

**$\chi_{c1}(1P)$**

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

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

### $\chi_{c1}(1P)$ MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>3510.66 ± 0.07</b>	<b>OUR AVERAGE</b>	Error includes scale factor of 1.5. See the ideogram below.		
3510.30 ± 0.14 ± 0.16		ABLIKIM	05G BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$
3510.719 ± 0.051 ± 0.019		ANDREOTTI	05A E835	$p\bar{p} \rightarrow e^+e^-\gamma$
3509.4 ± 0.9		BAI	99B BES	$\psi(2S) \rightarrow \gamma X$
3510.60 ± 0.087 ± 0.019	513	<sup>1</sup> ARMSTRONG	92 E760	$\bar{p}p \rightarrow e^+e^-\gamma$
3511.3 ± 0.4 ± 0.4	30	BAGLIN	86B SPEC	$\bar{p}p \rightarrow e^+e^-X$
3512.3 ± 0.3 ± 4.0		<sup>2</sup> GAISER	86 CBAL	$\psi(2S) \rightarrow \gamma X$
3507.4 ± 1.7	91	<sup>3</sup> LEMOIGNE	82 GOLI	$185 \pi^- \text{Be} \rightarrow \gamma \mu^+ \mu^- A$
3510.4 ± 0.6		OREGLIA	82 CBAL	$e^+e^- \rightarrow J/\psi 2\gamma$
3510.1 ± 1.1	254	<sup>4</sup> HIMEL	80 MRK2	$e^+e^- \rightarrow J/\psi 2\gamma$
3509 ± 11	21	BRANDELIK	79B DASP	$e^+e^- \rightarrow J/\psi 2\gamma$
3507 ± 3		<sup>4</sup> BARTEL	78B CNTR	$e^+e^- \rightarrow J/\psi 2\gamma$
3505.0 ± 4 ± 4		<sup>4,5</sup> TANENBAUM	78 MRK1	$e^+e^-$
3513 ± 7	367	<sup>4</sup> BIDDICK	77 CNTR	$\psi(2S) \rightarrow \gamma X$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
3500 ± 10	40	TANENBAUM	75 MRK1	Hadrons $\gamma$

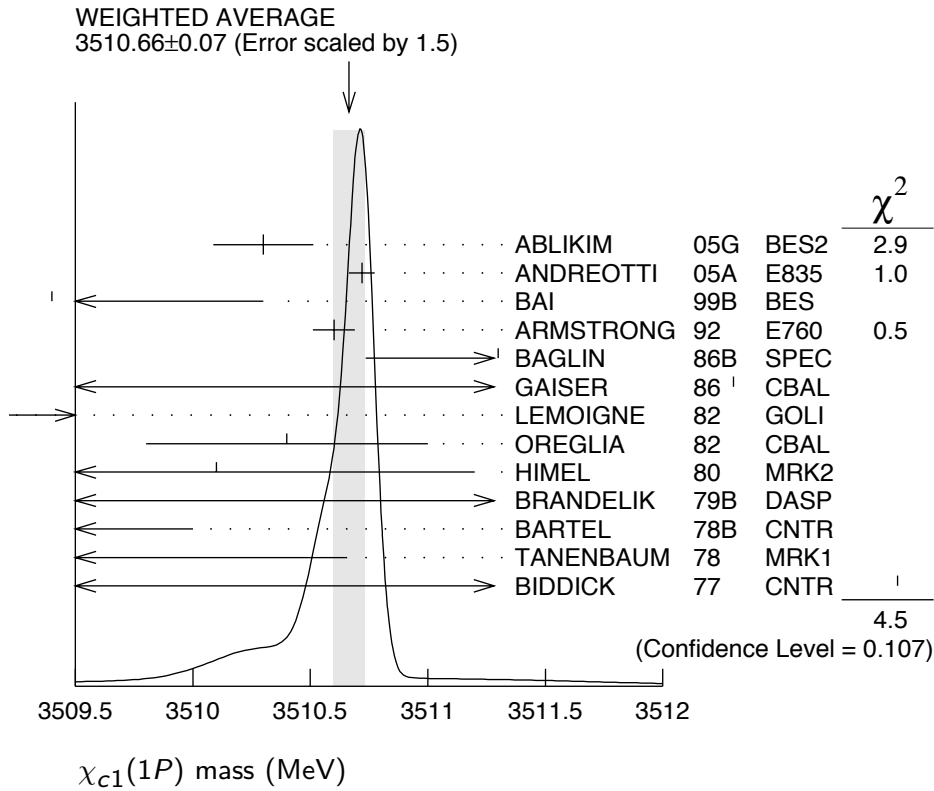
<sup>1</sup> Recalculated by ANDREOTTI 05A, using the value of  $\psi(2S)$  mass from AULCHENKO 03.

