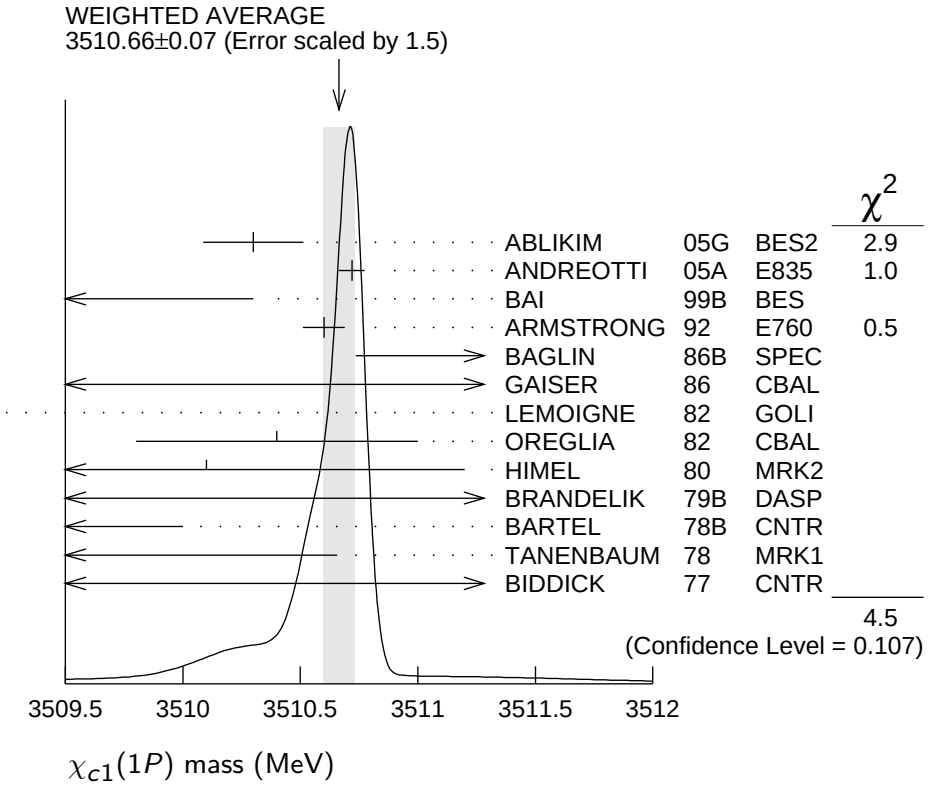
$\chi_{c1}(1P)$

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

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

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

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



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

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

VALUE (MeV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.84 ±0.04 OUR FIT						
0.88 ±0.05 OUR AVERAGE						
$1.39\ ^{+0.40}_{-0.38}\ ^{+0.26}_{-0.77}$			ABLIKIM	05G	BES2	$\psi(2S) \to \gamma\chi_{c1}$
$0.876 \pm 0.045 \pm 0.026$			ANDREOTTI	05A	E835	$p\overline{p} \to e^+e^-\gamma$
$0.87 \pm 0.11 \pm 0.08$		513	[1] ARMSTRONG	92	E760	$\overline{p}p \to e^+e^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<1.3	95		BAGLIN	86B	SPEC	$\overline{p}p \to e^+e^-X$
<3.8	90		GAISER	86	CBAL	$\psi(2S) \to \gamma X$

[1] Recalculated by ANDREOTTI 05A.

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

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
	Hadronic decays		
Γ_1	$3(\pi^+\pi^-)$	$(\ 5.8\ \pm 1.4\ ) \times 10^{-3}$	S=1.2
Γ_2	$2(\pi^+\pi^-)$	$(\ 7.6\ \pm 2.6\ ) \times 10^{-3}$	
Γ_3	$\pi^+\pi^-\pi^0\pi^0$	$(\ 1.22 \pm 0.16)$ %	
Γ_4	$\rho^+\pi^-\pi^0$ + c.c.	$(\ 1.48 \pm 0.25)$ %	
Γ_5	$\rho^0\pi^+\pi^-$	$(\ 3.9\ \pm 3.5\ ) \times 10^{-3}$	
Γ_6	$4\pi^0$	$(\ 5.5\ \pm 0.8\ ) \times 10^{-4}$	
Γ_7	$\pi^+\pi^-K^+K^-$	$(\ 4.5\ \pm 1.0\ ) \times 10^{-3}$	
Γ_8	$K^+K^-\pi^0\pi^0$	$(\ 1.14 \pm 0.28) \times 10^{-3}$	
Γ_9	$K^+K^-\pi^+\pi^-\pi^0$	$(\ 1.15 \pm 0.13)$ %	
Γ_{10}	$K^0_S K^\pm \pi^\mp \pi^+ \pi^-$	$(\ 7.5\ \pm 0.8\ ) \times 10^{-3}$	
Γ_{11}	$K^+\pi^-\overline{K}^0\pi^0$ + c.c.	$(\ 8.7\ \pm 1.4\ ) \times 10^{-3}$	
Γ_{12}	$\rho^- K^+\overline{K}^0$ + c.c.	$(\ 5.1\ \pm 1.2\ ) \times 10^{-3}$	
Γ_{13}	$K^*(892)^0\overline{K}^0\pi^0 \to K^+\pi^-\overline{K}^0\pi^0$ + c.c.	$(\ 2.4\ \pm 0.7\ ) \times 10^{-3}$	
Γ_{14}	$K^+K^-\eta\pi^0$	$(\ 1.14 \pm 0.35) \times 10^{-3}$	
Γ_{15}	$\pi^+\pi^- K^0_S K^0_S$	$(\ 7.0\ \pm 3.0\ ) \times 10^{-4}$	
Γ_{16}	$K^+K^-\eta$	$(\ 3.2\ \pm 1.0\ ) \times 10^{-4}$	
Γ_{17}	$\overline{K}^0 K^+\pi^-$ + c.c.	$(\ 7.1\ \pm 0.6\ ) \times 10^{-3}$	
Γ_{18}	$K^*(892)^0\overline{K}^0$ + c.c.	$(\ 1.0\ \pm 0.4\ ) \times 10^{-3}$	
Γ_{19}	$K^*(892)^+K^-$ + c.c.	$(\ 1.5\ \pm 0.7\ ) \times 10^{-3}$	

