$\psi(2S)$

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

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

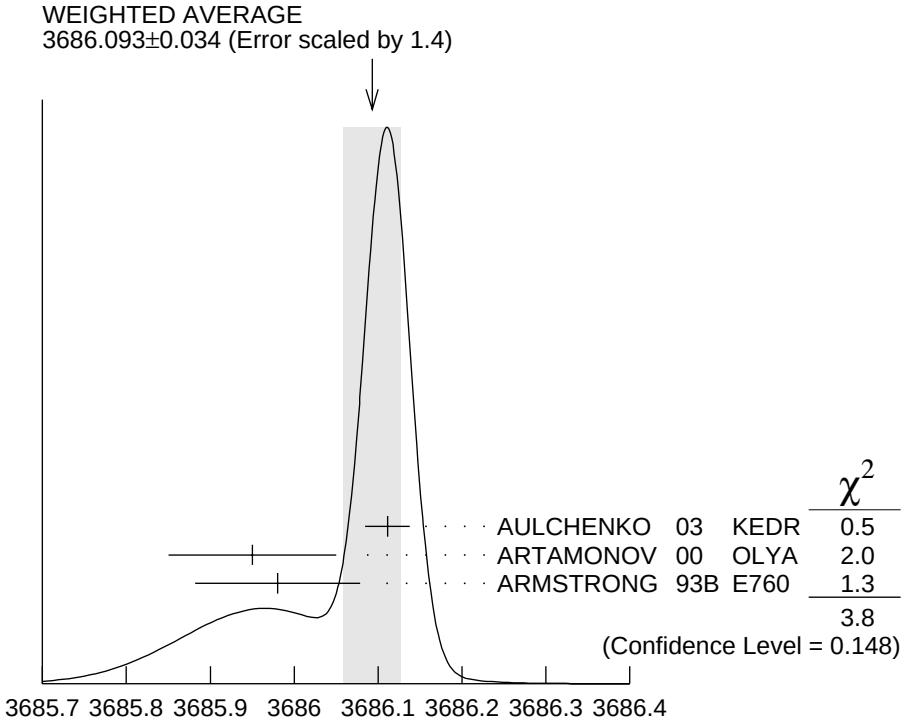
$\psi(2S)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
3686.093±0.034 OUR AVERAGE		Error includes scale factor of 1.4. See the ideogram below.			
3686.111±0.025±0.009		AULCHENKO	03	KEDR	$e^+e^- \to$ hadrons
3685.95 ±0.10	413	[1] ARTAMONOV	00	OLYA	$e^+e^- \to$ hadrons
3685.98 ±0.09 ±0.04		[2] ARMSTRONG	93B	E760	$\overline{p}p \to e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3684 ±2		GRIBUSHIN	96	FMPS	515 π^- Be $\to 2\mu X$
3683 ±5	77	ANTONIAZZI	94	E705	300 $\pi^\pm$, pLi $\to$ $J/\psi\pi^+\pi^-$X
3686.00 ±0.10	413	[3] ZHOLENTZ	80	OLYA	e^+e^-

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

[2] 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.

[3] Superseded by ARTAMONOV 00.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	[4] AULCHENKO	03	KEDR	$e^+e^- \rightarrow$ hadrons
589.7 ±1.2	LEMOIGNE	82	GOLI	190 π^- Be $\rightarrow 2\mu$
589.07 ±0.13	[4] 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	[5] BAI	98E	BES	e^+e^-

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

$\psi(2S)$ WIDTH

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
283±17 OUR FIT				
277±22 OUR AVERAGE				
264±27	[6] BAI	02B	BES	e^+e^-
306±36±16	ARMSTRONG	93B	E760	$\overline{p}p \rightarrow e^+e^-$

[6] From a simultaneous fit to the hadronic and $\mu^+\mu^-$ cross section, assuming $\Gamma = \Gamma_h + \Gamma_e + \Gamma_\mu + \Gamma_\tau$ and lepton universality.

$\psi(2S)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	$\psi(2S) \rightarrow$ hadrons	(97.85±0.13) %	
Γ_2	$\psi(2S) \rightarrow$ virtual $\gamma \rightarrow$ hadrons	(1.73±0.14) %	S=1.5
Γ_3	$\psi(2S) \rightarrow e^+e^-$	(7.41±0.28) $\times 10^{-3}$	
Γ_4	$\psi(2S) \rightarrow \mu^+\mu^-$	(7.3 ±0.8) $\times 10^{-3}$	
Γ_5	$\psi(2S) \rightarrow \tau^+\tau^-$	(2.8 ±0.7) $\times 10^{-3}$	
	Decays into $J/\psi(1S)$ and anything		
Γ_6	$\psi(2S) \rightarrow J/\psi(1S)$ anything	(57.6 ±1.9) %	
Γ_7	$\psi(2S) \rightarrow J/\psi(1S)$ neutrals	(24.6 ±0.9) %	
Γ_8	$\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-$	(31.7 ±1.1) %	
Γ_9	$\psi(2S) \rightarrow J/\psi(1S)\pi^0\pi^0$	(18.6 ±0.8) %	
Γ_{10}	$\psi(2S) \rightarrow J/\psi(1S)\eta$	(3.08±0.17) %	
Γ_{11}	$\psi(2S) \rightarrow J/\psi(1S)\pi^0$	(1.23±0.18) $\times 10^{-3}$	S=1.3

