

$\chi_{c2}(1P)$ 

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

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

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

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>3556.20 ± 0.09</b>	<b>OUR AVERAGE</b>			
3555.3 ± 0.6 ± 2.2	2.5k	UEHARA	08 BELL	$\gamma\gamma \rightarrow$ hadrons
3555.70 ± 0.59 ± 0.39		ABLIKIM	05G BES2	$\psi(2S) \rightarrow \gamma\chi_{c2}$
3556.173 ± 0.123 ± 0.020		ANDREOTTI	05A E835	$p\bar{p} \rightarrow e^+e^-\gamma$
3559.9 ± 2.9		EISENSTEIN	01 CLE2	$e^+e^- \rightarrow e^+e^-\chi_{c2}$
3556.4 ± 0.7		BAI	99B BES	$\psi(2S) \rightarrow \gamma X$
3556.22 ± 0.131 ± 0.020	585	<sup>1</sup> ARMSTRONG	92 E760	$\bar{p}p \rightarrow e^+e^-\gamma$
3556.9 ± 0.4 ± 0.5	50	BAGLIN	86B SPEC	$\bar{p}p \rightarrow e^+e^-X$
3557.8 ± 0.2 ± 4		<sup>2</sup> GAISER	86 CBAL	$\psi(2S) \rightarrow \gamma X$
3553.4 ± 2.2	66	<sup>3</sup> LEMOIGNE	82 GOLI	185 $\pi^- \text{Be} \rightarrow \gamma\mu^+\mu^-A$
3555.9 ± 0.7		<sup>4</sup> OREGLIA	82 CBAL	$e^+e^- \rightarrow J/\psi 2\gamma$
3557 ± 1.5	69	<sup>5</sup> HIMEL	80 MRK2	$e^+e^- \rightarrow J/\psi 2\gamma$
3551 ± 11	15	BRANDELIK	79B DASP	$e^+e^- \rightarrow J/\psi 2\gamma$
3553 ± 4		<sup>5</sup> BARTEL	78B CNTR	$e^+e^- \rightarrow J/\psi 2\gamma$
3553 ± 4 ± 4		<sup>5,6</sup> TANENBAUM	78 MRK1	$e^+e^-$
3563 ± 7	360	<sup>5</sup> BIDDICK	77 CNTR	$e^+e^- \rightarrow \gamma X$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
3555.4 ± 1.3	53	UEHARA	13 BELL	$\gamma\gamma \rightarrow K_S^0 K_S^0$
3543 ± 10	4	WHITAKER	76 MRK1	$e^+e^- \rightarrow J/\psi 2\gamma$

<sup>1</sup> Recalculated by ANDREOTTI 05A, using the value of  $\psi(2S)$  mass from AULCHENKO 03.

<sup>2</sup> Using mass of  $\psi(2S) = 3686.0$  MeV.

<sup>3</sup>  $J/\psi(1S)$  mass constrained to 3097 MeV.

<sup>4</sup> Assuming  $\psi(2S)$  mass = 3686 MeV and  $J/\psi(1S)$  mass = 3097 MeV.

<sup>5</sup> Mass value shifted by us by amount appropriate for  $\psi(2S)$  mass = 3686 MeV and  $J/\psi(1S)$  mass = 3097 MeV.

<sup>6</sup> From a simultaneous fit to radiative and hadronic decay channels.

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

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.93 ± 0.11</b>	<b>OUR FIT</b>			
<b>1.95 ± 0.13</b>	<b>OUR AVERAGE</b>			
1.915 ± 0.188 ± 0.013		ANDREOTTI	05A E835	$p\bar{p} \rightarrow e^+e^-\gamma$
1.96 ± 0.17 ± 0.07	585	<sup>1</sup> ARMSTRONG	92 E760	$\bar{p}p \rightarrow e^+e^-\gamma$
2.6 <sup>+1.4</sup> <sub>-1.0</sub>	50	BAGLIN	86B SPEC	$\bar{p}p \rightarrow e^+e^-X$
2.8 <sup>+2.1</sup> <sub>-2.0</sub>		<sup>2</sup> GAISER	86 CBAL	$\psi(2S) \rightarrow \gamma X$

<sup>1</sup> Recalculated by ANDREOTTI 05A.

<sup>2</sup> Errors correspond to 90% confidence level; authors give only width range.

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

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	
<b>Hadronic decays</b>			
$\Gamma_1$	$2(\pi^+\pi^-)$	( 1.07±0.10 ) %	
$\Gamma_2$	$\rho\rho$		
$\Gamma_3$	$\pi^+\pi^-\pi^0\pi^0$	( 1.92±0.25 ) %	
$\Gamma_4$	$\rho^+\pi^-\pi^0 + \text{c.c.}$	( 2.3 ±0.4 ) %	
$\Gamma_5$	$4\pi^0$	( 1.16±0.16 ) × 10 <sup>-3</sup>	
$\Gamma_6$	$K^+K^-\pi^0\pi^0$	( 2.2 ±0.4 ) × 10 <sup>-3</sup>	
$\Gamma_7$	$K^+\pi^-\bar{K}^0\pi^0 + \text{c.c.}$	( 1.44±0.21 ) %	
$\Gamma_8$	$\rho^-K^+\bar{K}^0 + \text{c.c.}$	( 4.3 ±1.3 ) × 10 <sup>-3</sup>	
$\Gamma_9$	$K^*(892)^0K^-\pi^+ \rightarrow$ $K^-\pi^+K^0\pi^0 + \text{c.c.}$	( 3.1 ±0.8 ) × 10 <sup>-3</sup>	
$\Gamma_{10}$	$K^*(892)^0\bar{K}^0\pi^0 \rightarrow$ $K^+\pi^-\bar{K}^0\pi^0 + \text{c.c.}$	( 4.0 ±0.9 ) × 10 <sup>-3</sup>	
$\Gamma_{11}$	$K^*(892)^-K^+\pi^0 \rightarrow$ $K^+\pi^-\bar{K}^0\pi^0 + \text{c.c.}$	( 3.9 ±0.9 ) × 10 <sup>-3</sup>	
$\Gamma_{12}$	$K^*(892)^+\bar{K}^0\pi^- \rightarrow$ $K^+\pi^-\bar{K}^0\pi^0 + \text{c.c.}$	( 3.1 ±0.8 ) × 10 <sup>-3</sup>	
$\Gamma_{13}$	$K^+K^-\eta\pi^0$	( 1.3 ±0.5 ) × 10 <sup>-3</sup>	
$\Gamma_{14}$	$K^+K^-\pi^+\pi^-$	( 8.9 ±1.0 ) × 10 <sup>-3</sup>	
$\Gamma_{15}$	$K^+K^-\pi^+\pi^-\pi^0$	( 1.23±0.34 ) %	
$\Gamma_{16}$	$K^+\bar{K}^*(892)^0\pi^- + \text{c.c.}$	( 2.2 ±1.1 ) × 10 <sup>-3</sup>	
$\Gamma_{17}$	$K^*(892)^0\bar{K}^*(892)^0$	( 2.4 ±0.5 ) × 10 <sup>-3</sup>	
$\Gamma_{18}$	$3(\pi^+\pi^-)$	( 8.6 ±1.8 ) × 10 <sup>-3</sup>	
$\Gamma_{19}$	$\phi\phi$	( 1.12±0.10 ) × 10 <sup>-3</sup>	
$\Gamma_{20}$	$\omega\omega$	( 8.8 ±1.1 ) × 10 <sup>-4</sup>	
$\Gamma_{21}$	$\omega\phi$		
$\Gamma_{22}$	$\pi\pi$	( 2.33±0.12 ) × 10 <sup>-3</sup>	
$\Gamma_{23}$	$\rho^0\pi^+\pi^-$	( 3.8 ±1.6 ) × 10 <sup>-3</sup>	
$\Gamma_{24}$	$\pi^+\pi^-\eta$	( 5.0 ±1.3 ) × 10 <sup>-4</sup>	
$\Gamma_{25}$	$\pi^+\pi^-\eta'$	( 5.2 ±1.9 ) × 10 <sup>-4</sup>	
$\Gamma_{26}$	$\eta\eta$	( 5.7 ±0.5 ) × 10 <sup>-4</sup>	
$\Gamma_{27}$	$K^+K^-$	( 1.05±0.07 ) × 10 <sup>-3</sup>	
$\Gamma_{28}$	$K_S^0K_S^0$	( 5.5 ±0.4 ) × 10 <sup>-4</sup>	
$\Gamma_{29}$	$\bar{K}^0K^+\pi^- + \text{c.c.}$	( 1.34±0.19 ) × 10 <sup>-3</sup>	
$\Gamma_{30}$	$K^+K^-\pi^0$	( 3.2 ±0.8 ) × 10 <sup>-4</sup>	
$\Gamma_{31}$	$K^+K^-\eta$	< 3.4 × 10 <sup>-4</sup>	90%
$\Gamma_{32}$	$\eta\eta'$	< 6 × 10 <sup>-5</sup>	90%
$\Gamma_{33}$	$\eta'\eta'$	< 1.0 × 10 <sup>-4</sup>	90%
$\Gamma_{34}$	$\pi^+\pi^-K_S^0K_S^0$	( 2.3 ±0.6 ) × 10 <sup>-3</sup>	
$\Gamma_{35}$	$K^+K^-K_S^0K_S^0$	< 4 × 10 <sup>-4</sup>	90%
$\Gamma_{36}$	$K^+K^-K^+K^-$	( 1.73±0.21 ) × 10 <sup>-3</sup>	

