$\eta_c(1S)$

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

$\eta_c(1S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
2983.9 ± 0.4 OUR AVERAGE		Error includes scale factor of 1.2.			
2983.9 ± 0.7 ± 0.1		[1] AAIJ	20H	LHCB	$p p \to b X \to p \overline{p} X$
2985.9 ± 0.7 ± 2.1	1705	ABLIKIM	19AV	BES3	$J/\psi \to \gamma \omega \omega$
2984.6 ± 0.7 ± 2.2	2673	XU	18	BELL	$e^+ e^- \to e^+ e^- \eta' \pi^+ \pi^-$
2986.7 ± 0.5 ± 0.9	11k	[2] AAIJ	17AD	LHCB	$p p \to B^+ X \to p \overline{p} K^+ X$
2982.8 ± 1.0 ± 0.5	6.4k	[3] AAIJ	17BB	LHCB	$p p \to b \overline{b} X \to 2(K^+ K^-) X$
2982.2 ± 1.5 ± 0.1	2.0k	[4] AAIJ	15BI	LHCB	$p p \to \eta_c(1S) X$
2983.5 ± 1.4 $^{+1.6}_{-3.6}$		[5] ANASHIN	14	KEDR	$J/\psi \to \gamma \eta_c$
2979.8 ± 0.8 ± 3.5	4.5k	[6,7] LEES	14E	BABR	$\gamma \gamma \to K^+ K^- \pi^0$
2984.1 ± 1.1 ± 2.1	900	[6,7,8] LEES	14E	BABR	$\gamma \gamma \to K^+ K^- \eta$
2984.3 ± 0.6 ± 0.6		[9,10] ABLIKIM	12F	BES3	$\psi(2S) \to \gamma \eta_c$
2984.49 ± 1.16 ± 0.52	832	[6] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0 \gamma$ hadrons
2982.7 ± 1.8 ± 2.2	486	ZHANG	12A	BELL	$e^+ e^- \to e^+ e^- \eta' \pi^+ \pi^-$
2984.5 ± 0.8 ± 3.1	11k	DEL-AMO-SA..	11M	BABR	$\gamma \gamma \to K^+ K^- \pi^+ \pi^- \pi^0$
2985.4 ± 1.5 $^{+0.5}_{-2.0}$	920	[10] VINOKUROVA	11	BELL	$B^\pm \to K^\pm (K^0_S K^\pm \pi^\mp)$
2982.2 ± 0.4 ± 1.6	14k	[11] LEES	10	BABR	$10.6\ e^+ e^- \to e^+ e^- K^0_S K^\pm \pi^\mp$
2985.8 ± 1.5 ± 3.1	0.9k	AUBERT	08AB	BABR	$B \to \eta_c(1S) K^{(*)} \to K \overline{K} \pi K^{(*)}$
2986.1 ± 1.0 ± 2.5	7.5k	UEHARA	08	BELL	$\gamma \gamma \to \eta_c \to$ hadrons
2970 ± 5 ± 6	501	[12] ABE	07	BELL	$e^+ e^- \to J/\psi (c \overline{c})$
2971 ± 3 $^{+2}_{-1}$	195	WU	06	BELL	$B^+ \to p \overline{p} K^+$
2974 ± 7 $^{+2}_{-1}$	20	WU	06	BELL	$B^+ \to \Lambda \overline{\Lambda} K^+$
2981.8 ± 1.3 ± 1.5	592	ASNER	04	CLEO	$\gamma \gamma \to \eta'_c \to K^0_S K^\pm \pi^\mp$
2984.1 ± 2.1 ± 1.0	190	[13] AMBROGIANI	03	E835	$\overline{p} p \to \eta_c \to \gamma \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2982.5 ± 0.4 ± 1.4	12k	[14] DEL-AMO-SA..	11M	BABR	$\gamma \gamma \to K^0_S K^\pm \pi^\mp$
2982.2 ± 0.6		[15] MITCHELL	09	CLEO	$e^+ e^- \to \gamma X$
2982 ± 5	270	[16] AUBERT	06E	BABR	$B^\pm \to K^\pm X_{c \overline{c}}$
2982.5 ± 1.1 ± 0.9	2.5k	[17] AUBERT	04D	BABR	$\gamma \gamma \to \eta_c(1S) \to K \overline{K} \pi$
2977.5 ± 1.0 ± 1.2		[15,18] BAI	03	BES	$J/\psi \to \gamma \eta_c$
2979.6 ± 2.3 ± 1.6	180	[19] FANG	03	BELL	$B \to \eta_c K$
2976.3 ± 2.3 ± 1.2		[15,20] BAI	00F	BES	$J/\psi,\ \psi(2S) \to \gamma \eta_c$