Γ_{20}	$K_J^*(1430)^0\overline{K}^0 +$ c.c. $\rightarrow$ $K_S^0 K^+\pi^- +$ c.c.	$<$ 8	$\times 10^{-4}$	CL=90%
Γ_{21}	$K_J^*(1430)^+ K^- +$ c.c. $\rightarrow$ $K_S^0 K^+\pi^- +$ c.c.	$<$ 2.2	$\times 10^{-3}$	CL=90%
Γ_{22}	$K^+K^-\pi^0$	(1.85$\pm$0.25)	$\times 10^{-3}$	
Γ_{23}	$\eta\pi^+\pi^-$	(4.9 $\pm$0.5)	$\times 10^{-3}$	
Γ_{24}	$a_0(980)^+\pi^- +$ c.c. $\rightarrow$ $\eta\pi^+\pi^-$	(1.8 $\pm$0.6)	$\times 10^{-3}$	
Γ_{25}	$f_2(1270)\eta$	(2.7 $\pm$0.8)	$\times 10^{-3}$	
Γ_{26}	$\pi^+\pi^-\eta'$	(2.3 $\pm$0.5)	$\times 10^{-3}$	
Γ_{27}	$K^+K^-\eta'(958)$	(8.8 $\pm$0.9)	$\times 10^{-4}$	
Γ_{28}	$K_0^*(1430)^+ K^- +$ c.c.	(6.4 $^{+2.2}_{-2.8}$)	$\times 10^{-4}$	
Γ_{29}	$f_0(980)\eta'(958)$	(1.6 $^{+1.4}_{-0.7}$)	$\times 10^{-4}$	
Γ_{30}	$f_0(1710)\eta'(958)$	(7 $^{+7}_{-5}$)	$\times 10^{-5}$	
Γ_{31}	$f_2'(1525)\eta'(958)$	(9 $\pm$6)	$\times 10^{-5}$	
Γ_{32}	$\pi^0 f_0(980) \rightarrow \pi^0\pi^+\pi^-$	$<$ 6	$\times 10^{-6}$	CL=90%
Γ_{33}	$K^+\overline{K}^*(892)^0\pi^- +$ c.c.	(3.2 $\pm$2.1)	$\times 10^{-3}$	
Γ_{34}	$K^*(892)^0\overline{K}^*(892)^0$	(1.5 $\pm$0.4)	$\times 10^{-3}$	
Γ_{35}	$K^+K^-K_S^0K_S^0$	$<$ 4	$\times 10^{-4}$	CL=90%
Γ_{36}	$K^+K^-K^+K^-$	(5.5 $\pm$1.1)	$\times 10^{-4}$	
Γ_{37}	$K^+K^-\phi$	(4.2 $\pm$1.6)	$\times 10^{-4}$	
Γ_{38}	$\overline{K}^0K^+\pi^-\phi +$ c.c.	(3.3 $\pm$0.5)	$\times 10^{-3}$	
Γ_{39}	$K^+K^-\pi^0\phi$	(1.62$\pm$0.30)	$\times 10^{-3}$	
Γ_{40}	$\phi\pi^+\pi^-\pi^0$	(7.5 $\pm$1.0)	$\times 10^{-4}$	
Γ_{41}	$\omega\omega$	(5.8 $\pm$0.7)	$\times 10^{-4}$	
Γ_{42}	ωK^+K^-	(7.8 $\pm$0.9)	$\times 10^{-4}$	
Γ_{43}	$\omega\phi$	(2.1 $\pm$0.6)	$\times 10^{-5}$	
Γ_{44}	$\phi\phi$	(4.2 $\pm$0.5)	$\times 10^{-4}$	
Γ_{45}	$p\overline{p}$	(7.72$\pm$0.35)	$\times 10^{-5}$	
Γ_{46}	$p\overline{p}\pi^0$	(1.59$\pm$0.19)	$\times 10^{-4}$	
Γ_{47}	$p\overline{p}\eta$	(1.48$\pm$0.25)	$\times 10^{-4}$	
Γ_{48}	$p\overline{p}\omega$	(2.16$\pm$0.31)	$\times 10^{-4}$	
Γ_{49}	$p\overline{p}\phi$	$<$ 1.8	$\times 10^{-5}$	CL=90%
Γ_{50}	$p\overline{p}\pi^+\pi^-$	(5.0 $\pm$1.9)	$\times 10^{-4}$	
Γ_{51}	$p\overline{p}\pi^0\pi^0$			
Γ_{52}	$p\overline{p}K^+K^-$(non-resonant)	(1.30$\pm$0.23)	$\times 10^{-4}$	
Γ_{53}	$p\overline{p}K_S^0K_S^0$	$<$ 4.5	$\times 10^{-4}$	CL=90%
Γ_{54}	$p\overline{n}\pi^-$	(3.9 $\pm$0.5)	$\times 10^{-4}$	
Γ_{55}	$\overline{p}n\pi^+$	(4.0 $\pm$0.5)	$\times 10^{-4}$	
Γ_{56}	$p\overline{n}\pi^-\pi^0$	(1.05$\pm$0.12)	$\times 10^{-3}$	
Γ_{57}	$\overline{p}n\pi^+\pi^0$	(1.03$\pm$0.12)	$\times 10^{-3}$	
Γ_{58}	$\Lambda\overline{\Lambda}$	(1.16$\pm$0.12)	$\times 10^{-4}$	
Γ_{59}	$\Lambda\overline{\Lambda}\pi^+\pi^-$	(3.0 $\pm$0.5)	$\times 10^{-4}$	

Γ_{60}	$\Lambda\overline{\Lambda}\pi^+\pi^-$ (non-resonant)	(2.5 ±0.6)	$\times 10^{-4}$	
Γ_{61}	$\Sigma(1385)^+\overline{\Lambda}\pi^-$ + c.c.	< 1.3	$\times 10^{-4}$	CL=90%
Γ_{62}	$\Sigma(1385)^-\overline{\Lambda}\pi^+$ + c.c.	< 1.3	$\times 10^{-4}$	CL=90%
Γ_{63}	$K^+\overline{p}\Lambda$	(4.2 ±0.4)	$\times 10^{-4}$	S=1.1
Γ_{64}	$K^+\overline{p}\Lambda(1520)$ + c.c.	(1.7 ±0.5)	$\times 10^{-4}$	
Γ_{65}	$\Lambda(1520)\overline{\Lambda}(1520)$	< 1.0	$\times 10^{-4}$	CL=90%
Γ_{66}	$\Sigma^0\overline{\Sigma}^0$	< 4	$\times 10^{-5}$	CL=90%
Γ_{67}	$\Sigma^+\overline{\Sigma}^-$	< 6	$\times 10^{-5}$	CL=90%
Γ_{68}	$\Sigma(1385)^+\overline{\Sigma}(1385)^-$	< 1.0	$\times 10^{-4}$	CL=90%
Γ_{69}	$\Sigma(1385)^-\overline{\Sigma}(1385)^+$	< 5	$\times 10^{-5}$	CL=90%
Γ_{70}	$K^-\Lambda\overline{\Xi}^+$ + c.c.	(1.38±0.25)	$\times 10^{-4}$	
Γ_{71}	$\Xi^0\overline{\Xi}^0$	< 6	$\times 10^{-5}$	CL=90%
Γ_{72}	$\Xi^-\overline{\Xi}^+$	(8.2 ±2.2)	$\times 10^{-5}$	
Γ_{73}	$\pi^+\pi^-$ + K^+K^-	< 2.1	$\times 10^{-3}$	
Γ_{74}	$K^0_S K^0_S$	< 6	$\times 10^{-5}$	CL=90%
Γ_{75}	$\eta_c\pi^+\pi^-$	< 3.2	$\times 10^{-3}$	CL=90%

Radiative decays

Γ_{76}	$\gamma J/\psi(1S)$	(33.9 ±1.2)	%	
Γ_{77}	$\gamma\rho^0$	(2.20±0.18)	$\times 10^{-4}$	
Γ_{78}	$\gamma\omega$	(6.9 ±0.8)	$\times 10^{-5}$	
Γ_{79}	$\gamma\phi$	(2.5 ±0.5)	$\times 10^{-5}$	
Γ_{80}	$\gamma\gamma$			

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 239 measurements to determine 49 parameters. The overall fit has a $\chi^2 = 342.4$ for 190 degrees of freedom.

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

x_{36}	6				
x_{45}	8	3			
x_{58}	13	5	7		
x_{76}	31	13	6	26	
Γ	−19	−8	−62	−16	−51
	x_{17}	x_{36}	x_{45}	x_{58}	x_{76}

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

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

$\Gamma(p\overline{p}) \times \Gamma(\gamma J/\psi(1S))/\Gamma_{total}$ **$\Gamma_{45}\Gamma_{76}/\Gamma$**

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
21.9±0.8 OUR FIT				
21.4±0.9 OUR AVERAGE				
21.5±0.5±0.8	[1] ANDREOTTI	05A	E835	$p\overline{p} \to e^+e^-\gamma$
21.4±1.5±2.2	[1,2] ARMSTRONG	92	E760	$\overline{p}p \to e^+e^-\gamma$
$19.9^{+4.4}_{-4.0}$	[1] BAGLIN	86B	SPEC	$\overline{p}p \to e^+e^-X$

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

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

HADRONIC DECAYS

$\Gamma(3(\pi^+\pi^-))/\Gamma_{total}$ **Γ_1/Γ**

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
5.8±1.4 OUR EVALUATION Error includes scale factor of 1.2. Treating systematic error as correlated.				
5.8±1.1 OUR AVERAGE				
5.4±0.7±0.9	[1] BAI	99B	BES	$\psi(2S) \to \gamma\chi_{c1}$
16.0±5.9±0.8	[1] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c1}$

[1] Rescaled by us using B($\psi(2S) \to \gamma\chi_{c1}$) = (8.8 ± 0.4)% and B($\psi(2S) \to J/\psi(1S)\pi^+\pi^-$) = (32.6 ± 0.5)%.

