

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

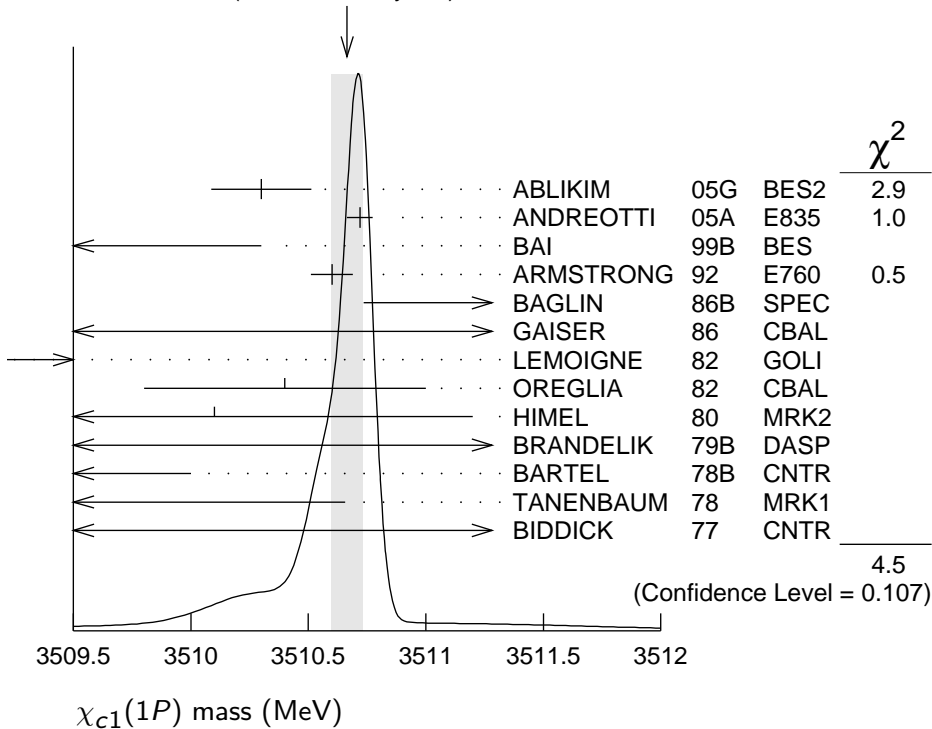
$$J^{PC} = 0^+(1^{++})$$

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

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

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<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 $\gamma$

WEIGHTED AVERAGE  
3510.66 ± 0.07 (Error scaled by 1.5)



<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>0.84 ± 0.04</b>					<b>OUR FIT</b>
<b>0.88 ± 0.05</b>					<b>OUR AVERAGE</b>
1.39 <sup>+0.40</sup> <sub>-0.38</sub>			ABLIKIM	05G BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$
0.876 ± 0.045 ± 0.026			ANDREOTTI 05A	E835	$p\bar{p} \rightarrow e^+ e^- \gamma$
0.87 ± 0.11 ± 0.08		513	<sup>1</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>1</sup> Recalculated by ANDREOTTI 05A.					

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

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level
<b>Hadronic decays</b>		
$\Gamma_1$ $3(\pi^+ \pi^-)$	$(5.8 \pm 1.4) \times 10^{-3}$	S=1.2
$\Gamma_2$ $2(\pi^+ \pi^-)$	$(7.6 \pm 2.6) \times 10^{-3}$	
$\Gamma_3$ $\pi^+ \pi^- \pi^0 \pi^0$	$(1.22 \pm 0.16) \%$	
$\Gamma_4$ $\rho^+ \pi^- \pi^0 + \text{c.c.}$	$(1.48 \pm 0.25) \%$	
$\Gamma_5$ $\rho^0 \pi^+ \pi^-$	$(3.9 \pm 3.5) \times 10^{-3}$	
$\Gamma_6$ $4\pi^0$	$(5.5 \pm 0.8) \times 10^{-4}$	
$\Gamma_7$ $\pi^+ \pi^- K^+ K^-$	$(4.5 \pm 1.0) \times 10^{-3}$	
$\Gamma_8$ $K^+ K^- \pi^0 \pi^0$	$(1.14 \pm 0.28) \times 10^{-3}$	
$\Gamma_9$ $K^+ \pi^- \bar{K}^0 \pi^0 + \text{c.c.}$	$(8.7 \pm 1.4) \times 10^{-3}$	
$\Gamma_{10}$ $\rho^- K^+ \bar{K}^0 + \text{c.c.}$	$(5.1 \pm 1.2) \times 10^{-3}$	
$\Gamma_{11}$ $K^*(892)^0 \bar{K}^0 \pi^0 \rightarrow$ $K^+ \pi^- \bar{K}^0 \pi^0 + \text{c.c.}$	$(2.4 \pm 0.7) \times 10^{-3}$	
$\Gamma_{12}$ $K^+ K^- \eta \pi^0$	$(1.14 \pm 0.35) \times 10^{-3}$	
$\Gamma_{13}$ $\pi^+ \pi^- K_S^0 K_S^0$	$(7.0 \pm 3.0) \times 10^{-4}$	
$\Gamma_{14}$ $K^+ K^- \eta$	$(3.2 \pm 1.0) \times 10^{-4}$	
$\Gamma_{15}$ $\bar{K}^0 K^+ \pi^- + \text{c.c.}$	$(7.1 \pm 0.6) \times 10^{-3}$	
$\Gamma_{16}$ $K^*(892)^0 \bar{K}^0 + \text{c.c.}$	$(1.0 \pm 0.4) \times 10^{-3}$	
$\Gamma_{17}$ $K^*(892)^+ K^- + \text{c.c.}$	$(1.5 \pm 0.7) \times 10^{-3}$	
$\Gamma_{18}$ $K_J^*(1430)^0 \bar{K}^0 + \text{c.c.} \rightarrow$ $K_S^0 K^+ \pi^- + \text{c.c.}$	$< 8 \times 10^{-4}$	CL=90%