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

<sup>5</sup> From a simultaneous fit to radiative and hadronic decay channels.



### $\chi_{c1}(1P)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.89 \pm 0.05</math></b>					<b>OUR FIT</b>
<b><math>0.88 \pm 0.05</math></b>					<b>OUR AVERAGE</b>
1.39 $+0.40$ $+0.26$ $-0.38$ $-0.77$			ABLIKIM	05G BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$
$0.876 \pm 0.045 \pm 0.026$			ANDREOTTI	05A E835	$p\bar{p} \rightarrow e^+ e^- \gamma$
$0.87 \pm 0.11 \pm 0.08$		513	<sup>6</sup> ARMSTRONG	92 E760	$\bar{p}p \rightarrow e^+ e^- \gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<1.3	95		BAGLIN	86B SPEC	$\bar{p}p \rightarrow e^+ e^- X$
<3.8	90		GAISER	86 CBAL	$\psi(2S) \rightarrow \gamma X$
<sup>6</sup> Recalculated by ANDREOTTI 05A.					

### $\chi_{c1}(1P)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level
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**Hadronic decays**

$\Gamma_1$	$3(\pi^+\pi^-)$	$(5.8 \pm 1.4) \times 10^{-3}$	S=1.2
$\Gamma_2$	$2(\pi^+\pi^-)$	$(7.6 \pm 2.6) \times 10^{-3}$	
$\Gamma_3$	$\pi^+\pi^-K^+K^-$	$(4.5 \pm 1.0) \times 10^{-3}$	
$\Gamma_4$	$\pi^+\pi^-\eta$	$(5.2 \pm 0.6) \times 10^{-3}$	
$\Gamma_5$	$\pi^+\pi^-\eta'$	$(2.5 \pm 0.5) \times 10^{-3}$	
$\Gamma_6$	$\rho^0\pi^+\pi^-$	$(3.9 \pm 3.5) \times 10^{-3}$	
$\Gamma_7$	$K^+K^-\eta$	$(3.5 \pm 1.1) \times 10^{-4}$	
$\Gamma_8$	$K^0K^+\pi^- + \text{c.c.}$	$(7.7 \pm 0.7) \times 10^{-3}$	
$\Gamma_9$	$K^+K^-\pi^0$	$(2.01 \pm 0.28) \times 10^{-3}$	
$\Gamma_{10}$	$\eta\pi^+\pi^-$	$(5.8 \pm 1.1) \times 10^{-3}$	
$\Gamma_{11}$	$a_0(980)^+\pi^- + \text{c.c.} \rightarrow \eta\pi^+\pi^-$	$(2.0 \pm 0.7) \times 10^{-3}$	
$\Gamma_{12}$	$f_2(1270)\eta$	$(3.0 \pm 0.9) \times 10^{-3}$	
$\Gamma_{13}$	$K^+\bar{K}^*(892)^0\pi^- + \text{c.c.}$	$(3.2 \pm 2.1) \times 10^{-3}$	
$\Gamma_{14}$	$K^*(892)^0\bar{K}^*(892)^0$	$(1.6 \pm 0.4) \times 10^{-3}$	
$\Gamma_{15}$	$K^*(892)^0\bar{K}^0 + \text{c.c.}$	$(1.1 \pm 0.4) \times 10^{-3}$	
$\Gamma_{16}$	$K^*(892)^+K^- + \text{c.c.}$	$(1.6 \pm 0.7) \times 10^{-3}$	
$\Gamma_{17}$	$K_J^*(1430)^0\bar{K}^0 + \text{c.c.} \rightarrow$ $K_S^0K^+\pi^- + \text{c.c.}$	$< 9 \times 10^{-4}$	CL=90%
$\Gamma_{18}$	$K_J^*(1430)^+K^- + \text{c.c.} \rightarrow$ $K_S^0K^+\pi^- + \text{c.c.}$	$< 2.4 \times 10^{-3}$	CL=90%
$\Gamma_{19}$	$\pi^+\pi^-K_S^0K_S^0$	$(7.6 \pm 3.2) \times 10^{-4}$	
$\Gamma_{20}$	$K^+K^-K_S^0K_S^0$	$< 5 \times 10^{-4}$	CL=90%
$\Gamma_{21}$	$K^+K^-K^+K^-$	$(5.8 \pm 1.2) \times 10^{-4}$	
$\Gamma_{22}$	$K^+K^-\phi$	$(4.5 \pm 1.7) \times 10^{-4}$	
$\Gamma_{23}$	$\rho\bar{\rho}$	$(6.6 \pm 0.5) \times 10^{-5}$	
$\Gamma_{24}$	$\rho\bar{\rho}\pi^0$	$(1.2 \pm 0.5) \times 10^{-4}$	
$\Gamma_{25}$	$\rho\bar{\rho}\eta$	$< 1.6 \times 10^{-4}$	CL=90%
$\Gamma_{26}$	$\pi^+\pi^-\rho\bar{\rho}$	$(5.0 \pm 1.9) \times 10^{-4}$	
$\Gamma_{27}$	$K_S^0K_S^0\rho\bar{\rho}$	$< 4.5 \times 10^{-4}$	CL=90%
$\Gamma_{28}$	$\Lambda\bar{\Lambda}$	$(2.4 \pm 1.0) \times 10^{-4}$	
$\Gamma_{29}$	$\Lambda\bar{\Lambda}\pi^+\pi^-$	$< 1.5 \times 10^{-3}$	CL=90%
$\Gamma_{30}$	$K^+\bar{p}\Lambda$	$(3.4 \pm 1.0) \times 10^{-4}$	
$\Gamma_{31}$	$\Xi^-\bar{\Xi}^+$	$< 3.4 \times 10^{-4}$	CL=90%
$\Gamma_{32}$	$\pi^+\pi^- + K^+K^-$	$< 2.1 \times 10^{-3}$	
$\Gamma_{33}$	$K_S^0K_S^0$	$< 7 \times 10^{-5}$	CL=90%

