT</u>
$3.3 \pm 0.8 \pm 0.1$	136	^{1,2} DOBBS 15	$\psi(2S) \rightarrow \gamma K \bar{K}$

¹ DOBBS 15 reports $[\Gamma(\psi(2S) \rightarrow \gamma f'_2(1525))/\Gamma_{\text{total}}] \times [B(f'_2(1525) \rightarrow K \bar{K})] = (2.9 \pm 0.6 \pm 0.3) \times 10^{-5}$ which we divide by our best (shown rounded) value $B(f'_2(1525) \rightarrow K \bar{K}) = (88.8 \pm 2.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

² Using CLEO-c data but not authored by the CLEO Collaboration.

$\Gamma(\gamma f'_2(1525) \rightarrow \gamma K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{212}/Γ

<u>VALUE (units 10^{-6})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$1.4^{+0.5}_{-0.4} \pm 0.4$	ABLIKIM	25CD BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\gamma f_0(1710) \rightarrow \gamma \pi \pi)/\Gamma_{\text{total}}$ Γ_{214}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.5 ± 0.6 OUR AVERAGE				
$3.6 \pm 0.4 \pm 0.5$	290	¹ DOBBS 15		$\psi(2S) \rightarrow \gamma \pi \pi$
$3.01 \pm 0.41 \pm 1.24$	35.6 ± 4.8	² BAI	03C BES	$\psi(2S) \rightarrow \gamma \pi^+ \pi^-$

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

² 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_{215}/Γ

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
6.6 ± 0.7 OUR AVERAGE					
$6.7 \pm 0.6 \pm 0.6$		375	¹ DOBBS 15		$\psi(2S) \rightarrow \gamma K \bar{K}$
$6.04 \pm 0.90 \pm 1.32$	39.6 ± 5.9		^{2,3} BAI	03C BES	$\psi(2S) \rightarrow \gamma K^+ K^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
< 15.6	90	6.8 ± 3.1	^{2,3} BAI	03C BES	$\psi(2S) \rightarrow \gamma K_S^0 K_S^0$

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

² 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.

³ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(\gamma f_0(1710) \rightarrow \gamma K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{216}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
$18.3^{+2.7}_{-2.0} \pm 1.8$	ABLIKIM	25CD BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\gamma f_2(1950) \rightarrow \gamma K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{217}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
$1.2^{+0.8}_{-0.5} \pm 0.6$	ABLIKIM	25CD BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\gamma f_0(2020) \rightarrow \gamma K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{218}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
$4.6^{+0.8}_{-0.7} \pm 1.3$	ABLIKIM	25CD BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(\gamma f_0(2100) \rightarrow \gamma \pi \pi)/\Gamma_{\text{total}}$ Γ_{219}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$4.8 \pm 0.5 \pm 0.9$	373	¹ DOBBS	15	$\psi(2S) \rightarrow \gamma \pi \pi$

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

$\Gamma(\gamma f_0(2200) \rightarrow \gamma K \bar{K})/\Gamma_{\text{total}}$ Γ_{220}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.2 \pm 0.6 \pm 0.8$	207	¹ DOBBS	15	$\psi(2S) \rightarrow \gamma K \bar{K}$

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

$\Gamma(\gamma f_J(2220) \rightarrow \gamma \pi \pi)/\Gamma_{\text{total}}$ Γ_{221}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 5.8 \times 10^{-6}$	90	^{1,2} DOBBS	15	$\psi(2S) \rightarrow \gamma \pi \pi$

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

² For $\Gamma = 20/50$ MeV, the 90% CL upper limits for $\pi^+ \pi^-$ and $\pi^0 \pi^0$ are $3.2/4.3 \times 10^{-6}$ and $2.6/4.0 \times 10^{-6}$, respectively.

$\Gamma(\gamma f_J(2220) \rightarrow \gamma K \bar{K})/\Gamma_{\text{total}}$ Γ_{222}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 9.5 \times 10^{-6}$	90	^{1,2} DOBBS	15	$\psi(2S) \rightarrow \gamma K \bar{K}$

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

² For $\Gamma = 20/50$ MeV, the 90% CL upper limits for $K^+ K^-$ and $K_S^0 K_S^0$ are $2.1/4.3 \times 10^{-6}$ and $3.7/5.5 \times 10^{-6}$, respectively.