Γ <sub>19</sub>	$K_J^*(1430)^+ K^- + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.}$	< 2.2	$\times 10^{-3}$	CL=90%
Γ <sub>20</sub>	$K^+ K^- \pi^0$	( 1.85 ± 0.25 )	$\times 10^{-3}$	
Γ <sub>21</sub>	$\eta \pi^+ \pi^-$	( 4.9 ± 0.5 )	$\times 10^{-3}$	
Γ <sub>22</sub>	$a_0(980)^+ \pi^- + \text{c.c.} \rightarrow \eta \pi^+ \pi^-$	( 1.8 ± 0.6 )	$\times 10^{-3}$	
Γ <sub>23</sub>	$f_2(1270) \eta$	( 2.7 ± 0.8 )	$\times 10^{-3}$	
Γ <sub>24</sub>	$\pi^+ \pi^- \eta'$	( 2.3 ± 0.5 )	$\times 10^{-3}$	
Γ <sub>25</sub>	$\pi^0 f_0(980) \rightarrow \pi^0 \pi^+ \pi^-$	< 6	$\times 10^{-6}$	CL=90%
Γ <sub>26</sub>	$K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.}$	( 3.2 ± 2.1 )	$\times 10^{-3}$	
Γ <sub>27</sub>	$K^*(892)^0 \bar{K}^*(892)^0$	( 1.5 ± 0.4 )	$\times 10^{-3}$	
Γ <sub>28</sub>	$K^+ K^- K_S^0 K_S^0$	< 4	$\times 10^{-4}$	CL=90%
Γ <sub>29</sub>	$K^+ K^- K^+ K^-$	( 5.5 ± 1.1 )	$\times 10^{-4}$	
Γ <sub>30</sub>	$K^+ K^- \phi$	( 4.2 ± 1.6 )	$\times 10^{-4}$	
Γ <sub>31</sub>	$\omega \omega$	( 5.8 ± 0.7 )	$\times 10^{-4}$	
Γ <sub>32</sub>	$\omega \phi$	( 2.1 ± 0.6 )	$\times 10^{-5}$	
Γ <sub>33</sub>	$\phi \phi$	( 4.2 ± 0.5 )	$\times 10^{-4}$	
Γ <sub>34</sub>	$\rho \bar{\rho}$	( 7.72 ± 0.35 )	$\times 10^{-5}$	
Γ <sub>35</sub>	$\rho \bar{\rho} \pi^0$	( 1.59 ± 0.19 )	$\times 10^{-4}$	
Γ <sub>36</sub>	$\rho \bar{\rho} \eta$	( 1.48 ± 0.25 )	$\times 10^{-4}$	
Γ <sub>37</sub>	$\rho \bar{\rho} \omega$	( 2.16 ± 0.31 )	$\times 10^{-4}$	
Γ <sub>38</sub>	$\rho \bar{\rho} \phi$	< 1.8	$\times 10^{-5}$	CL=90%
Γ <sub>39</sub>	$\rho \bar{\rho} \pi^+ \pi^-$	( 5.0 ± 1.9 )	$\times 10^{-4}$	
Γ <sub>40</sub>	$\rho \bar{\rho} \pi^0 \pi^0$			
Γ <sub>41</sub>	$\rho \bar{\rho} K^+ K^-$ (non-resonant)	( 1.30 ± 0.23 )	$\times 10^{-4}$	
Γ <sub>42</sub>	$\rho \bar{\rho} K_S^0 K_S^0$	< 4.5	$\times 10^{-4}$	CL=90%
Γ <sub>43</sub>	$\rho \bar{n} \pi^-$	( 3.9 ± 0.5 )	$\times 10^{-4}$	
Γ <sub>44</sub>	$\bar{\rho} n \pi^+$	( 4.0 ± 0.5 )	$\times 10^{-4}$	
Γ <sub>45</sub>	$\rho \bar{n} \pi^- \pi^0$	( 1.05 ± 0.12 )	$\times 10^{-3}$	
Γ <sub>46</sub>	$\bar{\rho} n \pi^+ \pi^0$	( 1.03 ± 0.12 )	$\times 10^{-3}$	
Γ <sub>47</sub>	$\Lambda \bar{\Lambda}$	( 1.16 ± 0.12 )	$\times 10^{-4}$	
Γ <sub>48</sub>	$\Lambda \bar{\Lambda} \pi^+ \pi^-$	( 3.0 ± 0.5 )	$\times 10^{-4}$	
Γ <sub>49</sub>	$\Lambda \bar{\Lambda} \pi^+ \pi^-$ (non-resonant)	( 2.5 ± 0.6 )	$\times 10^{-4}$	
Γ <sub>50</sub>	$\Sigma(1385)^+ \bar{\Lambda} \pi^- + \text{c.c.}$	< 1.3	$\times 10^{-4}$	CL=90%
Γ <sub>51</sub>	$\Sigma(1385)^- \bar{\Lambda} \pi^+ + \text{c.c.}$	< 1.3	$\times 10^{-4}$	CL=90%
Γ <sub>52</sub>	$K^+ \bar{\rho} \Lambda$	( 4.2 ± 0.4 )	$\times 10^{-4}$	S=1.1
Γ <sub>53</sub>	$K^+ \bar{\rho} \Lambda(1520) + \text{c.c.}$	( 1.7 ± 0.5 )	$\times 10^{-4}$	
Γ <sub>54</sub>	$\Lambda(1520) \bar{\Lambda}(1520)$	< 1.0	$\times 10^{-4}$	CL=90%
Γ <sub>55</sub>	$\Sigma^0 \bar{\Sigma}^0$	< 4	$\times 10^{-5}$	CL=90%
Γ <sub>56</sub>	$\Sigma^+ \bar{\Sigma}^-$	< 6	$\times 10^{-5}$	CL=90%
Γ <sub>57</sub>	$\Sigma(1385)^+ \bar{\Sigma}(1385)^-$	< 1.0	$\times 10^{-4}$	CL=90%
Γ <sub>58</sub>	$\Sigma(1385)^- \bar{\Sigma}(1385)^+$	< 5	$\times 10^{-5}$	CL=90%
Γ <sub>59</sub>	$\Xi^0 \bar{\Xi}^0$	< 6	$\times 10^{-5}$	CL=90%

$\Gamma_{60}$	$\Xi^- \Xi^+$	$(8.2 \pm 2.2) \times 10^{-5}$	
$\Gamma_{61}$	$\pi^+ \pi^- + K^+ K^-$	$< 2.1 \times 10^{-3}$	
$\Gamma_{62}$	$K_S^0 K_S^0$	$< 6 \times 10^{-5}$	CL=90%

### Radiative decays

$\Gamma_{63}$	$\gamma J/\psi(1S)$	$(33.9 \pm 1.2) \%$
$\Gamma_{64}$	$\gamma \rho^0$	$(2.20 \pm 0.18) \times 10^{-4}$
$\Gamma_{65}$	$\gamma \omega$	$(6.9 \pm 0.8) \times 10^{-5}$
$\Gamma_{66}$	$\gamma \phi$	$(2.5 \pm 0.5) \times 10^{-5}$
$\Gamma_{67}$	$\gamma \gamma$	

## 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 238 measurements to determine 49 parameters. The overall fit has a  $\chi^2 = 339.7$  for 189 degrees of freedom.

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

$x_{29}$	6				
$x_{34}$	8	3			
$x_{47}$	13	5	7		
$x_{63}$	31	13	6	26	
$\Gamma$	-19	-8	-62	-16	-51
	$x_{15}$	$x_{29}$	$x_{34}$	$x_{47}$	$x_{63}$

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

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

$$\Gamma(p\bar{p}) \times \Gamma(\gamma J/\psi(1S)) / \Gamma_{\text{total}} \qquad \Gamma_{34} \Gamma_{63} / \Gamma$$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
<b>21.9 ± 0.8 OUR FIT</b>			
<b>21.4 ± 0.9 OUR AVERAGE</b>			
21.5 ± 0.5 ± 0.8	<sup>1</sup> ANDREOTTI 05A	E835	$p\bar{p} \rightarrow e^+ e^- \gamma$
21.4 ± 1.5 ± 2.2	<sup>1,2</sup> ARMSTRONG 92	E760	$\bar{p}p \rightarrow e^+ e^- \gamma$
19.9 <sup>+4.4</sup> <sub>-4.0</sub>	<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.

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

### HADRONIC DECAYS

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

$\Gamma_1/\Gamma$

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
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**$5.8 \pm 1.4$  OUR EVALUATION** Error includes scale factor of 1.2. Treating systematic error as correlated.

**$5.8 \pm 1.1$  OUR AVERAGE**

$5.4 \pm 0.7 \pm 0.9$	<sup>1</sup> BAI	99B	BES $\psi(2S) \rightarrow \gamma \chi_{c1}$
$16.0 \pm 5.9 \pm 0.8$	<sup>1</sup> TANENBAUM	78	MRK1 $\psi(2S) \rightarrow \gamma \chi_{c1}$

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

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

$\Gamma_2/\Gamma$

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
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**$7.6 \pm 2.6$  OUR EVALUATION** Treating systematic error as correlated.

