$\psi(2S)$

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

$\psi(2S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
3685.96±0.09 OUR AVERAGE					
3685.95±0.10	413	[1] ARTAMONOV	00	OLYA	$e^+e^- \to$ hadrons
3686.02±0.09±0.27		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	[2] ZHOLENTZ	80	OLYA	e^+e^-

[1] Reanalysis of ZHOLENTZ 80 using new electron mass (COHEN 87) and radiative corrections (KURAEV 85).
[2] Superseded by ARTAMONOV 00.

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

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
589.07±0.13 OUR AVERAGE				
589.7 ±1.2	LEMOIGNE	82	GOLI	190 π^- Be $\to 2\mu$
589.07±0.13	[3] 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	[4] BAI	98E	BES	e^+e^-

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

$\psi(2S)$ WIDTH

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
277±31 OUR AVERAGE Error includes scale factor of 1.1.				
306±36±16	ARMSTRONG	93B	E760	$\overline{p}p \to e^+e^-$
243±43	[5] PDG	92	RVUE	

[5] Uses $\Gamma(ee)$ from ALEXANDER 89 and $B(ee) = (88 \pm 13) \times 10^{-4}$ from FELDMAN 77.

$\psi(2S)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	hadrons	(98.10±0.30) %	
Γ_2	virtual$\gamma \to$ hadrons	(2.9 ±0.4) %	
Γ_3	e^+e^-	(8.8 ±1.3) $\times 10^{-3}$	
Γ_4	$\mu^+\mu^-$	(1.03±0.35) %	

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

Γ_5	$J/\psi(1S)$anything	(55 ± 5) %	
Γ_6	$J/\psi(1S)$neutrals	(23.1 ± 2.3) %	
Γ_7	$J/\psi(1S)\pi^+\pi^-$	(31.0 ± 2.8) %	
Γ_8	$J/\psi(1S)\pi^0\pi^0$	(18.2 ± 2.3) %	
Γ_9	$J/\psi(1S)\eta$	(2.7 ± 0.4) %	S=1.6
Γ_{10}	$J/\psi(1S)\pi^0$	$(9.7 \pm 2.1) \times 10^{-4}$	

Hadronic decays

Γ_{11}	$3(\pi^+\pi^-)\pi^0$	$(3.5 \pm 1.6) \times 10^{-3}$	
Γ_{12}	$2(\pi^+\pi^-)\pi^0$	$(3.0 \pm 0.8) \times 10^{-3}$	
Γ_{13}	$\omega f_2(1270)$	$< 1.7 \times 10^{-4}$	CL=90%
Γ_{14}	$\rho a_2(1320)$	$< 2.3 \times 10^{-4}$	CL=90%
Γ_{15}	$\pi^+\pi^- K^+ K^-$	$(1.6 \pm 0.4) \times 10^{-3}$	
Γ_{16}	$K^*(892)\overline{K}^*_2(1430)^0$	$< 1.2 \times 10^{-4}$	CL=90%
Γ_{17}	$K_1(1270)^{\pm} K^{\mp}$	$(1.00 \pm 0.28) \times 10^{-3}$	
Γ_{18}	$\pi^+\pi^- p\overline{p}$	$(8.0 \pm 2.0) \times 10^{-4}$	
Γ_{19}	$K^+\overline{K}^*(892)^0\pi^- +$ c.c.	$(6.7 \pm 2.5) \times 10^{-4}$	
Γ_{20}	$b_1^{\pm}\pi^{\mp}$	$(5.2 \pm 1.3) \times 10^{-4}$	
Γ_{21}	$2(\pi^+\pi^-)$	$(4.5 \pm 1.0) \times 10^{-4}$	
Γ_{22}	$\rho^0\pi^+\pi^-$	$(4.2 \pm 1.5) \times 10^{-4}$	
Γ_{23}	$\overline{p}p$	$(1.9 \pm 0.5) \times 10^{-4}$	
Γ_{24}	$3(\pi^+\pi^-)$	$(1.5 \pm 1.0) \times 10^{-4}$	
Γ_{25}	$\overline{p}p\pi^0$	$(1.4 \pm 0.5) \times 10^{-4}$	
Γ_{26}	K^+K^-	$(1.0 \pm 0.7) \times 10^{-4}$	
Γ_{27}	$\pi^+\pi^-\pi^0$	$(8 \pm 5) \times 10^{-5}$	
Γ_{28}	$\rho\pi$	$< 8.3 \times 10^{-5}$	CL=90%
Γ_{29}	$\pi^+\pi^-$	$(8 \pm 5) \times 10^{-5}$	
Γ_{30}	$\Lambda\overline{\Lambda}$	$< 4 \times 10^{-4}$	CL=90%
Γ_{31}	$K_1(1400)^{\pm} K^{\mp}$	$< 3.1 \times 10^{-4}$	CL=90%
Γ_{32}	$\Xi^-\overline{\Xi}^+$	$< 2 \times 10^{-4}$	CL=90%
Γ_{33}	$K^+K^-\pi^0$	$< 2.96 \times 10^{-5}$	CL=90%
Γ_{34}	$K^+\overline{K}^*(892)^- +$ c.c.	$< 5.4 \times 10^{-5}$	CL=90%
Γ_{35}	$\phi f'_2(1525)$	$< 4.5 \times 10^{-5}$	CL=90%