$\Gamma_{37}$	$K^+ K^- \phi$	$(1.48 \pm 0.31) \times 10^{-3}$	
$\Gamma_{38}$	$\rho \bar{\rho}$	$(7.5 \pm 0.4) \times 10^{-5}$	
$\Gamma_{39}$	$\rho \bar{\rho} \pi^0$	$(4.9 \pm 0.4) \times 10^{-4}$	
$\Gamma_{40}$	$\rho \bar{\rho} \eta$	$(1.82 \pm 0.26) \times 10^{-4}$	
$\Gamma_{41}$	$\rho \bar{\rho} \omega$	$(3.8 \pm 0.5) \times 10^{-4}$	
$\Gamma_{42}$	$\rho \bar{\rho} \phi$	$(2.9 \pm 0.9) \times 10^{-5}$	
$\Gamma_{43}$	$\rho \bar{\rho} \pi^+ \pi^-$	$(1.32 \pm 0.34) \times 10^{-3}$	
$\Gamma_{44}$	$\rho \bar{\rho} \pi^0 \pi^0$	$(8.2 \pm 2.5) \times 10^{-4}$	
$\Gamma_{45}$	$\rho \bar{\rho} K^+ K^-$ (non-resonant)	$(2.00 \pm 0.34) \times 10^{-4}$	
$\Gamma_{46}$	$\rho \bar{\rho} K_S^0 K_S^0$	$< 7.9 \times 10^{-4}$	90%
$\Gamma_{47}$	$\rho \bar{n} \pi^-$	$(8.9 \pm 1.0) \times 10^{-4}$	
$\Gamma_{48}$	$\bar{\rho} n \pi^+$	$(9.3 \pm 0.9) \times 10^{-4}$	
$\Gamma_{49}$	$\rho \bar{n} \pi^- \pi^0$	$(2.27 \pm 0.19) \times 10^{-3}$	
$\Gamma_{50}$	$\bar{\rho} n \pi^+ \pi^0$	$(2.21 \pm 0.20) \times 10^{-3}$	
$\Gamma_{51}$	$\Lambda \bar{\Lambda}$	$(1.92 \pm 0.16) \times 10^{-4}$	
$\Gamma_{52}$	$\Lambda \bar{\Lambda} \pi^+ \pi^-$	$(1.31 \pm 0.17) \times 10^{-3}$	
$\Gamma_{53}$	$\Lambda \bar{\Lambda} \pi^+ \pi^-$ (non-resonant)	$(6.9 \pm 1.6) \times 10^{-4}$	
$\Gamma_{54}$	$\Sigma(1385)^+ \bar{\Lambda} \pi^- + \text{c.c.}$	$< 4 \times 10^{-4}$	90%
$\Gamma_{55}$	$\Sigma(1385)^- \bar{\Lambda} \pi^+ + \text{c.c.}$	$< 6 \times 10^{-4}$	90%
$\Gamma_{56}$	$K^+ \bar{\rho} \Lambda + \text{c.c.}$	$(8.1 \pm 0.6) \times 10^{-4}$	
$\Gamma_{57}$	$K^+ \bar{\rho} \Lambda(1520) + \text{c.c.}$	$(2.9 \pm 0.7) \times 10^{-4}$	
$\Gamma_{58}$	$\Lambda(1520) \bar{\Lambda}(1520)$	$(4.8 \pm 1.5) \times 10^{-4}$	
$\Gamma_{59}$	$\Sigma^0 \bar{\Sigma}^0$	$< 6 \times 10^{-5}$	90%
$\Gamma_{60}$	$\Sigma^+ \bar{\Sigma}^-$	$< 7 \times 10^{-5}$	90%
$\Gamma_{61}$	$\Sigma(1385)^+ \bar{\Sigma}(1385)^-$	$< 1.6 \times 10^{-4}$	90%
$\Gamma_{62}$	$\Sigma(1385)^- \bar{\Sigma}(1385)^+$	$< 8 \times 10^{-5}$	90%
$\Gamma_{63}$	$\Xi^0 \bar{\Xi}^0$	$< 1.1 \times 10^{-4}$	90%
$\Gamma_{64}$	$\Xi^- \bar{\Xi}^+$	$(1.48 \pm 0.33) \times 10^{-4}$	
$\Gamma_{65}$	$J/\psi(1S) \pi^+ \pi^- \pi^0$	$< 1.5 \%$	90%
$\Gamma_{66}$	$\eta_c(1S) \pi^+ \pi^-$	$< 2.2 \%$	90%

#### Radiative decays

$\Gamma_{67}$	$\gamma J/\psi(1S)$	$(19.2 \pm 0.7) \%$	
$\Gamma_{68}$	$\gamma \rho^0$	$< 2.0 \times 10^{-5}$	90%
$\Gamma_{69}$	$\gamma \omega$	$< 6 \times 10^{-6}$	90%
$\Gamma_{70}$	$\gamma \phi$	$< 8 \times 10^{-6}$	90%
$\Gamma_{71}$	$\gamma \gamma$	$(2.74 \pm 0.14) \times 10^{-4}$	

### 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, 25 combinations of partial widths obtained from integrated cross section, and 84 branching ratios uses 239 measurements to determine 49 parameters. The overall fit has a  $\chi^2 = 341.3$  for 190 degrees of freedom.

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

$x_{14}$	13										
$x_{16}$	3	21									
$x_{17}$	8	7	1								
$x_{19}$	14	12	3	7							
$x_{22}$	19	16	3	10	24						
$x_{23}$	19	3	1	2	3	4					
$x_{26}$	11	9	2	6	14	27	2				
$x_{27}$	14	12	3	7	17	33	3	19			
$x_{28}$	13	11	2	6	15	28	3	17	20		
$x_{29}$	7	6	1	4	8	16	1	9	11	10	
$x_{36}$	9	8	2	5	10	18	2	10	13	11	
$x_{38}$	16	13	3	8	16	24	4	14	17	15	
$x_{51}$	11	9	2	6	14	28	2	16	20	17	
$x_{67}$	24	21	4	12	29	55	5	32	40	34	
$x_{71}$	-8	-6	-1	-3	1	19	-2	13	13	10	
$\Gamma$	-28	-23	-5	-14	-28	-43	-6	-25	-32	-28	
	$x_1$	$x_{14}$	$x_{16}$	$x_{17}$	$x_{19}$	$x_{22}$	$x_{23}$	$x_{26}$	$x_{27}$	$x_{28}$	
$x_{36}$	6										
$x_{38}$	8	10									
$x_{51}$	9	11	14								
$x_{67}$	19	22	19	33							
$x_{71}$	6	4	26	13	30						
$\Gamma$	-15	-19	-54	-25	-61	-52					
	$x_{29}$	$x_{36}$	$x_{38}$	$x_{51}$	$x_{67}$	$x_{71}$					

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

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

$\Gamma(p\bar{p}) \times \Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$   $\Gamma_{38}\Gamma_{67}/\Gamma$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
<b>27.9±1.3 OUR FIT</b>			
<b>27.5±1.5 OUR AVERAGE</b>			
27.0±1.5±1.1	<sup>1</sup> ANDREOTTI 05A	E835	$p\bar{p} \rightarrow e^+e^-\gamma$
27.7±1.5±2.0	<sup>1,2</sup> ARMSTRONG 92	E760	$\bar{p}p \rightarrow e^+e^-\gamma$
36 ±8	<sup>1</sup> BAGLIN 86B	SPEC	$\bar{p}p \rightarrow e^+e^-X$

<sup>1</sup> Calculated by us using  $B(J/\psi(1S) \rightarrow e^+e^-) = 0.0593 \pm 0.0010$ .

<sup>2</sup> Recalculated by ANDREOTTI 05A.

$\Gamma(\gamma\gamma) \times \Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$   $\Gamma_{71}\Gamma_{67}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>102± 5 OUR FIT</b>				
<b>117± 10 OUR AVERAGE</b>				
111± 12± 9	147 ± 15	<sup>1</sup> DOBBS	06 CLE3	10.4 $e^+e^- \rightarrow e^+e^-\chi_{c2}$
114± 11± 9	136 ± 13.3	<sup>1,2</sup> ABE	02T BELL	$e^+e^- \rightarrow e^+e^-\chi_{c2}$
139± 55± 21		<sup>1,3</sup> ACCIARRI	99E L3	$e^+e^- \rightarrow e^+e^-\chi_{c2}$
242± 65± 51		<sup>1,4</sup> ACKER.,K...	98 OPAL	$e^+e^- \rightarrow e^+e^-\chi_{c2}$
150± 42± 36		<sup>1,5</sup> DOMINICK	94 CLE2	$e^+e^- \rightarrow e^+e^-\chi_{c2}$
470±240±120		<sup>1,6</sup> BAUER	93 TPC	$e^+e^- \rightarrow e^+e^-\chi_{c2}$

<sup>1</sup> Calculated by us using  $B(J/\psi \rightarrow \ell^+\ell^-) = 0.1187 \pm 0.0008$ .

<sup>2</sup> All systematic errors added in quadrature.

<sup>3</sup> The value for  $\Gamma(\chi_{c2} \rightarrow \gamma\gamma)$  reported in ACCIARRI 99E is derived using  $B(\chi_{c2} \rightarrow \gamma J/\psi(1S)) \times B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.0162 \pm 0.0014$ .

<sup>4</sup> The value for  $\Gamma(\chi_{c2} \rightarrow \gamma\gamma)$  reported in ACKERSTAFF,K 98 is derived using  $B(\chi_{c2} \rightarrow \gamma J/\psi(1S)) = 0.135 \pm 0.011$  and  $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1203 \pm 0.0038$ .

<sup>5</sup> The value for  $\Gamma(\chi_{c2} \rightarrow \gamma\gamma)$  reported in DOMINICK 94 is derived using  $B(\chi_{c2} \rightarrow \gamma J/\psi(1S)) = 0.135 \pm 0.011$ ,  $B(J/\psi(1S) \rightarrow e^+e^-) = 0.0627 \pm 0.0020$ , and  $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = 0.0597 \pm 0.0025$ .

<sup>6</sup> The value for  $\Gamma(\chi_{c2} \rightarrow \gamma\gamma)$  reported in BAUER 93 is derived using  $B(\chi_{c2} \rightarrow \gamma J/\psi(1S)) = 0.135 \pm 0.011$ ,  $B(J/\psi(1S) \rightarrow e^+e^-) = 0.0627 \pm 0.0020$ , and  $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = 0.0597 \pm 0.0025$ .

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

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_1\Gamma_{71}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>5.7 ±0.5 OUR FIT</b>				
<b>5.2 ±0.7 OUR AVERAGE</b>				
5.01±0.44±0.55	1597 ± 138	UEHARA 08	BELL	$\gamma\gamma \rightarrow \chi_{c2} \rightarrow 2(\pi^+\pi^-)$
6.4 ±1.8 ±0.8		EISENSTEIN 01	CLE2	$e^+e^- \rightarrow e^+e^-\chi_{c2}$

$\Gamma(\rho\rho) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{2}\Gamma_{71}/\Gamma$

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    $\gamma\gamma \rightarrow \chi_{c2} \rightarrow 2(\pi^+\pi^-)$

$\Gamma(K^+K^-\pi^+\pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{14}\Gamma_{71}/\Gamma$

VALUE (eV)              EVTS      DOCUMENT ID      TECN   COMMENT

**4.7 ± 0.5 OUR FIT**

**4.42 ± 0.42 ± 0.53**   780 ± 74   UEHARA      08   BELL    $\gamma\gamma \rightarrow \chi_{c2} \rightarrow K^+K^-\pi^+\pi^-$

$\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{15}\Gamma_{71}/\Gamma$

VALUE (eV)              EVTS      DOCUMENT ID      TECN   COMMENT

**6.5 ± 0.9 ± 1.5**              1250              DEL-AMO-SA..11M   BABR    $\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$

$\Gamma(K^*(892)^0\bar{K}^*(892)^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{17}\Gamma_{71}/\Gamma$

VALUE (eV)              EVTS      DOCUMENT ID      TECN   COMMENT

**1.26 ± 0.24 OUR FIT**

**0.8 ± 0.17 ± 0.27**   151 ± 30   UEHARA      08   BELL    $\gamma\gamma \rightarrow \chi_{c2} \rightarrow K^+K^-\pi^+\pi^-$

$\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{19}\Gamma_{71}/\Gamma$

VALUE (eV)              EVTS      DOCUMENT ID      TECN   COMMENT

**0.59 ± 0.05 OUR FIT**

**0.62 ± 0.07 ± 0.05**   89 ± 11   <sup>1</sup> LIU              12B   BELL    $\gamma\gamma \rightarrow 2(K^+K^-)$

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

0.58 ± 0.18 ± 0.16   26.5 ± 8.1   UEHARA      08   BELL    $\gamma\gamma \rightarrow \chi_{c2} \rightarrow 2(K^+K^-)$

<sup>1</sup>Supersedes UEHARA 08. Using  $B(\phi \rightarrow K^+K^-) = (48.9 \pm 0.5)\%$ .

$\Gamma(\omega\omega) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{20}\Gamma_{71}/\Gamma$

VALUE (eV)              CL%      DOCUMENT ID      TECN   COMMENT

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

<0.64              90      <sup>1</sup> LIU              12B   BELL    $\gamma\gamma \rightarrow 2(\pi^+\pi^-\pi^0)$

<sup>1</sup>Using  $B(\omega \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7)\%$ .

$\Gamma(\omega\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{21}\Gamma_{71}/\Gamma$

VALUE (eV)              CL%      DOCUMENT ID      TECN   COMMENT

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

<0.04              90      <sup>1</sup> LIU              12B   BELL    $\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$

<sup>1</sup>Using  $B(\phi \rightarrow K^+K^-) = (48.9 \pm 0.5)\%$  and  $B(\omega \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7)\%$ .