**$8 \pm 4$  OUR AVERAGE** Error includes scale factor of 1.5.

$4.6 \pm 2.1 \pm 2.6$	<sup>1</sup> BAI	99B	BES $\psi(2S) \rightarrow \gamma \chi_{c1}$
$12.5 \pm 4.2 \pm 0.6$	<sup>1</sup> TANENBAUM	78	MRK1 $\psi(2S) \rightarrow \gamma \chi_{c1}$

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

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

$\Gamma_3/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**$1.22 \pm 0.15 \pm 0.04$**  604.7 <sup>1</sup> HE 08B CLEO  $e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $1.28 \pm 0.06 \pm 0.15 \pm 0.08\%$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \pi^+ \pi^- \pi^0 \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

$\Gamma_4/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**$1.48 \pm 0.24 \pm 0.05$**  712.3 <sup>1,2</sup> HE 08B CLEO  $e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $1.56 \pm 0.13 \pm 0.22 \pm 0.10\%$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \rho^+ \pi^- \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . 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.

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

$\Gamma_5/\Gamma$

VALUE (units $10^{-4}$ )	DOCUMENT ID	TECN	COMMENT
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**$39 \pm 35$**  <sup>1</sup> TANENBAUM 78 MRK1  $\psi(2S) \rightarrow \gamma \chi_{c1}$

<sup>1</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.

**$\Gamma(4\pi^0)/\Gamma_{\text{total}}$**   **$\Gamma_6/\Gamma$**

<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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<b>0.55±0.08±0.02</b>	608	<sup>1</sup> ABLIKIM	11A BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c1}$
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<sup>1</sup> ABLIKIM 11A reports  $(0.57 \pm 0.03 \pm 0.08) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow 4\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\pi^+\pi^-K^+K^-)/\Gamma_{\text{total}}$**   **$\Gamma_7/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>4.5±1.0 OUR EVALUATION</b>	Treating systematic error as correlated.		
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**4.5±0.9 OUR AVERAGE**

4.2±0.4±0.9	<sup>1</sup> BAI	99B BES	$\psi(2S) \rightarrow \gamma\chi_{c1}$
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7.3±3.0±0.4	<sup>1</sup> TANENBAUM	78 MRK1	$\psi(2S) \rightarrow \gamma\chi_{c1}$
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<sup>1</sup> Rescaled by us using  $B(\psi(2S) \rightarrow \gamma\chi_{c1}) = (8.8 \pm 0.4)\%$  and  $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.6 \pm 0.5)\%$ .

**$\Gamma(K^+K^-\pi^0\pi^0)/\Gamma_{\text{total}}$**   **$\Gamma_8/\Gamma$**

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>0.114±0.028±0.004</b>	45.1	<sup>1</sup> HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+ h^- h^0 h^0$
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<sup>1</sup> HE 08B reports  $0.12 \pm 0.02 \pm 0.02 \pm 0.01\%$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+K^-\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>0.87±0.14±0.03</b>	141.3	<sup>1</sup> HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+ h^- h^0 h^0$
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<sup>1</sup> HE 08B reports  $0.92 \pm 0.09 \pm 0.11 \pm 0.06\%$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+\pi^-\bar{K}^0\pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>0.51±0.12±0.02</b>	141.3	<sup>1</sup> HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+ h^- h^0 h^0$
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<sup>1</sup> HE 08B reports  $0.54 \pm 0.11 \pm 0.07 \pm 0.03\%$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \rho^-K^+\bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.24±0.06±0.01</b>	141.3	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $0.25 \pm 0.06 \pm 0.03 \pm 0.02$  % from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^*(892)^0 \bar{K}^0 \pi^0 \rightarrow K^+ \pi^- \bar{K}^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+ K^- \eta \pi^0)/\Gamma_{\text{total}}$   $\Gamma_{12}/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.114±0.035±0.004</b>	141.3	<sup>1</sup> HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

<sup>1</sup> HE 08B reports  $0.12 \pm 0.03 \pm 0.02 \pm 0.01$  % from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- \eta \pi^0)/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>7.0±3.0±0.2</b>	19.8±7.7	<sup>1</sup> ABLIKIM	050 BES2	$\psi(2S) \rightarrow \chi_{c1} \gamma$

<sup>1</sup> ABLIKIM 050 reports  $[\Gamma(\chi_{c1}(1P) \rightarrow \pi^+ \pi^- K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] = (0.67 \pm 0.26 \pm 0.11) \times 10^{-4}$  which we divide by our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
<b>0.32±0.10±0.01</b>	<sup>1</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ATHAR 07 reports  $(0.34 \pm 0.10 \pm 0.04) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- \eta)/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\bar{K}^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{15}/\Gamma$

VALUE (units $10^{-3}$ )	DOCUMENT ID
<b>7.1±0.6 OUR FIT</b>	

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

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.00±0.37±0.03</b>	22	<sup>1</sup> ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$

<sup>1</sup> ABLIKIM 06R reports  $(1.1 \pm 0.4 \pm 0.1) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^*(892)^0 \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $\text{B}(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)^+ K^- + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{17}/\Gamma$ 

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.46±0.66±0.05</b>	27	<sup>1</sup> ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma\chi_{c1}$

<sup>1</sup> ABLIKIM 06R reports  $(1.6 \pm 0.7 \pm 0.2) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^*(892)^+ K^- + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K_J^*(1430)^0 \bar{K}^0 + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{18}/\Gamma$ 

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.8</b>	90	<sup>1</sup> ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma\chi_{c1}$

<sup>1</sup> ABLIKIM 06R reports  $< 0.9 \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K_J^*(1430)^0 \bar{K}^0 + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

 $\Gamma(K_J^*(1430)^+ K^- + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{19}/\Gamma$ 

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;2.2</b>	90	<sup>1</sup> ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma\chi_{c1}$

<sup>1</sup> ABLIKIM 06R reports  $< 2.4 \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K_J^*(1430)^+ K^- + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

 $\Gamma(K^+ K^- \pi^0)/\Gamma_{\text{total}}$   $\Gamma_{20}/\Gamma$ 

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
<b>1.85±0.24±0.06</b>	<sup>1</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ATHAR 07 reports  $(1.95 \pm 0.16 \pm 0.23) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$   $\Gamma_{21}/\Gamma$ 

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>4.9±0.5 OUR AVERAGE</b>				

4.7±0.5±0.2		<sup>1</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$
5.4±0.9±0.2	222	<sup>2</sup> ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma\chi_{c1}$

<sup>1</sup> ATHAR 07 reports  $(5.0 \pm 0.3 \pm 0.5) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . 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  $(5.9 \pm 0.7 \pm 0.8) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) =$



$(8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(a_0(980)^+ \pi^- + \text{c.c.} \rightarrow \eta \pi^+ \pi^-) / \Gamma_{\text{total}}$**   **$\Gamma_{22}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>1.8 \pm 0.6 \pm 0.1</math></b>	58	<sup>1</sup> ABLIKIM	06R	BES2 $\psi(2S) \rightarrow \gamma\chi_{c1}$

<sup>1</sup> ABLIKIM 06R reports  $(2.0 \pm 0.5 \pm 0.5) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow a_0(980)^+ \pi^- + \text{c.c.} \rightarrow \eta \pi^+ \pi^-) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(f_2(1270)\eta) / \Gamma_{\text{total}}$**   **$\Gamma_{23}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>2.7 \pm 0.8 \pm 0.1</math></b>	53	<sup>1</sup> ABLIKIM	06R	BES2 $\psi(2S) \rightarrow \gamma\chi_{c1}$

