$\chi_{c2}(1P)$

$I^G(J^{PC}) = 0^+(2^{++})$

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

$\chi_{c2}(1P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
3556.20 ± 0.09 OUR AVERAGE					
3555.3 ± 0.6 ±2.2	2.5k	UEHARA	08	BELL	$\gamma\gamma \to$ hadrons
3555.70 ± 0.59 ±0.39		ABLIKIM	05G	BES2	$\psi(2S) \to \gamma\chi_{c2}$
3556.173± 0.123±0.020		ANDREOTTI	05A	E835	$p\overline{p} \to e^+e^-\gamma$
3559.9 ± 2.9		EISENSTEIN	01	CLE2	$e^+e^- \to e^+e^-\chi_{c2}$
3556.4 ± 0.7		BAI	99B	BES	$\psi(2S) \to \gamma X$
3556.22 ± 0.131±0.020	585	[1] ARMSTRONG	92	E760	$\overline{p}p \to e^+e^-\gamma$
3556.9 ± 0.4 ±0.5	50	BAGLIN	86B	SPEC	$\overline{p}p \to e^+e^- X$
3557.8 ± 0.2 ±4		[2] GAISER	86	CBAL	$\psi(2S) \to \gamma X$
3553.4 ± 2.2	66	[3] LEMOIGNE	82	GOLI	185 π^- Be $\to \gamma\mu^+\mu^-$ A
3555.9 ± 0.7		[4] OREGLIA	82	CBAL	$e^+e^- \to J/\psi 2\gamma$
3557 ± 1.5	69	[5] HIMEL	80	MRK2	$e^+e^- \to J/\psi 2\gamma$
3551 ±11	15	BRANDELIK	79B	DASP	$e^+e^- \to J/\psi 2\gamma$
3553 ± 4		[5] BARTEL	78B	CNTR	$e^+e^- \to J/\psi 2\gamma$
3553 ± 4 ±4		[5,6] TANENBAUM	78	MRK1	e^+e^-
3563 ± 7	360	[5] BIDDICK	77	CNTR	$e^+e^- \to \gamma X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3543 ±10	4	WHITAKER	76	MRK1	$e^+e^- \to J/\psi 2\gamma$

[1] Recalculated by ANDREOTTI 05A, using the value of $\psi(2S)$ mass from AULCHENKO 03.
[2] Using mass of $\psi(2S)$ = 3686.0 MeV.
[3] $J/\psi(1S)$ mass constrained to 3097 MeV.
[4] Assuming $\psi(2S)$ mass = 3686 MeV and $J/\psi(1S)$ mass = 3097 MeV.
[5] Mass value shifted by us by amount appropriate for $\psi(2S)$ mass = 3686 MeV and $J/\psi(1S)$ mass = 3097 MeV.
[6] From a simultaneous fit to radiative and hadronic decay channels.

$\chi_{c2}(1P)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1.97 ±0.11 OUR FIT					
1.95 ±0.13 OUR AVERAGE					
1.915±0.188±0.013		ANDREOTTI	05A	E835	$p\overline{p} \to e^+e^-\gamma$
1.96 ±0.17 ±0.07	585	[7] ARMSTRONG	92	E760	$\overline{p}p \to e^+e^-\gamma$
2.6 $^{+1.4}_{-1.0}$	50	BAGLIN	86B	SPEC	$\overline{p}p \to e^+e^- X$
2.8 $^{+2.1}_{-2.0}$		[8] GAISER	86	CBAL	$\psi(2S) \to \gamma X$

[7] Recalculated by ANDREOTTI 05A.
[8] Errors correspond to 90% confidence level; authors give only width range.

$\chi_{c2}(1P)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
	Hadronic decays		
Γ_1	$2(\pi^+\pi^-)$	(1.11±0.11) %	
Γ_2	$\rho\rho$		
Γ_3	$\pi^+\pi^-\pi^0\pi^0$	(1.99±0.26) %	
Γ_4	$\rho^+\pi^-\pi^0+$ c.c.	(2.4 ±0.4) %	
Γ_5	$4\pi^0$	(1.21±0.17) $\times 10^{-3}$	
Γ_6	$K^+K^-\pi^0\pi^0$	(2.2 ±0.4) $\times 10^{-3}$	
Γ_7	$K^+\pi^-K^0\pi^0+$ c.c.	(1.50±0.22) %	
Γ_8	$\rho^+K^-K^0+$ c.c.	(4.5 ±1.4) $\times 10^{-3}$	
Γ_9	$K^*(892)^0K^+\pi^- \rightarrow K^+\pi^-K^0\pi^0+$ c.c.	(3.2 ±0.9) $\times 10^{-3}$	
Γ_{10}	$K^*(892)^0K^0\pi^0 \rightarrow K^+\pi^-K^0\pi^0+$ c.c.	(4.2 ±0.9) $\times 10^{-3}$	
Γ_{11}	$K^*(892)^-K^+\pi^0 \rightarrow K^+\pi^-K^0\pi^0+$ c.c.	(4.1 ±0.9) $\times 10^{-3}$	
Γ_{12}	$K^*(892)^+K^0\pi^- \rightarrow K^+\pi^-K^0\pi^0+$ c.c.	(3.2 ±0.9) $\times 10^{-3}$	
Γ_{13}	$K^+K^-\eta\pi^0$	(1.4 ±0.5) $\times 10^{-3}$	
Γ_{14}	$\pi^+\pi^-K^+K^-$	(9.2 ±1.1) $\times 10^{-3}$	
Γ_{15}	$K^+\overline{K}^*(892)^0\pi^-+$ c.c.	(2.3 ±1.2) $\times 10^{-3}$	
Γ_{16}	$K^*(892)^0\overline{K}^*(892)^0$	(2.5 ±0.5) $\times 10^{-3}$	
Γ_{17}	$3(\pi^+\pi^-)$	(8.6 ±1.8) $\times 10^{-3}$	
Γ_{18}	$\phi\phi$	(1.48±0.28) $\times 10^{-3}$	
Γ_{19}	$\omega\omega$	(1.9 ±0.6) $\times 10^{-3}$	
Γ_{20}	$\pi\pi$	(2.42±0.13) $\times 10^{-3}$	
Γ_{21}	$\rho^0\pi^+\pi^-$	(4.0 ±1.7) $\times 10^{-3}$	
Γ_{22}	$\pi^+\pi^-\eta$	(5.2 ±1.4) $\times 10^{-4}$	
Γ_{23}	$\pi^+\pi^-\eta'$	(5.4 ±2.0) $\times 10^{-4}$	
Γ_{24}	$\eta\eta$	(5.9 ±0.5) $\times 10^{-4}$	
Γ_{25}	K^+K^-	(1.09±0.08) $\times 10^{-3}$	
Γ_{26}	$K^0_SK^0_S$	(5.8 ±0.5) $\times 10^{-4}$	
Γ_{27}	$\overline{K}^0K^+\pi^-+$ c.c.	(1.32±0.20) $\times 10^{-3}$	
Γ_{28}	$K^+K^-\pi^0$	(3.3 ±0.8) $\times 10^{-4}$	
Γ_{29}	$K^+K^-\eta$	< 3.5 $\times 10^{-4}$	90%
Γ_{30}	$\eta\eta'$	< 6 $\times 10^{-5}$	90%
Γ_{31}	$\eta'\eta'$	< 1.1 $\times 10^{-4}$	90%
Γ_{32}	$\pi^+\pi^-K^0_SK^0_S$	(2.4 ±0.6) $\times 10^{-3}$	
Γ_{33}	$K^+K^-K^0_SK^0_S$	< 4 $\times 10^{-4}$	90%
Γ_{34}	$K^+K^-K^+K^-$	(1.78±0.22) $\times 10^{-3}$	
Γ_{35}	$K^+K^-\phi$	(1.55±0.32) $\times 10^{-3}$	
Γ_{36}	$K^0_SK^0_Sp\overline{p}$	< 7.9 $\times 10^{-4}$	90%

Γ_{37}	$p\overline{p}$	$(7.2 \pm 0.4) \times 10^{-5}$	
Γ_{38}	$p\overline{p}\pi^0$	$(5.1 \pm 0.5) \times 10^{-4}$	
Γ_{39}	$p\overline{p}\eta$	$(1.90 \pm 0.28) \times 10^{-4}$	
Γ_{40}	$p\overline{p}\omega$	$(3.9 \pm 0.5) \times 10^{-4}$	
Γ_{41}	$\pi^+\pi^- p\overline{p}$	$(1.32 \pm 0.34) \times 10^{-3}$	
Γ_{42}	$\pi^0\pi^0 p\overline{p}$	$(8.5 \pm 2.6) \times 10^{-4}$	
Γ_{43}	$p\overline{n}\pi^-$	$(1.1 \pm 0.4) \times 10^{-3}$	
Γ_{44}	$\Lambda\overline{\Lambda}$	$(1.86 \pm 0.27) \times 10^{-4}$	
Γ_{45}	$\Lambda\overline{\Lambda}\pi^+\pi^-$	$< 3.5 \times 10^{-3}$	90%
Γ_{46}	$K^+\overline{p}\Lambda$ + c.c.	$(9.1 \pm 1.8) \times 10^{-4}$	
Γ_{47}	$\Sigma^0\overline{\Sigma}^0$	$< 8 \times 10^{-5}$	90%
Γ_{48}	$\Sigma^+\overline{\Sigma}^-$	$< 7 \times 10^{-5}$	90%
Γ_{49}	$\Xi^0\overline{\Xi}^0$	$< 1.1 \times 10^{-4}$	90%
Γ_{50}	$\Xi^-\overline{\Xi}^+$	$(1.55 \pm 0.35) \times 10^{-4}$	
Γ_{51}	$J/\psi(1S)\pi^+\pi^-\pi^0$	< 1.5 %	90%
	Radiative decays		
Γ_{52}	$\gamma J/\psi(1S)$	(19.5 ± 0.8) %	
Γ_{53}	$\gamma\rho^0$	$< 5 \times 10^{-5}$	90%
Γ_{54}	$\gamma\omega$	$< 6 \times 10^{-6}$	90%
Γ_{55}	$\gamma\phi$	$< 1.2 \times 10^{-5}$	90%
Γ_{56}	$\gamma\gamma$	$(2.56 \pm 0.16) \times 10^{-4}$	

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, 24 combinations of partial widths obtained from integrated cross section, and 83 branching ratios uses 218 measurements to determine 48 parameters. The overall fit has a $\chi^2 = 307.7$ for 170 degrees of freedom.