2976.6 ± 2.9 ± 1.3	140	[15,21] BAI	00F	BES	$J/\psi \to \gamma \eta_c$
2980.4 ± 2.3 ± 0.6		[22] BRANDENB...	00B	CLE2	$\gamma\gamma \to \eta_c \to K^\pm K^0_S \pi^\mp$
2975.8 ± 3.9 ± 1.2		[21] BAI	99B	BES	Sup. by BAI 00F
2999 ± 8	25	ABREU	98O	DLPH	$e^+ e^- \to e^+ e^-$ +hadrons
2988.3 $^{+3.3}_{-3.1}$		ARMSTRONG	95F	E760	$\overline{p} p \to \gamma\gamma$
2974.4 ± 1.9		[15,23] BISELLO	91	DM2	$J/\psi \to \eta_c \gamma$
2969 ± 4 ± 4	80	[15] BAI	90B	MRK3	$J/\psi \to \gamma K^+ K^- K^+ K^-$
2956 ±12 ±12		[15] BAI	90B	MRK3	$J/\psi \to \gamma K^+ K^- K^0_S K^0_L$
2982.6 $^{+2.7}_{-2.3}$	12	BAGLIN	87B	SPEC	$\overline{p} p \to \gamma\gamma$
2980.2 ± 1.6		[15,23] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c \gamma$
2984 ± 2.3 ± 4.0		[15] GAISER	86	CBAL	$J/\psi \to \gamma X$, $\psi(2S) \to \gamma X$
2976 ± 8		[15,24] BALTRUSAIT...	84	MRK3	$J/\psi \to 2\phi\gamma$
2982 ± 8	18	[25] HIMEL	80B	MRK2	$e^+ e^-$
2980 ± 9		[25] PARTRIDGE	80B	CBAL	$e^+ e^-$

[1] AAIJ 20H report $m_{J/\psi} - m_{\eta_c(1S)} = 113.0 \pm 0.7 \pm 0.1$ MeV. We use the current value $m_{J/\psi} = 3096.900 \pm 0.006$ MeV to obtain the quoted mass.

[2] AAIJ 17AD report $m_{J/\psi} - m_{\eta_c(1S)} = 110.2 \pm 0.5 \pm 0.9$ MeV. We use the current value $m_{J/\psi} = 3096.900 \pm 0.006$ MeV to obtain the quoted mass.

[3] From a fit of the $\phi\phi$ invariant mass with the mass and width of $\eta_c(1S)$ as free parameters.

[4] AAIJ 15BI reports $m_{J/\psi} - m_{\eta_c(1S)} = 114.7 \pm 1.5 \pm 0.1$ MeV from a sample of $\eta_c(1S)$ and J/ψ produced in b-hadron decays. We have used current value of $m_{J/\psi} = 3096.900 \pm 0.006$ MeV to arrive at the quoted $m_{\eta_c(1S)}$ result.

[5] Taking into account an asymmetric photon lineshape.

[6] With floating width.

[7] Ignoring possible interference with the non-resonant 0^- amplitude.

[8] Using both, $\eta \to \gamma\gamma$ and $\eta \to \pi^+ \pi^- \pi^0$ decays.

[9] From a simultaneous fit to six decay modes of the η_c.

[10] Accounts for interference with non-resonant continuum.

[11] Taking into account interference with the non-resonant $J^P = 0^-$ amplitude.

[12] From a fit of the J/ψ recoil mass spectrum. Supersedes ABE,K 02 and ABE 04G.

[13] Using mass of $\psi(2S) = 3686.00$ MeV.

[14] Not independent from the measurements reported by LEES 10.

[15] MITCHELL 09 observes a significant asymmetry in the lineshapes of $\psi(2S) \to \gamma \eta_c$ and $J/\psi \to \gamma \eta_c$ transitions. If ignored, this asymmetry could lead to significant bias whenever the mass and width are measured in $\psi(2S)$ or J/ψ radiative decays.

[16] From the fit of the kaon momentum spectrum. Systematic errors not evaluated.