<sup>1</sup> ABLIKIM 06R reports  $(3.0 \pm 0.7 \pm 0.5) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow f_2(1270)\eta) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>2.3 \pm 0.5 \pm 0.1</math></b>	<sup>1</sup> ATHAR	07	CLEO $\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ATHAR 07 reports  $(2.4 \pm 0.4 \pm 0.3) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \pi^+ \pi^- \eta') / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\pi^0 f_0(980) \rightarrow \pi^0 \pi^+ \pi^-) / \Gamma_{\text{total}}$**   **$\Gamma_{25}/\Gamma$**

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>&lt; 6 \times 10^{-6}</math></b>	90	<sup>1</sup> ABLIKIM	11D	BES3 $\psi(2S) \rightarrow \gamma \pi^0 \pi^+ \pi^-$

<sup>1</sup> ABLIKIM 11D reports  $[\Gamma(\chi_{c1}(1P) \rightarrow \pi^0 f_0(980) \rightarrow \pi^0 \pi^+ \pi^-) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] < 6.0 \times 10^{-7}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

**$\Gamma(K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.}) / \Gamma_{\text{total}}$**   **$\Gamma_{26}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>32 \pm 21</math></b>	<sup>1</sup> TANENBAUM	78	MRK1 $\psi(2S) \rightarrow \gamma\chi_{c1}$

<sup>1</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.

$\Gamma(K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}$   $\Gamma_{27}/\Gamma$

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>1.47±0.36±0.05</b>	28.4 ± 5.5	<sup>1,2</sup> ABLIKIM	04H BES	$\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^-$
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<sup>1</sup> ABLIKIM 04H reports  $[\Gamma(\chi_{c1}(1P) \rightarrow K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  =  $(1.40 \pm 0.27 \pm 0.22) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> Assumes  $B(K^*(892)^0 \rightarrow K^- \pi^+) = 2/3$ .

$\Gamma(K^+ K^- K_S^0 \bar{K}_S^0)/\Gamma_{\text{total}}$   $\Gamma_{28}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>&lt;4</b>	90	3.2 ± 2.4	<sup>1</sup> ABLIKIM	050 BES2	$\psi(2S) \rightarrow \chi_{c1} \gamma$
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<sup>1</sup> ABLIKIM 050 reports  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- K_S^0 \bar{K}_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  <  $4.2 \times 10^{-5}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

$\Gamma(K^+ K^- K^+ K^-)/\Gamma_{\text{total}}$   $\Gamma_{29}/\Gamma$

VALUE (units $10^{-3}$ )	DOCUMENT ID
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**0.55±0.11 OUR FIT**

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

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>0.42±0.15±0.01</b>	17	<sup>1</sup> ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma 2K^+ 2K^-$
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<sup>1</sup> ABLIKIM 06T reports  $(0.46 \pm 0.16 \pm 0.06) \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- \phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\omega\omega)/\Gamma_{\text{total}}$   $\Gamma_{31}/\Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>5.8±0.7±0.2</b>	597	<sup>1</sup> ABLIKIM	11K BES3	$\psi(2S) \rightarrow \gamma$ hadrons
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<sup>1</sup> ABLIKIM 11K reports  $(6.0 \pm 0.3 \pm 0.7) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \omega\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\omega\phi)/\Gamma_{\text{total}}$   $\Gamma_{32}/\Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>0.21±0.06±0.01</b>	15	<sup>1</sup> ABLIKIM	11K BES3	$\psi(2S) \rightarrow \gamma$ hadrons
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<sup>1</sup> ABLIKIM 11K reports  $(0.22 \pm 0.06 \pm 0.02) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \omega\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\phi\phi)/\Gamma_{\text{total}}$**   **$\Gamma_{33}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>4.2 \pm 0.5 \pm 0.1</math></b>	366	<sup>1</sup> ABLIKIM	11K BES3	$\psi(2S) \rightarrow \gamma$ hadrons

<sup>1</sup> ABLIKIM 11K reports  $(4.4 \pm 0.3 \pm 0.5) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \phi\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(p\bar{p})/\Gamma_{\text{total}}$**   **$\Gamma_{34}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>
<b><math>0.772 \pm 0.035</math> OUR FIT</b>	

**$\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$**   **$\Gamma_{35}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>0.159 \pm 0.019</math> OUR AVERAGE</b>			
$0.166 \pm 0.020 \pm 0.005$	<sup>1</sup> ONYISI	10 CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}X$
$0.114 \pm 0.048 \pm 0.004$	<sup>2</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ONYISI 10 reports  $(1.75 \pm 0.16 \pm 0.13 \pm 0.11) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . 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  $(1.2 \pm 0.5 \pm 0.1) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(p\bar{p}\eta)/\Gamma_{\text{total}}$**   **$\Gamma_{36}/\Gamma$**

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>0.148 \pm 0.025 \pm 0.005</math></b>		<sup>1</sup> ONYISI	10 CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}X$

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

$< 0.15$	90	<sup>2</sup> ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$
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<sup>1</sup> ONYISI 10 reports  $(1.56 \pm 0.22 \pm 0.14 \pm 0.10) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . 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  $< 0.16 \times 10^{-3}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

**$\Gamma(p\bar{p}\omega)/\Gamma_{\text{total}}$**   **$\Gamma_{37}/\Gamma$**

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>0.216 \pm 0.031 \pm 0.007</math></b>		<sup>1</sup> ONYISI	10 CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}\chi$

<sup>1</sup> ONYISI 10 reports  $(2.28 \pm 0.28 \pm 0.16 \pm 0.14) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;1.8</b>	90	<sup>1</sup> ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p\bar{p}K^+K^-$

<sup>1</sup> ABLIKIM 11F reports  $< 1.82 \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

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

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>0.50 \pm 0.19</math> OUR EVALUATION</b>		Treating systematic error as correlated.		
<b><math>0.50 \pm 0.19</math> OUR AVERAGE</b>				

$0.46 \pm 0.12 \pm 0.15$		<sup>1</sup> BAI	99B BES	$\psi(2S) \rightarrow \gamma\chi_{c1}$
$1.08 \pm 0.77 \pm 0.05$		<sup>1</sup> TANENBAUM	78 MRK1	$\psi(2S) \rightarrow \gamma\chi_{c1}$

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

**$\Gamma(p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}$**   **$\Gamma_{40}/\Gamma$**

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT
<0.05	90	<sup>1</sup> HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+h^-h^0h^0$

<sup>1</sup> HE 08B reports  $< 0.05\%$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

**$\Gamma(p\bar{p}K^+K^- \text{ (non-resonant)})/\Gamma_{\text{total}}$**   **$\Gamma_{41}/\Gamma$**

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>1.30 \pm 0.23 \pm 0.04</math></b>	$82 \pm 9$	<sup>1</sup> ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p\bar{p}K^+K^-$

<sup>1</sup> ABLIKIM 11F reports  $(1.35 \pm 0.15 \pm 0.19) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}K^+K^- \text{ (non-resonant)})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(p\bar{p}K_S^0K_S^0)/\Gamma_{\text{total}}$**   **$\Gamma_{42}/\Gamma$**

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;4.5</b>	90	<sup>1</sup> ABLIKIM	06D BES2	$\psi(2S) \rightarrow \gamma\chi_{c1}$

<sup>1</sup> Using  $B(\psi(2S) \rightarrow \chi_{c1}\gamma) = (9.1 \pm 0.6)\%$ .