Radiative decays

Γ_{36}	$\gamma\chi_{c0}(1P)$	(9.3 ± 0.9) %	
Γ_{37}	$\gamma\chi_{c1}(1P)$	(8.7 ± 0.8) %	
Γ_{38}	$\gamma\chi_{c2}(1P)$	(7.8 ± 0.8) %	
Γ_{39}	$\gamma\eta_c(1S)$	$(2.8 \pm 0.6) \times 10^{-3}$	
Γ_{40}	$\gamma\eta_c(2S)$		

Γ_{41}	$\gamma \pi^0$		
Γ_{42}	$\gamma \eta'(958)$	$(1.5 \pm 0.4) \times 10^{-4}$	
Γ_{43}	$\gamma \eta$	$< 9 \times 10^{-5}$	CL=90%
Γ_{44}	$\gamma \gamma$	$< 1.6 \times 10^{-4}$	CL=90%
Γ_{45}	$\gamma \eta(1440) \rightarrow \gamma K \overline{K} \pi$	$< 1.2 \times 10^{-4}$	CL=90%

Mode needed for fitting purposes

Γ_{46}	1. − other fit modes	(21 ± 5) %	

CONSTRAINED FIT INFORMATION

An overall fit to 10 branching ratios uses 17 measurements and one constraint to determine 8 parameters. The overall fit has a $\chi^2 = 9.0$ for 10 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\left\langle \delta x_i \delta x_j \right\rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

	x_4	x_7	x_8	x_9	x_{36}	x_{37}	x_{38}
x_7	27						
x_8	17	63					
x_9	2	9	3				
x_{36}	0	0	0	0			
x_{37}	0	−1	−5	0	0		
x_{38}	0	0	−2	0	0	0	
x_{46}	−30	−89	−83	−15	−17	−13	−15

$\psi(2S)$ PARTIAL WIDTHS

Γ(hadrons) Γ_1

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

$\Gamma(e^+ e^-)$ Γ_3

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2.12±0.18 OUR AVERAGE				
2.07±0.32	[6] BAI	98E	BES	$e^+ e^-$
2.14±0.21	ALEXANDER	89	RVUE	See Υ mini-review
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.0 ±0.3	BRANDELIK	79C	DASP	$e^+ e^-$
2.1 ±0.3	[7] LUTH	75	MRK1	$e^+ e^-$

[6] Value includes radiative corrections computed by ALEXANDER 89.
[7] From a simultaneous fit to $e^+ e^-$, $\mu^+ \mu^-$, and hadronic channels assuming $\Gamma(e^+ e^-) = \Gamma(\mu^+ \mu^-)$.