$\Gamma(\gamma \eta)/\Gamma_{\text{total}}$ Γ_{223}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.92 ± 0.18 OUR AVERAGE					
$0.85 \pm 0.18 \pm 0.04$		382	¹ ABLIKIM	17X BES3	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- \pi^0, \gamma 3\pi^0$
$1.38 \pm 0.48 \pm 0.09$		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_{224}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
8.71±1.25±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_{226}/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 $\eta(1405) \rightarrow K \bar{K} \pi$.

$\Gamma(\gamma\eta(1405) \rightarrow \gamma\eta\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{227}/Γ

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

$\Gamma(\gamma\eta(1405) \rightarrow \gamma f_0(980) \pi^0 \rightarrow \gamma \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ Γ_{228}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<5.0 × 10⁻⁷	90	ABLIKIM	17AJ	BES3 $\psi(2S) \rightarrow \gamma \pi^+ \pi^- \pi^0$

$\Gamma(\gamma\eta(1475) \rightarrow \gamma K \bar{K} \pi)/\Gamma_{\text{total}}$ Γ_{230}/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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$\Gamma(\gamma\eta(1475) \rightarrow \gamma\eta\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{231}/Γ

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

$\Gamma(\gamma K^{*0} K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{232}/Γ

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

$\Gamma(\gamma K^{*0} \bar{K}^{*0})/\Gamma_{\text{total}}$ Γ_{233}/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_{234}/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_{235}/Γ

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

$\Gamma(\gamma K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}$ Γ_{236}/Γ

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

$\Gamma(\gamma 2(K^+ K^-))/\Gamma_{\text{total}}$ Γ_{237}/Γ

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

$\Gamma(\gamma p\bar{p})/\Gamma_{\text{total}}$ Γ_{238}/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 $e^+ e^- \rightarrow \psi(2S)$

¹From 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_{239}/Γ

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

¹From 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_{240}/Γ

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

¹From 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_{241}/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_{242}/Γ For a narrow resonance in the range $2.2 < M(X) < 2.8$ GeV.

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

 $\Gamma(\gamma p \bar{p} \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{243}/Γ

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

 $\Gamma(\gamma \gamma J/\psi)/\Gamma_{\text{total}}$ Γ_{245}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.1 ± 0.6^{+0.8}_{-1.0}	1.1k	ABLIKIM 120	BES3	$e^+ e^- \rightarrow \psi(2S)$

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

3.2 ± 0.6 1.1k ¹ABLIKIM 17N BES3 $\psi(2S) \rightarrow \gamma \gamma J/\psi$ ¹ Uses $B(J/\psi \rightarrow e^+ e^-) = (5.971 \pm 0.032)\%$ and $B(J/\psi \rightarrow \mu^+ \mu^-) = (5.961 \pm 0.033)\%$. No systematic error estimation. $\Gamma(e^+ e^- \eta')/\Gamma_{\text{total}}$ Γ_{246}/Γ

<u>VALUE (units 10^{-6})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.90 ± 0.26 OUR AVERAGE				
1.99 ± 0.33 ± 0.12	57	ABLIKIM 18Z	BES3	$\psi(2S) \rightarrow \eta' e^+ e^-$, $\eta' \rightarrow \gamma \pi^+ \pi^-$
1.79 ± 0.38 ± 0.11	20	ABLIKIM 18Z	BES3	$\psi(2S) \rightarrow \eta' e^+ e^-$, $\eta' \rightarrow \eta \pi^+ \pi^-$

 $\Gamma(e^+ e^- \eta_c(1S))/\Gamma_{\text{total}}$ Γ_{247}/Γ

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.77 ± 0.40 ± 0.18	3k	¹ ABLIKIM 22AX	BES3	$e^+ e^- \rightarrow \psi(2S)$

¹ From a fit to the recoil mass distribution of $e^+ e^-$ with inclusive $\eta_c(1S)$ decays. $\Gamma(e^+ e^- \chi_{c0}(1P))/\Gamma_{\text{total}}$ Γ_{248}/Γ