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

	x_1	x_{14}	x_{15}	x_{16}	x_{18}	x_{20}	x_{21}	x_{24}	x_{25}	x_{26}
x_{14}	17									
x_{15}	4	22								
x_{16}	10	8	2							
x_{18}	9	7	2	4						
x_{20}	23	20	4	12	13					
x_{21}	20	4	1	2	2	5				
x_{24}	14	12	3	7	8	32	3			
x_{25}	18	16	3	9	10	39	4	24		
x_{26}	17	15	3	9	9	34	4	21	25	
x_{34}	12	10	2	6	6	22	3	13	16	14
x_{37}	7	6	1	4	2	1	2	0	1	2
x_{44}	8	7	2	4	5	20	2	12	14	13
x_{52}	28	24	5	14	15	59	6	36	44	39
x_{56}	−18	−15	−3	−9	−5	3	−5	3	0	−2
Γ	−25	−21	−5	−13	−12	−36	−6	−21	−27	−25

	x_{34}	x_{37}	x_{44}	x_{52}	x_{56}
x_{37}	2				
x_{44}	8	0			
x_{52}	25	−11	22		
x_{56}	−3	26	2	9	
Γ	−17	−50	−13	−49	−47

$\chi_{c2}(1P)$ PARTIAL WIDTHS

$\chi_{c2}(1P)$ $\Gamma(i)\Gamma(\gamma J/\psi(1S))/\Gamma(\text{total})$

$\Gamma(p\overline{p}) \times \Gamma(\gamma J/\psi(1S))/\Gamma_{total}$ — $\Gamma_{37}\Gamma_{52}/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
27.7±1.4 OUR FIT				
27.5±1.5 OUR AVERAGE				
27.0±1.5±1.1	[9] ANDREOTTI	05A	E835	$p\overline{p} \to e^+e^-\gamma$
27.7±1.5±2.0	[9,10] ARMSTRONG	92	E760	$\overline{p}p \to e^+e^-\gamma$
36 ±8	[9] BAGLIN	86B	SPEC	$\overline{p}p \to e^+e^- X$

[9] Calculated by us using $B(J/\psi(1S) \to e^+e^-) = 0.0593 \pm 0.0010$.
[10] Recalculated by ANDREOTTI 05A.

$\Gamma(\gamma\gamma) \times \Gamma(\gamma J/\psi(1S))/\Gamma_{total}$ — $\Gamma_{56}\Gamma_{52}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
98± 6 OUR FIT					
117± 10 OUR AVERAGE					
111± 12± 9	147 ± 15	[11] DOBBS	06	CLE3	10.4 $e^+e^- \to e^+e^-\chi_{c2}$
114± 11± 9	136 ± 13.3	[11,12] ABE	02T	BELL	$e^+e^- \to e^+e^-\chi_{c2}$
139± 55± 21		[11,13] ACCIARRI	99E	L3	$e^+e^- \to e^+e^-\chi_{c2}$
242± 65± 51		[11,14] ACKER..,K...	98	OPAL	$e^+e^- \to e^+e^-\chi_{c2}$
150± 42± 36		[11,15] DOMINICK	94	CLE2	$e^+e^- \to e^+e^-\chi_{c2}$
470±240±120		[11,16] BAUER	93	TPC	$e^+e^- \to e^+e^-\chi_{c2}$

[11] Calculated by us using $B(J/\psi \to \ell^+\ell^-) = 0.1187 \pm 0.0008$.
[12] All systematic errors added in quadrature.
[13] The value for $\Gamma(\chi_{c2} \to \gamma\gamma)$ reported in ACCIARRI 99E is derived using $B(\chi_{c2} \to \gamma J/\psi(1S)) \times B(J/\psi(1S) \to \ell^+\ell^-) = 0.0162 \pm 0.0014$.
[14] The value for $\Gamma(\chi_{c2} \to \gamma\gamma)$ reported in ACKERSTAFF,K 98 is derived using $B(\chi_{c2} \to \gamma J/\psi(1S)) = 0.135 \pm 0.011$ and $B(J/\psi(1S) \to \ell^+\ell^-) = 0.1203 \pm 0.0038$.
[15] The value for $\Gamma(\chi_{c2} \to \gamma\gamma)$ reported in DOMINICK 94 is derived using $B(\chi_{c2} \to \gamma J/\psi(1S)) = 0.135 \pm 0.011$, $B(J/\psi(1S) \to e^+e^-) = 0.0627 \pm 0.0020$, and $B(J/\psi(1S) \to \mu^+\mu^-) = 0.0597 \pm 0.0025$.
[16] The value for $\Gamma(\chi_{c2} \to \gamma\gamma)$ reported in BAUER 93 is derived using $B(\chi_{c2} \to \gamma J/\psi(1S)) = 0.135 \pm 0.011$, $B(J/\psi(1S) \to e^+e^-) = 0.0627 \pm 0.0020$, and $B(J/\psi(1S) \to \mu^+\mu^-) = 0.0597 \pm 0.0025$.

$\chi_{c2}(1P)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_1\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
5.6 ±0.5 OUR FIT					
5.2 ±0.7 OUR AVERAGE					
5.01±0.44±0.55	1597±138	UEHARA	08	BELL	$\gamma\gamma \to \chi_{c2} \to 2(\pi^+\pi^-)$
6.4 ±1.8 ±0.8		EISENSTEIN	01	CLE2	$e^+e^- \to e^+e^-\chi_{c2}$

$\Gamma(\rho^0\pi^+\pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{21}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
2.0±0.9 OUR FIT					
3.2±1.9±0.5	986 ± 578	UEHARA	08	BELL	$\gamma\gamma \to \chi_{c2} \to 2(\pi^+\pi^-)$

$\Gamma(\rho\rho) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_2\Gamma_{56}/\Gamma$

VALUE (eV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<7.8	90	<598	UEHARA	08	BELL	$\gamma\gamma \to \chi_{c2} \to 2(\pi^+\pi^-)$

$\Gamma(\pi^+\pi^- K^+ K^-) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{14}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
4.6 ±0.5 OUR FIT					
4.42±0.42±0.53	780 ± 74	UEHARA	08	BELL	$\gamma\gamma \to \chi_{c2} \to K^+K^-\pi^+\pi^-$

$\Gamma(K^*(892)^0\overline{K}^*(892)^0) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{16}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
1.26±0.24 OUR FIT					
0.8 ±0.17±0.27	151 ± 30	UEHARA	08	BELL	$\gamma\gamma \to \chi_{c2} \to K^+K^-\pi^+\pi^-$

$\Gamma(K^+K^-K^+K^-) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{34}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.90±0.12 OUR FIT					
1.10±0.21±0.15	126 ± 24	UEHARA	08	BELL	$\gamma\gamma \to \chi_{c2} \to 2(K^+K^-)$

$\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{18}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.74±0.14 OUR FIT					
0.58±0.18±0.16	26.5 ± 8.1	UEHARA	08	BELL	$\gamma\gamma \to \chi_{c2} \to 2(K^+K^-)$

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{20}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
1.22±0.08 OUR FIT					
1.18±0.25 OUR AVERAGE					
1.44±0.54±0.47	34 ± 13	[17] UEHARA	09	BELL	10.6 $e^+e^- \to e^+e^-\pi^0\pi^0$
1.14±0.21±0.17	54 ± 10	[18] NAKAZAWA	05	BELL	10.6 $e^+e^- \to e^+e^-\pi^+\pi^-$

[17] We multiplied the measurement by 3 to convert from $\pi^0\pi^0$ to $\pi\pi$. Interference with the continuum included.

[18] We have multiplied $\pi^+\pi^-$ measurement by 3/2 to obtain $\pi\pi$.

$\Gamma(\eta\eta) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{24}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.53±0.22±0.09	8	[19] UEHARA	10A	BELL	10.6 $e^+e^- \to e^+e^-\eta\eta$

[19] Interference with the continuum not included.