$\Gamma(2(\pi^+\pi^-))/\Gamma_{total}$ **Γ_2/Γ**

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
7.6±2.6 OUR EVALUATION Treating systematic error as correlated.				
8 ±4 OUR AVERAGE Error includes scale factor of 1.5.				
4.6±2.1±2.6	[1] BAI	99B	BES	$\psi(2S) \to \gamma\chi_{c1}$
12.5±4.2±0.6	[1] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c1}$

[1] Rescaled by us using B($\psi(2S) \to \gamma\chi_{c1}$) = (8.8 ± 0.4)% and B($\psi(2S) \to J/\psi(1S)\pi^+\pi^-$) = (32.6 ± 0.5)%.

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
1.22±0.15±0.04	604.7	[1] HE	08B	CLEO	$e^+e^- \to \gamma h^+h^-h^0h^0$

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

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

VALUE (%)	EVTS		DOCUMENT ID		TECN	COMMENT
1.48±0.24±0.05	712.3	[1,2]	HE	08B	CLEO	$e^+e^- \to \gamma h^+ h^- h^0 h^0$

[1] HE 08B reports 1.56 ± 0.13 ± 0.22 ± 0.10 % from a measurement of $[\Gamma(\chi_{c1}(1P) \to \rho^+\pi^-\pi^0 + \text{ c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.07\pm0.11\pm0.54)\times10^{-2}$, which we rescale to our best value $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] 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.

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (units 10^{-4})		DOCUMENT ID		TECN	COMMENT
39±35	[1]	TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c1}$

[1] Estimated using $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = 0.087$. The errors do not contain the uncertainty in the $\psi(2S)$ decay.

$\Gamma(4\pi^0)/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE (units 10^{-3})	EVTS		DOCUMENT ID		TECN	COMMENT
0.55±0.08±0.02	608	[1]	ABLIKIM	11A	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c1}$

[1] ABLIKIM 11A reports $(0.57\pm0.03\pm0.08)\times10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to 4\pi^0)/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
4.5±1.0 OUR EVALUATION	Treating systematic error as correlated.			
4.5±0.9 OUR AVERAGE				
4.2±0.4±0.9	[1] BAI	99B	BES	$\psi(2S) \to \gamma\chi_{c1}$
7.3±3.0±0.4	[1] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c1}$

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

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

VALUE (%)	EVTS		DOCUMENT ID		TECN	COMMENT
0.114±0.028±0.004	45.1	[1]	HE	08B	CLEO	$e^+e^- \to \gamma h^+ h^- h^0 h^0$

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

$\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE (units 10^{-3})	EVTS		DOCUMENT ID		TECN	COMMENT
11.46±0.12±1.29	12k	[1]	ABLIKIM	13B	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c1}$

[1] Using 1.06×10^8 $\psi(2S)$ mesons and $\text{B}(\psi(2S) \to \chi_{c1}\gamma) = (9.2 \pm 0.4)\%$.

$\Gamma(K^0_S K^\pm \pi^\mp \pi^+ \pi^-)/\Gamma_{total}$ Γ_{10}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
7.52±0.11±0.79	5.1k	[1] ABLIKIM	13B	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c1}$

[1] Using 1.06×10^8 $\psi(2S)$ mesons and $B(\psi(2S) \to \chi_{c1}\gamma) = (9.2 \pm 0.4)\%$.

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

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.87±0.14±0.03	141.3	[1] HE	08B	CLEO	$e^+e^- \to \gamma h^+ h^- h^0 h^0$

[1] HE 08B reports $0.92 \pm 0.09 \pm 0.11 \pm 0.06$ % from a measurement of $[\Gamma(\chi_{c1}(1P) \to K^+\pi^-\overline{K}^0\pi^0 + \text{c.c.})/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho^- K^+ \overline{K}^0 + \text{c.c.})/\Gamma_{total}$ Γ_{12}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.51±0.12±0.02	141.3	[1] HE	08B	CLEO	$e^+e^- \to \gamma h^+ h^- h^0 h^0$

[1] HE 08B reports $0.54 \pm 0.11 \pm 0.07 \pm 0.03$ % from a measurement of $[\Gamma(\chi_{c1}(1P) \to \rho^- K^+ \overline{K}^0 + \text{c.c.})/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)^0\overline{K}^0\pi^0 \to K^+\pi^-\overline{K}^0\pi^0 + \text{c.c.})/\Gamma_{total}$ Γ_{13}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.24±0.06±0.01	141.3	[1] HE	08B	CLEO	$e^+e^- \to \gamma h^+ h^- h^0 h^0$

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

$\Gamma(K^+K^-\eta\pi^0)/\Gamma_{total}$ Γ_{14}/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
0.114±0.035±0.004	141.3	[1] HE	08B	CLEO	$e^+e^- \to \gamma h^+ h^- h^0 h^0$

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

$\Gamma(\pi^+\pi^- K^0_S K^0_S)/\Gamma_{total}$ Γ_{15}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.0±3.0±0.2	19.8±7.7	[1] ABLIKIM	05O	BES2	$\psi(2S) \to \chi_{c1}\gamma$

[1] ABLIKIM 05O reports $[\Gamma(\chi_{c1}(1P) \to \pi^+\pi^- K^0_S K^0_S)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))] = (0.67 \pm 0.26 \pm 0.11) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+K^-\eta)/\Gamma_{total}$ Γ_{16}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
0.32±0.10±0.01	[1] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

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

$\Gamma(\overline{K^0}K^+\pi^- + c.c.)/\Gamma_{total}$ Γ_{17}/Γ

VALUE (units 10^{-3})	DOCUMENT ID
7.1±0.6 OUR FIT	

$\Gamma(K^*(892)^0\overline{K}^0 + c.c.)/\Gamma_{total}$ Γ_{18}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.00±0.37±0.03	22	[1] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c1}$

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

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.46±0.66±0.05	27	[1] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c1}$

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

$\Gamma(K_J^*(1430)^0\overline{K}^0 + c.c. \to K_S^0K^+\pi^- + c.c.)/\Gamma_{total}$ Γ_{20}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<0.8	90	[1] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c1}$

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

$\Gamma(K_J^*(1430)^+K^- + c.c. \to K_S^0K^+\pi^- + c.c.)/\Gamma_{total}$ Γ_{21}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<2.2	90	[1] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c1}$

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

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

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
1.85±0.24±0.06	[1] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

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

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
4.9±0.5 OUR AVERAGE					
4.7±0.5±0.2		[1] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$
5.4±0.9±0.2	222	[2] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c1}$

[1] ATHAR 07 reports $(5.0 \pm 0.3 \pm 0.5) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to \eta\pi^+\pi^-)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] ABLIKIM 06R reports $(5.9 \pm 0.7 \pm 0.8) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to \eta\pi^+\pi^-)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(a_0(980)^+\pi^- + \text{c.c.} \to \eta\pi^+\pi^-)/\Gamma_{total}$ Γ_{24}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.8±0.6±0.1	58	[1] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c1}$

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

$\Gamma(f_2(1270)\eta)/\Gamma_{total}$ Γ_{25}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
2.7±0.8±0.1	53	[1] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c1}$

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

$\Gamma(\pi^+\pi^-\eta')/\Gamma_{total}$ Γ_{26}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
2.3±0.5±0.1	[1] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

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

$\Gamma(K^+K^-\eta'(958))/\Gamma_{\text{total}}$ Γ_{27}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
8.75±0.87	310	[1] ABLIKIM	14J	BES3	$\psi(2S) \to \gamma K^+K^-\eta'(958)$

[1] Derived using $\text{B}(\psi(2S) \to \gamma\chi_{c1}) = (9.2 \pm 0.4)\%$. Uncertainty includes both statistical and systematic contributions combined in quadrature.