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
11.0 ± 2.5 ± 0.7	48	¹ ABLIKIM 17i	BES3	$\psi(2S) \rightarrow e^+ e^- \gamma J/\psi$

¹ ABLIKIM 17i reports $(11.7 \pm 2.5 \pm 1.0) \times 10^{-4}$ from a measurement of $[\Gamma(\psi(2S) \rightarrow e^+ e^- \chi_{c0}(1P))/\Gamma_{\text{total}}] \times [B(\chi_{c0}(1P) \rightarrow \gamma J/\psi(1S))]$ assuming $B(\chi_{c0}(1P) \rightarrow \gamma J/\psi(1S)) = (1.27 \pm 0.06) \times 10^{-2}$, which we rescale to our best (shown rounded) value $B(\chi_{c0}(1P) \rightarrow \gamma J/\psi(1S)) = (1.35 \pm 0.09) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. $\Gamma(e^+ e^- \chi_{c0}(1P))/\Gamma(\gamma \chi_{c0}(1P))$ $\Gamma_{248}/\Gamma_{196}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
9.4 ± 1.9 ± 0.6	48	¹ ABLIKIM 17i	BES3	$\psi(2S) \rightarrow e^+ e^- \gamma J/\psi$

¹ Uses $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) \times B(\chi_{c0}(1P) \rightarrow \gamma J/\psi(1S)) = (15.8 \pm 0.3 \pm 0.6) \times 10^{-4}$ from ABLIKIM 17N and accounts for common systematic errors.

$\Gamma(e^+ e^- \chi_{c1}(1P))/\Gamma_{\text{total}}$ Γ_{249}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$8.6 \pm 0.3 \pm 0.6$	873	¹ ABLIKIM 17I	BES3	$\psi(2S) \rightarrow e^+ e^- \gamma J/\psi$

¹ ABLIKIM 17I reports $(8.6 \pm 0.3 \pm 0.6) \times 10^{-4}$ from a measurement of $[\Gamma(\psi(2S) \rightarrow e^+ e^- \chi_{c1}(1P))/\Gamma_{\text{total}}] \times [B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))]$ assuming $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = (33.9 \pm 1.2) \times 10^{-2}$.

$\Gamma(e^+ e^- \chi_{c1}(1P))/\Gamma(\gamma \chi_{c1}(1P))$ $\Gamma_{249}/\Gamma_{197}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$8.3 \pm 0.3 \pm 0.4$	873	¹ ABLIKIM 17I	BES3	$\psi(2S) \rightarrow e^+ e^- \gamma J/\psi$

¹ Uses $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) \times B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = (351.8 \pm 1.0 \pm 12.0) \times 10^{-4}$ from ABLIKIM 17N and accounts for common systematic errors.

$\Gamma(e^+ e^- \chi_{c2}(1P))/\Gamma_{\text{total}}$ Γ_{250}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$7.0 \pm 0.7 \pm 0.3$	227	¹ ABLIKIM 17I	BES3	$\psi(2S) \rightarrow e^+ e^- \gamma J/\psi$

¹ ABLIKIM 17I reports $(6.9 \pm 0.5 \pm 0.6) \times 10^{-4}$ from a measurement of $[\Gamma(\psi(2S) \rightarrow e^+ e^- \chi_{c2}(1P))/\Gamma_{\text{total}}] \times [B(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S))]$ assuming $B(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) = (19.2 \pm 0.7) \times 10^{-2}$, which we rescale to our best (shown rounded) value $B(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) = (19.0 \pm 0.8) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

$\Gamma(e^+ e^- \chi_{c2}(1P))/\Gamma(\gamma \chi_{c2}(1P))$ $\Gamma_{250}/\Gamma_{198}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$6.6 \pm 0.5 \pm 0.4$	227	¹ ABLIKIM 17I	BES3	$\psi(2S) \rightarrow e^+ e^- \gamma J/\psi$

¹ Uses $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) \times B(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) = (199.6 \pm 0.8 \pm 7.0) \times 10^{-4}$ from ABLIKIM 17N and accounts for common systematic errors.