$\Gamma(K^+K^-) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{25}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.55±0.04 OUR FIT					
0.44±0.11±0.07	33 ± 8	NAKAZAWA	05	BELL	10.6 $e^+e^- \to e^+e^-K^+K^-$

$\Gamma(K^0_S K^0_S) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{26}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.292±0.025 OUR FIT					
0.31 ±0.05 ±0.03	38 ± 7	CHEN	07B	BELL	$e^+ e^- \to e^+ e^- \chi_{c2}$

$\chi_{c2}(1P)$ BRANCHING RATIOS

HADRONIC DECAYS

$\Gamma(2(\pi^+\pi^-))/\Gamma_{total}$ — Γ_1/Γ

VALUE	DOCUMENT ID
0.0111±0.0011 OUR FIT	

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma(2(\pi^+\pi^-))$ — Γ_{21}/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
0.36±0.15 OUR FIT				
0.31±0.17	TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c2}$

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{total}$ — Γ_3/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.99±0.25±0.08	903.5	[20] HE	08B	CLEO	$e^+ e^- \to \gamma h^+ h^- h^0 h^0$

[20] HE 08B reports $1.87 \pm 0.07 \pm 0.22 \pm 0.13$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \to \pi^+\pi^-\pi^0\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho^+\pi^-\pi^0 + \text{c.c.})/\Gamma_{total}$ — Γ_4/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
2.4±0.4±0.1	1031.9	[21,22] HE	08B	CLEO	$e^+ e^- \to \gamma h^+ h^- h^0 h^0$

[21] HE 08B reports $2.23 \pm 0.11 \pm 0.32 \pm 0.16$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \to \rho^+\pi^-\pi^0 + \text{c.c.})/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[22] Calculated by us. We have added the values from HE 08B for $\rho^+\pi^-\pi^0$ and $\rho^-\pi^+\pi^0$ decays assuming uncorrelated statistical and fully correlated systematic uncertainties.

$\Gamma(K^+K^-\pi^0\pi^0)/\Gamma_{total}$ — Γ_6/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.22±0.04±0.01	76.9	[23] HE	08B	CLEO	$e^+ e^- \to \gamma h^+ h^- h^0 h^0$

[23] HE 08B reports $0.21 \pm 0.03 \pm 0.03 \pm 0.01$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \to K^+K^-\pi^0\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+\pi^-K^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.50±0.21±0.06	211.6	[24] HE	08B	CLEO	$e^+e^- \rightarrow \gamma h^+ h^- h^0 h^0$

[24] HE 08B reports $1.41 \pm 0.11 \pm 0.16 \pm 0.10$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+\pi^-K^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho^+K^-K^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.45±0.13±0.02	62.9	[25] HE	08B	CLEO	$e^+e^- \rightarrow \gamma h^+ h^- h^0 h^0$

[25] HE 08B reports $0.42 \pm 0.11 \pm 0.06 \pm 0.03$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \rho^+K^-K^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)^0K^+\pi^- \rightarrow K^+\pi^-K^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.32±0.09±0.01	38.7	[26] HE	08B	CLEO	$e^+e^- \rightarrow \gamma h^+ h^- h^0 h^0$

[26] HE 08B reports $0.30 \pm 0.07 \pm 0.04 \pm 0.02$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^0K^+\pi^- \rightarrow K^+\pi^-K^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)^0K^0\pi^0 \rightarrow K^+\pi^-K^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.42±0.09±0.02	63.0	[27] HE	08B	CLEO	$e^+e^- \rightarrow \gamma h^+ h^- h^0 h^0$

[27] HE 08B reports $0.39 \pm 0.07 \pm 0.05 \pm 0.03$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^0K^0\pi^0 \rightarrow K^+\pi^-K^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)^-K^+\pi^0 \rightarrow K^+\pi^-K^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.41±0.09±0.02	51.1	[28] HE	08B	CLEO	$e^+e^- \rightarrow \gamma h^+ h^- h^0 h^0$

[28] HE 08B reports $0.38 \pm 0.07 \pm 0.04 \pm 0.03$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^-K^+\pi^0 \rightarrow K^+\pi^-K^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)^+ K^0 \pi^- \to K^+ \pi^- K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{12}/Γ

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
0.32±0.09±0.01	39.3	[29] HE 08B	CLEO	$e^+ e^- \to \gamma h^+ h^- h^0 h^0$

[29] HE 08B reports $0.30 \pm 0.07 \pm 0.04 \pm 0.02$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \to K^*(892)^+ K^0 \pi^- \to K^+ \pi^- K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
0.14±0.05±0.01	22.9	[30] HE 08B	CLEO	$e^+ e^- \to \gamma h^+ h^- h^0 h^0$

[30] HE 08B reports $0.13 \pm 0.04 \pm 0.02 \pm 0.01$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \to K^+ K^- \eta\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}$ — Γ_{14}/Γ

VALUE (units 10^{-3})	DOCUMENT ID
9.2±1.1 OUR FIT	

$\Gamma(K^+ \overline{K}^*(892)^0 \pi^- + \text{c.c.})/\Gamma(\pi^+ \pi^- K^+ K^-)$ — Γ_{15}/Γ_{14}

VALUE	DOCUMENT ID	TECN	COMMENT
0.25±0.13 OUR FIT			
0.25±0.13	TANENBAUM 78	MRK1	$\psi(2S) \to \gamma\chi_{c2}$

$\Gamma(K^+ \overline{K}^*(892)^0 \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ — Γ_{15}/Γ

VALUE (units 10^{-4})	DOCUMENT ID
23±11 OUR FIT	

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

VALUE (units 10^{-3})	DOCUMENT ID
2.5±0.5 OUR FIT	

$\Gamma(3(\pi^+ \pi^-))/\Gamma_{\text{total}}$ — Γ_{17}/Γ

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
8.6±1.8 OUR EVALUATION Treating systematic error as correlated.			
8.6±1.8 OUR AVERAGE			
8.6±0.9±1.6	[31] BAI 99B	BES	$\psi(2S) \to \gamma\chi_{c2}$
8.7±5.9±0.4	[31] TANENBAUM 78	MRK1	$\psi(2S) \to \gamma\chi_{c2}$

[31] Rescaled by us using $B(\psi(2S) \to \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$ and $B(\psi(2S) \to J/\psi(1S)\pi^+\pi^-) = (32.6 \pm 0.5)\%$. Multiplied by a factor of 2 to convert from $K^0_S K^+ \pi^-$ to $K^0 K^+ \pi^-$ decay.

$\Gamma(\phi\phi)/\Gamma_{\text{total}}$ — Γ_{18}/Γ

VALUE (units 10^{-3})	DOCUMENT ID
1.48±0.28 OUR FIT	

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

VALUE (units 10^{-3})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.9±0.6±0.1	27.7 ± 7.4	[32] ABLIKIM	05N	BES2	$\psi(2S) \to \gamma\chi_{c2} \to \gamma 6\pi$

[32] ABLIKIM 05N reports $[\Gamma(\chi_{c2}(1P) \to \omega\omega)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))] = (0.165 \pm 0.044 \pm 0.032) \times 10^{-3}$ which we divide by our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\pi\pi)/\Gamma_{total}$ Γ_{20}/Γ

VALUE (units 10^{-3})	*DOCUMENT ID*
2.42±0.13 OUR FIT	

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

VALUE (units 10^{-4})	*DOCUMENT ID*
40±17 OUR FIT	

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

VALUE (units 10^{-3})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.52±0.14±0.02		[33] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.6	90	[34] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c2}$

[33] ATHAR 07 reports $(0.49 \pm 0.12 \pm 0.06) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \pi^+\pi^-\eta)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[34] ABLIKIM 06R reports $< 1.7 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \pi^+\pi^-\eta)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(\pi^+\pi^-\eta')/\Gamma_{total}$ Γ_{23}/Γ

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*	*COMMENT*
0.54±0.20±0.02	[35] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

[35] ATHAR 07 reports $(0.51 \pm 0.18 \pm 0.06) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \pi^+\pi^-\eta')/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\eta\eta)/\Gamma_{total}$ Γ_{24}/Γ

VALUE (units 10^{-4})	*DOCUMENT ID*
(5.9+-0.5) OUR FIT	

$\Gamma(4\pi^0)/\Gamma_{total}$ — Γ_5/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.21±0.16±0.05	1164	[36] ABLIKIM	11A	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c2}$

[36] ABLIKIM 11A reports $(1.21 \pm 0.05 \pm 0.16) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to 4\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-3})	DOCUMENT ID
1.09±0.08 OUR FIT	

$\Gamma(K^0_S K^0_S)/\Gamma_{total}$ — Γ_{26}/Γ

VALUE (units 10^{-3})	DOCUMENT ID
0.58±0.05 OUR FIT	

$\Gamma(K^0_S K^0_S)/\Gamma(\pi\pi)$ — Γ_{26}/Γ_{20}

VALUE	DOCUMENT ID		TECN	COMMENT
0.240±0.019 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.27 ±0.07 ±0.04	[37,38] CHEN	07B	BELL	$e^+e^- \to e^+e^-\chi_{c2}$

[37] Using $\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ from the $\pi^+\pi^-$ measurement of NAKAZAWA 05 rescaled by 3/2 to convert to $\pi\pi$.

[38] Not independent from other measurements.

$\Gamma(K^0_S K^0_S)/\Gamma(K^+K^-)$ — Γ_{26}/Γ_{25}

VALUE	DOCUMENT ID		TECN	COMMENT
0.53±0.05 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.70±0.21±0.12	[39,40] CHEN	07B	BELL	$e^+e^- \to e^+e^-\chi_{c2}$

[39] Using $\Gamma(K^+K^-) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ from NAKAZAWA 05.