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{22}\Gamma_{71}/\Gamma$

VALUE (eV)              EVTS      DOCUMENT ID      TECN   COMMENT

**1.23 ± 0.08 OUR FIT**

**1.18 ± 0.25 OUR AVERAGE**

1.44 ± 0.54 ± 0.47   34 ± 13   <sup>1</sup> UEHARA      09   BELL   10.6  $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$

1.14 ± 0.21 ± 0.17   54 ± 10   <sup>2</sup> NAKAZAWA   05   BELL   10.6  $e^+e^- \rightarrow e^+e^-\pi^+\pi^-$

<sup>1</sup>We multiplied the measurement by 3 to convert from  $\pi^0\pi^0$  to  $\pi\pi$ . Interference with the continuum included.

<sup>2</sup>We have multiplied  $\pi^+\pi^-$  measurement by 3/2 to obtain  $\pi\pi$ .

$\Gamma(\rho^0 \pi^+ \pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{23}\Gamma_{71}/\Gamma$

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

$\Gamma(\eta\eta) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{26}\Gamma_{71}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.53±0.22±0.09</b>	8	<sup>1</sup> UEHARA	10A BELL	10.6 $e^+e^- \rightarrow e^+e^-\eta\eta$

<sup>1</sup>Interference with the continuum not included.

$\Gamma(K^+ K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{27}\Gamma_{71}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.56±0.04 OUR FIT</b>				
<b>0.44±0.11±0.07</b>	33 ± 8	NAKAZAWA	05 BELL	10.6 $e^+e^- \rightarrow e^+e^-K^+K^-$

$\Gamma(K_S^0 K_S^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{28}\Gamma_{71}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.291±0.025 OUR FIT</b>				
<b>0.27 <sup>+0.07</sup> <sub>-0.06</sub> ±0.03</b>	53	<sup>1</sup> UEHARA	13 BELL	$\gamma\gamma \rightarrow K_S^0 K_S^0$

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

0.31 ±0.05 ±0.03	38 ± 7	CHEN	07B BELL	$e^+e^- \rightarrow e^+e^-\chi_{c2}$
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<sup>1</sup>Supersedes CHEN 07B.

$\Gamma(\bar{K}^0 K^+ \pi^- + \text{c.c.}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{29}\Gamma_{71}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.71±0.11 OUR FIT</b>				
<b>1.20±0.33±0.13</b>	126	<sup>1</sup> DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$

<sup>1</sup>We have multiplied  $\bar{K}K\pi$  by 2/3 to obtain  $\bar{K}^0 K^+ \pi^- + \text{c.c.}$

$\Gamma(K^+ K^- K^+ K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{36}\Gamma_{71}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.91±0.12 OUR FIT</b>				
<b>1.10±0.21±0.15</b>	126 ± 24	UEHARA	08 BELL	$\gamma\gamma \rightarrow \chi_{c2} \rightarrow 2(K^+ K^-)$

$\Gamma(\eta_c(1S)\pi^+\pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{66}\Gamma_{71}/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;15.7</b>	90	LEES	12AE BABR	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-\eta_c$

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

———— HADRONIC DECAYS ————

$\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$   $\Gamma_1/\Gamma$

VALUE	DOCUMENT ID
<b>0.0107±0.0010 OUR FIT</b>	

$\Gamma(\rho^0 \pi^+ \pi^-)/\Gamma(2(\pi^+ \pi^-))$   $\Gamma_{23}/\Gamma_1$

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

$\Gamma(\pi^+ \pi^- \pi^0 \pi^0)/\Gamma_{total}$   $\Gamma_3/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.92±0.24±0.07</b>	903.5	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $1.87 \pm 0.07 \pm 0.22 \pm 0.13$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+ \pi^- \pi^0 \pi^0)/\Gamma_{total}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho^+ \pi^- \pi^0 + c.c.)/\Gamma_{total}$   $\Gamma_4/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.28±0.35±0.08</b>	1031.9	<sup>1,2</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $2.23 \pm 0.11 \pm 0.32 \pm 0.16$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \rho^+ \pi^- \pi^0 + c.c.)/\Gamma_{total}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> 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.

$\Gamma(4\pi^0)/\Gamma_{total}$   $\Gamma_5/\Gamma$

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.16±0.15±0.04</b>	1164	<sup>1</sup> ABLIKIM	11A BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow \gamma \chi_{c2}$

<sup>1</sup> ABLIKIM 11A reports  $(1.21 \pm 0.05 \pm 0.16) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow 4\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.22±0.04±0.01</b>	76.9	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $0.21 \pm 0.03 \pm 0.03 \pm 0.01$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- \pi^0 \pi^0)/\Gamma_{total}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+ \pi^- \bar{K}^0 \pi^0 + c.c.)/\Gamma_{total}$   $\Gamma_7/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.44±0.20±0.05</b>	211.6	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$



<sup>1</sup> HE 08B reports  $1.41 \pm 0.11 \pm 0.16 \pm 0.10$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ \pi^- \bar{K}^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\rho^- K^+ \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_8/\Gamma$**

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.43±0.13±0.01</b>	62.9	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $0.42 \pm 0.11 \pm 0.06 \pm 0.03$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \rho^- K^+ \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(K^*(892)^0 K^- \pi^+ \rightarrow K^- \pi^+ K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_9/\Gamma$**

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.31±0.08±0.01</b>	38.7	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $0.30 \pm 0.07 \pm 0.04 \pm 0.02$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^0 K^- \pi^+ \rightarrow K^- \pi^+ K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.40±0.09±0.01</b>	63.0	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $0.39 \pm 0.07 \pm 0.05 \pm 0.03$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^0 \bar{K}^0 \pi^0 \rightarrow K^+ \pi^- \bar{K}^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.39±0.08±0.01</b>	51.1	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $0.38 \pm 0.07 \pm 0.04 \pm 0.03$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^- K^+ \pi^0 \rightarrow K^+ \pi^- \bar{K}^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(K^*(892)^+ \bar{K}^0 \pi^- \rightarrow K^+ \pi^- \bar{K}^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{12}/\Gamma$**

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.31±0.08±0.01</b>	39.3	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup>HE 08B reports  $0.30 \pm 0.07 \pm 0.04 \pm 0.02$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^+ \bar{K}^0 \pi^- \rightarrow K^+ \pi^- \bar{K}^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.133±0.046±0.005</b>	22.9	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup>HE 08B reports  $0.13 \pm 0.04 \pm 0.02 \pm 0.01$  % from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- \eta \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>
<b>8.9±1.0 OUR FIT</b>	

**$\Gamma(K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.})/\Gamma(K^+ K^- \pi^+ \pi^-)$   $\Gamma_{16}/\Gamma_{14}$**

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.25±0.13 OUR FIT</b>			
<b>0.25±0.13</b>	TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma \chi_{c2}$

**$\Gamma(K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{16}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>
<b>22±11 OUR FIT</b>	

**$\Gamma(K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}$   $\Gamma_{17}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>
<b>2.4±0.5 OUR FIT</b>	

**$\Gamma(3(\pi^+ \pi^-))/\Gamma_{\text{total}}$   $\Gamma_{18}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>8.6±1.8 OUR EVALUATION</b>			Treating systematic error as correlated.
<b>8.6±1.8 OUR AVERAGE</b>			

8.6±0.9±1.6	<sup>1</sup> BAI	99B BES	$\psi(2S) \rightarrow \gamma \chi_{c2}$
8.7±5.9±0.4	<sup>1</sup> TANENBAUM	78 MRK1	$\psi(2S) \rightarrow \gamma \chi_{c2}$

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

**$\Gamma(\phi\phi)/\Gamma_{\text{total}}$   $\Gamma_{19}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>
<b>1.12±0.10 OUR FIT</b>	

**$\Gamma(\omega\omega)/\Gamma_{\text{total}}$**   **$\Gamma_{20}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**0.88±0.11 OUR AVERAGE**

0.85±0.10±0.03	762	<sup>1</sup> ABLIKIM	11K BES3	$\psi(2S) \rightarrow \gamma$ hadrons
1.8 ±0.6 ±0.1	27.7 ±7.4	<sup>2</sup> ABLIKIM	05N BES2	$\psi(2S) \rightarrow \gamma\chi_{c2} \rightarrow \gamma 6\pi$

<sup>1</sup> ABLIKIM 11K reports  $(8.9 \pm 0.3 \pm 1.1) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \omega\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> ABLIKIM 05N reports  $[\Gamma(\chi_{c2}(1P) \rightarrow \omega\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  =  $(0.165 \pm 0.044 \pm 0.032) \times 10^{-3}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\omega\phi)/\Gamma_{\text{total}}$**   **$\Gamma_{21}/\Gamma$**

<u>VALUE (units <math>10^{-5}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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$<1.9$	90	<sup>1</sup> ABLIKIM	11K BES3	$\psi(2S) \rightarrow \gamma$ hadrons
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<sup>1</sup> ABLIKIM 11K reports  $< 2 \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \omega\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

**$\Gamma(\pi\pi)/\Gamma_{\text{total}}$**   **$\Gamma_{22}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>
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**2.33±0.12 OUR FIT**

**$\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{\text{total}}$**   **$\Gamma_{23}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>
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**38±16 OUR FIT**

**$\Gamma(\pi^+\pi^-\eta)/\Gamma_{\text{total}}$**   **$\Gamma_{24}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>0.50±0.13±0.02</b>		<sup>1</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$<1.5$	90	<sup>2</sup> ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma\chi_{c2}$
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<sup>1</sup> ATHAR 07 reports  $(0.49 \pm 0.12 \pm 0.06) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+\pi^-\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> ABLIKIM 06R reports  $< 1.7 \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+\pi^-\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(\pi^+\pi^-\eta')/\Gamma_{\text{total}}$   $\Gamma_{25}/\Gamma$

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.52±0.19±0.02</b>	<sup>1</sup> ATHAR	07	CLEO $\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ATHAR 07 reports  $(0.51 \pm 0.18 \pm 0.06) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+\pi^-\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\eta\eta)/\Gamma_{\text{total}}$   $\Gamma_{26}/\Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>
<b>5.7±0.5 OUR FIT</b>	

$\Gamma(K^+K^-)/\Gamma_{\text{total}}$   $\Gamma_{27}/\Gamma$

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>
<b>1.05±0.07 OUR FIT</b>	

$\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$   $\Gamma_{28}/\Gamma$

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>
<b>0.55±0.04 OUR FIT</b>	

$\Gamma(K_S^0 K_S^0)/\Gamma(\pi\pi)$   $\Gamma_{28}/\Gamma_{22}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.235±0.019 OUR FIT</b>			

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

$0.27 \pm 0.07 \pm 0.04$	<sup>1,2</sup> CHEN	07B	BELL $e^+e^- \rightarrow e^+e^-\chi_{c2}$
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<sup>1</sup> Using  $\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$  from the  $\pi^+\pi^-$  measurement of NAKAZAWA 05 rescaled by 3/2 to convert to  $\pi\pi$ .

<sup>2</sup> Not independent from other measurements.

$\Gamma(K_S^0 K_S^0)/\Gamma(K^+K^-)$   $\Gamma_{28}/\Gamma_{27}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.52±0.05 OUR FIT</b>			

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

$0.70 \pm 0.21 \pm 0.12$	<sup>1,2</sup> CHEN	07B	BELL $e^+e^- \rightarrow e^+e^-\chi_{c2}$
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<sup>1</sup> Using  $\Gamma(K^+K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$  from NAKAZAWA 05.

<sup>2</sup> Not independent from other measurements.