**Radiative decays**

$\Gamma_{34}$	$\gamma J/\psi(1S)$	$(36.0 \pm 1.9) \%$
$\Gamma_{35}$	$\gamma\gamma$	

 **$\chi_{c1}(1P)$  PARTIAL WIDTHS**

—————  $\chi_{c1}(1P) \Gamma(i)\Gamma(\gamma J/\psi(1S))/\Gamma(\text{total})$  —————

$\Gamma(p\bar{p}) \times \Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$   $\Gamma_{23}\Gamma_{34}/\Gamma$

<u>VALUE (eV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>21.3±0.9 OUR FIT</b>			
<b>21.4±0.9 OUR AVERAGE</b>			
21.5±0.5±0.8	<sup>7</sup> ANDREOTTI 05A	E835	$p\bar{p} \rightarrow e^+e^-\gamma$
21.4±1.5±2.2	<sup>7,8</sup> ARMSTRONG 92	E760	$\bar{p}p \rightarrow e^+e^-\gamma$
19.9 <sup>+4.4</sup> <sub>-4.0</sub>	<sup>7</sup> BAGLIN 86B	SPEC	$\bar{p}p \rightarrow e^+e^-\chi$

<sup>7</sup> Calculated by us using  $B(J/\psi(1S) \rightarrow e^+e^-) = 0.0593 \pm 0.0010$ .

<sup>8</sup> Recalculated by ANDREOTTI 05A.