[40] Not independent from other measurements.

$\Gamma(\overline{K}^0 K^+\pi^- + \text{c.c.})/\Gamma_{total}$ — Γ_{27}/Γ

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.32±0.20 OUR AVERAGE						
1.39±0.22±0.05			[41] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+h^-h^0$
1.11±0.41±0.04		28	[42] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c2}$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<2.0	90		[43] BAI	99B	BES	$\psi(2S) \to \gamma\chi_{c2}$

[41] ATHAR 07 reports $(1.3 \pm 0.2 \pm 0.1) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \overline{K}^0 K^+ \pi^- +$ c.c.$)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[42] We have multiplied the $K^0_S K^+ \pi^-$ measurement by a factor of 2 to convert to $K^0 K^+ \pi^-$. ABLIKIM 06R reports $(1.2 \pm 0.4 \pm 0.2) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \overline{K}^0 K^+ \pi^- +$ c.c.$)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.1 \pm 0.6) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[43] Rescaled by us using $B(\psi(2S) \to \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$ and $B(\psi(2S) \to J/\psi(1S)\pi^+\pi^-) = (32.6 \pm 0.5)\%$. Multiplied by a factor of 2 to convert from $K^0_S K^+ \pi^-$ to $K^0 K^+ \pi^-$ decay.

$\Gamma(K^+ K^- \pi^0)/\Gamma_{total}$ — Γ_{28}/Γ

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*	*COMMENT*
0.33±0.08±0.01	[44] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

[44] ATHAR 07 reports $(0.31 \pm 0.07 \pm 0.04) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to K^+ K^- \pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+ K^- \eta)/\Gamma_{total}$ — Γ_{29}/Γ

VALUE (units 10^{-3})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.35	90	[45] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

[45] ATHAR 07 reports $< 0.33 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to K^+ K^- \eta)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(\eta\eta')/\Gamma_{total}$ — Γ_{30}/Γ

VALUE (units 10^{-4})	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.6	90	3.3 ± 8.0	[46] ASNER	09	CLEO	$\psi(2S) \to \gamma\eta\eta'$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<2.5	90		[47] ADAMS	07	CLEO	$\psi(2S) \to \gamma\chi_{c2}$

[46] ASNER 09 reports $< 0.6 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \eta\eta')/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

[47] Superseded by ASNER 09. ADAMS 07 reports $< 2.3 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \eta\eta')/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 0.0933 \pm 0.0014 \pm 0.0061$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(\eta'\eta')/\Gamma_{total}$ — Γ_{31}/Γ

VALUE (units 10^{-4})	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
<1.1	90	12 ± 7	[48] ASNER	09	CLEO	$\psi(2S) \to \gamma\eta'\eta'$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<3.3	90		[49] ADAMS	07	CLEO	$\psi(2S) \to \gamma\chi_{c2}$

[48] ASNER 09 reports $< 1.0 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \eta'\eta')/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

[49] Superseded by ASNER 09. ADAMS 07 reports $< 3.1 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \eta'\eta')/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 0.0933 \pm 0.0014 \pm 0.0061$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(\pi^+\pi^- K^0_S K^0_S)/\Gamma_{total}$ — Γ_{32}/Γ

VALUE (units 10^{-3})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
2.4±0.6±0.1	57 ± 11	[50] ABLIKIM	05O	BES2	$\psi(2S) \to \gamma\chi_{c2}$

[50] ABLIKIM 05O reports $[\Gamma(\chi_{c2}(1P) \to \pi^+\pi^- K^0_S K^0_S)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))] = (0.207 \pm 0.039 \pm 0.033) \times 10^{-3}$ which we divide by our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-4})	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
<4	90	2.3 ± 2.2	[51] ABLIKIM	05O	BES2	$e^+e^- \to \chi_{c2}\gamma$

[51] ABLIKIM 05O reports $[\Gamma(\chi_{c2}(1P) \to K^+K^- K^0_S K^0_S)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))] < 3.5 \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(K^+K^-K^+K^-)/\Gamma_{total}$ — Γ_{34}/Γ

VALUE (units 10^{-3})	*DOCUMENT ID*
1.78±0.22 OUR FIT	

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

VALUE (units 10^{-3})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.55±0.32±0.06	52	[52] ABLIKIM	06T	BES2	$\psi(2S) \to \gamma 2K^+ 2K^-$

[52] ABLIKIM 06T reports $(1.67 \pm 0.26 \pm 0.24) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to K^+K^-\phi)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<7.9	90	[53] ABLIKIM	06D	BES2	$\psi(2S) \to \chi_{c2}\gamma$

[53] Using $B(\psi(2S) \to \chi_{c2}\gamma) = (9.3 \pm 0.6)\%$.

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

VALUE (units 10^{-4})	*DOCUMENT ID*
0.72±0.04 OUR FIT	

$\Gamma(p\overline{p}\pi^0)/\Gamma_{\text{total}}$ — Γ_{38}/Γ

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*	*COMMENT*
0.51±0.05 OUR AVERAGE				
0.52±0.04±0.02	[54] ONYISI	10	CLE3	$\psi(2S) \rightarrow \gamma p\overline{p}X$
0.47±0.10±0.02	[55] ATHAR	07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

[54] ONYISI 10 reports $(4.83 \pm 0.25 \pm 0.35 \pm 0.31) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\overline{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[55] ATHAR 07 reports $(0.44 \pm 0.08 \pm 0.05) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\overline{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\overline{p}\eta)/\Gamma_{\text{total}}$ — Γ_{39}/Γ

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*	*COMMENT*
0.190±0.028 OUR AVERAGE				
0.188±0.028±0.007	[56] ONYISI	10	CLE3	$\psi(2S) \rightarrow \gamma p\overline{p}X$
0.20 ±0.08 ±0.01	[57] ATHAR	07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

[56] ONYISI 10 reports $(1.76 \pm 0.23 \pm 0.14 \pm 0.11) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\overline{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[57] ATHAR 07 reports $(0.19 \pm 0.07 \pm 0.02) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\overline{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*	*COMMENT*
0.39±0.05±0.02	[58] ONYISI	10	CLE3	$\psi(2S) \rightarrow \gamma p\overline{p}X$

[58] ONYISI 10 reports $(3.68 \pm 0.35 \pm 0.26 \pm 0.24) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\overline{p}\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\pi^+\pi^- p\overline{p})/\Gamma_{total}$ Γ_{41}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
1.32±0.34 OUR EVALUATION	Treating systematic error as correlated.			
1.3 ±0.4 OUR AVERAGE	Error includes scale factor of 1.3.			
1.17±0.19±0.30	[59] BAI	99B	BES	$\psi(2S) \to \gamma\chi_{c2}$
2.64±1.03±0.14	[59] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c2}$

[59] Rescaled by us using B($\psi(2S) \to \gamma\chi_{c2}$)= (8.3 ± 0.4)% and B($\psi(2S) \to J/\psi(1S)\pi^+\pi^-$) = (32.6 ± 0.5)%. Multiplied by a factor of 2 to convert from $K^0_S K^+\pi^-$ to $K^0 K^+\pi^-$ decay.

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.085±0.025±0.003	29.2	[60] HE	08B	CLEO	$e^+e^- \to \gamma h^+ h^- h^0 h^0$

[60] HE 08B reports 0.08 ± 0.02 ± 0.01 ± 0.01 % from a measurement of [$\Gamma(\chi_{c2}(1P) \to \pi^0\pi^0 p\overline{p})/\Gamma_{total}$] × [B($\psi(2S) \to \gamma\chi_{c2}(1P)$)] assuming B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = $(9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = $(8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\overline{n}\pi^-)/\Gamma_{total}$ Γ_{43}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
11.1±3.8±0.4	[61] ABLIKIM	06I	BES2	$\psi(2S) \to \gamma p\pi^- X$

[61] ABLIKIM 06I reports [$\Gamma(\chi_{c2}(1P) \to p\overline{n}\pi^-)/\Gamma_{total}$] × [B($\psi(2S) \to \gamma\chi_{c2}(1P)$)] = $(0.97 \pm 0.20 \pm 0.26) \times 10^{-4}$ which we divide by our best value B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = $(8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Lambda\overline{\Lambda})/\Gamma_{total}$ Γ_{44}/Γ

VALUE (units 10^{-4})	DOCUMENT ID
(1.86+-0.27) OUR FIT	

$\Gamma(\Lambda\overline{\Lambda}\pi^+\pi^-)/\Gamma_{total}$ Γ_{45}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<3.5	90	[62] ABLIKIM	06D	BES2	$\psi(2S) \to \chi_{c2}\gamma$

[62] Using B($\psi(2S) \to \chi_{c2}\gamma$) = (9.3 ± 0.6)%.