$\Gamma(K^+K^-\pi^0)/\Gamma_{\text{total}}$   $\Gamma_{30}/\Gamma$

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.32±0.08±0.01</b>	<sup>1</sup> ATHAR	07	CLEO $\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ATHAR 07 reports  $(0.31 \pm 0.07 \pm 0.04) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+K^-\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+ K^- \eta)/\Gamma_{\text{total}}$   $\Gamma_{31}/\Gamma$

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.34</b>	90	<sup>1</sup> ATHAR 07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ATHAR 07 reports  $< 0.33 \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- \eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(\eta\eta')/\Gamma_{\text{total}}$   $\Gamma_{32}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.6</b>	90	$3.3 \pm 8.0$	<sup>1</sup> ASNER 09	CLEO	$\psi(2S) \rightarrow \gamma \eta \eta'$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<2.4	90		<sup>2</sup> ADAMS 07	CLEO	$\psi(2S) \rightarrow \gamma \chi_{c2}$

<sup>1</sup> ASNER 09 reports  $< 0.6 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \eta\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

<sup>2</sup> Superseded by ASNER 09. ADAMS 07 reports  $< 2.3 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \eta\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 0.0933 \pm 0.0014 \pm 0.0061$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(\eta'\eta')/\Gamma_{\text{total}}$   $\Gamma_{33}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>&lt;1.0</b>	90	$12 \pm 7$	<sup>1</sup> ASNER 09	CLEO	$\psi(2S) \rightarrow \gamma \eta' \eta'$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.2	90		<sup>2</sup> ADAMS 07	CLEO	$\psi(2S) \rightarrow \gamma \chi_{c2}$

<sup>1</sup> ASNER 09 reports  $< 1.0 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \eta' \eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

<sup>2</sup> Superseded by ASNER 09. ADAMS 07 reports  $< 3.1 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \eta' \eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 0.0933 \pm 0.0014 \pm 0.0061$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(\pi^+ \pi^- K_S^0 K_S^0)/\Gamma_{\text{total}}$   $\Gamma_{34}/\Gamma$

VALUE (units $10^{-3}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>2.3 \pm 0.6 \pm 0.1</math></b>		$57 \pm 11$	<sup>1</sup> ABLIKIM 050	BES2	$\psi(2S) \rightarrow \gamma \chi_{c2}$

<sup>1</sup> ABLIKIM 050 reports  $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+ \pi^- K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  =  $(0.207 \pm 0.039 \pm 0.033) \times 10^{-3}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+ K^- K_S^0 K_S^0)/\Gamma_{\text{total}}$   $\Gamma_{35}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>&lt;4</b>	90	$2.3 \pm 2.2$	<sup>1</sup> ABLIKIM	050 BES2	$e^+ e^- \rightarrow \chi_{c2} \gamma$

<sup>1</sup> ABLIKIM 050 reports  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))] < 3.5 \times 10^{-5}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(K^+ K^- K^+ K^-)/\Gamma_{\text{total}}$   $\Gamma_{36}/\Gamma$

VALUE (units $10^{-3}$ )	DOCUMENT ID
<b>1.73 ± 0.21 OUR FIT</b>	

$\Gamma(K^+ K^- \phi)/\Gamma_{\text{total}}$   $\Gamma_{37}/\Gamma$

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.48 ± 0.31 ± 0.05</b>	52	<sup>1</sup> ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma 2K^+ 2K^-$

<sup>1</sup> ABLIKIM 06T reports  $(1.67 \pm 0.26 \pm 0.24) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- \phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$   $\Gamma_{38}/\Gamma$

VALUE (units $10^{-4}$ )	DOCUMENT ID
<b>0.75 ± 0.04 OUR FIT</b>	

$\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$   $\Gamma_{39}/\Gamma$

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
<b>0.49 ± 0.04 OUR AVERAGE</b>			
0.49 ± 0.04 ± 0.02	<sup>1</sup> ONYISI	10 CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}X$
0.45 ± 0.09 ± 0.02	<sup>2</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ONYISI 10 reports  $(4.83 \pm 0.25 \pm 0.35 \pm 0.31) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> ATHAR 07 reports  $(0.44 \pm 0.08 \pm 0.05) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p}\eta)/\Gamma_{\text{total}}$   $\Gamma_{40}/\Gamma$

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
<b>0.182 ± 0.026 OUR AVERAGE</b>			
0.180 ± 0.027 ± 0.006	<sup>1</sup> ONYISI	10 CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}X$
0.19 ± 0.07 ± 0.01	<sup>2</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ONYISI 10 reports  $(1.76 \pm 0.23 \pm 0.14 \pm 0.11) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> ATHAR 07 reports  $(0.19 \pm 0.07 \pm 0.02) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(p\bar{p}\omega)/\Gamma_{\text{total}}$**   **$\Gamma_{41}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.38±0.04±0.01</b>	<sup>1</sup> ONYISI 10	CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}X$

<sup>1</sup> ONYISI 10 reports  $(3.68 \pm 0.35 \pm 0.26 \pm 0.24) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(p\bar{p}\phi)/\Gamma_{\text{total}}$**   **$\Gamma_{42}/\Gamma$**

<u>VALUE (units <math>10^{-5}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>2.9±0.9±0.1</b>	24 ± 7	<sup>1</sup> ABLIKIM 11F	BES3	$\psi(2S) \rightarrow \gamma p\bar{p}K^+K^-$

<sup>1</sup> ABLIKIM 11F reports  $(3.04 \pm 0.85 \pm 0.43) \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$**   **$\Gamma_{43}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1.32±0.34 OUR EVALUATION</b>	Treating systematic error as correlated.		
<b>1.3 ± 0.4 OUR AVERAGE</b>	Error includes scale factor of 1.3.		
1.17±0.19±0.30	<sup>1</sup> BAI 99B	BES	$\psi(2S) \rightarrow \gamma\chi_{c2}$
2.64±1.03±0.14	<sup>1</sup> TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma\chi_{c2}$

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

**$\Gamma(p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}$**   **$\Gamma_{44}/\Gamma$**

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.082±0.024±0.003</b>	29.2	<sup>1</sup> HE 08B	CLEO	$e^+e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $0.08 \pm 0.02 \pm 0.01 \pm 0.01 \%$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho\bar{p}K^+K^- \text{ (non-resonant)})/\Gamma_{\text{total}}$   $\Gamma_{45}/\Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>2.00 \pm 0.33 \pm 0.07</math></b>	$131 \pm 12$	<sup>1</sup> ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma\rho\bar{p}K^+K^-$

<sup>1</sup> ABLIKIM 11F reports  $(2.08 \pm 0.19 \pm 0.30) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \rho\bar{p}K^+K^- \text{ (non-resonant)})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho\bar{p}K_S^0K_S^0)/\Gamma_{\text{total}}$   $\Gamma_{46}/\Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&lt;7.9</b>	90	<sup>1</sup> ABLIKIM	06D BES2	$\psi(2S) \rightarrow \chi_{c2}\gamma$

<sup>1</sup> Using  $B(\psi(2S) \rightarrow \chi_{c2}\gamma) = (9.3 \pm 0.6)\%$ .

$\Gamma(\rho\bar{n}\pi^-)/\Gamma_{\text{total}}$   $\Gamma_{47}/\Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>8.9 \pm 1.0</math> OUR AVERAGE</b>				

$8.8 \pm 1.0 \pm 0.3$	3309	<sup>1</sup> ABLIKIM	12J BES3	$\psi(2S) \rightarrow \gamma\rho\bar{n}\pi^-$
$10.6 \pm 3.6 \pm 0.4$		<sup>2</sup> ABLIKIM	06i BES2	$\psi(2S) \rightarrow \gamma\rho\pi^-X$

<sup>1</sup> ABLIKIM 12J reports  $[\Gamma(\chi_{c2}(1P) \rightarrow \rho\bar{n}\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  =  $(0.80 \pm 0.02 \pm 0.09) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> ABLIKIM 06i reports  $[\Gamma(\chi_{c2}(1P) \rightarrow \rho\bar{n}\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  =  $(0.97 \pm 0.20 \pm 0.26) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\bar{p}n\pi^+)/\Gamma_{\text{total}}$   $\Gamma_{48}/\Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>9.3 \pm 0.8 \pm 0.3</math></b>	3732	<sup>1</sup> ABLIKIM	12J BES3	$\psi(2S) \rightarrow \gamma\bar{p}n\pi^+$

<sup>1</sup> ABLIKIM 12J reports  $[\Gamma(\chi_{c2}(1P) \rightarrow \bar{p}n\pi^+)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  =  $(0.85 \pm 0.02 \pm 0.07) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho\bar{n}\pi^-\pi^0)/\Gamma_{\text{total}}$   $\Gamma_{49}/\Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>22.7 \pm 1.8 \pm 0.8</math></b>	2128	<sup>1</sup> ABLIKIM	12J BES3	$\psi(2S) \rightarrow \gamma\rho\bar{n}\pi^-\pi^0$

<sup>1</sup> ABLIKIM 12J reports  $[\Gamma(\chi_{c2}(1P) \rightarrow \rho\bar{n}\pi^-\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  =  $(2.07 \pm 0.06 \pm 0.15) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.



$\Gamma(\bar{p}n\pi^+\pi^0)/\Gamma_{\text{total}}$   $\Gamma_{50}/\Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>22.1±1.9±0.8</b>	2352	<sup>1</sup> ABLIKIM	12J BES3	$\psi(2S) \rightarrow \gamma\bar{p}n\pi^+\pi^0$

<sup>1</sup> ABLIKIM 12J reports  $[\Gamma(\chi_{c2}(1P) \rightarrow \bar{p}n\pi^+\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] = (2.01 \pm 0.06 \pm 0.16) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$   $\Gamma_{51}/\Gamma$

VALUE (units $10^{-4}$ )	DOCUMENT ID
<b>1.92±0.16 OUR FIT</b>	

$\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$   $\Gamma_{52}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>131±16±5</b>		371	<sup>1</sup> ABLIKIM	12i BES3	$\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}\pi^+\pi^-$

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

<350	90	<sup>2</sup> ABLIKIM	06D BES2	$\psi(2S) \rightarrow \chi_{c2}\gamma$
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<sup>1</sup> ABLIKIM 12i reports  $(137.0 \pm 7.6 \pm 15.7) \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.72 \pm 0.34) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> Using  $B(\psi(2S) \rightarrow \chi_{c2}\gamma) = (9.3 \pm 0.6)\%$ .

$\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^- \text{ (non-resonant)})/\Gamma_{\text{total}}$   $\Gamma_{53}/\Gamma$

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>69±16±2</b>	36	<sup>1</sup> ABLIKIM	12i BES3	$\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}\pi^+\pi^-$

<sup>1</sup> ABLIKIM 12i reports  $(71.8 \pm 14.5 \pm 8.2) \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Lambda\bar{\Lambda}\pi^+\pi^- \text{ (non-resonant)})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.72 \pm 0.34) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Sigma(1385)^+\bar{\Lambda}\pi^- + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{54}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;40</b>	90	<sup>1</sup> ABLIKIM	12i BES3	$\psi(2S) \rightarrow \gamma\Sigma(1385)^+\bar{\Lambda}\pi^-$

<sup>1</sup> ABLIKIM 12i reports  $< 42 \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma(1385)^+\bar{\Lambda}\pi^- + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.72 \pm 0.34) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(\Sigma(1385)^-\bar{\Lambda}\pi^+ + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{55}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;60</b>	90	<sup>1</sup> ABLIKIM	12i BES3	$\psi(2S) \rightarrow \gamma\Sigma(1385)^-\bar{\Lambda}\pi^+$

<sup>1</sup> ABLIKIM 12l reports  $< 61 \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma(1385)^- \bar{\Lambda}\pi^+ + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.72 \pm 0.34) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

**$\Gamma(K^+ \bar{p}\Lambda + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{56}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>8.1±0.6 OUR AVERAGE</b>				
8.0±0.6±0.3	5k	<sup>1,2</sup> ABLIKIM	13D BES3	$\psi(2S) \rightarrow \gamma\Lambda\bar{p}K^+$
8.7±1.7±0.3		<sup>3</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ABLIKIM 13D reports  $(8.4 \pm 0.3 \pm 0.6) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ \bar{p}\Lambda + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.72 \pm 0.34) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> Using  $\text{B}(\Lambda \rightarrow p\pi^-) = 63.9\%$ .