Hadronic decays

Γ_{12}	$\psi(2S) \to 3(\pi^+\pi^-)\pi^0$	$(3.5 \pm 1.6) \times 10^{-3}$	
Γ_{13}	$\psi(2S) \to 2(\pi^+\pi^-)\pi^0$	$(3.0 \pm 0.8) \times 10^{-3}$	
Γ_{14}	$\psi(2S) \to \rho a_2(1320)$	$(2.6 \pm 0.9) \times 10^{-4}$	
Γ_{15}	$\psi(2S) \to \omega\pi^+\pi^-$	$(4.8 \pm 0.9) \times 10^{-4}$	
Γ_{16}	$\psi(2S) \to b_1^\pm\pi^\mp$	$(3.6 \pm 0.6) \times 10^{-4}$	
Γ_{17}	$\psi(2S) \to b_1^0\pi^0$	$(2.4 \pm 0.6) \times 10^{-4}$	
Γ_{18}	$\psi(2S) \to \omega f_2(1270)$	$(2.0 \pm 0.6) \times 10^{-4}$	
Γ_{19}	$\psi(2S) \to \pi^+\pi^- K^+K^-$	$(1.6 \pm 0.4) \times 10^{-3}$	
Γ_{20}	$\psi(2S) \to K^*(892)^0\overline{K}{}_2^*(1430)^0$	$(1.9 \pm 0.5) \times 10^{-4}$	
Γ_{21}	$\psi(2S) \to K_1(1270)^\pm K^\mp$	$(1.00 \pm 0.28) \times 10^{-3}$	
Γ_{22}	$\psi(2S) \to \pi^+\pi^- p\overline{p}$	$(8.0 \pm 2.0) \times 10^{-4}$	
Γ_{23}	$\psi(2S) \to K^+\overline{K}{}^*(892)^0\pi^- +$ c.c.	$(6.7 \pm 2.5) \times 10^{-4}$	
Γ_{24}	$\psi(2S) \to 2(\pi^+\pi^-)$	$(4.5 \pm 1.0) \times 10^{-4}$	
Γ_{25}	$\psi(2S) \to \rho^0\pi^+\pi^-$	$(4.2 \pm 1.5) \times 10^{-4}$	
Γ_{26}	$\psi(2S) \to \omega K^+K^-$	$(1.5 \pm 0.4) \times 10^{-4}$	
Γ_{27}	$\psi(2S) \to \omega p\overline{p}$	$(8.0 \pm 3.2) \times 10^{-5}$	
Γ_{28}	$\psi(2S) \to \overline{p}p$	$(2.07 \pm 0.31) \times 10^{-4}$	
Γ_{29}	$\psi(2S) \to \Lambda\overline{\Lambda}$	$(1.81 \pm 0.34) \times 10^{-4}$	
Γ_{30}	$\psi(2S) \to 3(\pi^+\pi^-)$	$(1.5 \pm 1.0) \times 10^{-4}$	
Γ_{31}	$\psi(2S) \to \overline{p}p\pi^0$	$(1.4 \pm 0.5) \times 10^{-4}$	
Γ_{32}	$\psi(2S) \to \Delta^{++}\overline{\Delta}{}^{--}$	$(1.28 \pm 0.35) \times 10^{-4}$	
Γ_{33}	$\psi(2S) \to \Sigma^0\overline{\Sigma}{}^0$	$(1.2 \pm 0.6) \times 10^{-4}$	
Γ_{34}	$\psi(2S) \to \Sigma^{*+}\overline{\Sigma}{}^{*-}$	$(1.1 \pm 0.4) \times 10^{-4}$	
Γ_{35}	$\psi(2S) \to K^+K^-$	$(1.0 \pm 0.7) \times 10^{-4}$	
Γ_{36}	$\psi(2S) \to K_S^0K_L^0$	$(5.2 \pm 0.7) \times 10^{-5}$	
Γ_{37}	$\psi(2S) \to \pi^+\pi^-\pi^0$	$(1.5 \pm 0.5) \times 10^{-4}$	S=1.8
Γ_{38}	$\psi(2S) \to \rho\pi$	$(2.4 \,^{+0.8}_{-0.7}) \times 10^{-5}$	
Γ_{39}	$\psi(2S) \to \pi^+\pi^-$	$(8 \pm 5) \times 10^{-5}$	
Γ_{40}	$\psi(2S) \to \Xi^-\overline{\Xi}{}^+$	$(9.4 \pm 3.1) \times 10^{-5}$	
Γ_{41}	$\psi(2S) \to K_1(1400)^\pm K^\mp$	$< 3.1 \times 10^{-4}$	CL=90%
Γ_{42}	$\psi(2S) \to \Xi^{*0}\overline{\Xi}{}^{*0}$	$< 8.1 \times 10^{-5}$	CL=90%
Γ_{43}	$\psi(2S) \to \Omega^-\overline{\Omega}{}^+$	$< 7.3 \times 10^{-5}$	CL=90%
Γ_{44}	$\psi(2S) \to K^+K^-\pi^0$	$< 2.96 \times 10^{-5}$	CL=90%
Γ_{45}	$\psi(2S) \to K^+\overline{K}{}^*(892)^- +$ c.c.	$(1.3 \,^{+1.0}_{-0.7}) \times 10^{-5}$	
Γ_{46}	$\psi(2S) \to K^*(892)^0\overline{K}{}^0$	$(9.2 \,^{+2.8}_{-2.4}) \times 10^{-5}$	
Γ_{47}	$\psi(2S) \to \phi\pi^+\pi^-$	$(1.50 \pm 0.28) \times 10^{-4}$	
Γ_{48}	$\psi(2S) \to \phi f_0(980) \to \pi^+\pi^-$	$(6.0 \pm 2.2) \times 10^{-5}$	
Γ_{49}	$\psi(2S) \to \phi K^+K^-$	$(6.0 \pm 2.2) \times 10^{-5}$	
Γ_{50}	$\psi(2S) \to \phi\eta$	$(2.8 \,^{+1.0}_{-0.8}) \times 10^{-5}$	
Γ_{51}	$\psi(2S) \to \phi\eta'$	$(3.1 \pm 1.6) \times 10^{-5}$	

Γ_{52}	$\psi(2S) \to \omega\eta'$	$(3.2\ ^{+2.5}_{-2.1}) \times 10^{-5}$		
Γ_{53}	$\psi(2S) \to \omega\pi^0$	$(2.1 \pm 0.6) \times 10^{-5}$		
Γ_{54}	$\psi(2S) \to \rho\eta'$	$(1.9\ ^{+1.7}_{-1.2}) \times 10^{-5}$		
Γ_{55}	$\psi(2S) \to \rho\eta$	$(2.2 \pm 0.6) \times 10^{-5}$		S=1.1
Γ_{56}	$\psi(2S) \to \omega\eta$	< 1.1	$\times 10^{-5}$	CL=90%
Γ_{57}	$\psi(2S) \to \phi\pi^0$	< 4	$\times 10^{-6}$	CL=90%
Γ_{58}	$\psi(2S) \to \phi p\overline{p}$	< 2.6	$\times 10^{-5}$	CL=90%
Γ_{59}	$\psi(2S) \to \phi f_2'(1525)$	$(4.4 \pm 1.6) \times 10^{-5}$		
Γ_{60}	$J/\psi(2S) \to \Theta(1540)\overline{\Theta}(1540) \to K^0_S p K^- \overline{n}$ + c.c.	< 8.8	$\times 10^{-6}$	CL=90%
Γ_{61}	$J/\psi(2S) \to \Theta(1540) K^- \overline{n} \to K^0_S p K^- \overline{n}$	< 1.0	$\times 10^{-5}$	CL=90%
Γ_{62}	$J/\psi(2S) \to \Theta(1540) K^0_S \overline{p} \to K^0_S \overline{p} K^+ n$	< 7.0	$\times 10^{-6}$	CL=90%
Γ_{63}	$J/\psi(2S) \to \overline{\Theta}(1540) K^+ n \to K^0_S \overline{p} K^+ n$	< 2.6	$\times 10^{-5}$	CL=90%
Γ_{64}	$J/\psi(2S) \to \overline{\Theta}(1540) K^0_S p \to K^0_S p K^- \overline{n}$	< 6.0	$\times 10^{-6}$	CL=90%
Γ_{65}	$\psi(2S) \to K^0_S K^0_S$	< 4.6	$\times 10^{-6}$	