[17] Superseded by LEES 10.

[18] From a simultaneous fit of five decay modes of the η_c.

[19] Superseded by VINOKUROVA 11.

[20] Weighted average of the $\psi(2S)$ and $J/\psi(1S)$ samples. Using an η_c width of 13.2 MeV.

[21] Average of several decay modes. Using an η_c width of 13.2 MeV.

[22] Superseded by ASNER 04.

[23] Average of several decay modes.

[24] $\eta_c \to \phi\phi$.
[25] Mass adjusted by us to correspond to $J/\psi(1S)$ mass = 3097 MeV.

$\eta_c(1S)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
32.0± 0.7 OUR FIT					
32.1± 0.8 OUR AVERAGE		Error includes scale factor of 1.1.			
$33.8 \pm 1.6 \pm 4.1$	1705	ABLIKIM	19AV	BES3	$J/\psi \to \gamma\omega\omega$
$30.8^{+2.3}_{-2.2} \pm 2.9$	2673	XU	18	BELL	$e^+e^- \to e^+e^-\eta'\pi^+\pi^-$
$34.0 \pm 1.9 \pm 1.3$	11k	AAIJ	17AD	LHCB	$pp \to B^+X \to p\overline{p}K^+X$
$31.4 \pm 3.5 \pm 2.0$	6.4k	[1] AAIJ	17BB	LHCB	$pp \to b\overline{b}X \to 2(K^+K^-)X$
$27.2 \pm 3.1^{+5.4}_{-2.6}$		[2] ANASHIN	14	KEDR	$J/\psi \to \gamma\eta_c$
$25.2 \pm 2.6 \pm 2.4$	4.5k	[3,4] LEES	14E	BABR	$\gamma\gamma \to K^+K^-\pi^0$
$34.8 \pm 3.1 \pm 4.0$	900	[3,4,5] LEES	14E	BABR	$\gamma\gamma \to K^+K^-\eta$
$32.0 \pm 1.2 \pm 1.0$		[6,7] ABLIKIM	12F	BES3	$\psi(2S) \to \gamma\eta_c$
$36.4 \pm 3.2 \pm 1.7$	832	[3] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma$ hadrons
$37.8^{+5.8}_{-5.3} \pm 3.1$	486	ZHANG	12A	BELL	$e^+e^- \to e^+e^-\eta'\pi^+\pi^-$
$36.2 \pm 2.8 \pm 3.0$	11k	DEL-AMO-SA...	11M	BABR	$\gamma\gamma \to K^+K^-\pi^+\pi^-\pi^0$
$35.1 \pm 3.1^{+1.0}_{-1.6}$	920	[7] VINOKUROVA	11	BELL	$B^\pm \to K^\pm(K^0_S K^\pm\pi^\mp)$
$31.7 \pm 1.2 \pm 0.8$	14k	[8] LEES	10	BABR	10.6 $e^+e^- \to e^+e^-K^0_S K^\pm\pi^\mp$
$36.3^{+3.7}_{-3.6} \pm 4.4$	0.9k	AUBERT	08AB	BABR	$B \to \eta_c(1S)K^{(*)} \to K\overline{K}\pi K^{(*)}$
$28.1 \pm 3.2 \pm 2.2$	7.5k	UEHARA	08	BELL	$\gamma\gamma \to \eta_c \to$ hadrons
$48\ ^{+8}_{-7} \pm 5$	195	WU	06	BELL	$B^+ \to p\overline{p}K^+$
$40 \pm 19 \pm 5$	20	WU	06	BELL	$B^+ \to \Lambda\overline{\Lambda}K^+$
$24.8 \pm 3.4 \pm 3.5$	592	ASNER	04	CLEO	$\gamma\gamma \to \eta'_c \to K^0_S K^\pm\pi^\mp$
$20.4^{+7.7}_{-6.7} \pm 2.0$	190	AMBROGIANI	03	E835	$\overline{p}p \to \eta_c \to \gamma\gamma$
$23.9^{+12.6}_{-7.1}$		ARMSTRONG	95F	E760	$\overline{p}p \to \gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$32.1 \pm 1.1 \pm 1.3$	12k	[9] DEL-AMO-SA...	11M	BABR	$\gamma\gamma \to K^0_S K^\pm\pi^\mp$
$34.3 \pm 2.3 \pm 0.9$	2.5k	[10] AUBERT	04D	BABR	$\gamma\gamma \to \eta_c(1S) \to K\overline{K}\pi$
$17.0 \pm 3.7 \pm 7.4$		[11] BAI	03	BES	$J/\psi \to \gamma\eta_c$
$29 \pm 8 \pm 6$	180	[12] FANG	03	BELL	$B \to \eta_c K$
$11.0 \pm 8.1 \pm 4.1$		[13] BAI	00F	BES	$J/\psi \to \gamma\eta_c$ and $\psi(2S) \to \gamma\eta_c$
$27.0 \pm 5.8 \pm 1.4$		[14] BRANDENB...	00B	CLE2	$\gamma\gamma \to \eta_c \to K^\pm K^0_S\pi^\mp$
$7.0^{+7.5}_{-7.0}$	12	BAGLIN	87B	SPEC	$\overline{p}p \to \gamma\gamma$
$10.1^{+33.0}_{-8.2}$	23	[15] BALTRUSAIT...	86	MRK3	$J/\psi \to \gamma p\overline{p}$