**$\chi_{c1}(1P)$  BRANCHING RATIOS**

————— HADRONIC DECAYS —————

$\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}}$   $\Gamma_1/\Gamma$

<u>VALUE (units 10<sup>-3</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>5.8±1.4 OUR EVALUATION</b>	Error includes scale factor of 1.2. Treating systematic error as correlated.		
<b>5.8±1.1 OUR AVERAGE</b>			
5.4±0.7±0.9	<sup>9</sup> BAI 99B	BES	$\psi(2S) \rightarrow \gamma\chi_{c1}$
16.0±5.9±0.8	<sup>9</sup> TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma\chi_{c1}$

$\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$   $\Gamma_2/\Gamma$

<u>VALUE (units 10<sup>-3</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>7.6±2.6 OUR EVALUATION</b>	Treating systematic error as correlated.		
<b>8 ±4 OUR AVERAGE</b>	Error includes scale factor of 1.5.		
4.6±2.1±2.6	<sup>9</sup> BAI 99B	BES	$\psi(2S) \rightarrow \gamma\chi_{c1}$
12.5±4.2±0.6	<sup>9</sup> TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma\chi_{c1}$

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

<u>VALUE (units 10<sup>-3</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>4.5±1.0 OUR EVALUATION</b>	Treating systematic error as correlated.		
<b>4.5±0.9 OUR AVERAGE</b>			
4.2±0.4±0.9	<sup>9</sup> BAI 99B	BES	$\psi(2S) \rightarrow \gamma\chi_{c1}$
7.3±3.0±0.4	<sup>9</sup> TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma\chi_{c1}$

$\Gamma(\pi^+\pi^-\eta)/\Gamma_{\text{total}}$   $\Gamma_4/\Gamma$

<u>VALUE (units 10<sup>-3</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>5.2±0.5±0.2</b>	<sup>10</sup> ATHAR 07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

$\Gamma(\pi^+\pi^-\eta')/\Gamma_{\text{total}}$   $\Gamma_5/\Gamma$

<u>VALUE (units 10<sup>-3</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>2.5±0.5±0.1</b>	<sup>11</sup> ATHAR 07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

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

<u>VALUE (units 10<sup>-4</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>39±35</b>	<sup>12</sup> TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma\chi_{c1}$

$\Gamma(K^+ K^- \eta)/\Gamma_{\text{total}}$					$\Gamma_7/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.35±0.11±0.02</b>		13 ATHAR 07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$	
$\Gamma(K^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$					$\Gamma_8/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>		<u>DOCUMENT ID</u>			
<b>7.7±0.7 OUR FIT</b>					
$\Gamma(K^+ K^- \pi^0)/\Gamma_{\text{total}}$					$\Gamma_9/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>2.01±0.26±0.09</b>		14 ATHAR 07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$	
$\Gamma(\eta \pi^+ \pi^-)/\Gamma_{\text{total}}$					$\Gamma_{10}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>5.8±1.0±0.3</b>	222	15 ABLIKIM 06R	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$	
$\Gamma(a_0(980)^+ \pi^- + \text{c.c.} \rightarrow \eta \pi^+ \pi^-)/\Gamma_{\text{total}}$					$\Gamma_{11}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>2.0±0.7±0.1</b>	58	16 ABLIKIM 06R	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$	
$\Gamma(f_2(1270)\eta)/\Gamma_{\text{total}}$					$\Gamma_{12}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>3.0±0.8±0.1</b>	53	17 ABLIKIM 06R	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$	
$\Gamma(K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.})/\Gamma_{\text{total}}$					$\Gamma_{13}/\Gamma$
<u>VALUE (units <math>10^{-4}</math>)</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>32±21</b>		12 TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma \chi_{c1}$	
$\Gamma(K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}$					$\Gamma_{14}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>1.6±0.4±0.1</b>	28.4 ± 5.5	18,19 ABLIKIM 04H	BES	$\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^-$	
$\Gamma(K^*(892)^0 \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}$					$\Gamma_{15}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>1.09±0.40±0.05</b>	22	20 ABLIKIM 06R	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$	
$\Gamma(K^*(892)^+ K^- + \text{c.c.})/\Gamma_{\text{total}}$					$\Gamma_{16}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>1.6±0.7±0.1</b>	27	21 ABLIKIM 06R	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$	
$\Gamma(K_J^*(1430)^0 \bar{K}^0 + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$					$\Gamma_{17}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>&lt;0.9</b>	90	22 ABLIKIM 06R	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$	
$\Gamma(K_J^*(1430)^+ K^- + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$					$\Gamma_{18}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>&lt;2.4</b>	90	23 ABLIKIM 06R	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$	