Radiative decays

Γ_{66}	$\psi(2S) \to \gamma\chi_{c0}(1P)$	(9.0 ± 0.4) %		
Γ_{67}	$\psi(2S) \to \gamma\chi_{c1}(1P)$	(8.7 ± 0.5) %		
Γ_{68}	$\psi(2S) \to \gamma\chi_{c2}(1P)$	(8.20 ± 0.30) %		
Γ_{69}	$\psi(2S) \to \gamma\eta_c(1S)$	$(2.6 \pm 0.4) \times 10^{-3}$		
Γ_{70}	$\psi(2S) \to \gamma\eta_c(2S)$	< 2.0	$\times 10^{-3}$	CL=90%
Γ_{71}	$\psi(2S) \to \gamma\pi^0$			
Γ_{72}	$\psi(2S) \to \gamma\eta'(958)$	$(1.5 \pm 0.4) \times 10^{-4}$		
Γ_{73}	$\psi(2S) \to \gamma f_2(1270)$	$(2.1 \pm 0.4) \times 10^{-4}$		
Γ_{74}	$\psi(2S) \to \gamma f_0(1710) \to \gamma\pi\pi$	$(3.0 \pm 1.3) \times 10^{-5}$		
Γ_{75}	$\psi(2S) \to \gamma f_0(1710) \to \gamma K\overline{K}$	$(6.0 \pm 1.6) \times 10^{-5}$		
Γ_{76}	$\psi(2S) \to \gamma\gamma$	< 1.5	$\times 10^{-4}$	CL=90%
Γ_{77}	$\psi(2S) \to \gamma\eta$	< 9	$\times 10^{-5}$	CL=90%
Γ_{78}	$\psi(2S) \to \gamma\eta(1405) \to \gamma K\overline{K}\pi$	< 1.2	$\times 10^{-4}$	CL=90%

$\psi(2S)$ PARTIAL WIDTHS

Γ(hadrons) Γ_1

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

$\Gamma(e^+e^-)$ Γ_3

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
2.10±0.12 OUR FIT				
2.14±0.21	ALEXANDER	89	RVUE	See Υ mini-review
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.44±0.21	[8] BAI	02B	BES	e^+e^-
2.0 ±0.3	BRANDELIK	79C	DASP	e^+e^-
2.1 ±0.3	[7] LUTH	75	MRK1	e^+e^-

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

$\Gamma(\gamma\gamma)$ Γ_{76}

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

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

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

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

$\Gamma(\text{hadrons}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_1\Gamma_3/\Gamma$

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.2±0.4	ABRAMS	75	MRK1	e^+e^-

$\Gamma(e^+e^-) \times \Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$ $\Gamma_3\Gamma_8/\Gamma$

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
0.66±0.05 OUR FIT				
0.68±0.09	[9] BAI	98E	BES	e^+e^-

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

$\psi(2S)$ 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	[10] BAI	02B	BES	e^+e^-
0.981 ±0.003	[10] LUTH	75	MRK1	e^+e^-

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.0173±0.0014 OUR AVERAGE Error includes scale factor of 1.5.				
0.0166±0.0010	[11,12] SETH	04	RVUE	e^+e^-
0.0199±0.0019	[11] BAI	02B	BES	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.029 ±0.004	[11] LUTH	75	MRK1	e^+e^-

$\Gamma(e^+e^-)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
74.1± 2.8 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
88 ±13	[13] FELDMAN	77	RVUE	e^+e^-

$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE (units 10^{-4})	DOCUMENT ID
73±8 OUR FIT	

$\Gamma(\tau^+\tau^-)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (units 10^{-4})	DOCUMENT ID
28±7 OUR FIT	

$\Gamma(\mu^+\mu^-)/\Gamma(e^+e^-)$ Γ_4/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
0.99±0.13 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.89±0.16	BOYARSKI	75C	MRK1	e^+e^-

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

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

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

[13] 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.

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

$\Gamma(J/\psi(1S)\text{anything})/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.576±0.019 OUR FIT				
0.55 ±0.07 OUR AVERAGE				
0.51 ±0.12	BRANDELIK	79C	DASP	$e^+e^- \to \mu^+\mu^-X$
0.57 ±0.08	ABRAMS	75B	MRK1	$e^+e^- \to \mu^+\mu^-X$

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

VALUE	DOCUMENT ID
0.246±0.009 OUR FIT	

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma_{total}$ Γ_8/Γ

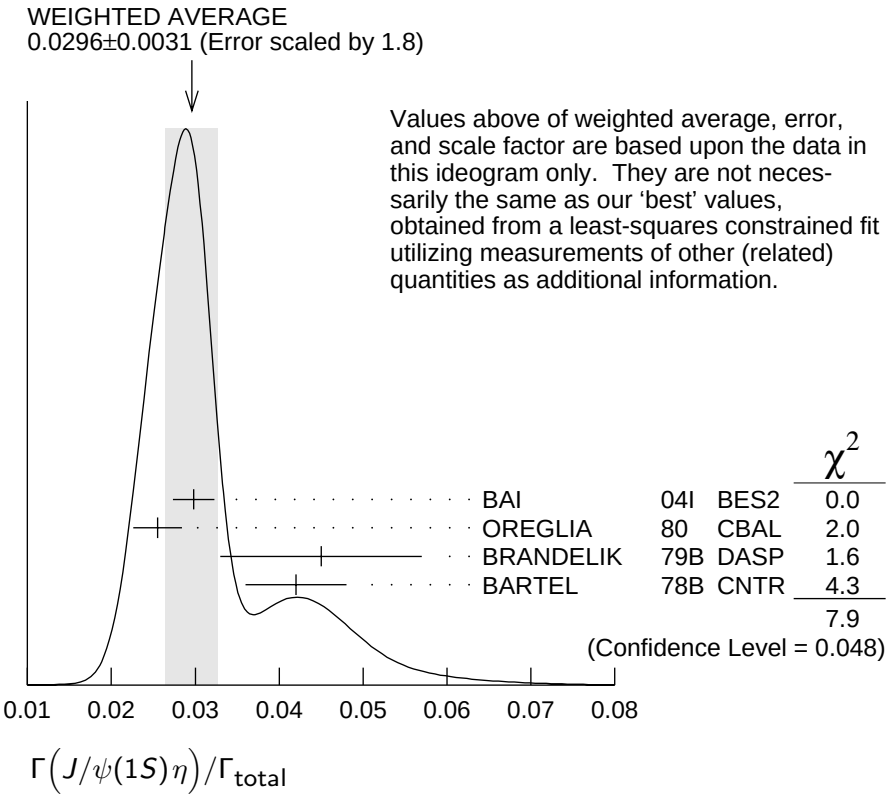
VALUE	DOCUMENT ID	TECN	COMMENT
0.317±0.011 OUR FIT			
0.323±0.013 OUR AVERAGE			
0.323±0.014	BAI	02B BES	e^+e^-
0.32 ±0.04	ABRAMS	75B MRK1	$e^+e^- \rightarrow J/\psi\pi^+\pi^-$