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

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>3.9 \pm 0.5 \pm 0.1</math></b>	1412	<sup>1</sup> ABLIKIM	12J BES3	$\psi(2S) \rightarrow \gamma\rho\bar{n}\pi^-$

<sup>1</sup> ABLIKIM 12J reports  $[\Gamma(\chi_{c1}(1P) \rightarrow \rho\bar{n}\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] = (0.37 \pm 0.02 \pm 0.04) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>4.0 \pm 0.5 \pm 0.1</math></b>	1625	<sup>1</sup> ABLIKIM	12J BES3	$\psi(2S) \rightarrow \gamma\bar{p}n\pi^+$

<sup>1</sup> ABLIKIM 12J reports  $[\Gamma(\chi_{c1}(1P) \rightarrow \bar{p}n\pi^+)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] = (0.38 \pm 0.02 \pm 0.04) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\rho\bar{n}\pi^-\pi^0)/\Gamma_{\text{total}}$**   **$\Gamma_{45}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>10.5 \pm 1.2 \pm 0.3</math></b>	1082	<sup>1</sup> ABLIKIM	12J BES3	$\psi(2S) \rightarrow \gamma\rho\bar{n}\pi^-\pi^0$

<sup>1</sup> ABLIKIM 12J reports  $[\Gamma(\chi_{c1}(1P) \rightarrow \rho\bar{n}\pi^-\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] = (1.00 \pm 0.05 \pm 0.10) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\bar{p}n\pi^+\pi^0)/\Gamma_{\text{total}}$**   **$\Gamma_{46}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>10.3 \pm 1.2 \pm 0.3</math></b>	1261	<sup>1</sup> ABLIKIM	12J BES3	$\psi(2S) \rightarrow \gamma\bar{p}n\pi^+\pi^0$

<sup>1</sup> ABLIKIM 12J reports  $[\Gamma(\chi_{c1}(1P) \rightarrow \bar{p}n\pi^+\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] = (0.98 \pm 0.05 \pm 0.10) \times 10^{-4}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

**$\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$**   **$\Gamma_{47}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>
<b><math>1.16 \pm 0.12</math> OUR FIT</b>	

**$\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$**   **$\Gamma_{48}/\Gamma$**

<u>VALUE (units <math>10^{-5}</math>)</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>30 \pm 5 \pm 1</math></b>		105	<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. • • •

<150	90	<sup>2</sup> ABLIKIM	06D BES2	$\psi(2S) \rightarrow \gamma\chi_{c1}$
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<sup>1</sup> ABLIKIM 12I reports  $(31.1 \pm 3.4 \pm 3.9) \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . 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  $B(\psi(2S) \rightarrow \chi_{c1}\gamma) (9.1 \pm 0.6)\%$ .

$\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^- \text{ (non-resonant)})/\Gamma_{\text{total}}$   $\Gamma_{49}/\Gamma$

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>25 \pm 6 \pm 1</math></b>	13	<sup>1</sup> ABLIKIM	12i	BES3 $\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}\pi^+\pi^-$

<sup>1</sup> ABLIKIM 12i reports  $(26.2 \pm 5.5 \pm 3.3) \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \Lambda\bar{\Lambda}\pi^+\pi^- \text{ (non-resonant)})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Sigma(1385)^+\bar{\Lambda}\pi^- + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{50}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;13</b>	90	<sup>1</sup> ABLIKIM	12i	BES3 $\psi(2S) \rightarrow \gamma\Sigma(1385)^+\bar{\Lambda}\pi^-$

<sup>1</sup> ABLIKIM 12i reports  $< 14 \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma(1385)^+\bar{\Lambda}\pi^- + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

$\Gamma(\Sigma(1385)^-\bar{\Lambda}\pi^+ + \text{c.c.})/\Gamma_{\text{total}}$   $\Gamma_{51}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;13</b>	90	<sup>1</sup> ABLIKIM	12i	BES3 $\psi(2S) \rightarrow \gamma\Sigma(1385)^-\bar{\Lambda}\pi^+$

<sup>1</sup> ABLIKIM 12i reports  $< 14 \times 10^{-5}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma(1385)^-\bar{\Lambda}\pi^+ + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

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

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>4.2 \pm 0.4</math> OUR AVERAGE</b>				Error includes scale factor of 1.1.

$4.3 \pm 0.4 \pm 0.1$       3k      <sup>1,2</sup> ABLIKIM      13D      BES3       $\psi(2S) \rightarrow \gamma\Lambda\bar{p}K^+$

$3.1 \pm 0.9 \pm 0.1$            <sup>3</sup> ATHAR      07      CLEO       $\psi(2S) \rightarrow \gamma h^+ h^- h^0$

<sup>1</sup> ABLIKIM 13D reports  $(4.5 \pm 0.2 \pm 0.4) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+\bar{p}\Lambda)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . 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  $B(\Lambda \rightarrow p\pi^-) = 63.9\%$ .

<sup>3</sup> ATHAR 07 reports  $(3.3 \pm 0.9 \pm 0.4) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+\bar{p}\Lambda)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+ \bar{p} \Lambda(1520) + \text{c.c.}) / \Gamma_{\text{total}}$   $\Gamma_{53} / \Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>1.7 \pm 0.4 \pm 0.1</math></b>	$48 \pm 10$	<sup>1</sup> ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p \bar{p} K^+ K^-$

<sup>1</sup> ABLIKIM 11F reports  $(1.81 \pm 0.38 \pm 0.28) \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ \bar{p} \Lambda(1520) + \text{c.c.}) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Lambda(1520) \bar{\Lambda}(1520)) / \Gamma_{\text{total}}$   $\Gamma_{54} / \Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&lt;1.0</b>	90	<sup>1</sup> ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p \bar{p} K^+ K^-$

<sup>1</sup> ABLIKIM 11F reports  $< 1.00 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \Lambda(1520) \bar{\Lambda}(1520)) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

$\Gamma(\Sigma^0 \bar{\Sigma}^0) / \Gamma_{\text{total}}$   $\Gamma_{55} / \Gamma$

<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;0.4</b>	90	$3.8 \pm 2.5$	<sup>1</sup> NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma \Sigma^0 \bar{\Sigma}^0$

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

<0.6	90		<sup>2</sup> ABLIKIM	13H BES3	$\psi(2S) \rightarrow \gamma \Sigma^0 \bar{\Sigma}^0$
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<sup>1</sup> NAIK 08 reports  $< 0.44 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma^0 \bar{\Sigma}^0) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

<sup>2</sup> ABLIKIM 13H reports  $< 0.62 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma^0 \bar{\Sigma}^0) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

$\Gamma(\Sigma^+ \bar{\Sigma}^-) / \Gamma_{\text{total}}$   $\Gamma_{56} / \Gamma$

<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	$4.3 \pm 2.3$	<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	$\psi(2S) \rightarrow \gamma \Sigma^+ \bar{\Sigma}^-$
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<sup>1</sup> NAIK 08 reports  $< 0.65 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma^+ \bar{\Sigma}^-) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

<sup>2</sup> ABLIKIM 13H reports  $< 0.87 \times 10^{-4}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma^+ \bar{\Sigma}^-) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

$\Gamma(\Sigma(1385)^+\bar{\Sigma}(1385)^-)/\Gamma_{\text{total}}$   $\Gamma_{57}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;10</b>	90	<sup>1</sup> ABLIKIM 12I	BES3	$\psi(2S) \rightarrow \gamma \Lambda \bar{\Lambda} \pi^+ \pi^-$
<sup>1</sup> ABLIKIM 12I reports $< 10 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma(1385)^+\bar{\Sigma}(1385)^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .				

$\Gamma(\Sigma(1385)^-\bar{\Sigma}(1385)^+)/\Gamma_{\text{total}}$   $\Gamma_{58}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;5</b>	90	<sup>1</sup> ABLIKIM 12I	BES3	$\psi(2S) \rightarrow \gamma \Lambda \bar{\Lambda} \pi^+ \pi^-$
<sup>1</sup> ABLIKIM 12I reports $< 5.7 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma(1385)^-\bar{\Sigma}(1385)^+)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .				