$\Gamma(\pi^+\pi^-K_S^0K_S^0)/\Gamma_{\text{total}}$					$\Gamma_{19}/\Gamma$
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>7.6±3.2±0.3</b>	19.8 ± 7.7	24 ABLIKIM	050 BES2	$\psi(2S) \rightarrow \chi_{c1}\gamma$	
$\Gamma(K^+K^-K_S^0K_S^0)/\Gamma_{\text{total}}$					$\Gamma_{20}/\Gamma$
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<5	90	3.2 ± 2.4	25 ABLIKIM	050 BES2	$\psi(2S) \rightarrow \chi_{c1}\gamma$
$\Gamma(K^+K^-K^+K^-)/\Gamma_{\text{total}}$					$\Gamma_{21}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>				
<b>0.58±0.12 OUR FIT</b>					
$\Gamma(K^+K^-\phi)/\Gamma_{\text{total}}$					$\Gamma_{22}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.45±0.17±0.02</b>	17	26 ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma 2K^+ 2K^-$	
$\Gamma(p\bar{p})/\Gamma_{\text{total}}$					$\Gamma_{23}/\Gamma$
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>				
<b>0.66±0.05 OUR FIT</b>					
$\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$					$\Gamma_{24}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<b>0.12±0.05±0.01</b>	27 ATHAR	07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$	
$\Gamma(p\bar{p}\eta)/\Gamma_{\text{total}}$					$\Gamma_{25}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.16	90	28 ATHAR	07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$
$\Gamma(\pi^+\pi^-p\bar{p})/\Gamma_{\text{total}}$					$\Gamma_{26}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<b>0.50±0.19 OUR EVALUATION</b>	Treating systematic error as correlated.				
<b>0.50±0.19 OUR AVERAGE</b>					
0.46±0.12±0.15	9 BAI	99B	BES	$\psi(2S) \rightarrow \gamma\chi_{c1}$	
1.08±0.77±0.05	9 TANENBAUM	78	MRK1	$\psi(2S) \rightarrow \gamma\chi_{c1}$	
$\Gamma(K_S^0K_S^0p\bar{p})/\Gamma_{\text{total}}$					$\Gamma_{27}/\Gamma$
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<4.5	90	29 ABLIKIM	06D BES2	$\psi(2S) \rightarrow \gamma\chi_{c1}$	
$\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$					$\Gamma_{28}/\Gamma$
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>2.4±0.9±0.5</b>	9.0 <sup>+3.5</sup> <sub>-3.1</sub>	9 BAI	03E BES	$\psi(2S) \rightarrow \gamma\chi_{c1} \rightarrow \gamma\Lambda\bar{\Lambda}$	
$\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$					$\Gamma_{29}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.5	90	29 ABLIKIM	06D BES2	$\psi(2S) \rightarrow \gamma\chi_{c1}$	

$\Gamma(K^+ \bar{p} \Lambda) / \Gamma_{\text{total}}$   $\Gamma_{30} / \Gamma$

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>0.34 ± 0.10 ± 0.02</b>		30 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

$\Gamma(\Xi^- \bar{\Xi}^+) / \Gamma_{\text{total}}$   $\Gamma_{31} / \Gamma$

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;3.4</b>	90	29 ABLIKIM	06D BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$

$[\Gamma(\pi^+ \pi^-) + \Gamma(K^+ K^-)] / \Gamma_{\text{total}}$   $\Gamma_{32} / \Gamma$

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;21</b>		12 FELDMAN	77 MRK1	$\psi(2S) \rightarrow \gamma \chi_{c1}$

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

<38	90	12 BRANDELIK	79B DASP	$\psi(2S) \rightarrow \gamma \chi_{c1}$
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$\Gamma(K_S^0 \bar{K}_S^0) / \Gamma_{\text{total}}$   $\Gamma_{33} / \Gamma$

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.7</b>	90	31 ABLIKIM	05O BES2	$\psi(2S) \rightarrow \chi_{c1} \gamma$

<sup>9</sup> Rescaled by us using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (8.8 \pm 0.4)\%$  and  $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (32.6 \pm 0.5)\%$ .

<sup>10</sup> ATHAR 07 reports  $(5.0 \pm 0.3 \pm 0.5) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>11</sup> ATHAR 07 reports  $(2.4 \pm 0.4 \pm 0.3) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>12</sup> Estimated using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.087$ . The errors do not contain the uncertainty in the  $\psi(2S)$  decay.