$\Gamma(K_0^*(1430)^+K^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{28}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{6.41 \pm 0.57^{+2.09}_{-2.71}}$	[1] ABLIKIM	14J	BES3	$\psi(2S) \to \gamma K^+K^-\eta'(958)$

[1] Normalized to $\text{B}(\chi_{c1} \to K^+K^-\eta'(958))$ branching fraction.

$\Gamma(f_0(980)\eta'(958))/\Gamma_{\text{total}}$ Γ_{29}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.65 \pm 0.47^{+1.32}_{-0.56}}$	[1] ABLIKIM	14J	BES3	$\psi(2S) \to \gamma K^+K^-\eta'(958)$

[1] Normalized to $\text{B}(\chi_{c1} \to K^+K^-\eta'(958))$ branching fraction.

$\Gamma(f_0(1710)\eta'(958))/\Gamma_{\text{total}}$ Γ_{30}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.71 \pm 0.22^{+0.68}_{-0.48}}$	[1] ABLIKIM	14J	BES3	$\psi(2S) \to \gamma K^+K^-\eta'(958)$

[1] Normalized to $\text{B}(\chi_{c1} \to K^+K^-\eta'(958))$ branching fraction.

$\Gamma(f_2'(1525)\eta'(958))/\Gamma_{\text{total}}$ Γ_{31}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.92 \pm 0.23^{+0.55}_{-0.51}}$	[1] ABLIKIM	14J	BES3	$\psi(2S) \to \gamma K^+K^-\eta'(958)$

[1] Normalized to $\text{B}(\chi_{c1} \to K^+K^-\eta'(958))$ branching fraction.

$\Gamma(\pi^0 f_0(980) \to \pi^0\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{32}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{< 6 \times 10^{-6}}$	90	[1] ABLIKIM	11D	BES3	$\psi(2S) \to \gamma\pi^0\pi^+\pi^-$

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

$\Gamma(K^+\overline{K}^*(892)^0\pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{33}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
32±21	[1] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c1}$

[1] Estimated using $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = 0.087$. The errors do not contain the uncertainty in the $\psi(2S)$ decay.

$\Gamma(K^*(892)^0\overline{K}^*(892)^0)/\Gamma_{total}$ Γ_{34}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.47±0.36±0.05	28.4 ± 5.5	[1,2] ABLIKIM	04H	BES	$\psi(2S) \to \gamma K^+ K^- \pi^+ \pi^-$

[1] ABLIKIM 04H reports $[\Gamma(\chi_{c1}(1P) \to K^*(892)^0\overline{K}^*(892)^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))] = (1.40 \pm 0.27 \pm 0.22) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] Assumes $B(K^*(892)^0 \to K^-\pi^+) = 2/3$.

$\Gamma(K^+K^-K^0_SK^0_S)/\Gamma_{total}$ Γ_{35}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<4	90	3.2 ± 2.4	[1] ABLIKIM	05O	BES2	$\psi(2S) \to \chi_{c1}\gamma$

[1] ABLIKIM 05O reports $[\Gamma(\chi_{c1}(1P) \to K^+K^-K^0_SK^0_S)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))] < 4.2 \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$.

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

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

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.42±0.15±0.01	17	[1] ABLIKIM	06T	BES2	$\psi(2S) \to \gamma 2K^+ 2K^-$

[1] ABLIKIM 06T reports $(0.46 \pm 0.16 \pm 0.06) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to K^+K^-\phi)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\overline{K}^0K^+\pi^-\phi + \text{c.c.})/\Gamma_{total}$ Γ_{38}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
3.27±0.28±0.46	ABLIKIM	15M	BES3	$\psi(2S) \to \gamma\chi_{c1}$

$\Gamma(K^+K^-\pi^0\phi)/\Gamma_{total}$ Γ_{39}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
1.62±0.12±0.28	ABLIKIM	15M	BES3	$\psi(2S) \to \gamma\chi_{c1}$

$\Gamma(\phi\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{40}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.75±0.06±0.08	373	[1] ABLIKIM	13B	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c1}$

[1] Using 1.06×10^8 $\psi(2S)$ mesons and $B(\psi(2S) \to \chi_{c1}\gamma) = (9.2 \pm 0.4)\%$.

$\Gamma(\omega\omega)/\Gamma_{total}$ Γ_{41}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
5.8±0.7±0.2	597	[1] ABLIKIM	11K	BES3	$\psi(2S) \to \gamma$ hadrons

[1] ABLIKIM 11K reports $(6.0 \pm 0.3 \pm 0.7) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to \omega\omega)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\omega K^+ K^-)/\Gamma_{total}$ Γ_{42}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.78±0.04±0.08	628	[1] ABLIKIM	13B	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c1}$

[1] Using 1.06×10^8 $\psi(2S)$ mesons and $B(\psi(2S) \to \chi_{c1}\gamma) = (9.2 \pm 0.4)\%$.

$\Gamma(\omega\phi)/\Gamma_{total}$ Γ_{43}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.21±0.06±0.01	15	[1] ABLIKIM	11K	BES3	$\psi(2S) \to \gamma$ hadrons

[1] ABLIKIM 11K reports $(0.22 \pm 0.06 \pm 0.02) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to \omega\phi)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
4.2±0.5±0.1	366	[1] ABLIKIM	11K	BES3	$\psi(2S) \to \gamma$ hadrons

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

$\Gamma(p\bar{p})/\Gamma_{total}$ Γ_{45}/Γ

VALUE (units 10^{-4})	DOCUMENT ID
0.772±0.035 OUR FIT	

$\Gamma(p\bar{p}\pi^0)/\Gamma_{total}$ Γ_{46}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
0.159±0.019 OUR AVERAGE				
0.166±0.020±0.005	[1] ONYISI	10	CLE3	$\psi(2S) \to \gamma p\bar{p}X$
0.114±0.048±0.004	[2] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

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

[2] ATHAR 07 reports $(1.2 \pm 0.5 \pm 0.1) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to p\overline{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\overline{p}\eta)/\Gamma_{\text{total}}$ Γ_{47}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
0.148±0.025±0.005		[1] ONYISI	10	CLE3	$\psi(2S) \to \gamma p\overline{p}X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.15	90	[2] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

[1] ONYISI 10 reports $(1.56 \pm 0.22 \pm 0.14 \pm 0.10) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to p\overline{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] ATHAR 07 reports $< 0.16 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to p\overline{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$.

$\Gamma(p\overline{p}\omega)/\Gamma_{\text{total}}$ Γ_{48}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
0.216±0.031±0.007	[1] ONYISI	10	CLE3	$\psi(2S) \to \gamma p\overline{p}X$

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

$\Gamma(p\overline{p}\phi)/\Gamma_{\text{total}}$ Γ_{49}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<1.8	90	[1] ABLIKIM	11F	BES3	$\psi(2S) \to \gamma p\overline{p}K^+K^-$

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

$\Gamma(p\overline{p}\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{50}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
0.50±0.19 OUR EVALUATION	Treating systematic error as correlated.			
0.50±0.19 OUR AVERAGE				
0.46±0.12±0.15	[1] BAI	99B	BES	$\psi(2S) \to \gamma\chi_{c1}$
1.08±0.77±0.05	[1] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c1}$

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

$\Gamma(p\overline{p}\pi^0\pi^0)/\Gamma_{total}$ Γ_{51}/Γ

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<0.05	90	[1] HE	08B	CLEO	$e^+e^- \to \gamma h^+ h^- h^0 h^0$

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

$\Gamma(p\overline{p}K^+K^-(\text{non-resonant}))/\Gamma_{total}$ Γ_{52}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.30±0.23±0.04	82 ± 9	[1] ABLIKIM	11F	BES3	$\psi(2S) \to \gamma p\overline{p}K^+K^-$

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

$\Gamma(p\overline{p}K^0_SK^0_S)/\Gamma_{total}$ Γ_{53}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<4.5	90	[1] ABLIKIM	06D	BES2	$\psi(2S) \to \gamma\chi_{c1}$

[1] Using $B(\psi(2S) \to \chi_{c1}\gamma)$ (9.1 ± 0.6)%.