$\Gamma(\Xi^0\Xi^0)/\Gamma_{\text{total}}$   $\Gamma_{59}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.6</b>	90	$1.7 \pm 2.4$	<sup>1</sup> NAIK 08	CLEO	$\psi(2S) \rightarrow \gamma \Xi^0\Xi^0$
<sup>1</sup> NAIK 08 reports $< 0.60 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \Xi^0\Xi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .					

$\Gamma(\Xi^-\Xi^+)/\Gamma_{\text{total}}$   $\Gamma_{60}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.82 \pm 0.22 \pm 0.03</math></b>		$16.4 \pm 4.3$	<sup>1</sup> NAIK 08	CLEO	$\psi(2S) \rightarrow \gamma \Xi^+\Xi^-$
<ul style="list-style-type: none"> <li>• • • We do not use the following data for averages, fits, limits, etc. • • •</li> </ul>					
<b>&lt; 3.4</b>	90		<sup>2</sup> ABLIKIM 06D	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$
<sup>1</sup> NAIK 08 reports $(0.86 \pm 0.22 \pm 0.08) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \Xi^-\Xi^+)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$ , which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . 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 $B(\psi(2S) \rightarrow \chi_{c1} \gamma) (9.1 \pm 0.6)\%$ .					

$[\Gamma(\pi^+\pi^-) + \Gamma(K^+K^-)]/\Gamma_{\text{total}}$   $\Gamma_{61}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;21</b>		<sup>1</sup> FELDMAN 77	MRK1	$\psi(2S) \rightarrow \gamma \chi_{c1}$
<ul style="list-style-type: none"> <li>• • • We do not use the following data for averages, fits, limits, etc. • • •</li> </ul>				
<b>&lt;38</b>	90	<sup>1</sup> BRANDELIK 79B	DASP	$\psi(2S) \rightarrow \gamma \chi_{c1}$
<sup>1</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.				



$\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$   $\Gamma_{62}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.6</b>	90	<sup>1</sup> ABLIKIM	050 BES2	$\psi(2S) \rightarrow \chi_{c1} \gamma$

<sup>1</sup> ABLIKIM 050 reports  $[\Gamma(\chi_{c1}(1P) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$   
 $< 0.6 \times 10^{-5}$  which we divide by our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

————— **RADIATIVE DECAYS** —————

$\Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$   $\Gamma_{63}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.339 ± 0.012 OUR FIT</b>			

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

0.379 ± 0.008 ± 0.021	<sup>1</sup> ADAM	05A CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \gamma \chi_{c1}$
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<sup>1</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.

$\Gamma(\gamma \rho^0)/\Gamma_{\text{total}}$   $\Gamma_{64}/\Gamma$

VALUE (units $10^{-6}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>220 ± 18 OUR AVERAGE</b>				

220 ± 23 ± 7	432 ± 25	<sup>1</sup> ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma \gamma \rho^0$
221 ± 24 ± 7	186 ± 15	<sup>2</sup> BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma \gamma \rho^0$

<sup>1</sup> ABLIKIM 11E reports  $(228 \pm 13 \pm 22) \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma \rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> BENNETT 08A reports  $(243 \pm 19 \pm 22) \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma \rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\gamma \omega)/\Gamma_{\text{total}}$   $\Gamma_{65}/\Gamma$

VALUE (units $10^{-6}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>69 ± 8 OUR AVERAGE</b>				

67 ± 9 ± 2	136 ± 14	<sup>1</sup> ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma \gamma \omega$
76 ± 17 ± 2	39 ± 7	<sup>2</sup> BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma \gamma \omega$

<sup>1</sup> ABLIKIM 11E reports  $(69.7 \pm 7.2 \pm 6.6) \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma \omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> BENNETT 08A reports  $(83 \pm 15 \pm 12) \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma \omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\gamma\phi)/\Gamma_{\text{total}}$						$\Gamma_{66}/\Gamma$
VALUE (units $10^{-6}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	

<b>25±5±1</b>		43 ± 9	<sup>1</sup> ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma\gamma\phi$	
<24	90	5.2 ± 3.1	<sup>2</sup> BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma\gamma\phi$	

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

<sup>1</sup> ABLIKIM 11E reports  $(25.8 \pm 5.2 \pm 2.3) \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> BENNETT 08A reports  $< 26 \times 10^{-6}$  from a measurement of  $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$ , which we rescale to our best value  $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$ .

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$						$\Gamma_{67}/\Gamma$
VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT		

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

< 3.5	90	ECKLUND	08A CLEO	$\psi(2S) \rightarrow \gamma\chi_{c1} \rightarrow 3\gamma$		
<150	90	<sup>1</sup> YAMADA	77 DASP	$e^+e^- \rightarrow 3\gamma$		

<sup>1</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

$$\Gamma(\chi_{c1}(1P) \rightarrow \rho\bar{\rho})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)$$

$$\Gamma_{34}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units $10^{-5}$ )	DOCUMENT ID	TECN	COMMENT
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**2.14±0.11 OUR FIT**

<b>1.1 ± 1.0</b>	<sup>1</sup> BAI	98I BES	$\psi(2S) \rightarrow \gamma\chi_{c1} \rightarrow \gamma\bar{p}p$
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<sup>1</sup> Calculated by us. The value for  $B(\chi_{c1} \rightarrow \rho\bar{\rho})$  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].

$$\Gamma(\chi_{c1}(1P) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{47}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{\psi(2S)}$$

VALUE (units $10^{-6}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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**11.1±1.1 OUR FIT**

**10.9±1.1 OUR AVERAGE**

11.2±1.0±0.9	136	<sup>1</sup> ABLIKIM	13H BES3	$\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}$
10.5±1.6±0.6	46 ± 7	<sup>2</sup> NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}$

<sup>1</sup> Calculated by us. ABLIKIM 13H reports  $B(\chi_{c1} \rightarrow \Lambda\bar{\Lambda}) = (12.2 \pm 1.1 \pm 1.1) \times 10^{-5}$  from a measurement of  $B(\chi_{c1} \rightarrow \Lambda\bar{\Lambda}) \times B(\psi(2S) \rightarrow \gamma\chi_{c1})$  assuming  $B(\psi(2S) \rightarrow \gamma\chi_{c1}) = (9.2 \pm 0.4)\%$ .

<sup>2</sup> Calculated by us. NAIK 08 reports  $B(\chi_{c1} \rightarrow \Lambda\bar{\Lambda}) = (11.6 \pm 1.8 \pm 0.7 \pm 0.7) \times 10^{-5}$  using  $B(\psi(2S) \rightarrow \gamma\chi_{c1}) = (9.07 \pm 0.11 \pm 0.54)\%$ .