$\Gamma(K^+\overline{p}\Lambda + c.c.)/\Gamma_{total}$ Γ_{46}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
0.91±0.17±0.04	[63] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

[63] ATHAR 07 reports $(0.85 \pm 0.14 \pm 0.10) \times 10^{-3}$ from a measurement of [$\Gamma(\chi_{c2}(1P) \to K^+\overline{p}\Lambda + c.c.)/\Gamma_{total}$] × [B($\psi(2S) \to \gamma\chi_{c2}(1P)$)] assuming B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = $(9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = $(8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Sigma^0\overline{\Sigma}^0)/\Gamma_{total}$ — Γ_{47}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<0.8	90	7.5 ± 3.4	[64] NAIK	08	CLEO	$\psi(2S) \to \gamma\Sigma^0\overline{\Sigma}^0$

[64] NAIK 08 reports $< 0.75 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \Sigma^0\overline{\Sigma}^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(\Sigma^+\overline{\Sigma}^-)/\Gamma_{total}$ — Γ_{48}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<0.7	90	4.0 ± 3.5	[65] NAIK	08	CLEO	$\psi(2S) \to \gamma\Sigma^+\overline{\Sigma}^-$

[65] NAIK 08 reports $< 0.67 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \Sigma^+\overline{\Sigma}^-)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(\Xi^0\overline{\Xi}^0)/\Gamma_{total}$ — Γ_{49}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<1.1	90	2.9 ± 1.7	[66] NAIK	08	CLEO	$\psi(2S) \to \gamma\Xi^0\overline{\Xi}^0$

[66] NAIK 08 reports $< 1.06 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \Xi^0\overline{\Xi}^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

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

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.55±0.34±0.06		29 ± 5	[67] NAIK	08	CLEO	$\psi(2S) \to \gamma\Xi^+\overline{\Xi}^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 3.7	90		[68] ABLIKIM	06D	BES2	$\psi(2S) \to \chi_{c2}\gamma$

[67] NAIK 08 reports $(1.45 \pm 0.30 \pm 0.15) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \Xi^-\overline{\Xi}^+)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.75 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[68] Using $B(\psi(2S) \to \chi_{c2}\gamma) = (9.3 \pm 0.6)\%$.

$\Gamma(J/\psi(1S)\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{51}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.015	90	BARATE	81	SPEC	190 GeV π^- Be $\to 2\pi 2\mu$

RADIATIVE DECAYS

$\Gamma(\gamma J/\psi(1S))/\Gamma_{total}$ — Γ_{52}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.195±0.008 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.199 \pm 0.005 \pm 0.012$	[69] ADAM	05A	CLEO	$e^+e^- \to \psi(2S) \to \gamma\chi_{c2}$

[69] Uses $B(\psi(2S) \to \gamma\chi_{c2} \to \gamma\gamma J/\psi)$ from ADAM 05A and $B(\psi(2S) \to \gamma\chi_{c2})$ from ATHAR 04.

$\Gamma(\gamma\rho^0)/\Gamma_{total}$ — Γ_{53}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<50	90	17.2 ± 6.8	[70] BENNETT	08A	CLEO	$\psi(2S) \to \gamma\gamma\rho^0$

[70] BENNETT 08A reports $< 50 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \gamma\rho^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(\gamma\omega)/\Gamma_{total}$ — Γ_{54}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<6	90	0.0 ± 1.8	[71] BENNETT	08A	CLEO	$\psi(2S) \to \gamma\gamma\omega$

[71] BENNETT 08A reports $< 7.0 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \gamma\omega)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(\gamma\phi)/\Gamma_{total}$ — Γ_{55}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<12	90	1.3 ± 2.5	[72] BENNETT	08A	CLEO	$\psi(2S) \to \gamma\gamma\phi$

[72] BENNETT 08A reports $< 13 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \to \gamma\phi)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 8.75 \times 10^{-2}$.

$\Gamma(\gamma\gamma)/\Gamma_{total}$ — Γ_{56}/Γ

VALUE (units 10^{-4})	DOCUMENT ID
(2.56+-0.16) OUR FIT	

$\Gamma(\gamma\gamma)/\Gamma(\gamma J/\psi(1S))$ — Γ_{56}/Γ_{52}

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
1.31±0.09 OUR FIT				
0.99±0.18	[73] AMBROGIANI	00B	E835	$\overline{p}p \to \chi_{c2} \to \gamma\gamma, \gamma J/\psi$

[73] Calculated by us using $B(J/\psi(1S) \to e^+e^-) = 0.0593 \pm 0.0010$.

$\Gamma(\gamma\gamma)/\Gamma_{total} \times \Gamma(p\overline{p})/\Gamma_{total}$ — $\Gamma_{56}/\Gamma \times \Gamma_{37}/\Gamma$

VALUE (units 10^{-8})	DOCUMENT ID		TECN	COMMENT
(1.85+-0.18) OUR FIT				
(1.7+-0.4) OUR AVERAGE				
1.60 ± 0.42	ARMSTRONG	93	E760	$\overline{p}p \to \gamma\gamma X$
9.9 ± 4.5	BAGLIN	87B	SPEC	$\overline{p}p \to \gamma\gamma X$

$\chi_{c2}(1P)$ CROSS-PARTICLE BRANCHING RATIOS

$\Gamma(\chi_{c2}(1P) \to \pi^+\pi^-K^+K^-)/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ — $\Gamma_{14}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
2.39±0.27 OUR FIT				
2.5 ±0.9 OUR AVERAGE Error includes scale factor of 2.3.				
$1.90 \pm 0.14 \pm 0.44$	BAI	99B	BES	$\psi(2S) \to \gamma\chi_{c2}$
3.8 ± 0.67	[74] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c2}$

[74] The reported value is derived using $B(\psi(2S) \to \pi^+\pi^- J/\psi) \times B(J/\psi \to \ell^+\ell^-) = (4.6 \pm 0.7)\%$. Calculated by us using $B(J/\psi \to \ell^+\ell^-) = 0.1181 \pm 0.0020$.

$\Gamma(\chi_{c2}(1P) \to K^*(892)^0 \overline{K}^*(892)^0)/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma_{total}$ $\qquad \Gamma_{16}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
(2.2±0.4) OUR FIT				
3.11±0.36±0.48	ABLIKIM	04H	BES2	$\psi(2S) \to \gamma\chi_{c2}$

$\Gamma(\chi_{c2}(1P) \to p\overline{p})/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ $\qquad \Gamma_{37}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}_{11}$

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
(1.88±0.14) OUR FIT				
1.4±1.1	[75] BAI	98I	BES	$\psi(2S) \to \gamma\chi_{c2} \to \gamma\overline{p}p$

[75] Calculated by us. The value for $B(\chi_{c2} \to p\overline{p})$ reported in BAI 98I is derived using $B(\psi(2S) \to \gamma\chi_{c2}) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \to J/\psi(1S)\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

$\Gamma(\chi_{c2}(1P) \to p\overline{p})/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma_{total}$ $\qquad \Gamma_{37}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
(6.3±0.5) OUR FIT					
(6.7±1.1) OUR AVERAGE Error includes scale factor of 1.5.					
7.2±0.7±0.4	121 ± 12	[76] NAIK	08	CLEO	$\psi(2S) \to \gamma p\overline{p}$
$4.4^{+1.6}_{-1.4}\pm0.6$	$14.3^{+5.2}_{-4.7}$	BAI	04F	BES	$\psi(2S) \to \gamma\chi_{c2}(1P) \to \gamma\overline{p}p$

[76] Calculated by us. NAIK 08 reports $B(\chi_{c2} \to p\overline{p}) = (7.7 \pm 0.8 \pm 0.4 \pm 0.5) \times 10^{-5}$ using $B(\psi(2S) \to \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$.

$\Gamma(\chi_{c2}(1P) \to \Lambda\overline{\Lambda})/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma_{total}$ $\qquad \Gamma_{44}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
16.3±2.3 OUR FIT					
15.9±2.1±1.0	71 ± 9	[77] NAIK	08	CLEO	$\psi(2S) \to \gamma\Lambda\overline{\Lambda}$

[77] Calculated by us. NAIK 08 reports $B(\chi_{c2} \to \Lambda\overline{\Lambda}) = (17.0 \pm 2.2 \pm 1.1 \pm 1.1) \times 10^{-5}$ using $B(\psi(2S) \to \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$.

$\Gamma(\chi_{c2}(1P) \to \Lambda\overline{\Lambda})/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ $\qquad \Gamma_{44}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}_{11}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
(4.8±0.7) OUR FIT					
$\mathbf{7.1^{+3.1}_{-2.9}\pm1.3}$	$8.3^{+3.7}_{-3.4}$	[78] BAI	03E	BES	$\psi(2S) \to \gamma\Lambda\overline{\Lambda}$

[78] BAI 03E reports $[B(\chi_{c2} \to \Lambda\overline{\Lambda})\, B(\psi(2S) \to \gamma\chi_{c2}) / B(\psi(2S) \to J/\psi\pi^+\pi^-)] \times [B^2(\Lambda \to \pi^- p) / B(J/\psi \to p\overline{p})] = (1.33^{+0.59}_{-0.55} \pm 0.25)\%$. We calculate from this measurement the presented value using $B(\Lambda \to \pi^- p) = (63.9 \pm 0.5)\%$ and $B(J/\psi \to p\overline{p}) = (2.17 \pm 0.07) \times 10^{-3}$.