<sup>13</sup> ATHAR 07 reports  $(0.34 \pm 0.10 \pm 0.04) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>14</sup> ATHAR 07 reports  $(1.95 \pm 0.16 \pm 0.23) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>15</sup> ABLIKIM 06R reports  $(5.9 \pm 0.7 \pm 0.8) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>16</sup> ABLIKIM 06R reports  $(2.0 \pm 0.5 \pm 0.5) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>17</sup> ABLIKIM 06R reports  $(3.0 \pm 0.7 \pm 0.5) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

- <sup>18</sup> ABLIKIM 04H reports  $[B(\chi_{c1}(1P) \rightarrow K^*(892)^0 \bar{K}^*(892)^0)] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] = (1.40 \pm 0.27 \pm 0.22) \times 10^{-4}$ . We divide by our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.
- <sup>19</sup> Assumes  $B(K^*(892)^0 \rightarrow K^- \pi^+) = 2/3$ .
- <sup>20</sup> ABLIKIM 06R reports  $(1.1 \pm 0.4 \pm 0.1) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.
- <sup>21</sup> ABLIKIM 06R reports  $(1.6 \pm 0.7 \pm 0.2) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.
- <sup>22</sup> ABLIKIM 06R reports  $< 0.9 \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.088$ .
- <sup>23</sup> ABLIKIM 06R reports  $< 2.4 \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.088$ .
- <sup>24</sup> ABLIKIM 050 reports  $[B(\chi_{c1}(1P) \rightarrow \pi^+ \pi^- K_S^0 K_S^0)] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] = (0.67 \pm 0.26 \pm 0.11) \times 10^{-4}$ . We divide by our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.
- <sup>25</sup> ABLIKIM 050 reports  $[B(\chi_{c1}(1P) \rightarrow K^+ K^- K_S^0 K_S^0)] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] < 4.2 \times 10^{-5}$ . We divide by our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.088$ .
- <sup>26</sup> ABLIKIM 06T reports  $(0.46 \pm 0.16 \pm 0.06) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.
- <sup>27</sup> ATHAR 07 reports  $(0.12 \pm 0.05 \pm 0.01) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.
- <sup>28</sup> ATHAR 07 reports  $< 0.16 \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.088$ .
- <sup>29</sup> Using  $B(\psi(2S) \rightarrow \chi_{c1} \gamma) (9.1 \pm 0.6)\%$ .
- <sup>30</sup> ATHAR 07 reports  $(0.33 \pm 0.09 \pm 0.04) \times 10^{-3}$  for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ . We rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.8 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.
- <sup>31</sup> ABLIKIM 050 reports  $[B(\chi_{c1}(1P) \rightarrow K_S^0 K_S^0)] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] < 0.6 \times 10^{-5}$ . We divide by our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.088$ .

## RADIATIVE DECAYS

$\Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$   $\Gamma_{34}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.360±0.019 OUR FIT</b>			

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

0.379±0.008±0.021	<sup>32</sup> ADAM	05A CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \gamma \chi_{c1}$
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$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_{35}/\Gamma$

VALUE CL% DOCUMENT ID TECN COMMENT

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

<0.0015            90        <sup>33</sup> YAMADA        77    DASP     $e^+e^- \rightarrow 3\gamma$

<sup>32</sup> Uses  $B(\psi(2S) \rightarrow \gamma\chi_{c1} \rightarrow \gamma\gamma J/\psi)$  from ADAM 05A and  $B(\psi(2S) \rightarrow \gamma\chi_{c1})$  from ATHAR 04.

<sup>33</sup> Estimated using  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 0.087$ . The errors do not contain the uncertainty in the  $\psi(2S)$  decay.