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_{47}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

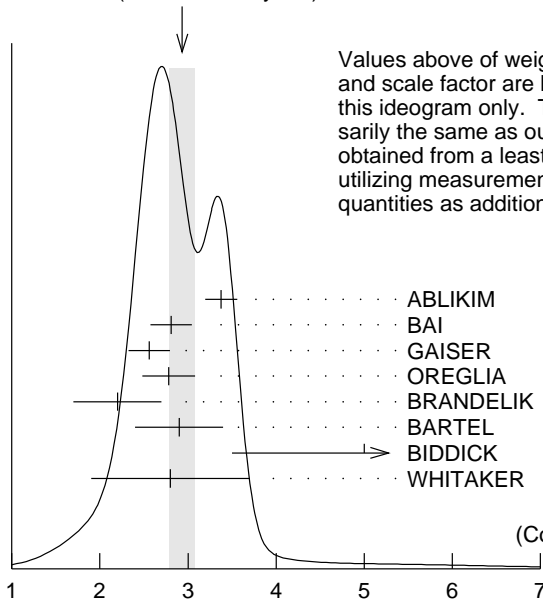
VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>3.22 ± 0.31 OUR FIT</b>				
<b>7.1 <math>^{+2.8}_{-2.4}</math> ± 1.3</b>	$9.0^{+3.5}_{-3.1}$	<sup>1</sup> BAI	03E BES	$\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}$

<sup>1</sup>BAI 03E reports [  $B(\chi_{c1} \rightarrow \Lambda\bar{\Lambda}) B(\psi(2S) \rightarrow \gamma\chi_{c1}) / B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) ] \times [B^2(\Lambda \rightarrow \pi^-p) / B(J/\psi \rightarrow p\bar{p})] = (1.33^{+0.52}_{-0.46} \pm 0.25)\%$ . We calculate from this measurement the presented value using  $B(\Lambda \rightarrow \pi^-p) = (63.9 \pm 0.5)\%$  and  $B(J/\psi \rightarrow p\bar{p}) = (2.17 \pm 0.07) \times 10^{-3}$ .

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}}{\Gamma_{63}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{\psi(2S)}}$$

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>3.24 ± 0.07 OUR FIT</b>				
<b>2.93 ± 0.15 OUR AVERAGE</b>		Error includes scale factor of 1.4. See the ideogram below.		
$3.377 \pm 0.009 \pm 0.183$	142k	ABLIKIM	120 BES3	$\psi(2S) \rightarrow \gamma\chi_{c1}$
$2.81 \pm 0.05 \pm 0.23$	13k	BAI	04I BES2	$\psi(2S) \rightarrow J/\psi\gamma\gamma$
$2.56 \pm 0.12 \pm 0.20$		GAISER	86 CBAL	$\psi(2S) \rightarrow \gamma X$
$2.78 \pm 0.30$		<sup>1</sup> OREGLIA	82 CBAL	$\psi(2S) \rightarrow \gamma\chi_{c1}$
$2.2 \pm 0.5$		<sup>2</sup> BRANDELIK	79B DASP	$\psi(2S) \rightarrow \gamma\chi_{c1}$
$2.9 \pm 0.5$		<sup>2</sup> BARTEL	78B CNTR	$\psi(2S) \rightarrow \gamma\chi_{c1}$
$5.0 \pm 1.5$		<sup>3</sup> BIDDICK	77 CNTR	$e^+e^- \rightarrow \gamma X$
$2.8 \pm 0.9$		<sup>1</sup> WHITAKER	76 MRK1	$e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$3.56 \pm 0.03 \pm 0.12$	24.9k	<sup>4</sup> MENDEZ	08 CLEO	$\psi(2S) \rightarrow \gamma\chi_{c1}$
$3.44 \pm 0.06 \pm 0.13$	3.7k	<sup>5</sup> ADAM	05A CLEO	Repl. by MENDEZ 08

WEIGHTED AVERAGE  
2.93 ± 0.15 (Error scaled by 1.4)



Values above of weighted average, error, and scale factor are based upon the data in this ideogram only. They are not necessarily the same as our 'best' values, obtained from a least-squares constrained fit utilizing measurements of other (related) quantities as additional information.

			$\chi^2$
ABLIKIM	120	BES3	5.8
BAI	04I	BES2	0.3
GAISER	86	CBAL	2.6
OREGLIA	82	CBAL	0.3
BRANDELIK	79B	DASP	2.2
BARTEL	78B	CNTR	0.0
BIDDICK	77	CNTR	0.0
WHITAKER	76	MRK1	0.0
			11.1
			(Confidence Level = 0.084)

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}}{\Gamma_{63}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{\psi(2S)}}$$

<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.

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

$$\frac{\Gamma_{63}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_9^{\psi(2S)}}{\Gamma_{63}/\Gamma \times \Gamma_{129}^{\psi(2S)}/(\Gamma_{11}^{\psi(2S)} + \Gamma_{12}^{\psi(2S)} + \Gamma_{13}^{\psi(2S)}) + 0.339\Gamma_{129}^{\psi(2S)} + 0.192\Gamma_{130}^{\psi(2S)}}$$

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>5.32±0.11 OUR FIT</b>				

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

5.70±0.04±0.15	24.9k	<sup>1</sup> MENDEZ	08	CLEO	$\psi(2S) \rightarrow \gamma \chi_{c1}$
5.77±0.10±0.12	3.7k	ADAM	05A	CLEO	Repl. by MENDEZ 08

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

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

$$\frac{\Gamma_{63}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma_{63}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>9.41±0.21 OUR FIT</b>				

**10.15±0.28 OUR AVERAGE**

10.17±0.07±0.27	24.9k	MENDEZ	08	CLEO	$\psi(2S) \rightarrow \gamma \chi_{c1}$
12.6 ±0.3 ±3.8	3k	<sup>1</sup> ABLIKIM	04B	BES	$\psi(2S) \rightarrow J/\psi X$
8.5 ±2.1		<sup>2</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>3</sup> ADAM	05A	CLEO	Repl. by MENDEZ 08
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<sup>1</sup> From a fit to the  $J/\psi$  recoil mass spectra.

<sup>2</sup> The value for  $B(\psi(2S) \rightarrow \gamma \chi_{c1}) \times B(\chi_{c1} \rightarrow \gamma J/\psi(1S))$  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>3</sup> Not independent from other values reported by ADAM 05A.

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

$$\frac{\Gamma_{15}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{\psi(2S)}}{\Gamma_{15}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{\psi(2S)}}$$

VALUE (units $10^{-4}$ )	DOCUMENT ID	TECN	COMMENT
<b>6.8±0.5 OUR FIT</b>			

**7.2±0.6 OUR AVERAGE**

7.3±0.5±0.5	<sup>1</sup> ATHAR	07	CLEO	$\psi(2S) \rightarrow \gamma K_S^0 K^+ \pi^-$
7.0±0.5±0.9	<sup>2</sup> ABLIKIM	06R	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$

<sup>1</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>2</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  $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (8.7 \pm 0.4) \times 10^{-2}$ .

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow \bar{K}^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))/\Gamma_{15}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}$$

VALUE (units $10^{-4}$ )	DOCUMENT ID	TECN	COMMENT
<b>19.7±1.6 OUR FIT</b>			
<b>13.2±2.4±3.2</b>	<sup>1</sup> BAI	99B BES	$\psi(2S) \rightarrow \gamma K_S^0 K^+ \pi^-$

<sup>1</sup> 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].

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))/\Gamma_{29}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma_{\text{total}}}$$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.52±0.11 OUR FIT</b>				
<b>0.61±0.11±0.08</b>	54	<sup>1</sup> ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma K^+ K^+ K^- K^-$

<sup>1</sup> Calculated by us. The value of  $B(\chi_{c1} \rightarrow 2K^+ 2K^-)$  reported by ABLIKIM 06T was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.8)\%$ .