<sup>3</sup> ATHAR 07 reports  $(8.5 \pm 1.4 \pm 1.0) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ \bar{p}\Lambda + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(K^+ \bar{p}\Lambda(1520) + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{57}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>2.9±0.7±0.1</b>	79 ± 13	<sup>1</sup> ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p \bar{p} K^+ K^-$

<sup>1</sup> ABLIKIM 11F reports  $(3.06 \pm 0.50 \pm 0.54) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ \bar{p}\Lambda(1520) + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\Lambda(1520)\bar{\Lambda}(1520))/\Gamma_{\text{total}}$   $\Gamma_{58}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>4.8±1.5±0.2</b>	29 ± 7	<sup>1</sup> ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p \bar{p} K^+ K^-$

<sup>1</sup> ABLIKIM 11F reports  $(5.05 \pm 1.29 \pm 0.93) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Lambda(1520)\bar{\Lambda}(1520))/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\Sigma^0 \bar{\Sigma}^0)/\Gamma_{\text{total}}$   $\Gamma_{59}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&lt;0.6</b>	90		<sup>1</sup> ABLIKIM	13H BES3	$\psi(2S) \rightarrow \gamma \Sigma^0 \bar{\Sigma}^0$
••• We do not use the following data for averages, fits, limits, etc. •••					
<0.8	90	7.5 ± 3.4	<sup>2</sup> NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma \Sigma^0 \bar{\Sigma}^0$

<sup>1</sup> ABLIKIM 13H reports  $< 0.65 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma^0 \bar{\Sigma}^0) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

<sup>2</sup> NAIK 08 reports  $< 0.75 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma^0 \bar{\Sigma}^0) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

**$\Gamma(\Sigma^+ \bar{\Sigma}^-) / \Gamma_{\text{total}}$   $\Gamma_{60} / \Gamma$**

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.7</b>	90	$4.0 \pm 3.5$	<sup>1</sup> NAIK	08	CLEO $\psi(2S) \rightarrow \gamma \Sigma^+ \bar{\Sigma}^-$

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

<0.8                      90                      <sup>2</sup> ABLIKIM                      13H                      BES3                       $\psi(2S) \rightarrow \gamma \Sigma^+ \bar{\Sigma}^-$

<sup>1</sup> NAIK 08 reports  $< 0.67 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma^+ \bar{\Sigma}^-) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

<sup>2</sup> ABLIKIM 13H reports  $< 0.88 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma^+ \bar{\Sigma}^-) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

**$\Gamma(\Sigma(1385)^+ \bar{\Sigma}(1385)^-) / \Gamma_{\text{total}}$   $\Gamma_{61} / \Gamma$**

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;16</b>	90	<sup>1</sup> ABLIKIM                      12i	BES3	$\psi(2S) \rightarrow \gamma \Sigma(1385)^+ \bar{\Sigma}(1385)^-$

<sup>1</sup> ABLIKIM 12i reports  $< 17 \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma(1385)^+ \bar{\Sigma}(1385)^-) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.72 \pm 0.34) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

**$\Gamma(\Sigma(1385)^- \bar{\Sigma}(1385)^+) / \Gamma_{\text{total}}$   $\Gamma_{62} / \Gamma$**

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;8</b>	90	<sup>1</sup> ABLIKIM                      12i	BES3	$\psi(2S) \rightarrow \gamma \Sigma(1385)^- \bar{\Sigma}(1385)^+$

<sup>1</sup> ABLIKIM 12i reports  $< 8.5 \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma(1385)^- \bar{\Sigma}(1385)^+) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.72 \pm 0.34) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

**$\Gamma(\Xi^0 \bar{\Xi}^0) / \Gamma_{\text{total}}$   $\Gamma_{63} / \Gamma$**

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>&lt;1.1</b>	90	$2.9 \pm 1.7$	<sup>1</sup> NAIK	08	CLEO $\psi(2S) \rightarrow \gamma \Xi^0 \bar{\Xi}^0$

<sup>1</sup> NAIK 08 reports  $< 1.06 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Xi^0 \bar{\Xi}^0) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(\Xi^- \Xi^+)/\Gamma_{\text{total}}$   $\Gamma_{64}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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<b><math>1.48 \pm 0.33 \pm 0.05</math></b>		$29 \pm 5$	<sup>1</sup> NAIK	08	CLEO $\psi(2S) \rightarrow \gamma \Xi^+ \Xi^-$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 3.7$	90		<sup>2</sup> ABLIKIM	06D	BES2 $\psi(2S) \rightarrow \chi_{c2} \gamma$
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<sup>1</sup> NAIK 08 reports  $(1.45 \pm 0.30 \pm 0.15) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \Xi^- \Xi^+)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  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  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.11 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> Using  $B(\psi(2S) \rightarrow \chi_{c2} \gamma) = (9.3 \pm 0.6)\%$ .

$\Gamma(J/\psi(1S)\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$   $\Gamma_{65}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<b><math>&lt; 0.015</math></b>	90	BARATE	81	SPEC 190 GeV $\pi^- \text{Be} \rightarrow 2\pi 2\mu$
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$\Gamma(\eta_c(1S)\pi^+\pi^-)/\Gamma(\bar{K}^0 K^+ \pi^- + \text{c.c.})$   $\Gamma_{66}/\Gamma_{29}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<b><math>&lt; 16.4</math></b>	90	<sup>1</sup> LEES	12AE BABR	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \eta_c$
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<sup>1</sup> We divided the reported limit by 2 to take into account the  $K_L^0 K^+ \pi^-$  mode.

————— RADIATIVE DECAYS —————

$\Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$   $\Gamma_{67}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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**$0.192 \pm 0.007$  OUR FIT**

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

$0.199 \pm 0.005 \pm 0.012$	<sup>1</sup> ADAM	05A	CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow \gamma \chi_{c2}$
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<sup>1</sup> Uses  $B(\psi(2S) \rightarrow \gamma \chi_{c2} \rightarrow \gamma \gamma J/\psi)$  from ADAM 05A and  $B(\psi(2S) \rightarrow \gamma \chi_{c2})$  from ATHAR 04.

$\Gamma(\gamma \rho^0)/\Gamma_{\text{total}}$   $\Gamma_{68}/\Gamma$

VALUE (units $10^{-6}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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<b><math>&lt; 20</math></b>	90	$13 \pm 11$	<sup>1</sup> ABLIKIM	11E	BES3 $\psi(2S) \rightarrow \gamma \gamma \rho^0$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 40$	90	$17.2 \pm 6.8$	<sup>2</sup> BENNETT	08A	CLEO $\psi(2S) \rightarrow \gamma \gamma \rho^0$
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<sup>1</sup> ABLIKIM 11E reports  $< 20.8 \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma \rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

<sup>2</sup> BENNETT 08A reports  $< 50 \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma \rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(\gamma\omega)/\Gamma_{\text{total}}$   $\Gamma_{69}/\Gamma$

<u>VALUE (units <math>10^{-6}</math>)</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>&lt;6</b>	90	$1 \pm 6$	<sup>1</sup> ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma\gamma\omega$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<6	90	$0.0 \pm 1.8$	<sup>2</sup> BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma\gamma\omega$
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<sup>1</sup> ABLIKIM 11E reports  $< 6.1 \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

<sup>2</sup> BENNETT 08A reports  $< 7.0 \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(\gamma\phi)/\Gamma_{\text{total}}$   $\Gamma_{70}/\Gamma$

<u>VALUE (units <math>10^{-6}</math>)</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>&lt; 8</b>	90	$5 \pm 5$	<sup>1</sup> ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma\gamma\phi$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<12	90	$1.3 \pm 2.5$	<sup>2</sup> BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma\gamma\phi$
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<sup>1</sup> ABLIKIM 11E reports  $< 8.1 \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

<sup>2</sup> BENNETT 08A reports  $< 13 \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 9.11 \times 10^{-2}$ .

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{71}/\Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>
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**2.74±0.14 OUR FIT**

$\Gamma(\gamma\gamma)/\Gamma(\gamma J/\psi(1S))$   $\Gamma_{71}/\Gamma_{67}$

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**1.43±0.08 OUR FIT**

<b>0.99±0.18</b>	<sup>1</sup> AMBROGIANI 00B	E835	$\bar{p}p \rightarrow \chi_{c2} \rightarrow \gamma\gamma, \gamma J/\psi$
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<sup>1</sup> Calculated by us using  $B(J/\psi(1S) \rightarrow e^+e^-) = 0.0593 \pm 0.0010$ .

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}} \times \Gamma(p\bar{p})/\Gamma_{\text{total}}$   $\Gamma_{71}/\Gamma \times \Gamma_{38}/\Gamma$

<u>VALUE (units <math>10^{-8}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**2.06±0.16 OUR FIT**

**1.7 ± 0.4 OUR AVERAGE**

1.60±0.42	ARMSTRONG 93	E760	$\bar{p}p \rightarrow \gamma\gamma X$
9.9 ± 4.5	BAGLIN	87B SPEC	$\bar{p}p \rightarrow \gamma\gamma X$

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

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- \pi^+ \pi^-)}{\Gamma_{\text{total}}} \times \frac{\Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)} = \frac{\Gamma_{14}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
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**2.34 ± 0.26 OUR FIT****2.5 ± 0.9 OUR AVERAGE** Error includes scale factor of 2.3.

1.90 ± 0.14 ± 0.44	BAI	99B	BES $\psi(2S) \rightarrow \gamma \chi_{c2}$
3.8 ± 0.67	<sup>1</sup> TANENBAUM	78	MRK1 $\psi(2S) \rightarrow \gamma \chi_{c2}$

<sup>1</sup> The reported value is derived using  $B(\psi(2S) \rightarrow \pi^+ \pi^- J/\psi) \times B(J/\psi \rightarrow \ell^+ \ell^-) = (4.6 \pm 0.7)\%$ . Calculated by us using  $B(J/\psi \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$ .

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^0 \bar{K}^*(892)^0)}{\Gamma_{\text{total}}} \times \frac{\Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))}{\Gamma_{\text{total}}} = \frac{\Gamma_{17}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-4}$ )	DOCUMENT ID	TECN	COMMENT
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**2.2 ± 0.4 OUR FIT**

<b>3.11 ± 0.36 ± 0.48</b>	ABLIKIM	04H	BES2 $\psi(2S) \rightarrow \gamma \chi_{c2}$
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$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \rho \bar{\rho})}{\Gamma_{\text{total}}} \times \frac{\Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)} = \frac{\Gamma_{38}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-5}$ )	DOCUMENT ID	TECN	COMMENT
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**1.99 ± 0.10 OUR FIT**

<b>1.4 ± 1.1</b>	<sup>1</sup> BAI	98I	BES $\psi(2S) \rightarrow \gamma \chi_{c2} \rightarrow \gamma \bar{p} p$
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<sup>1</sup> Calculated by us. The value for  $B(\chi_{c2} \rightarrow \rho \bar{\rho})$  reported in BAI 98I is derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (7.8 \pm 0.8)\%$  and  $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (32.4 \pm 2.6)\%$  [BAI 98D].