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

VALUE	DOCUMENT ID
0.186±0.008 OUR FIT	

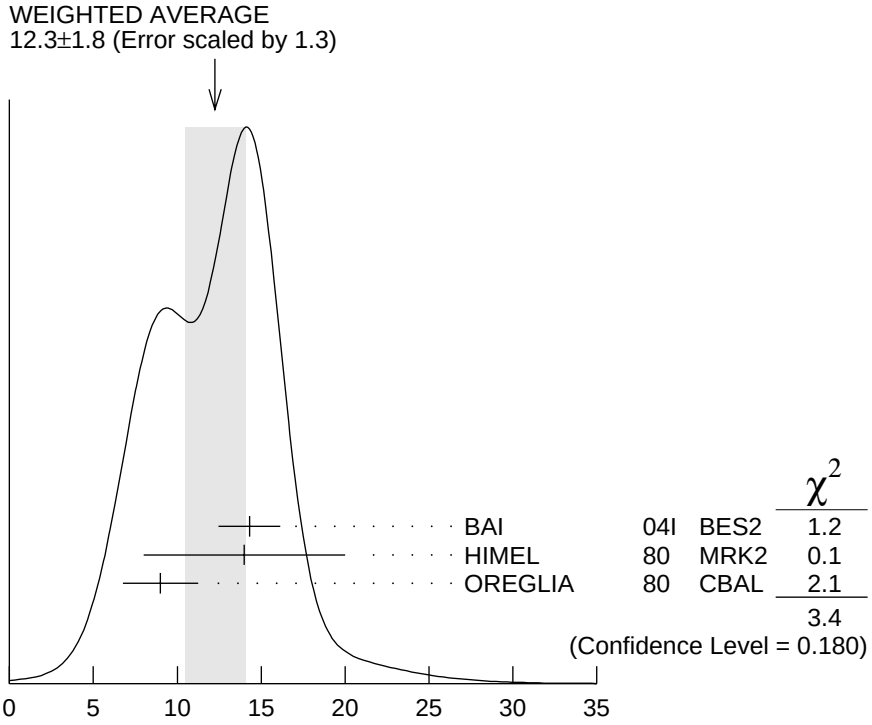
$\Gamma(J/\psi(1S)\eta)/\Gamma_{total}$ Γ_{10}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0308±0.0017 OUR FIT				
0.0296±0.0031 OUR AVERAGE Error includes scale factor of 1.8. See the ideogram below.				
0.0298±0.0009±0.0023	5.7k	BAI	04I BES2	$\psi(2S) \rightarrow J/\psi\gamma\gamma$
0.0255±0.0029	386	[15] OREGLIA	80 CBAL	$e^+e^- \rightarrow J/\psi 2\gamma$
0.045 ±0.012	17	[16] BRANDELIK	79B DASP	$e^+e^- \rightarrow J/\psi 2\gamma$
0.042 ±0.006	164	[16] BARTEL	78B CNTR	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.043 ±0.008	44	TANENBAUM	76 MRK1	e^+e^-



$\Gamma(J/\psi(1S)\pi^0)/\Gamma_{total}$ Γ_{11}/Γ

VALUE (units 10^{-4})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
12.3±1.8 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.				
14.3±1.4±1.2	280	BAI	04I	BES2	$\psi(2S) \rightarrow J/\psi\gamma\gamma$
14 ±6	7	HIMEL	80	MRK2	e^+e^-
9 ±2 ±1	23	[15] OREGLIA	80	CBAL	$\psi(2S) \rightarrow J/\psi 2\gamma$



$\Gamma(J/\psi(1S)\text{neutrals})/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_7/Γ_8

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.776±0.021 OUR FIT				
0.73 ±0.09	TANENBAUM	76	MRK1	e^+e^-

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma(J/\psi(1S)\text{anything})$ Γ_8/Γ_6

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.550±0.006 OUR FIT					
0.528±0.013 OUR AVERAGE					
0.525±0.009±0.022	4090 ± 67	ANDREOTTI	05	E835	$\psi(2S) \rightarrow J/\psi X$
0.536±0.007±0.016	20k	[14,17] ABLIKIM	04B	BES	$\psi(2S) \rightarrow J/\psi X$
0.496±0.037		ARMSTRONG	97	E760	$\overline{p}p \rightarrow \psi(2S)$

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

$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma(J/\psi(1S)\text{anything})$ Γ_9/Γ_6

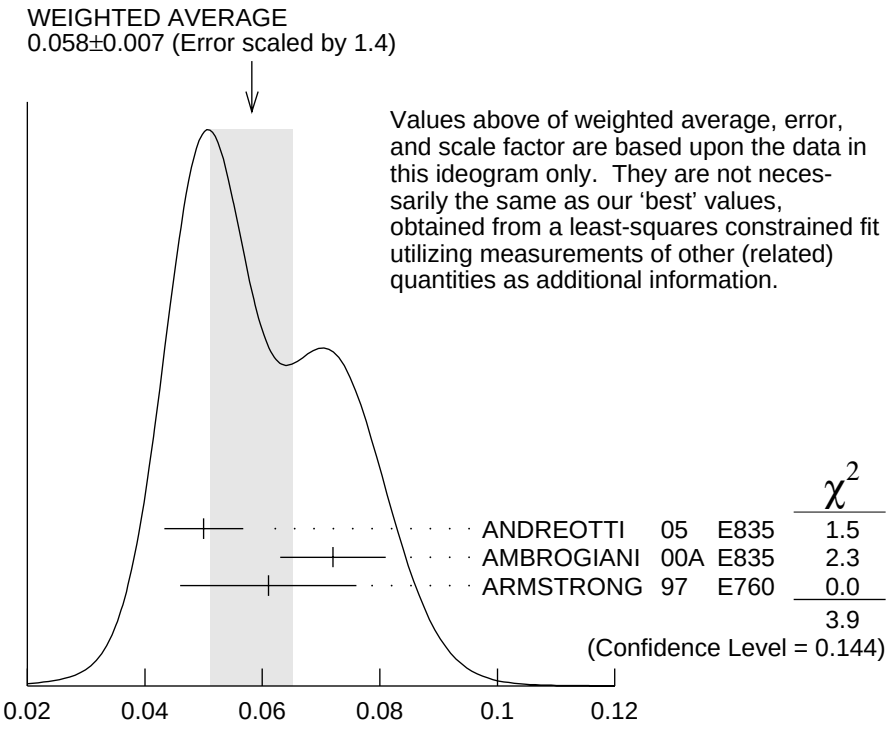
VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.323±0.007 OUR FIT					
0.320±0.012 OUR AVERAGE					
0.300±0.008±0.022	1655 ± 44	ANDREOTTI	05	E835	$\psi(2S) \rightarrow J/\psi X$
0.328±0.013±0.008		AMBROGIANI	00A	E835	$p\overline{p} \rightarrow \psi(2S)$
0.323±0.033		ARMSTRONG	97	E760	$\overline{p}p \rightarrow \psi(2S)$