**$\chi_{c1}(1P)$  CROSS-PARTICLE BRANCHING RATIOS**

$$B(\chi_{c1}(1P) \rightarrow p\bar{p}) \times \frac{\Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}$$

VALUE (units  $10^{-5}$ ) DOCUMENT ID TECN COMMENT

**1.78±0.19 OUR FIT**

**1.1 ±1.0**            <sup>34</sup> BAI            98i    BES     $\psi(2S) \rightarrow \gamma\chi_{c1} \rightarrow \gamma\bar{p}p$

$$B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) \times B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))$$

VALUE (units  $10^{-2}$ ) EVTS DOCUMENT ID TECN COMMENT

**3.15±0.08 OUR FIT**

**2.70±0.13 OUR AVERAGE**

2.81±0.05±0.23        13k        BAI            04i    BES2     $\psi(2S) \rightarrow J/\psi\gamma\gamma$

2.56±0.12±0.20                    GAISER        86    CBAL     $\psi(2S) \rightarrow \gamma X$

2.78±0.30                    <sup>35</sup> OREGLIA        82    CBAL     $\psi(2S) \rightarrow \gamma\chi_{c1}$

2.2 ±0.5                    <sup>36</sup> BRANDELIK    79B    DASP     $\psi(2S) \rightarrow \gamma\chi_{c1}$

2.9 ±0.5                    <sup>36</sup> BARTEL        78B    CNTR     $\psi(2S) \rightarrow \gamma\chi_{c1}$

5.0 ±1.5                    <sup>37</sup> BIDDICK        77    CNTR     $e^+e^- \rightarrow \gamma X$

2.8 ±0.9                    <sup>35</sup> WHITAKER     76    MRK1     $e^+e^-$

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

3.44±0.06±0.13        3.7k        <sup>38</sup> ADAM            05A    CLEO     $\psi(2S) \rightarrow J/\psi\gamma\gamma$

$$B(\chi_{c1}(1P) \rightarrow \gamma J/\psi) \times \frac{\Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S)\text{anything})}$$

VALUE (units  $10^{-2}$ ) EVTS DOCUMENT ID TECN COMMENT

**5.49±0.08 OUR FIT**

**5.77±0.10±0.12**        3.7k        ADAM            05A    CLEO     $\psi(2S) \rightarrow J/\psi\gamma\gamma$

$$B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) \times \frac{\Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}$$

VALUE (units  $10^{-2}$ ) EVTS DOCUMENT ID TECN COMMENT

**9.67±0.33 OUR FIT**

**9.5 ±1.8 OUR AVERAGE**

12.6 ±0.3 ±3.8        3k        <sup>39</sup> ABLIKIM        04B    BES     $\psi(2S) \rightarrow J/\psi X$

8.5 ±2.1                    <sup>40</sup> HIMEL            80    MRK2     $\psi(2S) \rightarrow \gamma\chi_{c1}$

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

10.24±0.17±0.23        3.7k        <sup>38</sup> ADAM            05A    CLEO     $\psi(2S) \rightarrow J/\psi\gamma\gamma$

**$B(\chi_{c1}(1P) \rightarrow K^0 K^+ \pi^- + \text{c.c.}) \times B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>6.7±0.5 OUR FIT</b>			
<b>7.2±0.6 OUR AVERAGE</b>			
7.3±0.5±0.5	41 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma K_S^0 K^+ \pi^-$
7.0±0.5±0.9	42 ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$

$$B(\chi_{c1}(1P) \rightarrow K^0 K^+ \pi^- + \text{c.c.}) \times \frac{\Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)}$$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>20.6±1.7 OUR FIT</b>			
<b>13.2±2.4±3.2</b>	43 BAI	99B BES	$\psi(2S) \rightarrow \gamma K_S^0 K^+ \pi^-$

**$B(\chi_{c1}(1P) \rightarrow K^+ K^- K^+ K^-) \times B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.51±0.10 OUR FIT</b>				
<b>0.61±0.11±0.08</b>	54	44 ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma K^+ K^+ K^- K^-$

$$B(\chi_{c1}(1P) \rightarrow K^+ K^- K^+ K^-) \times \frac{\Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)}$$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1.56±0.32 OUR FIT</b>			
<b>1.13±0.40±0.29</b>	45 BAI	99B BES	$\psi(2S) \rightarrow \gamma K^+ K^+ K^- K^-$

**$B(\chi_{c1}(1P) \rightarrow p \bar{p}) \times B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$**

<u>VALUE (units <math>10^{-6}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>5.8±0.6 OUR FIT</b>				
<b>4.8<sup>+1.4</sup><sub>-1.3</sub>±0.6</b>	18.2 <sup>+5.5</sup> <sub>-4.9</sub>	BAI	04F BES	$\psi(2S) \rightarrow \gamma \chi_{c1}(1P) \rightarrow \gamma p \bar{p}$

<sup>34</sup> Calculated by us. The value for  $B(\chi_{c1} \rightarrow p \bar{p})$  reported in BAI 98I is derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (8.7 \pm 0.8)\%$  and  $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (32.4 \pm 2.6)\%$  [BAI 98D].