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \rho \bar{\rho})}{\Gamma_{\text{total}}} \times \frac{\Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))}{\Gamma_{\text{total}}} = \frac{\Gamma_{38}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-6}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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**6.85 ± 0.33 OUR FIT****7.1 ± 0.5 OUR AVERAGE** Error includes scale factor of 1.2.

7.3 ± 0.4 ± 0.3	405	ABLIKIM	13V	BES3 $\psi(2S) \rightarrow \gamma \rho \bar{\rho}$
7.2 ± 0.7 ± 0.4	121 ± 12	<sup>1</sup> NAIK	08	CLEO $\psi(2S) \rightarrow \gamma \rho \bar{\rho}$
4.4 $^{+1.6}_{-1.4}$ ± 0.6	14.3 $^{+5.2}_{-4.7}$	BAI	04F	BES $\psi(2S) \rightarrow \gamma \chi_{c2}(1P) \rightarrow \gamma \bar{p} p$

<sup>1</sup> Calculated by us. NAIK 08 reports  $B(\chi_{c2} \rightarrow \rho \bar{\rho}) = (7.7 \pm 0.8 \pm 0.4 \pm 0.5) \times 10^{-5}$  using  $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$ .

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \Lambda \bar{\Lambda})}{\Gamma_{\text{total}}} \times \frac{\Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))}{\Gamma_{\text{total}}} = \frac{\Gamma_{51}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-6}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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**17.5 ± 1.3 OUR FIT****17.4 ± 1.4 OUR AVERAGE**

18.2 ± 1.4 ± 0.9	207	<sup>1</sup> ABLIKIM	13H	BES3 $\psi(2S) \rightarrow \gamma \Lambda \bar{\Lambda}$
15.9 ± 2.1 ± 1.0	71 ± 9	<sup>2</sup> NAIK	08	CLEO $\psi(2S) \rightarrow \gamma \Lambda \bar{\Lambda}$

<sup>1</sup> Calculated by us. ABLIKIM 13H reports  $B(\chi_{c2} \rightarrow \Lambda\bar{\Lambda}) = (20.8 \pm 1.6 \pm 2.3) \times 10^{-5}$  from a measurement of  $B(\chi_{c2} \rightarrow \Lambda\bar{\Lambda}) \times B(\psi(2S) \rightarrow \gamma\chi_{c2})$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (8.74 \pm 0.35)\%$ .

<sup>2</sup> Calculated by us. NAIK 08 reports  $B(\chi_{c2} \rightarrow \Lambda\bar{\Lambda}) = (17.0 \pm 2.2 \pm 1.1 \pm 1.1) \times 10^{-5}$  using  $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$ .

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_{51}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>5.1 ± 0.4 OUR FIT</b>				
7.1 <sup>+3.1</sup> <sub>-2.9</sub> ± 1.3	8.3 <sup>+3.7</sup> <sub>-3.4</sub>	<sup>1</sup> BAI	03E BES	$\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}$

<sup>1</sup> BAI 03E reports  $[B(\chi_{c2} \rightarrow \Lambda\bar{\Lambda}) B(\psi(2S) \rightarrow \gamma\chi_{c2}) / B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-)] \times [B^2(\Lambda \rightarrow \pi^-p) / B(J/\psi \rightarrow p\bar{p})] = (1.33^{+0.59}_{-0.55} \pm 0.25)\%$ . We calculate from this measurement the presented value using  $B(\Lambda \rightarrow \pi^-p) = (63.9 \pm 0.5)\%$  and  $B(J/\psi \rightarrow p\bar{p}) = (2.17 \pm 0.07) \times 10^{-3}$ .

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \pi\pi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma_{\text{total}}}{\Gamma_{22}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.12 ± 0.08 OUR FIT</b>				
<b>2.17 ± 0.09 OUR AVERAGE</b>				
2.19 ± 0.05 ± 0.15	4.5k	<sup>1</sup> ABLIKIM	10A BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c2}$
2.23 ± 0.06 ± 0.10	2.5k	<sup>2</sup> ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$
1.90 ± 0.08 ± 0.20	0.8k	<sup>3</sup> ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\pi^0\pi^0$

<sup>1</sup> Calculated by us. ABLIKIM 10A reports  $B(\chi_{c2} \rightarrow \pi^0\pi^0) = (0.88 \pm 0.02 \pm 0.06 \pm 0.04) \times 10^{-3}$  using  $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$ . We have multiplied the  $\pi^0\pi^0$  measurement by 3 to obtain  $\pi\pi$ .

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

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

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \pi\pi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_{22}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.616 ± 0.023 OUR FIT</b>				
<b>0.54 ± 0.06 OUR AVERAGE</b>				
0.66 ± 0.18 ± 0.37	21 ± 6	<sup>1</sup> BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi^0\pi^0$
0.54 ± 0.05 ± 0.04	185 ± 16	<sup>2</sup> BAI	98I BES	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$

<sup>1</sup> We have multiplied  $\pi^0\pi^0$  measurement by 3 to obtain  $\pi\pi$ .

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

$$\Gamma(\chi_{c2}(1P) \rightarrow \eta\eta)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{26}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{\psi(2S)}$$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.52±0.04 OUR FIT</b>					
<b>0.52±0.04 OUR AVERAGE</b>					
0.54±0.03±0.04		386	<sup>1</sup> ABLIKIM	10A BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c2}$
0.47±0.05±0.05		156 ± 14	ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\eta\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 0.44	90		<sup>2</sup> ADAMS	07 CLEO	$\psi(2S) \rightarrow \gamma\chi_{c2}$
< 3	90		BAI	03C BES	$\psi(2S) \rightarrow \gamma\eta\eta \rightarrow 5\gamma$
0.62±0.31±0.19			LEE	85 CBAL	$\psi(2S) \rightarrow \text{photons}$

<sup>1</sup> Calculated by us. ABLIKIM 10A reports  $B(\chi_{c2} \rightarrow \eta\eta) = (0.65 \pm 0.04 \pm 0.05 \pm 0.03) \times 10^{-3}$  using  $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$ .

<sup>2</sup> Superseded by ASNER 09.

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

$$\Gamma_{27}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{\psi(2S)}$$

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>9.6±0.6 OUR FIT</b>				
<b>10.5±0.3±0.6</b>	1.6k	<sup>1</sup> ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma K^+K^-$

<sup>1</sup> Calculated by us. ASNER 09 reports  $B(\chi_{c2} \rightarrow K^+K^-) = (1.13 \pm 0.03 \pm 0.06 \pm 0.07) \times 10^{-3}$  using  $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$ .

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

$$\Gamma_{27}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.278±0.017 OUR FIT</b>				
<b>0.190±0.034±0.019</b>	115 ± 13	<sup>1</sup> BAI	98I BES	$\psi(2S) \rightarrow \gamma K^+K^-$

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

$$\Gamma(\chi_{c2}(1P) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{28}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{\psi(2S)}$$

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>5.0 ± 0.4 OUR FIT</b>				
<b>5.0 ± 0.4 OUR AVERAGE</b>				
4.9 ± 0.3 ± 0.3	373 ± 20	<sup>1</sup> ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma K_S^0 K_S^0$
5.72±0.76±0.63	65	ABLIKIM	050 BES2	$\psi(2S) \rightarrow \gamma K_S^0 K_S^0$

<sup>1</sup> Calculated by us. ASNER 09 reports  $B(\chi_{c2} \rightarrow K_S^0 K_S^0) = (0.53 \pm 0.03 \pm 0.03 \pm 0.03) \times 10^{-3}$  using  $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$ .



$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_{28}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-5}$ )	DOCUMENT ID	TECN	COMMENT
<b>14.5±1.1 OUR FIT</b>			
<b>14.7±4.1±3.3</b>	<sup>1</sup> BAI	99B BES	$\psi(2S) \rightarrow \gamma K_S^0 K_S^0$

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

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \bar{K}^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma_{\text{total}}}{\Gamma_{29}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.22±0.17 OUR FIT</b>				
<b>1.15±0.18 OUR AVERAGE</b>				

1.21±0.19±0.09	37	<sup>1</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
0.97±0.32±0.13	28	<sup>2</sup> ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp$

<sup>1</sup> Calculated by us. ATHAR 07 reports  $B(\chi_{c2} \rightarrow \bar{K}^0 K^+ \pi^- + \text{c.c.}) = (1.3 \pm 0.2 \pm 0.1 \pm 0.1) \times 10^{-3}$  using  $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$ .

<sup>2</sup> Calculated by us. ABLIKIM 06R reports  $B(\chi_{c2} \rightarrow K_S^0 K^\pm \pi^\mp) = (0.6 \pm 0.2 \pm 0.1) \times 10^{-3}$  using  $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (8.1 \pm 0.6)\%$ . We have multiplied by 2 to obtain  $\bar{K}^0 K^+ \pi^- + \text{c.c.}$  from  $K_S^0 K^\pm \pi^\mp$ .

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow 2(\pi^+ \pi^-))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_1/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
<b>2.83±0.27 OUR FIT</b>			

**3.1 ±1.0 OUR AVERAGE** Error includes scale factor of 2.5.

2.3 ±0.1 ±0.5	<sup>1</sup> BAI	99B BES	$\psi(2S) \rightarrow \gamma \chi_{c2}$
4.3 ±0.6	<sup>2</sup> TANENBAUM	78 MRK1	$\psi(2S) \rightarrow \gamma \chi_{c2}$

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

<sup>2</sup> The value for  $B(\psi(2S) \rightarrow \gamma \chi_{c2}) \times B(\chi_{c2} \rightarrow 2\pi^+ \pi^-)$  reported in TANENBAUM 78 is derived using  $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times B(J/\psi(1S)\ell^+\ell^-) = (4.6 \pm 0.7)\%$ . Calculated by us using  $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$ .

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma_{\text{total}}}{\Gamma_{36}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.57±0.19 OUR FIT</b>				
<b>1.76±0.16±0.24</b>	160	<sup>1</sup> ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma 2K^+ 2K^-$

<sup>1</sup> Calculated by us. The value of  $B(\chi_{c2} \rightarrow 2K^+ 2K^-)$  reported by ABLIKIM 06T was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.1 \pm 0.4)\%$ .

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- K^+ K^-) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma_{\text{total}}}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)} \times \frac{\Gamma_{36} / \Gamma \times \Gamma_{130}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}{\Gamma_{19} / \Gamma \times \Gamma_{130}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-4}$ )	DOCUMENT ID	TECN	COMMENT
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**4.6 ± 0.5 OUR FIT**

<b>3.6 ± 0.6 ± 0.6</b>	<sup>1</sup> BAI	99B	BES $\psi(2S) \rightarrow \gamma 2K^+ 2K^-$
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<sup>1</sup> Calculated by us. The value of  $B(\chi_{c2} \rightarrow 2K^+ 2K^-)$  reported by BAI 99B was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (7.8 \pm 0.8)\%$  and  $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$  [BAI 98D].

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \phi\phi) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma_{\text{total}}}{\Gamma_{19} / \Gamma \times \Gamma_{130}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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**1.02 ± 0.08 OUR FIT**

**0.98 ± 0.13 OUR AVERAGE** Error includes scale factor of 1.3.

0.94 ± 0.03 ± 0.10	849	<sup>1</sup> ABLIKIM	11K	BES3 $\psi(2S) \rightarrow \gamma$ hadrons
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1.38 ± 0.24 ± 0.23	41	<sup>2</sup> ABLIKIM	06T	BES2 $\psi(2S) \rightarrow \gamma 2K^+ 2K^-$
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<sup>1</sup> Calculated by us. The value of  $B(\chi_{c2} \rightarrow \phi\phi)$  reported by ABLIKIM 11K was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.74 \pm 0.35)\%$ .