$\Gamma(p\overline{n}\pi^-)/\Gamma_{total}$ Γ_{54}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
3.9±0.5±0.1	1412	[1] ABLIKIM	12J	BES3	$\psi(2S) \to \gamma p\overline{n}\pi^-$

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

$\Gamma(\overline{p}n\pi^+)/\Gamma_{total}$ Γ_{55}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
4.0±0.5±0.1	1625	[1] ABLIKIM	12J	BES3	$\psi(2S) \to \gamma\overline{p}n\pi^+$

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

$\Gamma(p\overline{n}\pi^-\pi^0)/\Gamma_{total}$ Γ_{56}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
10.5±1.2±0.3	1082	[1] ABLIKIM	12J	BES3	$\psi(2S) \to \gamma p\overline{n}\pi^-\pi^0$

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

$\Gamma(\overline{p}n\pi^+\pi^0)/\Gamma_{total}$ Γ_{57}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
10.3±1.2±0.3	1261	[1] ABLIKIM	12J	BES3	$\psi(2S) \to \gamma\overline{p}n\pi^+\pi^0$

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

$\Gamma(\Lambda\overline{\Lambda})/\Gamma_{total}$ Γ_{58}/Γ

VALUE (units 10^{-4})	DOCUMENT ID
1.16±0.12 OUR FIT	

$\Gamma(\Lambda\overline{\Lambda}\pi^+\pi^-)/\Gamma_{total}$ Γ_{59}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
30±5±1		105	[1] ABLIKIM	12I	BES3	$\psi(2S) \to \gamma\Lambda\overline{\Lambda}\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<150	90		[2] ABLIKIM	06D	BES2	$\psi(2S) \to \gamma\chi_{c1}$

[1] ABLIKIM 12I reports $(31.1 \pm 3.4 \pm 3.9) \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to \Lambda\overline{\Lambda}\pi^+\pi^-)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] Using $B(\psi(2S) \to \chi_{c1}\gamma)$ (9.1 ± 0.6)%.

$\Gamma(\Lambda\overline{\Lambda}\pi^+\pi^-(\text{non-resonant}))/\Gamma_{total}$ Γ_{60}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
25±6±1	13	[1] ABLIKIM	12I	BES3	$\psi(2S) \to \gamma\Lambda\overline{\Lambda}\pi^+\pi^-$

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

$\Gamma(\Sigma(1385)^+\overline{\Lambda}\pi^- + \text{c.c.})/\Gamma_{total}$ Γ_{61}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<13	90	[1] ABLIKIM	12I	BES3	$\psi(2S) \to \gamma\Sigma(1385)^+\overline{\Lambda}\pi^-$

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

$\Gamma(\Sigma(1385)^-\overline{\Lambda}\pi^+ + \text{c.c.})/\Gamma_{total}$ Γ_{62}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<13	90	[1] ABLIKIM	12I	BES3	$\psi(2S) \to \gamma\Sigma(1385)^-\overline{\Lambda}\pi^+$

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

$\Gamma(K^+\overline{p}\Lambda)/\Gamma_{\text{total}}$ Γ_{63}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
4.2±0.4 OUR AVERAGE	Error includes scale factor of 1.1.				
4.3±0.4±0.1	3k	[1,2] ABLIKIM	13D	BES3	$\psi(2S) \to \gamma\Lambda\overline{p}K^+$
3.1±0.9±0.1		[3] ATHAR	07	CLEO	$\psi(2S) \to \gamma h^+ h^- h^0$

[1] ABLIKIM 13D reports $(4.5 \pm 0.2 \pm 0.4) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to K^+\overline{p}\Lambda)/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] Using $\text{B}(\Lambda \to p\pi^-) = 63.9\%$.

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

$\Gamma(K^+\overline{p}\Lambda(1520)+\text{c.c.})/\Gamma_{\text{total}}$ Γ_{64}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.7±0.4±0.1	48 ± 10	[1] ABLIKIM	11F	BES3	$\psi(2S) \to \gamma p\overline{p}K^+K^-$

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

$\Gamma(\Lambda(1520)\overline{\Lambda}(1520))/\Gamma_{\text{total}}$ Γ_{65}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.0	90	[1] ABLIKIM	11F	BES3	$\psi(2S) \to \gamma p\overline{p}K^+K^-$

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

$\Gamma(\Sigma^0\overline{\Sigma}^0)/\Gamma_{\text{total}}$ Γ_{66}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<0.4	90	3.8 ± 2.5	[1] NAIK	08	CLEO	$\psi(2S) \to \gamma\Sigma^0\overline{\Sigma}^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.6	90		[2] ABLIKIM	13H	BES3	$\psi(2S) \to \gamma\Sigma^0\overline{\Sigma}^0$

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

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

$\Gamma(\Sigma^+\overline{\Sigma}^-)/\Gamma_{\text{total}}$ Γ_{67}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<0.6	90	4.3 ± 2.3	[1] NAIK	08	CLEO	$\psi(2S) \to \gamma\Sigma^+\overline{\Sigma}^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.8	90		[2] ABLIKIM	13H	BES3	$\psi(2S) \to \gamma\Sigma^+\overline{\Sigma}^-$

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

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

$\Gamma(\Sigma(1385)^+\overline{\Sigma}(1385)^-)/\Gamma_{\text{total}}$ Γ_{68}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<10	90	[1] ABLIKIM	12I	BES3	$\psi(2S) \to \gamma\Lambda\overline{\Lambda}\pi^+\pi^-$

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

$\Gamma(\Sigma(1385)^-\overline{\Sigma}(1385)^+)/\Gamma_{\text{total}}$ Γ_{69}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<5	90	[1] ABLIKIM	12I	BES3	$\psi(2S) \to \gamma\Lambda\overline{\Lambda}\pi^+\pi^-$

[1] ABLIKIM 12I reports $< 5.7 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to \Sigma(1385)^-\overline{\Sigma}(1385)^+)/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P))]$ assuming $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = 9.55 \times 10^{-2}$.

$\Gamma(K^-\Lambda\overline{\Xi}^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{70}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
$1.38 \pm 0.24 \pm 0.05$	49	[1] ABLIKIM	15I	BES3	$\psi(2S) \to \gamma K^-\Lambda\overline{\Xi}^+ + \text{c.c.}$

[1] ABLIKIM 15I reports $[\Gamma(\chi_{c1}(1P) \to K^-\Lambda\overline{\Xi}^+ + \text{c.c.})/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P))] = (1.32 \pm 0.20 \pm 0.12) \times 10^{-5}$ which we divide by our best value $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Xi^0\overline{\Xi}^0)/\Gamma_{total}$ Γ_{71}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<0.6	90	1.7 ± 2.4	[1] NAIK	08	CLEO	$\psi(2S) \to \gamma\Xi^0\overline{\Xi}^0$

[1] NAIK 08 reports $< 0.60\times10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to \Xi^0\overline{\Xi}^0)/\Gamma_{total}]$ $\times$ [B($\psi(2S) \to \gamma\chi_{c1}(1P)$)] assuming B($\psi(2S) \to \gamma\chi_{c1}(1P)$) $= (9.07 \pm 0.11 \pm 0.54)\times 10^{-2}$, which we rescale to our best value B($\psi(2S) \to \gamma\chi_{c1}(1P)$) $= 9.55 \times 10^{-2}$.