$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_9/Γ_8

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.59 ±0.04 OUR FIT					
0.570±0.009±0.026	14k	[17] ABLIKIM	04B	BES	$\psi(2S) \rightarrow J/\psi X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.571±0.018±0.044		[18] ANDREOTTI	05	E835	$\psi(2S) \rightarrow J/\psi X$
0.53 ±0.06		TANENBAUM	76	MRK1	e^+e^-
0.64 ±0.15		[19] HILGER	75	SPEC	e^+e^-

$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\text{anything})$ Γ_{10}/Γ_6

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.054±0.003 OUR FIT					
0.058±0.007 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.					
0.050±0.006±0.003	298 ± 20	ANDREOTTI	05	E835	$\psi(2S) \rightarrow J/\psi X$
0.072±0.009		AMBROGIANI	00A	E835	$p\overline{p} \rightarrow \psi(2S)$
0.061±0.015		ARMSTRONG	97	E760	$\overline{p}p \rightarrow \psi(2S)$



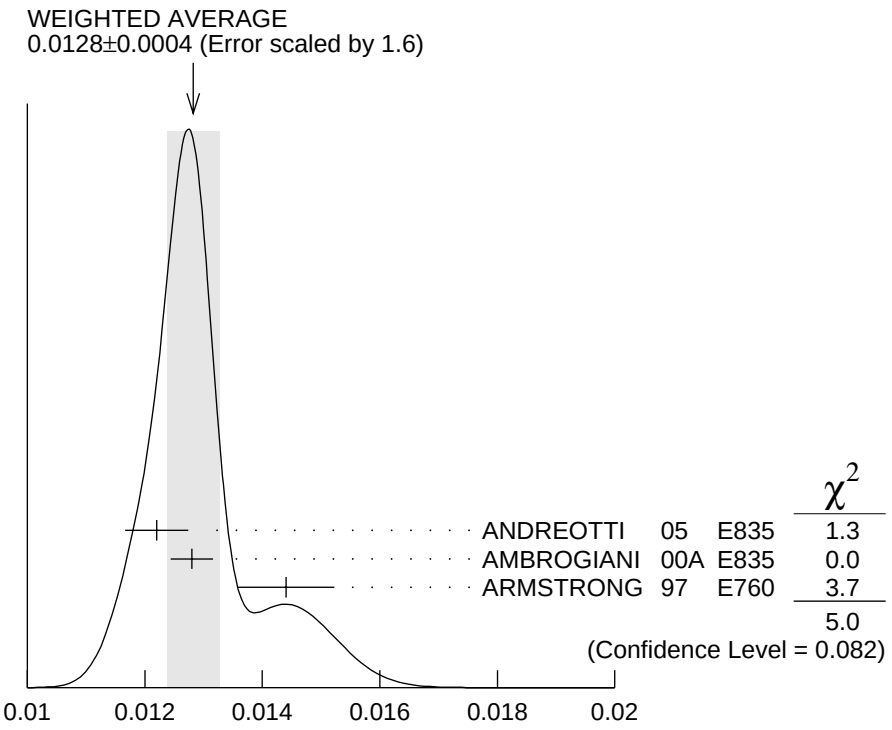
$\Gamma\left(J/\psi(1S)\eta\right)/\Gamma\left(J/\psi(1S)\text{anything}\right)$ Γ_{10}/Γ_6

$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_{10}/Γ_8

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.097±0.007 OUR FIT					
0.096±0.010 OUR AVERAGE					
0.098±0.005±0.010	2k	[17] ABLIKIM	04B	BES	$\psi(2S) \rightarrow J/\psi X$
0.091±0.021		[20] HIMEL	80	MRK2	$e^+e^- \rightarrow \psi(2S)X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.095±0.007±0.007		[18] ANDREOTTI	05	E835	$\psi(2S) \rightarrow J/\psi X$

$\Gamma(e^+e^-)/\Gamma(J/\psi(1S)\text{anything})$ Γ_3/Γ_6

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0129±0.0007 OUR FIT					
0.0128±0.0004 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.					
0.0122±0.0002±0.0005	5097 ± 73	[21] ANDREOTTI	05	E835	$p\overline{p} \rightarrow \psi(2S) \rightarrow e^+e^-$
0.0128±0.0003±0.0002		[21] AMBROGIANI	00A	E835	$p\overline{p} \rightarrow \psi(2S)$
0.0144±0.0008±0.0002		[21] ARMSTRONG	97	E760	$\overline{p}p \rightarrow \psi(2S)$



$\Gamma(e^+e^-)/\Gamma(J/\psi(1S)\text{anything})$ Γ_3/Γ_6

$\Gamma(e^+e^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_3/Γ_8

VALUE	DOCUMENT ID		TECN	COMMENT
0.0234±0.0016 OUR FIT				
0.0252±0.0028±0.0011	[21] AUBERT	02B	BABR	e^+e^-

$\Gamma(\mu^+\mu^-)/\Gamma(J/\psi(1S)\text{anything})$ Γ_4/Γ_6

VALUE	DOCUMENT ID		TECN	COMMENT
0.0127±0.0031 OUR FIT				
0.014 ±0.003	HILGER	75	SPEC	e^+e^-

$\Gamma(\mu^+\mu^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_4/Γ_8

VALUE	DOCUMENT ID		TECN	COMMENT
0.0231±0.0030 OUR FIT				
0.0224±0.0029 OUR AVERAGE				
0.0216±0.0026±0.0014	[22] AUBERT	02B	BABR	e^+e^-
0.0327±0.0077±0.0072	[22] GRIBUSHIN	96	FMPS	515 π^- Be → $2\mu X$

$\Gamma(\tau^+\tau^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_5/Γ_8

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
8.7 ±2.2 OUR FIT				
8.73±1.39±1.57	BAI	02	BES	e^+e^-

[15] Recalculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = 0.1181 ± 0.0020.
[16] Recalculated by us using B($J/\psi(1S) \to \mu^+\mu^-$) = 0.0588 ± 0.0010.
[17] From a fit to the J/ψ recoil mass spectra.
[18] Not independent from other values reported by ANDREOTTI 05.
[19] Ignoring the $J/\psi(1S)\eta$ and $J/\psi(1S)\gamma\gamma$ decays.
[20] The value for B($\psi(2S) \to J/\psi(1s)\eta$) reported in HIMEL 80 is derived using B(ψ(2S)) → $J/\psi(1S)\pi^+\pi^-$) = (33 ± 3))% and B($J/\psi(1S) \to \ell^+\ell^-$) = 0.138 ± 0.018. Calculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = (0.1181 ± 0.0020).
[21] Using B($J/\psi(1S) \to e^+e^-$) = 0.0593 ± 0.0010.
[22] Using B($J/\psi(1S) \to \mu^+\mu^-$) = 0.0588 ± 0.0010.