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))/\Gamma_{29}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}$$

VALUE (units $10^{-4}$ )	DOCUMENT ID	TECN	COMMENT
<b>1.52±0.31 OUR FIT</b>			
<b>1.13±0.40±0.29</b>	<sup>1</sup> BAI	99B BES	$\psi(2S) \rightarrow \gamma K^+ K^+ K^- K^-$

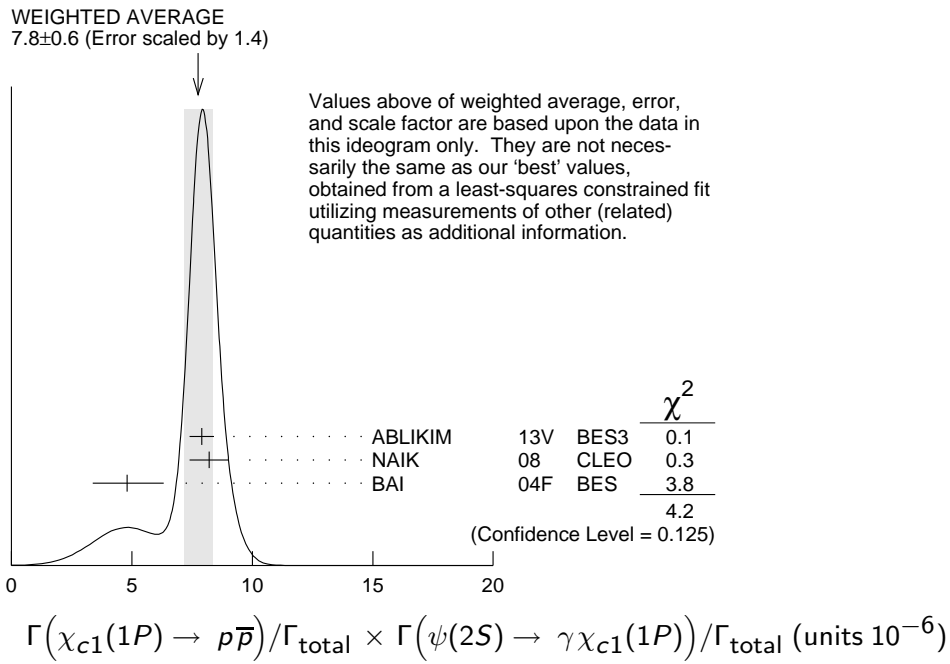
<sup>1</sup> Calculated by us. The value of  $B(\chi_{c1} \rightarrow 2K^+ 2K^-)$  reported by BAI 99B was derived using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.8)\%$  and  $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$  [BAI 98D].

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))/\Gamma_{34}/\Gamma \times \Gamma_{129}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}{\Gamma_{\text{total}}}$$

VALUE (units $10^{-6}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>7.4±0.4 OUR FIT</b>				
<b>7.8±0.6 OUR AVERAGE</b>				Error includes scale factor of 1.4. See the ideogram below.

7.9±0.4±0.3	453	ABLIKIM	13V BES3	$\psi(2S) \rightarrow \gamma p\bar{p}$
8.2±0.7±0.4	141 ± 13	<sup>1</sup> NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma p\bar{p}$
4.8 <sup>+1.4</sup> <sub>-1.3</sub> ±0.6	18.2 <sup>+5.5</sup> <sub>-4.9</sub>	BAI	04F BES	$\psi(2S) \rightarrow \gamma \chi_{c1}(1P) \rightarrow \gamma p\bar{p}$

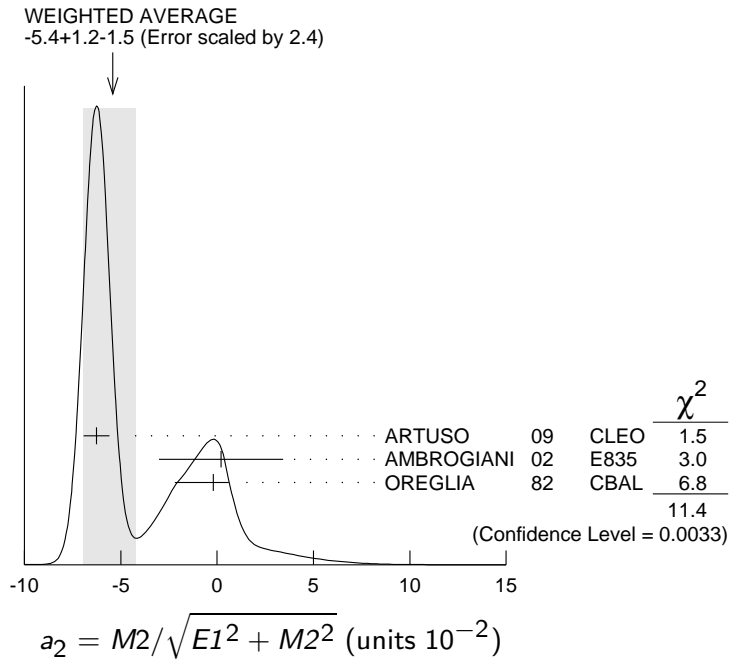
<sup>1</sup> Calculated by us. NAIK 08 reports  $B(\chi_{c1} \rightarrow p\bar{p}) = (9.0 \pm 0.8 \pm 0.4 \pm 0.5) \times 10^{-5}$  using  $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (9.07 \pm 0.11 \pm 0.54)\%$ .



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

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

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>-5.4</b> <sup>+1.2</sup> / <sub>-1.5</sub>				<b>OUR AVERAGE</b> Error includes scale factor of 2.4. See the ideogram below.
-6.26±0.63±0.24	39k	ARTUSO	09 CLEO	$\psi(2S) \rightarrow \gamma\gamma l^+ l^-$
0.2 ±3.2 ±0.4	2090	AMBROGIANI	02 E835	$p\bar{p} \rightarrow \chi_{c1} \rightarrow J/\psi\gamma$
-0.2 <sup>+0.8</sup> / <sub>-2.0</sub>	921	OREGLIA	82 CBAL	$\psi(2S) \rightarrow \chi_{c1}\gamma \rightarrow J/\psi\gamma\gamma$



## MULTIPOLE AMPLITUDES IN $\psi(2S) \rightarrow \gamma\chi_{c1}(1S)$ RADIATIVE DECAY

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

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.9 ± 0.8 OUR AVERAGE</b>				
2.76 ± 0.73 ± 0.23	39k	ARTUSO	09	CLEO $\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
7.7 $^{+5.0}_{-4.5}$	921	OREGLIA	82	CBAL $\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

## MULTIPOLE AMPLITUDE RATIOS IN RADIATIVE DECAYS

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

$a_2/b_2$  Magnetic quadrupole transition amplitude ratio

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>-2.27<math>^{+0.57}_{-0.99}</math></b>	39k	<sup>1</sup> ARTUSO	09	CLEO $\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

<sup>1</sup>Statistical and systematic errors combined. Not independent of  $a_2(\chi_{c1})$  and  $b_2(\chi_{c1})$  values from ARTUSO 09.

## $\chi_{c1}(1P)$ 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.)
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.)
ABLIKIM	11A	PR D83 012006	M. Ablikim <i>et al.</i>	(BES III Collab.)
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ABLIKIM	11E	PR D83 112005	M. Ablikim <i>et al.</i>	(BES III Collab.)
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ONYISI	10	PR D82 011103	P.U.E. Onyisi <i>et al.</i>	(CLEO Collab.)
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BENNETT	08A	PRL 101 151801	J.V. Bennett <i>et al.</i>	(CLEO Collab.)
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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.)
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.)
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ADAM	05A	PRL 94 232002	N.E. Adam <i>et al.</i>	(CLEO Collab.)
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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.)
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AULCHENKO	03	PL B573 63	V.M. Aulchenko <i>et al.</i>	(KEDR Collab.)
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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.)
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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+)
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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)
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TANENBAUM	75	PRL 35 1323	W.M. Tanenbaum <i>et al.</i>	(LBL, SLAC)

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