$\Gamma(\gamma\gamma)$ — Γ_{44}

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 $\Gamma(I)$/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^-

$\psi(2S)$ BRANCHING RATIOS

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

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.981 ±0.003	[8] LUTH	75	MRK1	e^+e^-

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

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.029±0.004	[9] LUTH	75	MRK1	e^+e^-

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

VALUE (units 10^{-4})	*DOCUMENT ID*		*TECN*	*COMMENT*
88±13	[10] FELDMAN	77	RVUE	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •				
83± 5±7	[11] ARMSTRONG	97	E760	$\overline{p}p \to \psi(2S)X$

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

VALUE (units 10^{-4})	*DOCUMENT ID*		*TECN*	*COMMENT*
77±17	[12] HILGER	75	SPEC	e^+e^-

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

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

[8] Includes cascade decay into $J/\psi(1S)$.
[9] Included in $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$.
[10] 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.
[11] Using $B(J/\psi \to e^+e^-) = 0.0599 \pm 0.0025$ and $B(\psi(2S) \to J/\psi(1S)\text{anything}) = 0.57 \pm 0.04$. Not an independent measurement, see GU 99.
[12] Restated by us using $B(\psi(2S) \to J/\psi(1S)\text{anything}) = 0.55$.

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

$\Gamma(J/\psi(1S)\text{anything})/\Gamma_{total}$ — $\Gamma_5/\Gamma = (\Gamma_7+\Gamma_8+\Gamma_9+0.273\Gamma_{37}+0.135\Gamma_{38})/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.55±0.05 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	$e^+e^- \to \mu^+\mu^- X$

$\Gamma(J/\psi(1S)\text{neutrals})/\Gamma_{total}$ — $\Gamma_6/\Gamma = (0.9761\Gamma_8+0.715\Gamma_9+0.273\Gamma_{37}+0.135\Gamma_{38})/\Gamma$

VALUE	DOCUMENT ID
0.231±0.023 OUR FIT	

$\Gamma(J/\psi(1S)\text{neutrals})/\Gamma(J/\psi(1S)\text{anything})$ — $\Gamma_6/\Gamma_5 = (0.9761\Gamma_8+0.715\Gamma_9+0.273\Gamma_{37}+0.135\Gamma_{38})/(\Gamma_7+\Gamma_8+\Gamma_9+0.273\Gamma_{37}+0.135\Gamma_{38})$

VALUE	DOCUMENT ID		TECN	COMMENT
0.418±0.019 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.44 ±0.03	[13] ABRAMS	75B	MRK1	$e^+e^- \to J/\psi X$

$\Gamma(J/\psi(1S)\text{neutrals})/\Gamma(J/\psi(1S)\pi^+\pi^-)$ — $\Gamma_6/\Gamma_7 = (0.9761\Gamma_8+0.715\Gamma_9+0.273\Gamma_{37}+0.135\Gamma_{38})/\Gamma_7$

VALUE	DOCUMENT ID		TECN	COMMENT
0.75±0.06 OUR FIT				
0.73±0.09	[13] TANENBAUM	76	MRK1	e^+e^-

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma_{total}$ — Γ_7/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.310±0.028 OUR FIT					
0.32 ±0.04		ABRAMS	75B	MRK1	$e^+e^- \to J/\psi\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.283±0.021±0.020	363	[14] ARMSTRONG	97	E760	$\overline{p}p \to \psi(2S)X$

$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma_{total}$ — Γ_8/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.182±0.023 OUR FIT					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.184±0.019±0.013	157	[14] ARMSTRONG	97	E760	$\overline{p}p \to \psi(2S)X$