$\Gamma(\Xi^-\overline{\Xi}^+)/\Gamma_{total}$ Γ_{72}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.82±0.22±0.03		16.4 ± 4.3	[1] NAIK	08	CLEO	$\psi(2S) \to \gamma\Xi^+\overline{\Xi}^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 3.4	90		[2] ABLIKIM	06D	BES2	$\psi(2S) \to \gamma\chi_{c1}$

[1] NAIK 08 reports $(0.86 \pm 0.22 \pm 0.08) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \to \Xi^-\overline{\Xi}^+)/\Gamma_{total}]$ $\times$ [B($\psi(2S) \to \gamma\chi_{c1}(1P)$)] assuming B($\psi(2S) \to \gamma\chi_{c1}(1P)$) $= (9.07 \pm 0.11 \pm 0.54)\times 10^{-2}$, which we rescale to our best value B($\psi(2S) \to \gamma\chi_{c1}(1P)$) $= (9.55 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] Using B($\psi(2S) \to \chi_{c1}\gamma$) (9.1 ± 0.6)%.

$[\Gamma(\pi^+\pi^-) + \Gamma(K^+K^-)]/\Gamma_{total}$ Γ_{73}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<21		[1] FELDMAN	77	MRK1	$\psi(2S) \to \gamma\chi_{c1}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<38	90	[1] BRANDELIK	79B	DASP	$\psi(2S) \to \gamma\chi_{c1}$

[1] Estimated using B($\psi(2S) \to \gamma\chi_{c1}(1P)$) = 0.087. The errors do not contain the uncertainty in the $\psi(2S)$ decay.

$\Gamma(K^0_S K^0_S)/\Gamma_{total}$ Γ_{74}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.6	90	[1] ABLIKIM	05O	BES2	$\psi(2S) \to \chi_{c1}\gamma$

[1] ABLIKIM 05O reports $[\Gamma(\chi_{c1}(1P) \to K^0_S K^0_S)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\chi_{c1}(1P))]$ $< 0.6\times10^{-5}$ which we divide by our best value B($\psi(2S) \to \gamma\chi_{c1}(1P)$) $= 9.55\times10^{-2}$.

$\Gamma(\eta_c\pi^+\pi^-)/\Gamma_{total}$ Γ_{75}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.2\times10^{-3}$	90	[1,2] ABLIKIM	13B	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c1}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<4.4\times10^{-3}$	90	[1,3] ABLIKIM	13B	BES3	$e^+e^- \to \psi(2S) \to \gamma\chi_{c1}$

[1] Using 1.06×10^8 $\psi(2S)$ mesons and B($\psi(2S) \to \chi_{c1}\gamma$) = (9.2 ± 0.4)%.

[2] Using the $\eta_c \to K^0_S K^\pm\pi^\mp$ decays.

[3] Using the $\eta_c \to K^+K^-\pi^0$ decays.

RADIATIVE DECAYS

$\Gamma(\gamma J/\psi(1S))/\Gamma_{total}$ Γ_{76}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.339±0.012 OUR FIT			

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

0.379±0.008±0.021	[1] ADAM	05A	CLEO	$e^+e^- \to \psi(2S) \to \gamma\chi_{c1}$

[1] Uses B($\psi(2S) \to \gamma\chi_{c1} \to \gamma\gamma J/\psi$) from ADAM 05A and B($\psi(2S) \to \gamma\chi_{c1}$) from ATHAR 04.

$\Gamma(\gamma\rho^0)/\Gamma_{total}$ Γ_{77}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
220±18 OUR AVERAGE					
220±23±7	432 ± 25	[1] ABLIKIM	11E	BES3	$\psi(2S) \to \gamma\gamma\rho^0$
221±24±7	186 ± 15	[2] BENNETT	08A	CLEO	$\psi(2S) \to \gamma\gamma\rho^0$

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

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

$\Gamma(\gamma\omega)/\Gamma_{total}$ Γ_{78}/Γ

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
69± 8 OUR AVERAGE					
67± 9±2	136 ± 14	[1] ABLIKIM	11E	BES3	$\psi(2S) \to \gamma\gamma\omega$
76±17±2	39 ± 7	[2] BENNETT	08A	CLEO	$\psi(2S) \to \gamma\gamma\omega$

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

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

$\Gamma(\gamma\phi)/\Gamma_{total}$ Γ_{79}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
25±5±1		43 ± 9	[1] ABLIKIM	11E	BES3	$\psi(2S) \to \gamma\gamma\phi$

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

<24	90	5.2 ± 3.1	[2] BENNETT	08A	CLEO	$\psi(2S) \to \gamma\gamma\phi$

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

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

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ Γ_{80}/Γ

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	$\psi(2S) \to \gamma\chi_{c1} \to 3\gamma$
<150	90	[1] YAMADA	77	DASP	$e^+e^- \to 3\gamma$

[1] Estimated using $\text{B}(\psi(2S) \to \gamma\chi_{c1}(1P)) = 0.087$. The errors do not contain the uncertainty in the $\psi(2S)$ decay.

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

$\Gamma(\chi_{c1}(1P) \to p\overline{p})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ $\Gamma_{45}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
2.14±0.11 OUR FIT				
1.1 ±1.0	[1] BAI	98I	BES	$\psi(2S) \to \gamma\chi_{c1} \to \gamma\overline{p}p$

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

$\Gamma(\chi_{c1}(1P) \to \Lambda\overline{\Lambda})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$ $\Gamma_{58}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
11.1±1.1 OUR FIT					
10.9±1.1 OUR AVERAGE					
$11.2 \pm 1.0 \pm 0.9$	136	[1] ABLIKIM	13H	BES3	$\psi(2S) \to \gamma\Lambda\overline{\Lambda}$
$10.5 \pm 1.6 \pm 0.6$	46 ± 7	[2] NAIK	08	CLEO	$\psi(2S) \to \gamma\Lambda\overline{\Lambda}$

[1] Calculated by us. ABLIKIM 13H reports $\text{B}(\chi_{c1} \to \Lambda\overline{\Lambda}) = (12.2 \pm 1.1 \pm 1.1) \times 10^{-5}$ from a measurement of $\text{B}(\chi_{c1} \to \Lambda\overline{\Lambda}) \times \text{B}(\psi(2S) \to \gamma\chi_{c1})$ assuming $\text{B}(\psi(2S) \to \gamma\chi_{c1}) = (9.2 \pm 0.4)\%$.

[2] Calculated by us. NAIK 08 reports $\text{B}(\chi_{c1} \to \Lambda\overline{\Lambda}) = (11.6 \pm 1.8 \pm 0.7 \pm 0.7) \times 10^{-5}$ using $\text{B}(\psi(2S) \to \gamma\chi_{c1}) = (9.07 \pm 0.11 \pm 0.54)\%$.

$\Gamma(\chi_{c1}(1P) \to \Lambda\overline{\Lambda})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ $\Gamma_{58}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

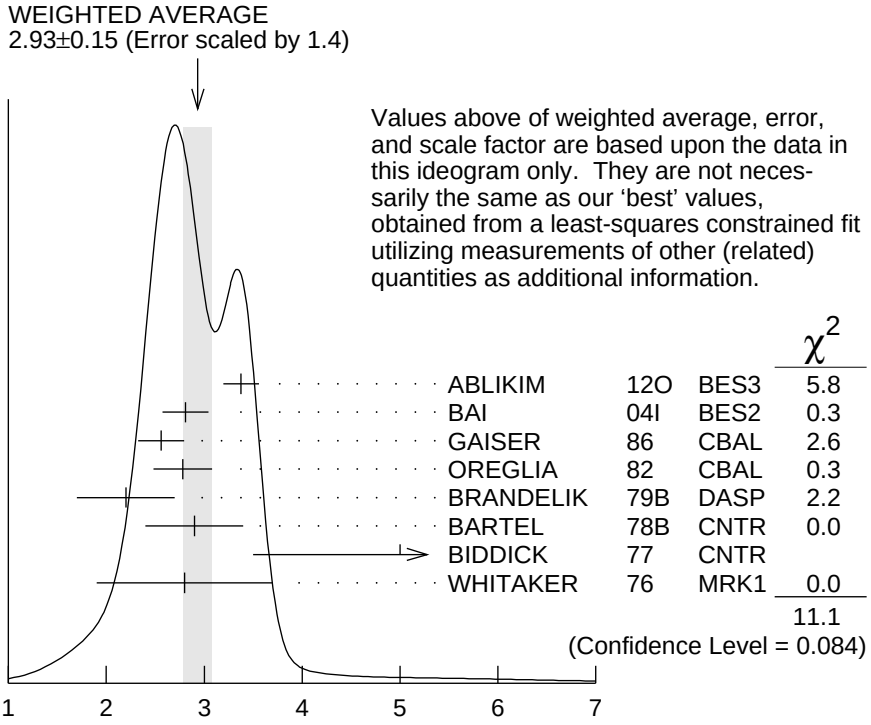
VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
3.22±0.31 OUR FIT					
7.1 $^{+2.8}_{-2.4}$ ±1.3	$9.0^{+3.5}_{-3.1}$	[1] BAI	03E	BES	$\psi(2S) \to \gamma\Lambda\overline{\Lambda}$