$\Gamma(\chi_{c2}(1P) \to \pi\pi)/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma_{total}$ — $\Gamma_{20}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
(2.12±0.08) OUR FIT					
(2.17±0.09) OUR AVERAGE					
$2.19 \pm 0.05 \pm 0.15$	4.5k	[79] ABLIKIM	10A	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c2}$
$2.23 \pm 0.06 \pm 0.10$	2.5k	[80] ASNER	09	CLEO	$\psi(2S) \to \gamma\pi^+\pi^-$
$1.90 \pm 0.08 \pm 0.20$	0.8k	[81] ASNER	09	CLEO	$\psi(2S) \to \gamma\pi^0\pi^0$

[79] Calculated by us. ABLIKIM 10A reports $B(\chi_{c2} \to \pi^0\pi^0) = (0.88 \pm 0.02 \pm 0.06 \pm 0.04) \times 10^{-3}$ using $B(\psi(2S) \to \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$. We have multiplied the $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$.

[80] Calculated by us. ASNER 09 reports $B(\chi_{c2} \to \pi^+\pi^-) = (1.59 \pm 0.04 \pm 0.07 \pm 0.10) \times 10^{-3}$ using $B(\psi(2S) \to \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$. We have multiplied the $\pi^+\pi^-$ measurement by 3/2 to obtain $\pi\pi$.

[81] Calculated by us. ASNER 09 reports $B(\chi_{c2} \to \pi^0\pi^0) = (0.68 \pm 0.03 \pm 0.07 \pm 0.04) \times 10^{-3}$ using $B(\psi(2S) \to \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$. We have multiplied the $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$.

$\Gamma(\chi_{c2}(1P) \to \pi\pi)/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ — $\Gamma_{20}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}_{11}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.629±0.024 OUR FIT					
0.54 ±0.06 OUR AVERAGE					
$0.66 \pm 0.18 \pm 0.37$	21 ± 6	[82] BAI	03C	BES	$\psi(2S) \to \gamma\pi^0\pi^0$
$0.54 \pm 0.05 \pm 0.04$	185 ± 16	[83] BAI	98I	BES	$\psi(2S) \to \gamma\pi^+\pi^-$

[82] We have multiplied $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$.

[83] Calculated by us. The value for $B(\chi_{c2} \to \pi^+\pi^-)$ reported by BAI 98I is derived using $B(\psi(2S) \to \gamma\chi_{c2}) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \to J/\psi\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D]. We have multiplied $\pi^+\pi^-$ measurement by 3/2 to obtain $\pi\pi$.

$\Gamma(\chi_{c2}(1P) \to \eta\eta)/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma_{total}$ — $\Gamma_{24}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.52±0.04 OUR FIT						
0.52±0.04 OUR AVERAGE						
$0.54 \pm 0.03 \pm 0.04$		386	[84] ABLIKIM	10A	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c2}$
$0.47 \pm 0.05 \pm 0.05$		156 ± 14	ASNER	09	CLEO	$\psi(2S) \to \gamma\eta\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 0.44	90		[85] ADAMS	07	CLEO	$\psi(2S) \to \gamma\chi_{c2}$
< 3	90		BAI	03C	BES	$\psi(2S) \to \gamma\eta\eta \to 5\gamma$
$0.62 \pm 0.31 \pm 0.19$			LEE	85	CBAL	$\psi(2S) \to$ photons

[84] Calculated by us. ABLIKIM 10A reports $B(\chi_{c2} \to \eta\eta) = (0.65 \pm 0.04 \pm 0.05 \pm 0.03) \times 10^{-3}$ using $B(\psi(2S) \to \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$.

[85] Superseded by ASNER 09.

$\Gamma(\chi_{c2}(1P) \to K^+K^-)/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma_{total}$

$\Gamma_{25}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-5})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
(9.5±0.6) OUR FIT					
10.5±0.3±0.6	1.6k	[86] ASNER	09	CLEO	$\psi(2S) \to \gamma K^+K^-$

[86] Calculated by us. ASNER 09 reports B($\chi_{c2} \to K^+K^-$) = (1.13 ± 0.03 ± 0.06 ± 0.07) × 10^{-3} using B($\psi(2S) \to \gamma\chi_{c2}$) = (9.33 ± 0.14 ± 0.61)%.

$\Gamma(\chi_{c2}(1P) \to K^+K^-)/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$

$\Gamma_{25}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

VALUE (units 10^{-3})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.283±0.017 OUR FIT					
0.190±0.034±0.019	115 ± 13	[87] BAI	98I	BES	$\psi(2S) \to \gamma K^+K^-$

[87] Calculated by us. The value for B($\chi_{c2} \to K^+K^-$) reported by BAI 98I is derived using B($\psi(2S) \to \gamma\chi_{c2}$) = (7.8 ± 0.8)% and B($\psi(2S) \to J/\psi\pi^+\pi^-$) = (32.4 ± 2.6)% [BAI 98D].

$\Gamma(\chi_{c2}(1P) \to K^0_S K^0_S)/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma_{total}$

$\Gamma_{26}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-5})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
(5.1±0.4) OUR FIT					
(5.0±0.4) OUR AVERAGE					
4.9 ±0.3 ±0.3	373 ± 20	[88] ASNER	09	CLEO	$\psi(2S) \to \gamma K^0_S K^0_S$
5.72±0.76±0.63	65	ABLIKIM	05O	BES2	$\psi(2S) \to \gamma K^0_S K^0_S$

[88] Calculated by us. ASNER 09 reports B($\chi_{c2} \to K^0_S K^0_S$) = (0.53 ± 0.03 ± 0.03 ± 0.03) × 10^{-3} using B($\psi(2S) \to \gamma\chi_{c2}$) = (9.33 ± 0.14 ± 0.61)%.

$\Gamma(\chi_{c2}(1P) \to K^0_S K^0_S)/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$

$\Gamma_{26}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

VALUE (units 10^{-5})	*DOCUMENT ID*		*TECN*	*COMMENT*
15.1±1.1 OUR FIT				
14.7±4.1±3.3	[89] BAI	99B	BES	$\psi(2S) \to \gamma K^0_S K^0_S$

[89] Calculated by us. The value of B($\chi_{c2} \to K^0_S K^0_S$) reported by BAI 99B was derived using B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = (7.8 ± 0.8)% and B($\psi(2S) \to J/\psi\pi^+\pi^-$) = (32.4 ± 2.6)% [BAI 98D].

$\Gamma(\chi_{c2}(1P) \to \gamma J/\psi(1S))/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma_{total}$

$\Gamma_{52}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma^{\psi(2S)}$

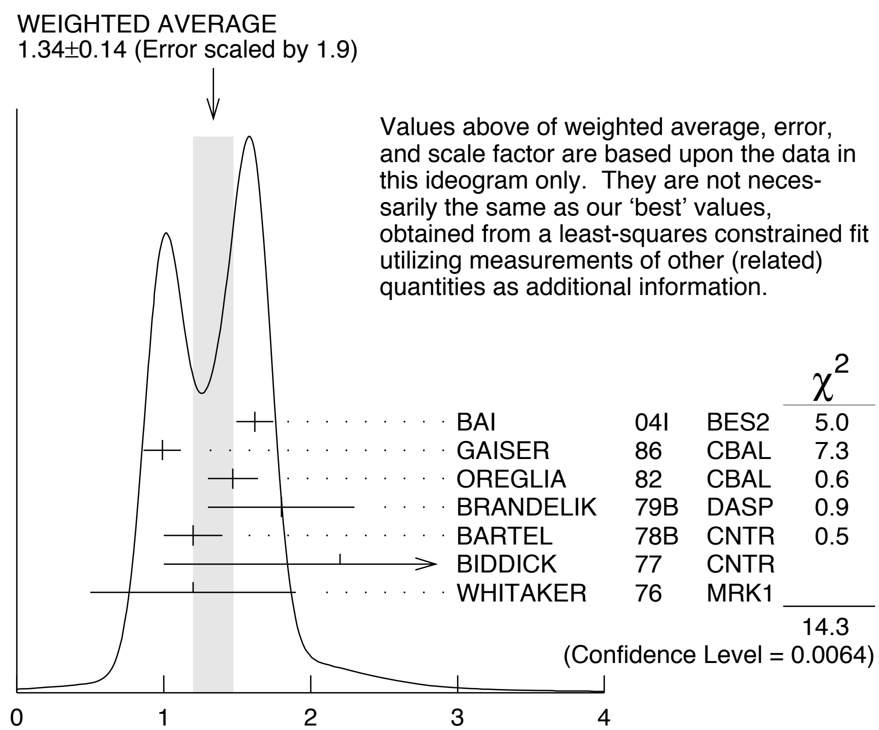
VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.70±0.04 OUR FIT					
1.34±0.14 OUR AVERAGE Error includes scale factor of 1.9. See the ideogram below.					
1.62±0.04±0.12	5.8k	BAI	04I	BES2	$\psi(2S) \to J/\psi\gamma\gamma$
0.99±0.10±0.08		GAISER	86	CBAL	$\psi(2S) \to \gamma X$
1.47±0.17		[90] OREGLIA	82	CBAL	$\psi(2S) \to \gamma\chi_{c2}$

1.8 $\pm$0.5		[91] BRANDELIK	79B	DASP	$\psi(2S) \rightarrow \gamma\chi_{c2}$
1.2 $\pm$0.2		[91] BARTEL	78B	CNTR	$\psi(2S) \rightarrow \gamma\chi_{c2}$
2.2 $\pm$1.2		[92] BIDDICK	77	CNTR	$e^+e^- \rightarrow \gamma X$
1.2 $\pm$0.7		[90] WHITAKER	76	MRK1	e^+e^-

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

1.95$\pm$0.02$\pm$0.07	12.4k	[93] MENDEZ	08	CLEO	$\psi(2S) \rightarrow \gamma\chi_{c2}$
1.85$\pm$0.04$\pm$0.07	1.9k	[94] ADAM	05A	CLEO	Repl. by MENDEZ 08

[90] Recalculated by us using B($J/\psi(1S) \rightarrow \ell^+\ell^-$) = 0.1181 $\pm$ 0.0020.
[91] Recalculated by us using B($J/\psi(1S) \rightarrow \mu^+\mu^-$) = 0.0588 $\pm$ 0.0010.
[92] Assumes isotropic gamma distribution.
[93] Not independent from other measurements of MENDEZ 08.
[94] Not independent from other values reported by ADAM 05A.