$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ — Γ_8/Γ_7

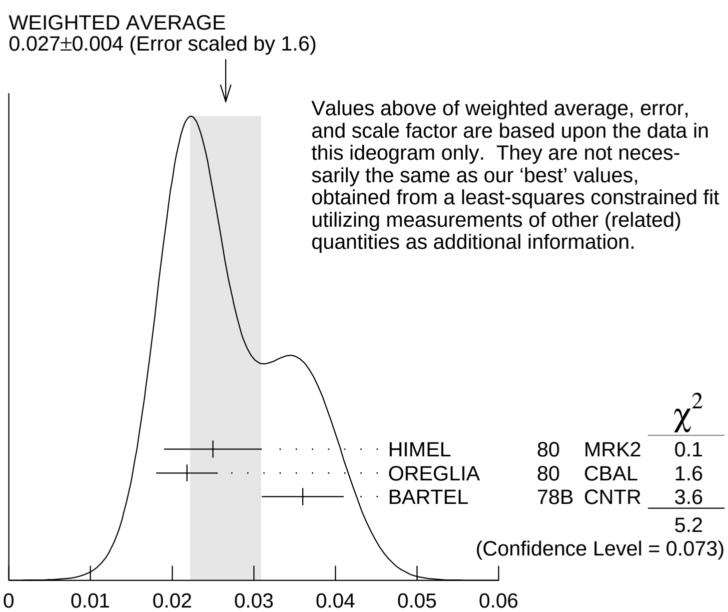
VALUE	DOCUMENT ID		TECN	COMMENT
0.59 ±0.06 OUR FIT				
0.609±0.079	[15] GU	99	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.53 ±0.06	[16] TANENBAUM	76	MRK1	e^+e^-
0.64 ±0.15	[17] HILGER	75	SPEC	e^+e^-

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma(\mu^+\mu^-)$ Γ_7/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
30 ±10 OUR FIT				
30.2± 7.1±6.8	[18] GRIBUSHIN	96	FMPS	515 π^- Be $\rightarrow$ $2\mu X$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.027 ±0.004 OUR FIT Error includes scale factor of 1.6.					
0.027 ±0.004 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.					
0.025 ±0.006	166	HIMEL	80	MRK2	e^+e^-
0.0218±0.0014±0.0035	386	OREGLIA	80	CBAL	$e^+e^- \rightarrow J/\psi\,2\gamma$
0.036 ±0.005	164	BARTEL	78B	CNTR	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.032 ±0.010 ±0.002	36	[19] ARMSTRONG	97	E760	$\overline{p}p \rightarrow \psi(2S)X$
0.035 ±0.009	17	[19] BRANDELIK	79B	DASP	$e^+e^- \rightarrow J/\psi\,2\gamma$
0.043 ±0.008	44	[19] TANENBAUM	76	MRK1	e^+e^-



$\Gamma\Big(J/\psi(1S)\eta\Big)/\Gamma_{total}$

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

$\Gamma_9/\Gamma_5 = \Gamma_9/(\Gamma_7+\Gamma_8+\Gamma_9+0.273\Gamma_{37}+0.135\Gamma_{38})$

VALUE	DOCUMENT ID		TECN
0.049±0.008 OUR FIT Error includes scale factor of 1.3.			
0.062±0.016	[15] GU	99	RVUE

$\Gamma(J/\psi(1S)\pi^0)/\Gamma_{total}$ — Γ_{10}/Γ

VALUE (units 10^{-4})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
9.7±2.1 OUR AVERAGE					
15 ±6	7	HIMEL	80	MRK2	e^+e^-
9 ±2 ±1	23	OREGLIA	80	CBAL	$\psi(2S) \rightarrow J/\psi 2\gamma$

[13] The ABRAMS 75B measurement of Γ_6/Γ_5 and the TANENBAUM 76 result for Γ_6/Γ_7 are not independent. The TANENBAUM 76 result is used in the fit because it includes more accurate corrections for angular distributions.

[14] Using B($J/\psi \rightarrow e^+e^-$) = 0.0599 ± 0.0025 and B($\psi(2S) \rightarrow J/\psi(1S)$anything)= 0.57 ± 0.04.

[15] Using data from ARMSTRONG 97.

[16] Not independent of the TANENBAUM 76 result for Γ_6/Γ_7.

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

[18] Using B($J/\psi(1S) \rightarrow \mu^+\mu^-$) = 0.0597 ± 0.0025.