11.5± 4.5			GAISER	86	CBAL	$J/\psi \to \gamma X$, $\psi(2S) \to \gamma X$
< 40	90% CL	18	HIMEL	80B	MRK2	$e^+ e^-$
< 20	90% CL		PARTRIDGE	80B	CBAL	$e^+ e^-$

[1] From a fit of the $\phi\phi$ invariant mass with the mass and width of $\eta_c(1S)$ as free parameters.
[2] Taking into account an asymmetric photon lineshape.
[3] With floating mass.
[4] Ignoring possible interference with the non-resonant 0^- amplitude.
[5] Using both, $\eta \to \gamma\gamma$ and $\eta \to \pi^+\pi^-\pi^0$ decays.
[6] From a simultaneous fit to six decay modes of the η_c.
[7] Accounts for interference with non-resonant continuum.
[8] Taking into account interference with the non-resonant $J^P = 0^-$ amplitude.
[9] Not independent from the measurements reported by LEES 10.
[10] Superseded by LEES 10.
[11] From a simultaneous fit of five decay modes of the η_c.
[12] Superseded by VINOKUROVA 11.
[13] From a fit to the 4-prong invariant mass in $\psi(2S) \to \gamma\eta_c$ and $J/\psi(1S) \to \gamma\eta_c$ decays.
[14] Superseded by ASNER 04.
[15] Positive and negative errors correspond to 90% confidence level.

$\eta_c(1S)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
	Decays involving hadronic resonances		
Γ_1	$\eta'(958)\pi\pi$	(1.87 ± 0.26) %	
Γ_2	$\eta'(958)K\overline{K}$	(1.61 ± 0.25) %	
Γ_3	$\rho\rho$	(1.5 ± 0.4) %	
Γ_4	$K^*(892)^0K^-\pi^+$ + c.c.	(1.5 ± 0.5) %	
Γ_5	$K^*(892)\overline{K}^*(892)$	$(6.3\pm1.2)\times10^{-3}$	
Γ_6	$K^*(892)^0\overline{K}^*(892)^0\pi^+\pi^-$	(1.1 ± 0.5) %	
Γ_7	ϕK^+K^-	$(2.9\pm1.4)\times10^{-3}$	
Γ_8	$\phi\phi$	$(1.58\pm0.19)\times10^{-3}$	
Γ_9	$\phi 2(\pi^+\pi^-)$	$< 4 \times10^{-3}$	90%
Γ_{10}	$a_0(980)\pi$	seen	
Γ_{11}	$a_2(1320)\pi$		
Γ_{12}	$K^*(892)\overline{K}$ + c.c.	< 1.28 %	90%
Γ_{13}	$f_2(1270)\eta$	seen	
Γ_{14}	$f_2(1270)\eta'$	seen	
Γ_{15}	$\omega\omega$	$(2.1\pm0.5)\times10^{-3}$	
Γ_{16}	$\omega\phi$	$< 2.5 \times10^{-4}$	90%
Γ_{17}	$f_2(1270)f_2(1270)$	$(9.7\pm2.5)\times10^{-3}$	
Γ_{18}	$f_2(1270)f'_2(1525)$	$(9.1\pm3.0)\times10^{-3}$	
Γ_{19}	$f_0(500)\eta$	seen	
Γ_{20}	$f_0(500)\eta'$	seen	
Γ_{21}	$f_0(980)\eta$	seen	
Γ_{22}	$f_0(980)\eta'$	seen	