$\Gamma\big(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)\big)/\Gamma_{\text{total}} \times \Gamma\big(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)\big)/\Gamma_{\text{total}}$ (units 10^{-2})

$\Gamma\big(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)\big)/\Gamma_{\text{total}} \times \Gamma\big(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)\big)/\Gamma\big(\psi(2S) \rightarrow J/\psi(1S)\,\text{anything}\big)$ $\quad\Gamma_{52}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}_{9}$

$\Gamma_{52}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}_{9} = \Gamma_{52}/\Gamma \times \Gamma^{\psi(2S)}_{111}/(\Gamma^{\psi(2S)}_{11}+\Gamma^{\psi(2S)}_{12}+\Gamma^{\psi(2S)}_{13}+0.344\Gamma^{\psi(2S)}_{110}+0.195\Gamma^{\psi(2S)}_{111})$

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
2.86$\pm$0.07 OUR FIT					

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

3.12$\pm$0.03$\pm$0.09	12.4k	[95] MENDEZ	08	CLEO	$\psi(2S) \rightarrow \gamma\chi_{c2}$
3.11$\pm$0.07$\pm$0.07	1.9k	ADAM	05A	CLEO	Repl. by MENDEZ 08

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

$\Gamma\big(\chi_{c2}(1P) \to \gamma J/\psi(1S)\big)/\Gamma_{total} \times \Gamma\big(\psi(2S) \to \gamma\chi_{c2}(1P)\big)/\Gamma\big(\psi(2S) \to J/\psi(1S)\pi^+\pi^-\big)$ $\Gamma_{52}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.07±0.13 OUR FIT					
5.53±0.17 OUR AVERAGE					
5.56±0.05±0.16	12.4k	MENDEZ	08	CLEO	$\psi(2S) \to \gamma\chi_{c2}$
6.0 ±2.8	1.3k	[96] ABLIKIM	04B	BES	$\psi(2S) \to J/\psi X$
3.9 ±1.2		[97] HIMEL	80	MRK2	$\psi(2S) \to \gamma\chi_{c2}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.52±0.13±0.13	1.9k	[98] ADAM	05A	CLEO	Repl. by MENDEZ 08

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

[97] The value for B($\psi(2S) \to \gamma\chi_{c2}$)×B($\chi_{c2} \to \gamma J/\psi(1S)$) reported in HIMEL 80 is derived using B($\psi(2S) \to J/\psi(1S)\pi^+\pi^-$) = (33 ± 3)% and B($J/\psi(1S) \to \ell^+\ell^-$) = 0.138 ± 0.018. Calculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = (0.1181 ± 0.0020).

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

$\Gamma\big(\chi_{c2}(1P) \to \gamma\gamma\big)/\Gamma_{total} \times \Gamma\big(\psi(2S) \to \gamma\chi_{c2}(1P)\big)/\Gamma_{total}$ $\Gamma_{56}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
(2.24+-0.16) OUR FIT					
(2.73+-0.32) OUR AVERAGE					
2.68±0.28±0.15	333 ± 35	ECKLUND	08A	CLEO	$\psi(2S) \to \gamma\chi_{c2} \to 3\gamma$
7.0 ±2.1 ±2.0		LEE	85	CBAL	$\psi(2S) \to \gamma\chi_{c2}$

$\Gamma\big(\chi_{c2}(1P) \to 2(\pi^+\pi^-)\big)/\Gamma_{total} \times \Gamma\big(\psi(2S) \to \gamma\chi_{c2}(1P)\big)/\Gamma\big(\psi(2S) \to J/\psi(1S)\pi^+\pi^-\big)$ $\Gamma_{1}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
2.89±0.27 OUR FIT				
3.1 ±1.0 OUR AVERAGE Error includes scale factor of 2.5.				
2.3 ±0.1 ±0.5	[99] BAI	99B	BES	$\psi(2S) \to \gamma\chi_{c2}$
4.3 ±0.6	[100] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c2}$

[99] Calculated by us. The value for B($\chi_{c2} \to 2\pi^+2\pi^-$) reported in BAI 99B is derived using B($\psi(2S) \to \gamma\chi_{c2}$) = (7.8 ± 0.8)% and B($\psi(2S) \to J/\psi(1S)\pi^+\pi^-$) = (32.4 ± 2.6)% [BAI 98D].

[100] The value for B($\psi(2S) \to \gamma\chi_{c2}$)×B($\chi_{c2} \to 2\pi^+\pi^-$) reported in TANENBAUM 78 is derived using B($\psi(2S) \to J/\psi(1S)\pi^+\pi^-$)×B($J/\psi(1S)\ell^+\ell^-$) = (4.6 ± 0.7)%. Calculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = 0.1181 ± 0.0020.

$\Gamma\big(\chi_{c2}(1P) \to K^+K^-K^+K^-\big)/\Gamma_{total} \times \Gamma\big(\psi(2S) \to \gamma\chi_{c2}(1P)\big)/\Gamma_{total}$ $\Gamma_{34}/\Gamma \times \Gamma_{111}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
(1.55+-0.19) OUR FIT					
1.76±0.16±0.24	160	[101] ABLIKIM	06T	BES2	$\psi(2S) \to \gamma 2K^+2K^-$

[101] Calculated by us. The value of B($\chi_{c2} \to 2K^+2K^-$) reported by ABLIKIM 06T was derived using B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = (8.1 ± 0.4)%.

$\Gamma(\chi_{c2}(1P) \to K^+K^-K^+K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ $\quad \Gamma_{34}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}_{11}$

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
(4.6±0.6) OUR FIT				
3.6±0.6±0.6	[102] BAI	99B	BES	$\psi(2S) \to \gamma 2K^+2K^-$

[102] Calculated by us. The value of B($\chi_{c2} \to 2K^+2K^-$) reported by BAI 99B was derived using B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = (7.8 ± 0.8)% and B($\psi(2S) \to J/\psi\pi^+\pi^-$) = (32.4 ± 2.6)% [BAI 98D].

$\Gamma(\chi_{c2}(1P) \to \phi\phi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma_{\text{total}}$ $\quad \Gamma_{18}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
(1.29±0.24) OUR FIT					
1.38±0.24±0.23	41	[103] ABLIKIM	06T	BES2	$\psi(2S) \to \gamma 2K^+2K^-$

[103] Calculated by us. The value of B($\chi_{c2} \to \phi\phi$) reported by ABLIKIM 06T was derived using B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = (8.1 ± 0.4)%.

$\Gamma(\chi_{c2}(1P) \to \phi\phi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ $\quad \Gamma_{18}/\Gamma \times \Gamma^{\psi(2S)}_{111}/\Gamma^{\psi(2S)}_{11}$

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
(3.8±0.7) OUR FIT				
4.8±1.3±1.3	[104] BAI	99B	BES	$\psi(2S) \to \gamma 2K^+2K^-$

[104] Calculated by us. The value of B($\chi_{c2} \to \phi\phi$) reported by BAI 99B was derived using B($\psi(2S) \to \gamma\chi_{c2}(1P)$) = (7.8 ± 0.8)% and B($\psi(2S) \to J/\psi\pi^+\pi^-$) = (32.4 ± 2.6)% [BAI 98D].

MULTIPOLE AMPLITUDES IN $\chi_{c2}(1P) \to \gamma J/\psi(1S)$ RADIATIVE DECAY

$a_2 = M2/\sqrt{E1^2 + M2^2 + E3^2}$ Magnetic quadrupole fractional transition amplitude

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
−10.0± 1.5 OUR AVERAGE					
− 9.3± 1.6±0.3	19.8k	[105] ARTUSO	09	CLEO	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$
$-9.3^{+3.9}_{-4.1}\pm0.6$	5.9k	[106] AMBROGIANI	02	E835	$p\bar{p} \to \chi_{c2} \to J/\psi\gamma$
−14 ± 6	1.9k	[106] ARMSTRONG	93E	E760	$p\bar{p} \to \chi_{c2} \to J/\psi\gamma$
$-33.3^{+11.6}_{-29.2}$	441	[106] OREGLIA	82	CBAL	$\psi(2S) \to \chi_{c1}\gamma \to J/\psi\gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
− 7.9± 1.9±0.3	19.8k	[107] ARTUSO	09	CLEO	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$

[105] From a fit with floating *M2* amplitudes a_2 and b_2, and fixed *E3* amplitudes a_3=b_3=0.
[106] Assuming a_3=0.
[107] From a fit with floating *M2* and *E3* amplitudes a_2, b_2, and a_3, and b_3.