HADRONIC DECAYS

$\Gamma(3(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}$ Γ_{12}/Γ

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

$\Gamma(2(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}$ Γ_{13}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
30±8	42	FRANKLIN	83	MRK2	e^+e^-

$\Gamma(\omega\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{15}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
4.8±0.6±0.7	100 ± 22	[23] BAI	03B	BES	$\psi(2S) \to 2(\pi^+\pi^-)\pi^0$

$\Gamma(b_1^\pm\pi^\mp)/\Gamma_{\text{total}}$ Γ_{16}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
3.6 ±0.6 OUR AVERAGE					
$4.18^{+0.43}_{-0.42}\pm0.92$	170	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
3.2 ±0.6 ±0.5	61 ± 11	[23,24] BAI	03B	BES	$\psi(2S) \to 2(\pi^+\pi^-)\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.2 ±0.8 ±1.0		[24] BAI	99C	BES	Repl. by BAI 03B

$\Gamma(b_1^0\pi^0)/\Gamma_{total}$ Γ_{17}/Γ

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

$\Gamma(\omega f_2(1270))/\Gamma_{total}$ Γ_{18}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{2.05\pm0.41\pm0.38}$		62 ± 12	BAI	04C	BES2	$\psi(2S) \to 2(\pi^+\pi^-)\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<1.5	90		[23] BAI	03B	BES	$\psi(2S) \to 2(\pi^+\pi^-)\pi^0$
<1.7	90		BAI	98J	BES	Repl. by BAI 03B

$\Gamma(\pi^+\pi^- K^+K^-)/\Gamma_{total}$ Γ_{19}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{16\pm4}$	[25] TANENBAUM	78	MRK1	e^+e^-

$\Gamma(K_1(1270)^\pm K^\mp)/\Gamma_{total}$ Γ_{21}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{10.0\pm1.8\pm2.1}$	[26] BAI	99C	BES	e^+e^-

$\Gamma(\pi^+\pi^- p\overline{p})/\Gamma_{total}$ Γ_{22}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{8\ \pm2}$	[25] TANENBAUM	78	MRK1	e^+e^-

$\Gamma(K^+\overline{K}^*(892)^0\pi^- + \text{c.c.})/\Gamma_{total}$ Γ_{23}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{6.7\pm2.5}$	TANENBAUM	78	MRK1	e^+e^-

$\Gamma(\omega K^+K^-)/\Gamma_{total}$ Γ_{26}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.5\pm0.3\pm0.2}$	23.0 ± 5.2	[23] BAI	03B	BES	$\psi(2S) \to K^+K^-\pi^+\pi^-\pi^0$

$\Gamma(\omega p\overline{p})/\Gamma_{total}$ Γ_{27}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.8\ \pm0.3\ \pm0.1}$	14.9 ± 0.1	[23] BAI	03B	BES	$\psi(2S) \to p\overline{p}\pi^+\pi^-\pi^0$

$\Gamma(2(\pi^+\pi^-))/\Gamma_{total}$ Γ_{24}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{4.5\pm1.0}$	TANENBAUM	78	MRK1	e^+e^-

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{total}$ Γ_{25}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{4.2\pm1.5}$	TANENBAUM	78	MRK1	e^+e^-

$\Gamma(\rho a_2(1320))/\Gamma_{total}$ Γ_{14}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$2.55\pm0.73\pm0.47$		112 ± 31	BAI	04C	BES2	$\psi(2S)\to 2(\pi^+\pi^-)\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<2.3	90		BAI	98J	BES	e^+e^-

$\Gamma(\overline{p}p)/\Gamma_{total}$ Γ_{28}/Γ

VALUE (units 10^{-4})	EVTS		DOCUMENT ID		TECN	COMMENT
2.07 ± 0.31 OUR AVERAGE						
$2.16\pm0.15\pm0.36$	201	[27]	BAI	01	BES	$e^+e^-\to\psi(2S)$
$1.4\ \pm0.8$	4		BRANDELIK	79C	DASP	e^+e^-
$2.3\ \pm0.7$			FELDMAN	77	MRK1	e^+e^-

$\Gamma(\Lambda\overline{\Lambda})/\Gamma_{total}$ Γ_{29}/Γ

VALUE (units 10^{-4})	CL%	EVTS		DOCUMENT ID		TECN	COMMENT
$1.81\pm0.20\pm0.27$		80	[27]	BAI	01	BES	$e^+e^-\to\psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •							
<4	90			FELDMAN	77	MRK1	e^+e^-

$\Gamma(3(\pi^+\pi^-))/\Gamma_{total}$ Γ_{30}/Γ

VALUE (units 10^{-4})		DOCUMENT ID		TECN	COMMENT
1.5 ± 1.0	[25]	TANENBAUM	78	MRK1	e^+e^-

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.4 ± 0.5	9	FRANKLIN	83	MRK2	e^+e^-

$\Gamma(K^+K^-)/\Gamma_{total}$ Γ_{35}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
1.0 ± 0.7		BRANDELIK	79C	DASP	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.5	90	FELDMAN	77	MRK1	e^+e^-

$\Gamma(K^0_S K^0_L)/\Gamma_{total}$ Γ_{36}/Γ

VALUE (units 10^{-5})	EVTS		DOCUMENT ID		TECN	COMMENT
$5.24\pm0.47\pm0.48$	156 ± 14	[28]	BAI	04B	BES2	$\psi(2S)\to K^0_S K^0_L\to \pi^+\pi^- X$

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ Γ_{39}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
0.8 ± 0.5		BRANDELIK	79C	DASP	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.5	90	FELDMAN	77	MRK1	e^+e^-

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{37}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.5 ±0.5 OUR AVERAGE Error includes scale factor of 1.8.					
$1.88^{+0.16}_{-0.15}\pm0.28$	194	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
0.85 ± 0.46	4	FRANKLIN	83	MRK2	$e^+e^- \to$ hadrons

$\Gamma(\rho\pi)/\Gamma_{total}$ Γ_{38}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.24^{+0.08}_{-0.07}\pm0.02}$		22	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 0.83	90	1	FRANKLIN	83	MRK2	e^+e^-
<10	90		BARTEL	76	CNTR	e^+e^-
<10	90		[29] ABRAMS	75	MRK1	e^+e^-