[19] Low statistics data removed from average.

HADRONIC DECAYS

$\Gamma(3(\pi^+\pi^-)\pi^0)/\Gamma_{total}$ — Γ_{11}/Γ

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

$\Gamma(2(\pi^+\pi^-)\pi^0)/\Gamma_{total}$ — Γ_{12}/Γ

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

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

VALUE (units 10^{-4})	*DOCUMENT ID*		*TECN*	*COMMENT*
16±4	[20] TANENBAUM	78	MRK1	e^+e^-

$\Gamma(K_1(1270)^{\pm}K^{\mp})/\Gamma_{total}$ — Γ_{17}/Γ

VALUE (units 10^{-4})	*DOCUMENT ID*		*TECN*	*COMMENT*
10.0±1.8±2.1	[21] BAI	99C	BES	e^+e^-

$\Gamma(\pi^+\pi^-p\overline{p})/\Gamma_{total}$ — Γ_{18}/Γ

VALUE (units 10^{-4})	*DOCUMENT ID*		*TECN*	*COMMENT*
8 ±2	[20] TANENBAUM	78	MRK1	e^+e^-

$\Gamma(K^+\overline{K}^*(892)^0\pi^- + c.c.)/\Gamma_{total}$ — Γ_{19}/Γ

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

$\Gamma(b_1^{\pm}\pi^{\mp})/\Gamma_{total}$ — Γ_{20}/Γ

VALUE (units 10^{-4})	*DOCUMENT ID*		*TECN*	*COMMENT*
5.2±0.8±1.0	[22] BAI	99C	BES	e^+e^-

$\Gamma(2(\pi^+\pi^-))/\Gamma_{total}$ — Γ_{21}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
4.5±1.0	TANENBAUM	78	MRK1	e^+e^-

$\Gamma(\omega f_2(1270))/\Gamma_{total}$ — Γ_{13}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.7	90	BAI	98J	BES	e^+e^-

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{total}$ — Γ_{22}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
4.2±1.5	TANENBAUM	78	MRK1	e^+e^-

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<2.3	90	BAI	98J	BES	e^+e^-

$\Gamma(\bar{p}p)/\Gamma_{total}$ — Γ_{23}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.9±0.5 OUR AVERAGE					
1.4±0.8	4	BRANDELIK	79C	DASP	e^+e^-
2.3±0.7		FELDMAN	77	MRK1	e^+e^-

$\Gamma(3(\pi^+\pi^-))/\Gamma_{total}$ — Γ_{24}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
1.5±1.0	[20] TANENBAUM	78	MRK1	e^+e^-

$\Gamma(\bar{p}p\pi^0)/\Gamma_{total}$ — Γ_{25}/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_{26}/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^-

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ — Γ_{29}/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_{27}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.85±0.46	4	FRANKLIN	83	MRK2	$e^+e^- \to$ hadrons

$\Gamma(\Lambda\overline{\Lambda})/\Gamma_{total}$ — Γ_{30}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<4	90	FELDMAN	77	MRK1	e^+e^-

$\Gamma(K_1(1400)^{\pm}K^{\mp})/\Gamma_{total}$ — Γ_{31}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<3.1	90	[23] BAI	99C	BES	e^+e^-

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<2	90	FELDMAN	77	MRK1	e^+e^-

$\Gamma(\rho\pi)/\Gamma_{total}$ — Γ_{28}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
< 0.83	90	1	FRANKLIN	83	MRK2	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<10	90		BARTEL	76	CNTR	e^+e^-
<10	90		[24] ABRAMS	75	MRK1	e^+e^-

$\Gamma(K^+K^-\pi^0)/\Gamma_{total}$ — Γ_{33}/Γ

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

$\Gamma(K^+\overline{K}^*(892)^- + \text{c.c.})/\Gamma_{total}$ — Γ_{34}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<5.4	90	FRANKLIN	83	MRK2	$e^+e^- \rightarrow$ hadrons