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

$\Gamma(\chi_{c1}(1P) \to \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$
$\Gamma_{76}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
3.24 ±0.07 OUR FIT					
2.93 ±0.15 OUR AVERAGE		Error includes scale factor of 1.4. See the ideogram below.			
3.377±0.009±0.183	142k	ABLIKIM	12O	BES3	$\psi(2S) \to \gamma\chi_{c1}$
2.81 ±0.05 ±0.23	13k	BAI	04I	BES2	$\psi(2S) \to J/\psi\gamma\gamma$
2.56 ±0.12 ±0.20		GAISER	86	CBAL	$\psi(2S) \to \gamma$X
2.78 ±0.30		[1] OREGLIA	82	CBAL	$\psi(2S) \to \gamma\chi_{c1}$
2.2 ±0.5		[2] BRANDELIK	79B	DASP	$\psi(2S) \to \gamma\chi_{c1}$
2.9 ±0.5		[2] BARTEL	78B	CNTR	$\psi(2S) \to \gamma\chi_{c1}$
5.0 ±1.5		[3] BIDDICK	77	CNTR	$e^+e^- \to \gamma$X
2.8 ±0.9		[1] WHITAKER	76	MRK1	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3.56 ±0.03 ±0.12	24.9k	[4] MENDEZ	08	CLEO	$\psi(2S) \to \gamma\chi_{c1}$
3.44 ±0.06 ±0.13	3.7k	[5] ADAM	05A	CLEO	Repl. by MENDEZ 08

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



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

10^{-2})

$\Gamma(\chi_{c1}(1P) \to \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\text{anything})$ $\Gamma_{76}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma_{9}^{\psi(2S)}$

$\Gamma_{76}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma_{9}^{\psi(2S)} = \Gamma_{76}/\Gamma \times \Gamma_{135}^{\psi(2S)}/(\Gamma_{11}^{\psi(2S)}+\Gamma_{12}^{\psi(2S)}+\Gamma_{13}^{\psi(2S)}+0.339\Gamma_{135}^{\psi(2S)}+0.192\Gamma_{136}^{\psi(2S)})$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.31±0.11 OUR FIT					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.70±0.04±0.15	24.9k	[1] MENDEZ	08	CLEO	$\psi(2S) \to \gamma\chi_{c1}$
5.77±0.10±0.12	3.7k	ADAM	05A	CLEO	Repl. by MENDEZ 08

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

$\Gamma(\chi_{c1}(1P) \to \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ $\Gamma_{76}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
9.40±0.21 OUR FIT					
10.15±0.28 OUR AVERAGE					
10.17±0.07±0.27	24.9k	MENDEZ	08	CLEO	$\psi(2S) \to \gamma\chi_{c1}$
12.6 ±0.3 ±3.8	3k	[1] ABLIKIM	04B	BES	$\psi(2S) \to J/\psi X$
8.5 ±2.1		[2] HIMEL	80	MRK2	$\psi(2S) \to \gamma\chi_{c1}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
10.24±0.17±0.23	3.7k	[3] ADAM	05A	CLEO	Repl. by MENDEZ 08

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

[2] The value for $B(\psi(2S) \to \gamma\chi_{c1})\times B(\chi_{c1} \to \gamma J/\psi(1S))$ quoted in HIMEL 80 is derived using $B(\psi(2S) \to J/\psi(1S)\pi^+\pi^-) = (33 \pm 3)\%$ and $B(J/\psi(1S) \to \ell^+\ell^-) = 0.138 \pm 0.018$. Calculated by us using $B(J/\psi(1S) \to \ell^+\ell^-) = 0.1181 \pm 0.0020$.

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

$\Gamma(\chi_{c1}(1P) \to \overline{K}^0 K^+\pi^- + \text{c.c.})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$ $\Gamma_{17}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
6.8±0.5 OUR FIT				
7.2±0.6 OUR AVERAGE				
7.3±0.5±0.5	[1] ATHAR	07	CLEO	$\psi(2S) \to \gamma K_S^0 K^+\pi^-$
7.0±0.5±0.9	[2] ABLIKIM	06R	BES2	$\psi(2S) \to \gamma\chi_{c1}$

[1] Calculated by us. The value of $B(\chi_{c1} \to K^0 K^+\pi^- + \text{c.c.})$ reported by ATHAR 07 was derived using $B(\psi(2S) \to \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54)\%$.

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

$\Gamma(\chi_{c1}(1P) \to \overline{K}^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ $\Gamma_{17}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

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

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

$\Gamma(\chi_{c1}(1P) \to K^+K^-K^+K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$ $\Gamma_{36}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma^{\psi(2S)}$

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

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

$\Gamma(\chi_{c1}(1P) \to K^+K^-K^+K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \to J/\psi(1S)\pi^+\pi^-)$ $\Gamma_{36}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$

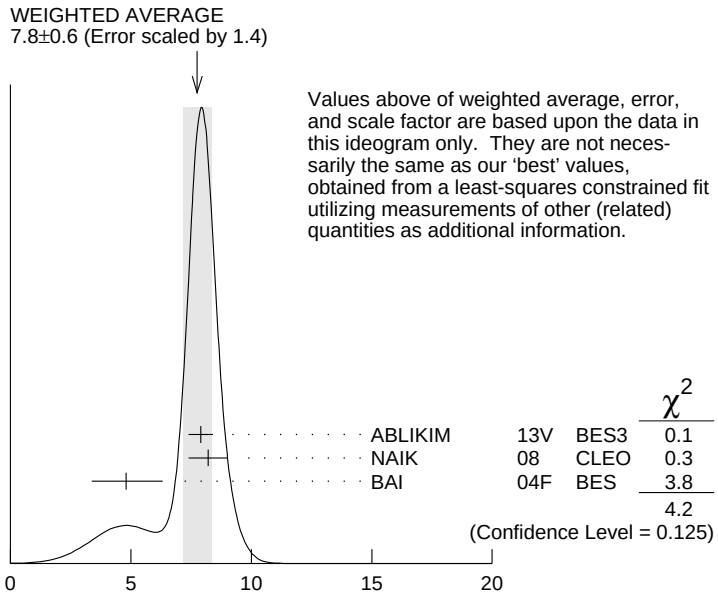
VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
1.52±0.31 OUR FIT				
1.13±0.40±0.29	[1] BAI	99B	BES	$\psi(2S) \to \gamma K^+K^+K^-K^-$

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

$\Gamma(\chi_{c1}(1P) \to p\overline{p})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$ $\Gamma_{45}/\Gamma \times \Gamma_{135}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
7.4±0.4 OUR FIT					
7.8±0.6 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.					
7.9±0.4±0.3	453	ABLIKIM	13V	BES3	$\psi(2S) \to \gamma p\overline{p}$
8.2±0.7±0.4	141 ± 13	[1] NAIK	08	CLEO	$\psi(2S) \to \gamma p\overline{p}$
$4.8^{+1.4}_{-1.3}\pm0.6$	$18.2^{+5.5}_{-4.9}$	BAI	04F	BES	$\psi(2S) \to \gamma\chi_{c1}(1P) \to \gamma\overline{p}p$

[1] Calculated by us. NAIK 08 reports $B(\chi_{c1} \to p\overline{p}) = (9.0 \pm 0.8 \pm 0.4 \pm 0.5) \times 10^{-5}$ using $B(\psi(2S) \to \gamma\chi_{c1}) = (9.07 \pm 0.11 \pm 0.54)\%$.