———— WEAK DECAYS ————

$\Gamma(D^0 e^+ e^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{251}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 1.4 \times 10^{-7}$	90	¹ ABLIKIM 17AF	BES3	$e^+ e^- \rightarrow \psi(2S)$

¹ Using D^0 decays to $K^- \pi^+$, $K^- \pi^+ \pi^0$, and $K^- \pi^+ \pi^+ \pi^-$.

$\Gamma(\Lambda_c^+ \bar{\Sigma}^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{252}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 1.4 \times 10^{-5}$	90	¹ ABLIKIM 23	BES3	$e^+ e^- \rightarrow \psi(2S)$

¹ Using $\Lambda_c^+ \rightarrow p K^- \pi^+$ and $\bar{\Sigma}^- \rightarrow \bar{p} \pi^0$.

———— OTHER DECAYS ————

$\Gamma(\text{invisible})/\Gamma(e^+ e^-)$ Γ_{253}/Γ_7

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 2.0	90	LEES 13I	BABR	$B \rightarrow K^{(*)} \psi(2S)$

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

For measurements involving $B(\psi(2S) \rightarrow \gamma \eta_c(2S)) \times B(\eta_c(2S) \rightarrow X)$ see the corresponding entries in the $\eta_c(2S)$ 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
63 ± 7 OUR AVERAGE				
61.7 ± 8.3	253k	¹ ABLIKIM	17N BES3	$\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$
67 ⁺¹⁹ ₋₁₃	59k	² ARTUSO	09 CLEO	$\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$

¹ Statistical and systematic errors combined.

² Statistical and systematic errors combined. Using values from fits with floating $M2$ amplitudes $a_2(\chi_{c1})$, $a_2(\chi_{c2})$, $b_2(\chi_{c1})$, $b_2(\chi_{c2})$ and fixed $E3$ amplitudes of $a_3(\chi_{c2}) = b_3(\chi_{c2}) = 0$. Not independent of values for $a_2(\chi_{c1}(1P))$ and $a_2(\chi_{c2}(1P))$ from ARTUSO 09.

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
60 ± 31 OUR AVERAGE				
74 ± 40	253k	¹ ABLIKIM	17N BES3	$\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$
37 ⁺⁵³ ₋₄₇	59k	² ARTUSO	09 CLEO	$\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$

¹ Statistical and systematic errors combined. Derived from the reported measurement of $b_2(\chi_{c1})/b_2(\chi_{c2}) = 1.35 \pm 0.72$.

² Statistical and systematic errors combined. Using values from fits with floating $M2$ amplitudes $a_2(\chi_{c1})$, $a_2(\chi_{c2})$, $b_2(\chi_{c1})$, $b_2(\chi_{c2})$ and fixed $E3$ amplitudes of $a_3(\chi_{c2}) = b_3(\chi_{c2}) = 0$. Not independent of values for $b_2(\chi_{c1}(1P))$ and $b_2(\chi_{c2}(1P))$ from ARTUSO 09.

$\psi(2S)$ REFERENCES

ABLIKIM	25AF	JHEP 2502 212	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25AG	JHEP 2503 145	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25AJ	JHEP 2506 233	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25BY	PR D112 112017	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25CC	PR D112 052010	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25CD	JHEP 2510 081	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25E	PRL 134 191901	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25M	PR D111 032011	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25P	PR D111 052011	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25Q	PR D111 052012	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	25W	PR D111 092007	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	24AG	JHEP 2404 013	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	24BS	PR D110 052011	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	24J	PR D109 032004	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	24N	PR D109 072008	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	24O	PR D109 072015	M. Ablikim <i>et al.</i>	(BESIII Collab.)
AAIJ	23AP	JHEP 2307 084	R. Aaij <i>et al.</i>	(LHCb Collab.)
ABLIKIM	23	CP C47 013002	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	23BA	PR D108 052001	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	23BE	PR D108 092011	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	23BV	PR D108 112014	M. Ablikim <i>et al.</i>	(BESIII Collab.)
LEES	23	PR D107 072001	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LIAO	23	PR D107 112007	L. Liao <i>et al.</i>	