$\Gamma(K^*(892)\overline{K}_2^*(1430)^0)/\Gamma_{total}$ — Γ_{16}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.2	90	BAI	98J	BES	e^+e^-

$\Gamma(\phi f_2'(1525))/\Gamma_{total}$ — Γ_{35}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.45	90	BAI	98J	BES	$e^+e^- \rightarrow 2(K^+K^-)$

[20] Assuming entirely strong decay.
[21] Assuming $B(K_1(1270) \rightarrow K\rho)=0.42 \pm 0.06$
[22] Assuming $B(b_1 \rightarrow \omega\pi)=1$.
[23] Assuming $B(K_1(1400) \rightarrow K^*\pi)=0.94 \pm 0.06$
[24] Final state $\rho^0\pi^0$.

RADIATIVE DECAYS

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma_{total}$ — Γ_{36}/Γ

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
9.3±0.9 OUR FIT				
9.3±0.8 OUR AVERAGE				
9.9±0.5±0.8	[25] GAISER	86	CBAL	$e^+e^- \rightarrow \gamma X$
7.2±2.3	[25] BIDDICK	77	CNTR	$e^+e^- \rightarrow \gamma X$
7.5±2.6	[25] WHITAKER	76	MRK1	e^+e^-

$\Gamma(\gamma\chi_{c1}(1P))/\Gamma_{total}$ — Γ_{37}/Γ

VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
8.7±0.8 OUR FIT				
8.7±0.8 OUR AVERAGE				
9.0±0.5±0.7	[26] GAISER	86	CBAL	$e^+e^- \rightarrow \gamma X$
7.1±1.9	[27] BIDDICK	77	CNTR	$e^+e^- \rightarrow \gamma X$

$\Gamma(\gamma\chi_{c2}(1P))/\Gamma_{total}$ — Γ_{38}/Γ

VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
7.8±0.8 OUR FIT				
7.8±0.8 OUR AVERAGE				
8.0±0.5±0.7	[28] GAISER	86	CBAL	$e^+e^- \rightarrow \gamma X$
7.0±2.0	[27] BIDDICK	77	CNTR	$e^+e^- \rightarrow \gamma X$

$\Gamma(\gamma\eta_c(1S))/\Gamma_{total}$ — Γ_{39}/Γ

VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
0.28±0.06	GAISER	86	CBAL	$e^+e^- \rightarrow \gamma X$

$\Gamma(\gamma\eta_c(2S))/\Gamma_{total}$ — Γ_{40}/Γ

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

$\Gamma(\gamma\pi^0)/\Gamma_{total}$ — Γ_{41}/Γ

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 54	95	[29] LIBERMAN	75	SPEC	e^+e^-
<100	90	WIIK	75	DASP	e^+e^-

$\Gamma(\gamma\eta'(958))/\Gamma_{total}$ — Γ_{42}/Γ

VALUE (units 10^{-4})	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
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		[30] BRAUNSCH...	77	DASP	e^+e^-
<11	90		[31] BARTEL	76	CNTR	e^+e^-

$\Gamma(\gamma\eta)/\Gamma_{total}$ — Γ_{43}/Γ

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

$\Gamma(\gamma\eta(1440) \to \gamma K\overline{K}\pi)/\Gamma_{total}$ — Γ_{45}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<0.12	90	[32] SCHARRE	80	MRK1	e^+e^-

[25] Angular distribution $(1+\cos^2\theta)$ assumed.
[26] Angular distribution $(1-0.189\cos^2\theta)$ assumed.
[27] Valid for isotropic distribution of the photon.
[28] Angular distribution $(1-0.052\cos^2\theta)$ assumed.
[29] Restated by us using $B(\psi(2S) \to \mu^+\mu^-) = 0.0077$.
[30] Restated by us using total decay width 228 keV.
[31] The value is normalized to the branching ratio for $\Gamma(J/\psi(1S)\eta)/\Gamma_{total}$.
[32] Includes unknown branching fraction $\eta(1440) \to K\overline{K}\pi$.

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