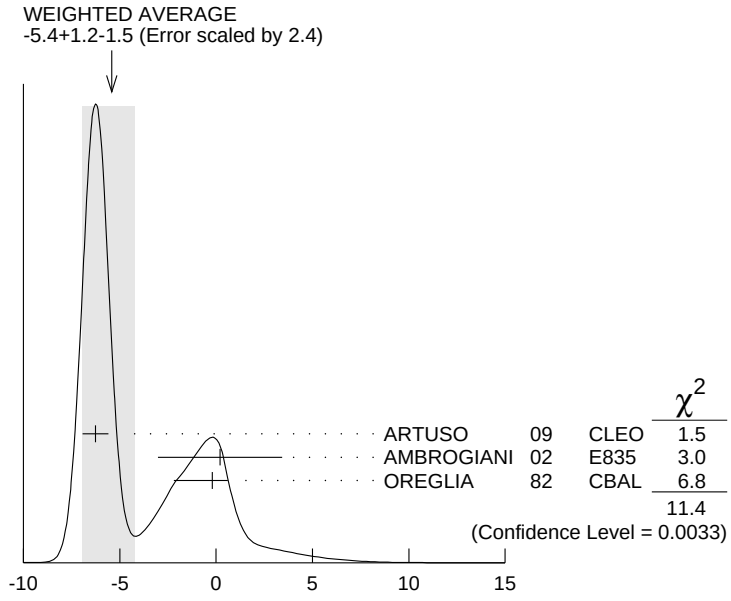


$\Gamma\left(\chi_{c1}(1P) \rightarrow\ p\overline{p}\right)/\Gamma_{\text{total}} \times \Gamma\left(\psi(2S) \rightarrow\ \gamma\chi_{c1}(1P)\right)/\Gamma_{\text{total}}$ (units 10^{-6})

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*
$-5.4\ ^{+1.2}_{-1.5}$ OUR AVERAGE		Error includes scale factor of 2.4. See the ideogram below.			
$-6.26 \pm 0.63 \pm 0.24$	39k	ARTUSO	09	CLEO	$\psi(2S) \rightarrow\ \gamma\gamma\ell^+\ell^-$
$0.2\ \pm 3.2\ \pm 0.4$	2090	AMBROGIANI	02	E835	$p\overline{p} \rightarrow\ \chi_{c1} \rightarrow\ J/\psi\gamma$
$-0.2\ ^{+0.8}_{-2.0}$	921	OREGLIA	82	CBAL	$\psi(2S) \rightarrow\ \chi_{c1}\gamma \rightarrow\ J/\psi\gamma\gamma$



$a_2 = M2/\sqrt{E1^2 + M2^2}$ (units 10^{-2})

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*
2.9 ±0.8 OUR AVERAGE					
$2.76 \pm 0.73 \pm 0.23$	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*
$\mathbf{-2.27^{+0.57}_{-0.99}}$	39k	[1] ARTUSO	09	CLEO	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

[1] 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	15I	PR D91 092006	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	15M	PR D91 112008	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	14J	PR D89 074030	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	13B	PR D87 012002	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	13D	PR D87 012007	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	13H	PR D87 032007	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	13V	PR D88 112001	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	12I	PR D86 052004	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	12J	PR D86 052011	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	12O	PRL 109 172002	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	11A	PR D83 012006	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	11D	PR D83 032003	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	11E	PR D83 112005	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	11F	PR D83 112009	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	11K	PRL 107 092001	M. Ablikim *et al.*	(BES III Collab.)
ONYISI	10	PR D82 011103	P.U.E. Onyisi *et al.*	(CLEO Collab.)
ARTUSO	09	PR D80 112003	M. Artuso *et al.*	(CLEO Collab.)
BENNETT	08A	PRL 101 151801	J.V. Bennett *et al.*	(CLEO Collab.)
ECKLUND	08A	PR D78 091501	K.M. Ecklund *et al.*	(CLEO Collab.)
HE	08B	PR D78 092004	Q. He *et al.*	(CLEO Collab.)
MENDEZ	08	PR D78 011102	H. Mendez *et al.*	(CLEO Collab.)
NAIK	08	PR D78 031101	P. Naik *et al.*	(CLEO Collab.)
ATHAR	07	PR D75 032002	S.B. Athar *et al.*	(CLEO Collab.)
ABLIKIM	06D	PR D73 052006	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	06R	PR D74 072001	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	06T	PL B642 197	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	05G	PR D71 092002	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	05O	PL B630 21	M. Ablikim *et al.*	(BES Collab.)
ADAM	05A	PRL 94 232002	N.E. Adam *et al.*	(CLEO Collab.)
ANDREOTTI	05A	NP B717 34	M. Andreotti *et al.*	(FNAL E835 Collab.)
ABLIKIM	04B	PR D70 012003	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	04H	PR D70 092003	M. Ablikim *et al.*	(BES Collab.)
ATHAR	04	PR D70 112002	S.B. Athar *et al.*	(CLEO Collab.)
BAI	04F	PR D69 092001	J.Z. Bai *et al.*	(BES Collab.)
BAI	04I	PR D70 012006	J.Z. Bai *et al.*	(BES Collab.)
AULCHENKO	03	PL B573 63	V.M. Aulchenko *et al.*	(KEDR Collab.)
BAI	03E	PR D67 112001	J.Z. Bai *et al.*	(BES Collab.)
AMBROGIANI	02	PR D65 052002	M. Ambrogiani *et al.*	(FNAL E835 Collab.)
BAI	99B	PR D60 072001	J.Z. Bai *et al.*	(BES Collab.)
BAI	98D	PR D58 092006	J.Z. Bai *et al.*	(BES Collab.)

BAI	98I	PRL 81 3091	J.Z. Bai *et al.*	(BES Collab.)
ARMSTRONG	92	NP B373 35	T.A. Armstrong *et al.*	(FNAL, FERR, GENO+)
Also		PRL 68 1468	T.A. Armstrong *et al.*	(FNAL, FERR, GENO+)
BAGLIN	86B	PL B172 455	C. Baglin	(LAPP, CERN, GENO, LYON, OSLO+)
GAISER	86	PR D34 711	J. Gaiser *et al.*	(Crystal Ball Collab.)
LEMOIGNE	82	PL 113B 509	Y. Lemoigne *et al.*	(SACL, LOIC, SHMP+)
OREGLIA	82	PR D25 2259	M.J. Oreglia *et al.*	(SLAC, CIT, HARV+)
Also		Private Comm.	M.J. Oreglia	(EFI)
HIMEL	80	PRL 44 920	T. Himel *et al.*	(LBL, SLAC)
Also		Private Comm.	G. Trilling	(LBL, UCB)
BRANDELIK	79B	NP B160 426	R. Brandelik *et al.*	(DASP Collab.)
BARTEL	78B	PL 79B 492	W. Bartel *et al.*	(DESY, HEIDP)
TANENBAUM	78	PR D17 1731	W.M. Tanenbaum *et al.*	(SLAC, LBL)
Also		Private Comm.	G. Trilling	(LBL, UCB)
BIDDICK	77	PRL 38 1324	C.J. Biddick *et al.*	(UCSD, UMD, PAVI+)
FELDMAN	77	PRPL 33C 285	G.J. Feldman, M.L. Perl	(LBL, SLAC)
YAMADA	77	Hamburg Conf. 69	S. Yamada	(DASP Collab.)
WHITAKER	76	PRL 37 1596	J.S. Whitaker *et al.*	(SLAC, LBL)
TANENBAUM	75	PRL 35 1323	W.M. Tanenbaum *et al.*	(LBL, SLAC)