ABLIKIM	22AP	PR D106 072006	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	22AQ	PR D106 072007	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	22AV	JHEP 2212 016	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	22AX	PR D106 112002	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	22AY	PR D106 112007	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	22AZ	PR D106 112011	M. Ablikim <i>et al.</i>	(BESIII Collab.)
PDG	22	PTEP 2022 083C01	R.L. Workman <i>et al.</i>	(PDG Collab.)
ABLIKIM	21AL	PR D104 092003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	21AO	PR D104 092012	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	21AT	JHEP 2111 226	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	21E	PRL 126 092002	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	21L	PR D103 112004	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	21S	PL B820 136576	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	21Z	PRL 127 082002	M. Ablikim <i>et al.</i>	(BESIII Collab.)
LEES	21	PR D103 092001	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	21C	PR D104 112004	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ABLIKIM	20F	PR D101 032008	M. Ablikim <i>et al.</i>	(BESIII Collab.)
PDG	20	PTEP 2020 083C01	P.A. Zyla <i>et al.</i>	(PDG Collab.)
ABLIKIM	19AO	PR D99 112010	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	19AT	PR D100 051101	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	19AU	PR D100 052010	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	19BA	PR D100 092003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	19I	PR D99 012014	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	19N	PR D99 032006	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	18Q	PR D97 091102	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	18T	PR D98 032006	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	18Z	PL B783 452	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ANASHIN	18	PL B781 174	V.V. Anashin <i>et al.</i>	(KEDR Collab.)
LEES	18E	PR D98 112015	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ABLIKIM	17AF	PR D96 111101	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	17AJ	PR D96 112008	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	17AK	PR D96 112012	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	17E	PL B770 217	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	17I	PRL 118 221802	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	17L	PR D95 052003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	17N	PR D95 072004	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	17U	PR D96 032001	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	17X	PR D96 052003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
DOBBS	17	PR D96 092004	S. Dobbs <i>et al.</i>	(NWES, WAYN)
LEES	17A	PR D95 052001	J.P. Lees <i>et al.</i>	(BABAR Collab.)
AAIJ	16Y	JHEP 1605 132	R. Aaij <i>et al.</i>	(LHCb Collab.)
ABLIKIM	16L	PR D93 072003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	15I	PR D91 092006	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	15V	PL B749 414	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ANASHIN	15	PL B749 50	V.V. Anashin <i>et al.</i>	(KEDR Collab.)
DOBBS	15	PR D91 052006	S. Dobbs <i>et al.</i>	(NWES)
LEES	15J	PR D92 072008	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ABLIKIM	14G	PR D89 112006	M. Ablikim <i>et al.</i>	(BESIII Collab.)
DOBBS	14	PL B739 90	S. Dobbs <i>et al.</i>	(NWES, WAYN)
ABLIKIM	13A	PRL 110 022001	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	13D	PR D87 012007	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	13F	PR D87 052007	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	13M	PR D87 092006	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	13R	PR D88 032007	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	13S	PR D88 032010	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	13W	PR D88 112007	M. Ablikim <i>et al.</i>	(BESIII Collab.)
LEES	13I	PR D87 112005	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	13O	PR D87 092005	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	13Q	PR D88 032013	J.P. Lees <i>et al.</i>	(BABAR Collab.)
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AAIJ	12H	EPJ C72 1972	R. Aaij <i>et al.</i>	(LHCb Collab.)
ABLIKIM	12D	PRL 108 112003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	12G	PRL 109 042003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	12H	PL B710 594	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	12L	PR D86 072011	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	12M	PR D86 092008	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	12O	PRL 109 172002	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	12Q	CP C36 1040	M. Ablikim <i>et al.</i>	(BES II 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.)
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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>	(BESIII Collab.)
ABLIKIM	10F	PRL 105 261801	M. Ablikim <i>et al.</i>	(BESIII 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.)
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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>	(PDG Collab.)
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 and 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)
		Translated from YAF 41	733.	
FRANKLIN	83	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)
		Translated from YAF 34	1471.	
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
WIJK	75	Stanford Symp. 69	B.H. Wiik	(DESY)