$\Gamma(\Delta^{++}\overline{\Delta}^{--})/\Gamma_{total}$ Γ_{32}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
12.8±1.0±3.4	157	[27] BAI	01	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\Sigma^0\overline{\Sigma}^0)/\Gamma_{total}$ Γ_{33}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
12±4±4	8	[27] BAI	01	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\Sigma^{*+}\overline{\Sigma}^{*-})/\Gamma_{total}$ Γ_{34}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
11±3±3	14	[27] BAI	01	BES	$e^+e^- \to \psi(2S)$

$\Gamma(K_1(1400)^{\pm}K^{\mp})/\Gamma_{total}$ Γ_{41}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<3.1	90	[30] BAI	99C	BES	e^+e^-

$\Gamma(\Xi^-\overline{\Xi}^+)/\Gamma_{total}$ Γ_{40}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
9.4±2.7±1.5		12	[27] BAI	01	BES	$e^+e^- \to \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<20	90		FELDMAN	77	MRK1	e^+e^-

$\Gamma(\Xi^{*0}\overline{\Xi}^{*0})/\Gamma_{total}$ Γ_{42}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<8.1	90	[27] BAI	01	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\Omega^-\overline{\Omega}^+)/\Gamma_{total}$ Γ_{43}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<7.3	90	[27] BAI	01	BES	$e^+e^- \to \psi(2S)$

$\Gamma(K^+K^-\pi^0)/\Gamma_{total}$ Γ_{44}/Γ

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

$\Gamma(K^+\overline{K}^*(892)^- + \text{c.c.})/\Gamma_{total}$ Γ_{45}/Γ

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

$\Gamma(K^*(892)^0\overline{K}^0)/\Gamma_{total}$ Γ_{46}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{9.2^{+2.7}_{-2.2}\pm0.9}$	25	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$

$\Gamma(K^+\overline{K}^*(892)^- + \text{c.c.})/\Gamma(K^*(892)^0\overline{K}^0)$ Γ_{45}/Γ_{46}

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.14^{+0.08}_{-0.06}}$	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$

$\Gamma(K^*(892)^0\overline{K}_2^*(1430)^0)/\Gamma_{total}$ Γ_{20}/Γ

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

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

VALUE (units 10^{-4})	EVTS		DOCUMENT ID		TECN	COMMENT
1.5 ±0.2 ±0.2	51.5 ± 8.3	[23]	BAI	03B	BES	$\psi(2S) \to K^+K^-\pi^+\pi^-$

$\Gamma(\phi f_0(980) \to \pi^+\pi^-)/\Gamma_{total}$ Γ_{48}/Γ

VALUE (units 10^{-4})	EVTS		DOCUMENT ID		TECN	COMMENT
0.6 ±0.2 ±0.1	18.4 ± 6.4	[23]	BAI	03B	BES	$\psi(2S) \to K^+K^-\pi^+\pi^-$

$\Gamma(\phi K^+K^-)/\Gamma_{total}$ Γ_{49}/Γ

VALUE (units 10^{-4})	EVTS		DOCUMENT ID		TECN	COMMENT
0.6 ±0.2 ±0.1	16.1 ± 5.0	[23]	BAI	03B	BES	$\psi(2S) \to 2(K^+K^-)$

$\Gamma(\phi\eta)/\Gamma_{total}$ Γ_{50}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{2.8^{+1.0}_{-0.8}}$ **OUR AVERAGE**					
$2.0^{+1.5}_{-1.1}\pm0.4$	6	ADAM	05	CLEO	$e^+e^- \to \psi(2S)$
3.3±1.1±0.5	17	ABLIKIM	04K	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\phi\eta')/\Gamma_{total}$ Γ_{51}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
$3.1\pm1.4\pm0.7$	8	[31] ABLIKIM	04K	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\omega\eta')/\Gamma_{total}$ Γ_{52}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
$3.2^{+2.4}_{-2.0}\pm0.7$	4	[31] ABLIKIM	04K	BES	$e^+e^- \to \psi(2S)$

$\Gamma(\omega\pi^0)/\Gamma_{total}$ Γ_{53}/Γ

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

$\Gamma(\rho\eta')/\Gamma_{total}$ Γ_{54}/Γ

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

$\Gamma(\rho\eta)/\Gamma_{total}$ Γ_{55}/Γ

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

$\Gamma(\omega\eta)/\Gamma_{total}$ Γ_{56}/Γ

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

$\Gamma(\phi\pi^0)/\Gamma_{total}$ Γ_{57}/Γ

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

$\Gamma(\phi p\overline{p})/\Gamma_{total}$ Γ_{58}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.26	90	[23] BAI	03B	BES	$\psi(2S) \to K^+K^-p\overline{p}$

$\Gamma(\phi f_2'(1525))/\Gamma_{total}$ Γ_{59}/Γ

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

$\Gamma(\Theta(1540)\overline{\Theta}(1540) \to K^0_S p K^- \overline{n} + \text{c.c.})/\Gamma_{total}$ Γ_{60}/Γ

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

$\Gamma(\Theta(1540)K^-\overline{n} \to K^0_S p K^- \overline{n})/\Gamma_{total}$ Γ_{61}/Γ

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

$\Gamma(\Theta(1540)K^0_S\overline{p} \to K^0_S\overline{p}K^+ n)/\Gamma_{total}$ Γ_{62}/Γ

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

$\Gamma(\overline{\Theta}(1540)K^+ n \to K^0_S\overline{p}K^+ n)/\Gamma_{total}$ Γ_{63}/Γ

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

$\Gamma(\overline{\Theta}(1540)K^0_S p \to K^0_S p K^-\overline{n})/\Gamma_{total}$ Γ_{64}/Γ

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

$\Gamma(K^0_S K^0_S)/\Gamma_{total}$ Γ_{65}/Γ

VALUE (units 10^{-4})		DOCUMENT ID		TECN	COMMENT
<0.046	[32]	BAI	04D	BES	e^+e^-

[23] Normalized to B($\psi(2S) \to J/\psi\pi^+\pi^-$) = 0.305 ± 0.016.
[24] Assuming B($b_1 \to \omega\pi$)=1.
[25] Assuming entirely strong decay.
[26] Assuming B($K_1(1270) \to K\rho$)=0.42 ± 0.06
[27] Estimated using B($\psi(2S) \to J/\psi\pi^+\pi^-$)= 0.310 ± 0.028.
[28] Using B($K^0_S \to \pi^+\pi^-$) = 0.6860 ± 0.0027.
[29] Final state $\rho^0\pi^0$.
[30] Assuming B($K_1(1400) \to K^*\pi$)=0.94 ± 0.06
[31] Calculated combining $\eta' \to \gamma\rho$ and $\eta\pi^+\pi^-$ channels.
[32] Forbidden by *CP*.