<sup>2</sup> Calculated by us. The value of  $B(\chi_{c2} \rightarrow \phi\phi)$  reported by ABLIKIM 06T was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.1 \pm 0.4)\%$ .

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \phi\phi) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma_{\text{total}}}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)} \times \frac{\Gamma_{19} / \Gamma \times \Gamma_{130}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}{\Gamma_{19} / \Gamma \times \Gamma_{130}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-4}$ )	DOCUMENT ID	TECN	COMMENT
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**2.95 ± 0.24 OUR FIT**

<b>4.8 ± 1.3 ± 1.3</b>	<sup>1</sup> BAI	99B	BES $\psi(2S) \rightarrow \gamma 2K^+ 2K^-$
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<sup>1</sup> Calculated by us. The value of  $B(\chi_{c2} \rightarrow \phi\phi)$  reported by BAI 99B was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (7.8 \pm 0.8)\%$  and  $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$  [BAI 98D].

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma_{\text{total}}}{\Gamma_{67} / \Gamma \times \Gamma_{130}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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**1.75 ± 0.04 OUR FIT**

**1.52 ± 0.15 OUR AVERAGE** Error includes scale factor of 2.6. See the ideogram below.

1.874 ± 0.007 ± 0.102	76k	ABLIKIM	120	BES3 $\psi(2S) \rightarrow \gamma \chi_{c2}$
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1.62 ± 0.04 ± 0.12	5.8k	BAI	04I	BES2 $\psi(2S) \rightarrow J/\psi \gamma \gamma$
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0.99 ± 0.10 ± 0.08		GAISER	86	CBAL $\psi(2S) \rightarrow \gamma X$
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1.47 ± 0.17		<sup>1</sup> OREGLIA	82	CBAL $\psi(2S) \rightarrow \gamma \chi_{c2}$
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1.8 ± 0.5		<sup>2</sup> BRANDELIK	79B	DASP $\psi(2S) \rightarrow \gamma \chi_{c2}$
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1.2 ± 0.2		<sup>2</sup> BARTEL	78B	CNTR $\psi(2S) \rightarrow \gamma \chi_{c2}$
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2.2 ± 1.2		<sup>3</sup> BIDDICK	77	CNTR $e^+ e^- \rightarrow \gamma X$
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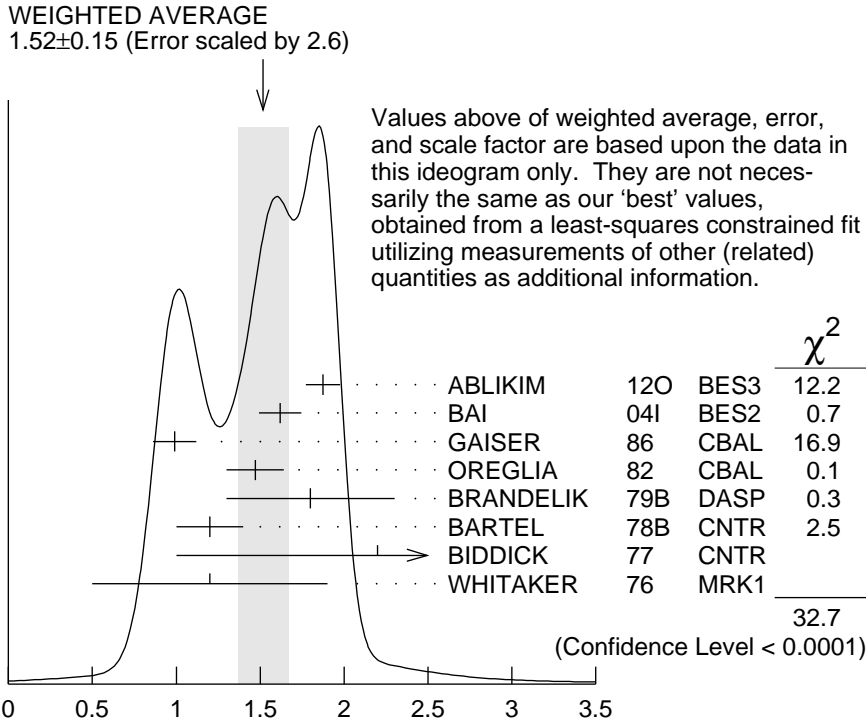
1.2 ± 0.7		<sup>1</sup> WHITAKER	76	MRK1 $e^+ e^-$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1.95 ± 0.02 ± 0.07	12.4k	<sup>4</sup> MENDEZ	08	CLEO $\psi(2S) \rightarrow \gamma \chi_{c2}$
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1.85 ± 0.04 ± 0.07	1.9k	<sup>5</sup> ADAM	05A	CLEO Repl. by MENDEZ 08
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- <sup>1</sup> Recalculated by us using  $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$ .
- <sup>2</sup> Recalculated by us using  $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.0588 \pm 0.0010$ .
- <sup>3</sup> Assumes isotropic gamma distribution.
- <sup>4</sup> Not independent from other measurements of MENDEZ 08.
- <sup>5</sup> Not independent from other values reported by ADAM 05A.



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

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

$$\frac{\Gamma_{67}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_9^{\psi(2S)}}{\Gamma_{67}/\Gamma \times \Gamma_{130}^{\psi(2S)}/(\Gamma_{11}^{\psi(2S)} + \Gamma_{12}^{\psi(2S)} + \Gamma_{13}^{\psi(2S)}) + 0.339\Gamma_{129}^{\psi(2S)} + 0.192\Gamma_{130}^{\psi(2S)}}$$

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.87±0.07 OUR FIT</b>				

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

3.12±0.03±0.09	12.4k	<sup>1</sup> MENDEZ	08	CLEO	$\psi(2S) \rightarrow \gamma \chi_{c2}$
3.11±0.07±0.07	1.9k	ADAM	05A	CLEO	Repl. by MENDEZ 08

<sup>1</sup> Not independent from other measurements of MENDEZ 08.

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S))}{\Gamma_{\text{total}}} \times \frac{\Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)} \times \frac{\Gamma_{67}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma_{130}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>5.08 ± 0.12 OUR FIT</b>				
<b>5.53 ± 0.17 OUR AVERAGE</b>				
5.56 ± 0.05 ± 0.16	12.4k	MENDEZ	08	CLEO $\psi(2S) \rightarrow \gamma \chi_{c2}$
6.0 ± 2.8	1.3k	<sup>1</sup> ABLIKIM	04B	BES $\psi(2S) \rightarrow J/\psi X$
3.9 ± 1.2		<sup>2</sup> HIMEL	80	MRK2 $\psi(2S) \rightarrow \gamma \chi_{c2}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.52 ± 0.13 ± 0.13	1.9k	<sup>3</sup> ADAM	05A	CLEO Repl. by MENDEZ 08

<sup>1</sup> From a fit to the  $J/\psi$  recoil mass spectra.

<sup>2</sup> The value for  $B(\psi(2S) \rightarrow \gamma \chi_{c2}) \times B(\chi_{c2} \rightarrow \gamma J/\psi(1S))$  reported in HIMEL 80 is derived using  $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (33 \pm 3)\%$  and  $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.138 \pm 0.018$ . Calculated by us using  $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = (0.1181 \pm 0.0020)$ .

<sup>3</sup> Not independent from other values reported by ADAM 05A.

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \gamma \gamma)}{\Gamma_{\text{total}}} \times \frac{\Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))}{\Gamma_{\text{total}}} \times \frac{\Gamma_{71}/\Gamma \times \Gamma_{130}^{\psi(2S)}/\Gamma_{\psi(2S)}}{\Gamma_{130}^{\psi(2S)}/\Gamma_{\psi(2S)}}$$

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.50 ± 0.13 OUR FIT</b>				
<b>2.78 ± 0.18 OUR AVERAGE</b>				
2.81 ± 0.17 ± 0.15	1.1k	<sup>1</sup> ABLIKIM	12A	BES3 $\psi(2S) \rightarrow \gamma \chi_{c2} \rightarrow 3\gamma$
2.68 ± 0.28 ± 0.15	0.3k	ECKLUND	08A	CLEO $\psi(2S) \rightarrow \gamma \chi_{c2} \rightarrow 3\gamma$
7.0 ± 2.1 ± 2.0		LEE	85	CBAL $\psi(2S) \rightarrow \gamma \chi_{c2}$

<sup>1</sup> ABLIKIM 12A measures the ratio of two-photon partial widths for the helicity  $\lambda = 0$  and helicity  $\lambda = 2$  components to be  $f_{0/2} = \frac{\Gamma_{\gamma\gamma}^{\lambda=0}}{\Gamma_{\gamma\gamma}^{\lambda=2}} = 0.00 \pm 0.02 \pm 0.02$ .

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \gamma \gamma)}{\Gamma(\chi_{c0}(1P) \rightarrow \gamma \gamma)} \times \frac{\Gamma_{71}/\Gamma_{81}^{\chi_{c0}(1P)}}{\Gamma_{81}^{\chi_{c0}(1P)}}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.273 ± 0.035 OUR AVERAGE</b>				
0.271 ± 0.029 ± 0.030	1.9k	<sup>1</sup> ABLIKIM	12A	BES3 $\psi(2S) \rightarrow \gamma \chi_{cJ} \rightarrow 3\gamma$
0.278 ± 0.050 ± 0.036	0.5k	<sup>1</sup> ECKLUND	08A	CLEO $\psi(2S) \rightarrow \gamma \chi_{cJ} \rightarrow 3\gamma$

<sup>1</sup> Not independent from the values of  $\Gamma(\chi_{c0}, \chi_{c2})$  and  $B(\psi(2S) \rightarrow \chi_{c0}, \chi_{c2})$ .

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

$a_2 = M_2/\sqrt{E_1^2 + M_2^2 + E_3^2}$  Magnetic quadrupole fractional transition amplitude

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>-10.0 ± 1.5 OUR AVERAGE</b>				
-9.3 ± 1.6 ± 0.3	19.8k	<sup>1</sup> ARTUSO	09	CLEO $\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$
-9.3 <sup>+</sup> <sub>-</sub> 3.9 <sup>+</sup> <sub>4.1</sub> ± 0.6	5.9k	<sup>2</sup> AMBROGIANI	02	E835 $p\bar{p} \rightarrow \chi_{c2} \rightarrow J/\psi \gamma$
-14 ± 6	1.9k	<sup>2</sup> ARMSTRONG	93E	E760 $p\bar{p} \rightarrow \chi_{c2} \rightarrow J/\psi \gamma$
-33.3 <sup>+</sup> <sub>-</sub> 11.6 <sub>29.2</sub>	441	<sup>2</sup> OREGLIA	82	CBAL $\psi(2S) \rightarrow \chi_{c1} \gamma \rightarrow J/\psi \gamma \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-7.9 ± 1.9 ± 0.3	19.8k	<sup>3</sup> ARTUSO	09	CLEO $\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$

<sup>1</sup> From a fit with floating  $M2$  amplitudes  $a_2$  and  $b_2$ , and fixed  $E3$  amplitudes  $a_3=b_3=0$ .

<sup>2</sup> Assuming  $a_3=0$ .

<sup>3</sup> 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**

<u>VALUE (units <math>10^{-2}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1.6±1.3 OUR AVERAGE</b>				
1.7±1.4±0.3	19.8k	<sup>1</sup> ARTUSO 09	CLEO	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
2.0 <sup>+5.5</sup> <sub>-4.4</sub> ±0.9	5908	AMBROGIANI 02	E835	$\rho\bar{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$
0 <sup>+6</sup> <sub>-5</sub>	1904	ARMSTRONG 93E	E760	$\rho\bar{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$

<sup>1</sup> From a fit with floating  $M2$  and  $E3$  amplitudes  $a_2$ ,  $b_2$ , and  $a_3$ , and  $b_3$ .