<sup>35</sup> Recalculated by us using  $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$ .

<sup>36</sup> Recalculated by us using  $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.0588 \pm 0.0010$ .

<sup>37</sup> Assumes isotropic gamma distribution.

<sup>38</sup> Not independent from other values reported by ADAM 05A.

<sup>39</sup> From a fit to the  $J/\psi$  recoil mass spectra.

<sup>40</sup> The value for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}) \times B(\chi_{c1} \rightarrow \gamma J/\psi(1S))$  quoted 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>41</sup> Calculated by us. The value of  $B(\chi_{c1} \rightarrow K^0 K^+ \pi^- + \text{c.c.})$  reported by ATHAR 07 was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54)\%$ .

<sup>42</sup> Calculated by us. ABLIKIM 06R reports  $B(\chi_{c1} \rightarrow K_S^0 K^+ \pi^-) = (4.0 \pm 0.3 \pm 0.5) \times 10^{-3}$ . We use  $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (8.7 \pm 0.4) \times 10^{-2}$ .

- 43 Calculated by us. The value of  $B(\chi_{c1} \rightarrow K_S^0 K^+ \pi^-)$  reported by BAI 99B was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.8)\%$  and  $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$  [BAI 98D].
- 44 Calculated by us. The value of  $B(\chi_{c1} \rightarrow 2K^+ 2K^-)$  reported by ABLIKIM 06T was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.8)\%$ .
- 45 Calculated by us. The value of  $B(\chi_{c1} \rightarrow 2K^+ 2K^-)$  reported by BAI 99B was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.8)\%$  and  $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$  [BAI 98D].

## MULTIPOLE AMPLITUDES IN $\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)$

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

VALUE	EVTs	DOCUMENT ID	TECN	COMMENT
<b>-0.002<sup>+0.008</sup><sub>-0.017</sub> OUR AVERAGE</b>				
0.002 ± 0.032 ± 0.004	2090	AMBROGIANI 02	E835	$p\bar{p} \rightarrow \chi_{c1} \rightarrow J/\psi \gamma$
-0.002 <sup>+0.008</sup> <sub>-0.020</sub>	921	OREGLIA 82	CBAL	$\psi(2S) \rightarrow \chi_{c1} \gamma \rightarrow J/\psi \gamma \gamma$

## $\chi_{c1}(1P)$ REFERENCES

ATHAR	07	PR D75 032002	S.B. Athar <i>et al.</i>	(CLEO Collab.)
ABLIKIM	06D	PR D73 052006	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.)
ABLIKIM	05G	PR D71 092002	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.)
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.)
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	03E	PR D67 112001	J.Z. Bai <i>et al.</i>	(BES Collab.)
AMBROGIANI	02	PR D65 052002	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)
BAI	99B	PR D60 072001	J.Z. Bai <i>et al.</i>	(BES 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.)
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	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.)
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)
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)
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BIDDICK	77	PRL 38 1324	C.J. Biddick <i>et al.</i>	(UCSD, UMD, PAVI+)
FELDMAN	77	PRPL 33C 285	G.J. Feldman, M.L. Perl	(LBL, SLAC)
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WHITAKER	76	PRL 37 1596	J.S. Whitaker <i>et al.</i>	(SLAC, LBL)
TANENBAUM	75	PRL 35 1323	W.M. Tanenbaum <i>et al.</i>	(LBL, SLAC)

————— **OTHER RELATED PAPERS** —————

BARBERIS	00G	PL B485 357	D. Barberis <i>et al.</i>	(Omega Expt.)
BARATE	83	PL 121B 449	R. Barate <i>et al.</i>	(SACL, LOIC, SHMP, IND)
BRAUNSCH...	75B	PL 57B 407	W. Braunschweig <i>et al.</i>	(DASP Collab.)
SIMPSON	75	PRL 35 699	J.W. Simpson <i>et al.</i>	(STAN, PENN)

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