$a_3 = E3/\sqrt{E1^2 + M2^2 + E3^2}$ Electric octupole fractional transition amplitude

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.6±1.3 OUR AVERAGE					
$1.7 \pm 1.4 \pm 0.3$	19.8k	[108] ARTUSO	09	CLEO	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$
$2.0^{+5.5}_{-4.4} \pm 0.9$	5908	AMBROGIANI	02	E835	$p\overline{p} \to \chi_{c2} \to J/\psi\gamma$
$0\ ^{+6}_{-5}$	1904	ARMSTRONG	93E	E760	$p\overline{p} \to \chi_{c2} \to J/\psi\gamma$

[108] From a fit with floating *M2* and *E3* amplitudes a_2, b_2, and a_3, and b_3.

MULTIPOLE AMPLITUDES IN $\psi(2S) \to \gamma\chi_{c2}(1P)$ RADIATIVE DECAY

$b_2 = M2/\sqrt{E1^2 + M2^2 + E3^2}$ Magnetic quadrupole fractional transition amplitude

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.0±1.4 OUR AVERAGE Error includes scale factor of 1.1.					
$1.0 \pm 1.3 \pm 0.3$	19.8k	[109] ARTUSO	09	CLEO	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$
$-\ 5.1^{+5.4}_{-3.6}$	721	[110] ABLIKIM	04I	BES2	$\psi(2S) \to \gamma\pi^+\pi^-, \gamma K^+K^-$
$13.2^{+9.8}_{-7.5}$	441	[109] OREGLIA	82	CBAL	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.2 \pm 1.5 \pm 0.4$	19.8k	[111] ARTUSO	09	CLEO	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$

[109] From a fit with floating *M2* amplitudes a_2 and b_2, and fixed *E3* amplitudes a_3=b_3=0.
[110] From a fit with floating *M2* and *E3* amplitudes a_2 and a_3.
[111] From a fit with floating *M2* and *E3* amplitudes a_2, b_2, and a_3, and b_3.

$b_3 = E3/\sqrt{E1^2 + M2^2 + E3^2}$ Electric octupole fractional transition amplitude

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
−1.0±1.1 OUR AVERAGE					
$-0.8 \pm 1.2 \pm 0.2$	19.8k	ARTUSO	09	CLEO	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$
$-2.7^{+4.3}_{-2.9}$	721	[112] ABLIKIM	04I	BES2	$\psi(2S) \to \gamma\pi^+\pi^-, \gamma K^+K^-$

[112] From a fit with floating *M2* and *E3* amplitudes a_2 and a_3.

MULTIPOLE AMPLITUDE RATIOS IN RADIATIVE DECAYS $\psi(2S) \to \gamma\chi_{c2}(1P)$ and $\chi_{c2} \to \gamma J/\psi(1S)$

b_2/a_2 Magnetic quadrupole transition amplitude ratio

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{-11^{+14}_{-15}}$	19.8k	[113] ARTUSO	09	CLEO	$\psi(2S) \to \gamma\gamma\ell^+\ell^-$

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

$\chi_{c2}(1P)$ REFERENCES

ABLIKIM	11A	PR D83 012006	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	10A	PR D81 052005	M. Ablikim *et al.*	(BES III Collab.)
ONYISI	10	PR D82 011103R	P.U.E. Onyisi *et al.*	(CLEO Collab.)
UEHARA	10A	PR D82 114031	S. Uehara *et al.*	(BELLE Collab.)
ARTUSO	09	PR D80 112003	M. Artuso *et al.*	(CLEO Collab.)
ASNER	09	PR D79 072007	D.M. Asner *et al.*	(CLEO Collab.)
UEHARA	09	PR D79 052009	S. Uehara *et al.*	(BELLE Collab.)
BENNETT	08A	PRL 101 151801	J.V. Bennett *et al.*	(CLEO Collab.)
ECKLUND	08A	PR D78 091501R	K.M. Ecklund *et al.*	(CLEO Collab.)
HE	08B	PR D78 092004	Q. He *et al.*	(CLEO Collab.)
MENDEZ	08	PR D78 011102R	H. Mendez *et al.*	(CLEO Collab.)
NAIK	08	PR D78 031101R	P. Naik *et al.*	(CLEO Collab.)
UEHARA	08	EPJ C53 1	S. Uehara *et al.*	(BELLE Collab.)
ADAMS	07	PR D75 071101R	G.S. Adams *et al.*	(CLEO Collab.)
ATHAR	07	PR D75 032002	S.B. Athar *et al.*	(CLEO Collab.)
CHEN	07B	PL B651 15	W.T. Chen *et al.*	(BELLE Collab.)
ABLIKIM	06D	PR D73 052006	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	06I	PR D74 012004	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	06R	PR D74 072001	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	06T	PL B642 197	M. Ablikim *et al.*	(BES Collab.)
DOBBS	06	PR D73 071101R	S. Dobbs *et al.*	(CLEO Collab.)
ABLIKIM	05G	PR D71 092002	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	05N	PL B630 7	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	05O	PL B630 21	M. Ablikim *et al.*	(BES Collab.)
ADAM	05A	PRL 94 232002	N.E. Adam *et al.*	(CLEO Collab.)
ANDREOTTI	05A	NP B717 34	M. Andreotti *et al.*	(FNAL E835 Collab.)
NAKAZAWA	05	PL B615 39	H. Nakazawa *et al.*	(BELLE Collab.)
ABLIKIM	04B	PR D70 012003	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	04H	PR D70 092003	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	04I	PR D70 092004	M. Ablikim *et al.*	(BES Collab.)
ATHAR	04	PR D70 112002	S.B. Athar *et al.*	(CLEO Collab.)
BAI	04F	PR D69 092001	J.Z. Bai *et al.*	(BES Collab.)
BAI	04I	PR D70 012006	J.Z. Bai *et al.*	(BES Collab.)
AULCHENKO	03	PL B573 63	V.M. Aulchenko *et al.*	(KEDR Collab.)
BAI	03C	PR D67 032004	J.Z. Bai *et al.*	(BES Collab.)
BAI	03E	PR D67 112001	J.Z. Bai *et al.*	(BES Collab.)
ABE	02T	PL B540 33	K. Abe *et al.*	(BELLE Collab.)
AMBROGIANI	02	PR D65 052002	M. Ambrogiani *et al.*	(FNAL E835 Collab.)
EISENSTEIN	01	PRL 87 061801	B.I. Eisenstein *et al.*	(CLEO Collab.)
AMBROGIANI	00B	PR D62 052002	M. Ambrogiani *et al.*	(FNAL E835 Collab.)
ACCIARRI	99E	PL B453 73	M. Acciarri *et al.*	(L3 Collab.)
BAI	99B	PR D60 072001	J.Z. Bai *et al.*	(BES Collab.)
ACKER..,K...	98	PL B439 197	K. Ackerstaff *et al.*	(OPAL Collab.)
BAI	98D	PR D58 092006	J.Z. Bai *et al.*	(BES Collab.)
BAI	98I	PRL 81 3091	J.Z. Bai *et al.*	(BES Collab.)
DOMINICK	94	PR D50 4265	J. Dominick *et al.*	(CLEO Collab.)
ARMSTRONG	93	PRL 70 2988	T.A. Armstrong *et al.*	(FNAL E760 Collab.)
ARMSTRONG	93E	PR D48 3037	T.A. Armstrong *et al.*	(FNAL-E760 Collab.)
BAUER	93	PL B302 345	D.A. Bauer *et al.*	(TPC Collab.)
ARMSTRONG	92	NP B373 35	T.A. Armstrong *et al.*	(FNAL, FERR, GENO+)
Also		PRL 68 1468	T.A. Armstrong *et al.*	(FNAL, FERR, GENO+)
BAGLIN	87B	PL B187 191	C. Baglin *et al.*	(R704 Collab.)
BAGLIN	86B	PL B172 455	C. Baglin	(LAPP, CERN, GENO, LYON, OSLO+)
GAISER	86	PR D34 711	J. Gaiser *et al.*	(Crystal Ball Collab.)
LEE	85	SLAC 282	R.A. Lee	(SLAC)
LEMOIGNE	82	PL 113B 509	Y. Lemoigne *et al.*	(SACL, LOIC, SHMP+)
OREGLIA	82	PR D25 2259	M.J. Oreglia *et al.*	(SLAC, CIT, HARV+)
Also		Private Comm.	M.J. Oreglia	(EFI)
BARATE	81	PR D24 2994	R. Barate *et al.*	(SACL, LOIC, SHMP, CERN+)
HIMEL	80	PRL 44 920	T. Himel *et al.*	(LBL, SLAC)
Also		Private Comm.	G. Trilling	(LBL, UCB)
BRANDELIK	79B	NP B160 426	R. Brandelik *et al.*	(DASP Collab.)
BARTEL	78B	PL 79B 492	W. Bartel *et al.*	(DESY, HEIDP)
TANENBAUM	78	PR D17 1731	W.M. Tanenbaum *et al.*	(SLAC, LBL)
Also		Private Comm.	G. Trilling	(LBL, UCB)
BIDDICK	77	PRL 38 1324	C.J. Biddick *et al.*	(UCSD, UMD, PAVI+)
WHITAKER	76	PRL 37 1596	J.S. Whitaker *et al.*	(SLAC, LBL)