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

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

<u>VALUE (units <math>10^{-2}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>2.2±1.8 OUR AVERAGE</b> Error includes scale factor of 1.7. See the ideogram below.				
4.6±1.0±1.3	13.8k	<sup>1</sup> ABLIKIM 11I	BES3	$\psi(2S) \rightarrow \gamma\pi^+\pi^-, \gamma K^+ K^-$
0.2±1.5±0.4	19.8k	<sup>2</sup> ARTUSO 09	CLEO	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
- 5.1 <sup>+5.4</sup> <sub>-3.6</sub>	721	<sup>1</sup> ABLIKIM 04I	BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-, \gamma K^+ K^-$
13.2 <sup>+9.8</sup> <sub>-7.5</sub>	441	<sup>3</sup> OREGLIA 82	CBAL	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

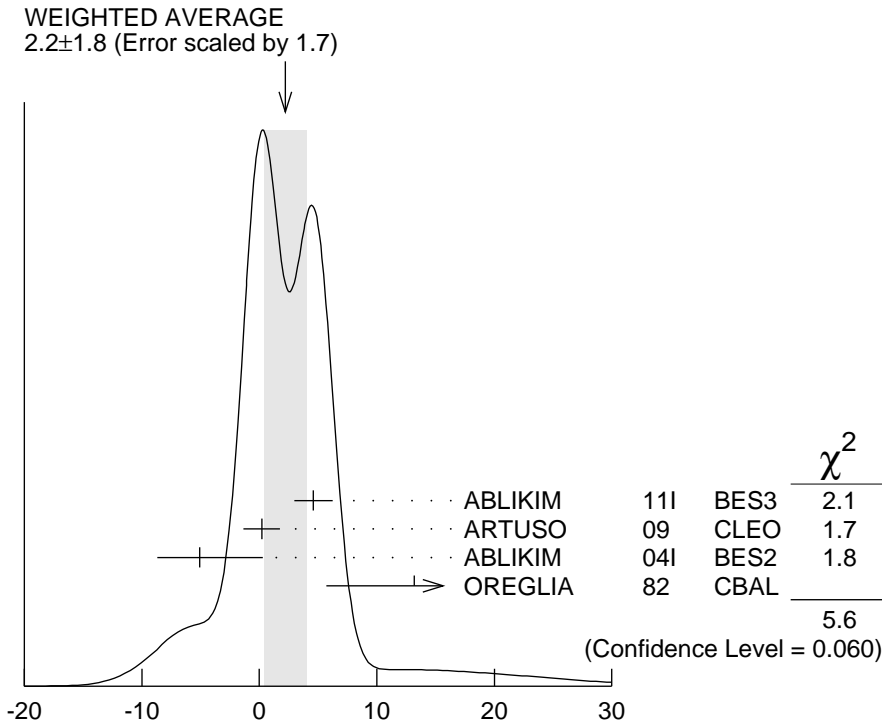
• • • We do not use the following data for averages, fits, limits, etc. • • •

1.0±1.3±0.3 19.8k <sup>3</sup> ARTUSO 09 CLEO  $\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

<sup>1</sup> From a fit with floating  $M2$  and  $E3$  amplitudes  $b_2$  and  $b_3$ .

<sup>2</sup> From a fit with floating  $M2$  and  $E3$  amplitudes  $a_2$ ,  $b_2$ , and  $a_3$ , and  $b_3$ .

<sup>3</sup> From a fit with floating  $M2$  amplitudes  $a_2$  and  $b_2$ , and fixed  $E3$  amplitudes  $a_3=b_3=0$ .



$b_2 = M2 / \sqrt{E1^2 + M2^2 + E3^2}$  Magnetic quadrupole fractional transition amplitude (units  $10^{-2}$ )

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

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>-0.3 \pm 1.0</math> OUR AVERAGE</b>				
$1.5 \pm 0.8 \pm 1.8$	13.8k	<sup>1</sup> ABLIKIM	11I BES3	$\psi(2S) \rightarrow \gamma \pi^+ \pi^-, \gamma K^+ K^-$
$-0.8 \pm 1.2 \pm 0.2$	19.8k	ARTUSO	09 CLEO	$\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$
$-2.7^{+4.3}_{-2.9}$	721	<sup>1</sup> ABLIKIM	04I BES2	$\psi(2S) \rightarrow \gamma \pi^+ \pi^-, \gamma K^+ K^-$

<sup>1</sup> From a fit with floating  $M2$  and  $E3$  amplitudes  $b_2$  and  $b_3$ .

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

$b_2/a_2$  Magnetic quadrupole transition amplitude ratio

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>-11^{+14}_{-15}</math></b>	19.8k	<sup>1</sup> ARTUSO	09 CLEO	$\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$

<sup>1</sup> 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	13D	PR D87 012007	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	13H	PR D87 032007	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	13V	PR D88 112001	M. Ablikim <i>et al.</i>	(BES III Collab.)
UEHARA	13	PTEP 2013 123C01	S. Uehara <i>et al.</i>	(BELLE Collab.)
ABLIKIM	12A	PR D85 112008	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12I	PR D86 052004	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12J	PR D86 052011	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12O	PRL 109 172002	M. Ablikim <i>et al.</i>	(BES III Collab.)
LEES	12AE	PR D86 092005	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LIU	12B	PRL 108 232001	Z.Q. Liu <i>et al.</i>	(BELLE Collab.)
ABLIKIM	11A	PR D83 012006	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11E	PR D83 112005	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11F	PR D83 112009	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11I	PR D84 092006	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11K	PRL 107 092001	M. Ablikim <i>et al.</i>	(BES III Collab.)
DEL-AMO-SA...	11M	PR D84 012004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
ABLIKIM	10A	PR D81 052005	M. Ablikim <i>et al.</i>	(BES III Collab.)
ONYISI	10	PR D82 011103	P.U.E. Onyisi <i>et al.</i>	(CLEO Collab.)
UEHARA	10A	PR D82 114031	S. Uehara <i>et al.</i>	(BELLE Collab.)
ARTUSO	09	PR D80 112003	M. Artuso <i>et al.</i>	(CLEO Collab.)
ASNER	09	PR D79 072007	D.M. Asner <i>et al.</i>	(CLEO Collab.)
UEHARA	09	PR D79 052009	S. Uehara <i>et al.</i>	(BELLE Collab.)
BENNETT	08A	PRL 101 151801	J.V. Bennett <i>et al.</i>	(CLEO Collab.)
ECKLUND	08A	PR D78 091501	K.M. Ecklund <i>et al.</i>	(CLEO Collab.)
HE	08B	PR D78 092004	Q. He <i>et al.</i>	(CLEO Collab.)
MENDEZ	08	PR D78 011102	H. Mendez <i>et al.</i>	(CLEO Collab.)
NAIK	08	PR D78 031101	P. Naik <i>et al.</i>	(CLEO Collab.)
UEHARA	08	EPJ C53 1	S. Uehara <i>et al.</i>	(BELLE Collab.)
ADAMS	07	PR D75 071101	G.S. Adams <i>et al.</i>	(CLEO Collab.)
ATHAR	07	PR D75 032002	S.B. Athar <i>et al.</i>	(CLEO Collab.)
CHEN	07B	PL B651 15	W.T. Chen <i>et al.</i>	(BELLE Collab.)
ABLIKIM	06D	PR D73 052006	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06I	PR D74 012004	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06R	PR D74 072001	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06T	PL B642 197	M. Ablikim <i>et al.</i>	(BES Collab.)
DOBBS	06	PR D73 071101	S. Dobbs <i>et al.</i>	(CLEO Collab.)
ABLIKIM	05G	PR D71 092002	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05N	PL B630 7	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05O	PL B630 21	M. Ablikim <i>et al.</i>	(BES Collab.)
ADAM	05A	PRL 94 232002	N.E. Adam <i>et al.</i>	(CLEO Collab.)
ANDREOTTI	05A	NP B717 34	M. Andreotti <i>et al.</i>	(FNAL E835 Collab.)
NAKAZAWA	05	PL B615 39	H. Nakazawa <i>et al.</i>	(BELLE Collab.)
ABLIKIM	04B	PR D70 012003	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	04H	PR D70 092003	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	04I	PR D70 092004	M. Ablikim <i>et al.</i>	(BES Collab.)
ATHAR	04	PR D70 112002	S.B. Athar <i>et al.</i>	(CLEO Collab.)
BAI	04F	PR D69 092001	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	04I	PR D70 012006	J.Z. Bai <i>et al.</i>	(BES Collab.)
AULCHENKO	03	PL B573 63	V.M. Aulchenko <i>et al.</i>	(KEDR Collab.)
BAI	03C	PR D67 032004	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	03E	PR D67 112001	J.Z. Bai <i>et al.</i>	(BES Collab.)
ABE	02T	PL B540 33	K. Abe <i>et al.</i>	(BELLE Collab.)
AMBROGIANI	02	PR D65 052002	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)
EISENSTEIN	01	PRL 87 061801	B.I. Eisenstein <i>et al.</i>	(CLEO Collab.)
AMBROGIANI	00B	PR D62 052002	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)
ACCIARRI	99E	PL B453 73	M. Acciarri <i>et al.</i>	(L3 Collab.)
BAI	99B	PR D60 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)
ACKER...,K...	98	PL B439 197	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
BAI	98D	PR D58 092006	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	98I	PRL 81 3091	J.Z. Bai <i>et al.</i>	(BES Collab.)
DOMINICK	94	PR D50 4265	J. Dominick <i>et al.</i>	(CLEO Collab.)
ARMSTRONG	93	PRL 70 2988	T.A. Armstrong <i>et al.</i>	(FNAL E760 Collab.)
ARMSTRONG	93E	PR D48 3037	T.A. Armstrong <i>et al.</i>	(FNAL-E760 Collab.)
BAUER	93	PL B302 345	D.A. Bauer <i>et al.</i>	(TPC Collab.)
ARMSTRONG	92	NP B373 35	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
Also		PRL 68 1468	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
BAGLIN	87B	PL B187 191	C. Baglin <i>et al.</i>	(R704 Collab.)
BAGLIN	86B	PL B172 455	C. Baglin	(LAPP, CERN, GENO, LYON, OSLO+)

GAISER	86	PR D34 711	J. Gaiser <i>et al.</i>	(Crystal Ball Collab.)
LEE	85	SLAC 282	R.A. Lee	(SLAC)
LEMOIGNE	82	PL 113B 509	Y. Lemoigne <i>et al.</i>	(SACL, LOIC, SHMP+)
OREGLIA	82	PR D25 2259	M.J. Oreglia <i>et al.</i>	(SLAC, CIT, HARV+)
Also		Private Comm.	M.J. Oreglia	(EFI)
BARATE	81	PR D24 2994	R. Barate <i>et al.</i>	(SACL, LOIC, SHMP, CERN+)
HIMEL	80	PRL 44 920	T. Himel <i>et al.</i>	(LBL, SLAC)
Also		Private Comm.	G. Trilling	(LBL, UCB)
BRANDELIK	79B	NP B160 426	R. Brandelik <i>et al.</i>	(DASP Collab.)
BARTEL	78B	PL 79B 492	W. Bartel <i>et al.</i>	(DESY, HEIDP)
TANENBAUM	78	PR D17 1731	W.M. Tanenbaum <i>et al.</i>	(SLAC, LBL)
Also		Private Comm.	G. Trilling	(LBL, UCB)
BIDDICK	77	PRL 38 1324	C.J. Biddick <i>et al.</i>	(UCSD, UMD, PAVI+)
WHITAKER	76	PRL 37 1596	J.S. Whitaker <i>et al.</i>	(SLAC, LBL)

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