RADIATIVE DECAYS

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma_{total}$ Γ_{66}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
9.0 ±0.4 OUR FIT					
9.2 ±0.4 OUR AVERAGE					
9.22±0.11±0.46	72600	ATHAR	04	CLEO	$e^+e^- \to \gamma X$
9.9 ±0.5 ±0.8		[33] GAISER	86	CBAL	$e^+e^- \to \gamma X$
7.2 ±2.3		[33] BIDDICK	77	CNTR	$e^+e^- \to \gamma X$
7.5 ±2.6		[33] WHITAKER	76	MRK1	e^+e^-

$\Gamma(\gamma\chi_{c1}(1P))/\Gamma_{total}$ Γ_{67}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
8.7 ±0.5 OUR FIT					
8.9 ±0.5 OUR AVERAGE					
9.07±0.11±0.54	76700	ATHAR	04	CLEO	$e^+e^- \to \gamma X$
9.0 ±0.5 ±0.7		[34] GAISER	86	CBAL	$e^+e^- \to \gamma X$
7.1 ±1.9		[35] BIDDICK	77	CNTR	$e^+e^- \to \gamma X$

$\Gamma(\gamma\chi_{c2}(1P))/\Gamma_{total}$ Γ_{68}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
8.2 ±0.3 OUR FIT					
8.8 ±0.5 OUR AVERAGE Error includes scale factor of 1.1.					
9.33±0.14±0.61	79300	ATHAR	04	CLEO	$e^+e^- \to \gamma X$
8.0 ±0.5 ±0.7		[36] GAISER	86	CBAL	$e^+e^- \to \gamma X$
7.0 ±2.0		[35] BIDDICK	77	CNTR	$e^+e^- \to \gamma X$

$[\Gamma(\gamma\chi_{c0}(1P)) + \Gamma(\gamma\chi_{c1}(1P)) + \Gamma(\gamma\chi_{c2}(1P))]/\Gamma_{total}$ $(\Gamma_{66}+\Gamma_{67}+\Gamma_{68})/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
27.6±0.3±2.0	[37] ATHAR	04	CLEO	$e^+e^- \to \gamma X$

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c1}(1P))$ Γ_{66}/Γ_{67}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.02±0.01±0.07	[37] ATHAR	04	CLEO	$e^+e^- \to \gamma X$

$\Gamma(\gamma\chi_{c2}(1P))/\Gamma(\gamma\chi_{c1}(1P))$ Γ_{68}/Γ_{67}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.03±0.02±0.03	[37] ATHAR	04	CLEO	$e^+e^- \to \gamma X$

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c2}(1P))$ Γ_{66}/Γ_{68}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.99±0.02±0.08	[37] ATHAR	04	CLEO	$e^+e^- \to \gamma X$

$\Gamma(\gamma\eta_c(1S))/\Gamma_{total}$ Γ_{69}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.27±0.04 OUR AVERAGE					
0.25±0.06	2560	[38] ATHAR	04	CLEO	$e^+e^- \to \gamma X$
0.28±0.06		GAISER	86	CBAL	$e^+e^- \to \gamma X$

$\Gamma(\gamma\eta_c(2S))/\Gamma_{total}$ Γ_{70}/Γ

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
<0.20	90	ATHAR	04	CLEO	$e^+e^- \to \gamma X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.2 to 1.3	95	EDWARDS	82C	CBAL	$e^+e^- \to \gamma X$

$\Gamma(\gamma\pi^0)/\Gamma_{total}$ Γ_{71}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 54	95	[39] LIBERMAN	75	SPEC	e^+e^-
<100	90	WIIK	75	DASP	e^+e^-

$\Gamma(\gamma\eta'(958))/\Gamma_{total}$ Γ_{72}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.54±0.31±0.20		~ 43	BAI	98F	BES	$\psi(2S) \to \pi^+\pi^- 2\gamma$, $\pi^+\pi^- 3\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<60	90		[40] BRAUNSCH...	77	DASP	e^+e^-
<11	90		[41] BARTEL	76	CNTR	e^+e^-

$\Gamma(\gamma f_2(1270))/\Gamma_{total}$ Γ_{73}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.12±0.19±0.32		[42,43] BAI	03C	BES	$\psi(2S) \to \gamma\pi\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.08±0.19±0.33	200.6 ± 18.8	[42] BAI	03C	BES	$\psi(2S) \to \gamma\pi^+\pi^-$
2.90±1.08±1.07	29.9 ± 11.1	[42] BAI	03C	BES	$\psi(2S) \to \gamma\pi^0\pi^0$

$\Gamma(\gamma f_0(1710) \to \gamma\pi\pi)/\Gamma_{total}$ Γ_{74}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.301±0.041±0.124	35.6 ± 4.8	[42] BAI	03C	BES	$\psi(2S) \to \gamma\pi^+\pi^-$

$\Gamma(\gamma f_0(1710) \to \gamma K\overline{K})/\Gamma_{total}$ Γ_{75}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.604±0.090±0.132		39.6± 5.9	[42,44] BAI	03C	BES	$\psi(2S) \to \gamma K^+K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<1.56	90	6.8 ± 3.1	[42,44] BAI	03C	BES	$\psi(2S) \to \gamma K^0_S K^0_S$

$\Gamma(\gamma\eta)/\Gamma_{\text{total}}$ Γ_{77}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.9	90	BAI	98F	BES	$\psi(2S) \to \pi^+\pi^- 3\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<2	90	YAMADA	77	DASP	$e^+e^- \to 3\gamma$

$\Gamma(\gamma\eta(1405) \to \gamma K\overline{K}\pi)/\Gamma_{\text{total}}$ Γ_{78}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<0.12	90	[45] SCHARRE	80	MRK1	e^+e^-

[33] Angular distribution $(1+\cos^2\theta)$ assumed.
[34] Angular distribution $(1-0.189\ \cos^2\theta)$ assumed.
[35] Valid for isotropic distribution of the photon.
[36] Angular distribution $(1-0.052\ \cos^2\theta)$ assumed.
[37] Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.
[38] Using $\Gamma_{\eta_c}(1S) = (11.5 \pm 4.5)$ MeV.
[39] Restated by us using $B(\psi(2S) \to \mu^+\mu^-) = 0.0077$.
[40] Restated by us using total decay width 228 keV.
[41] The value is normalized to the branching ratio for $\Gamma(J/\psi(1S)\eta)/\Gamma_{\text{total}}$.
[42] Normalized to $B(\psi(2S) \to J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.
[43] Combining the results from $\pi^+\pi^-$ and $\pi^0\pi^0$ decay modes.
[44] Includes unknown branching fractions to K^+K^- or $K^0_S K^0_S$. We have multiplied the K^+K^- result by a factor of 2 and the $K^0_S K^0_S$ result by a factor of 4 to obtain the $K\overline{K}$ result.
[45] Includes unknown branching fraction $\eta(1405) \to K\overline{K}\pi$.

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

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

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