Γ_{23}	$f_0(1500)\eta$	seen	
Γ_{24}	$f_0(1710)\eta'$	seen	
Γ_{25}	$f_0(2100)\eta'$	seen	
Γ_{26}	$f_0(2200)\eta$	seen	
Γ_{27}	$a_0(1320)\pi$	seen	
Γ_{28}	$a_0(1450)\pi$	seen	
Γ_{29}	$a_0(1700)\pi$	seen	
Γ_{30}	$a_0(1950)\pi$	seen	
Γ_{31}	$K_0^*(1430)\overline{K}$	seen	
Γ_{32}	$K_2^*(1430)\overline{K}$	seen	
Γ_{33}	$K_0^*(1950)\overline{K}$	seen	

Decays into stable hadrons

Γ_{34}	$K\overline{K}\pi$	(7.0 ± 0.4) %	
Γ_{35}	$K\overline{K}\eta$	(1.32 ± 0.15) %	
Γ_{36}	$\eta\pi^+\pi^-$	(1.7 ± 0.5) %	
Γ_{37}	$\eta 2(\pi^+\pi^-)$	(4.6 ± 1.4) %	
Γ_{38}	$K^+K^-\pi^+\pi^-$	$(6.5 \pm 1.0) \times 10^{-3}$	
Γ_{39}	$K^+K^-\pi^+\pi^-\pi^0$	(3.4 ± 0.5) %	
Γ_{40}	$K^0K^-\pi^+\pi^-\pi^+$+c.c.	(5.7 ± 1.6) %	
Γ_{41}	$K^+K^-2(\pi^+\pi^-)$	$(7.6 \pm 2.4) \times 10^{-3}$	
Γ_{42}	$2(K^+K^-)$	$(1.38 \pm 0.29) \times 10^{-3}$	
Γ_{43}	$\pi^+\pi^-\pi^0$	$< 5 \times 10^{-4}$	90%
Γ_{44}	$\pi^+\pi^-\pi^0\pi^0$	(4.8 ± 1.1) %	
Γ_{45}	$2(\pi^+\pi^-)$	$(8.7 \pm 1.1) \times 10^{-3}$	
Γ_{46}	$2(\pi^+\pi^-\pi^0)$	(16.2 ± 2.1) %	
Γ_{47}	$3(\pi^+\pi^-)$	(1.8 ± 0.4) %	
Γ_{48}	$p\overline{p}$	$(1.35 \pm 0.13) \times 10^{-3}$	
Γ_{49}	$p\overline{p}\pi^0$	$(3.6 \pm 1.4) \times 10^{-3}$	
Γ_{50}	$\Lambda\overline{\Lambda}$	$(1.02 \pm 0.23) \times 10^{-3}$	
Γ_{51}	$K^+\overline{p}\Lambda$+ c.c.	$(2.5 \pm 0.4) \times 10^{-3}$	
Γ_{52}	$\overline{\Lambda}(1520)\Lambda$+ c.c.	$(3.1 \pm 1.3) \times 10^{-3}$	
Γ_{53}	$\Sigma^+\overline{\Sigma}^-$	$(2.1 \pm 0.6) \times 10^{-3}$	
Γ_{54}	$\Xi^-\overline{\Xi}^+$	$(9.0 \pm 2.6) \times 10^{-4}$	
Γ_{55}	$\pi^+\pi^-p\overline{p}$	$(5.5 \pm 1.9) \times 10^{-3}$	

Radiative decays

Γ_{56}	$\gamma\gamma$	$(1.68 \pm 0.12) \times 10^{-4}$	

Charge conjugation (*C*), Parity (*P*), Lepton Family number (*LF*) violating modes

Γ_{57}	$\pi^+\pi^-$	*P,CP*	$< 1.1 \times 10^{-4}$	90%
Γ_{58}	$\pi^0\pi^0$	*P,CP*	$< 4 \times 10^{-5}$	90%
Γ_{59}	K^+K^-	*P,CP*	$< 6 \times 10^{-4}$	90%
Γ_{60}	$K_S^0K_S^0$	*P,CP*	$< 3.1 \times 10^{-4}$	90%

CONSTRAINED FIT INFORMATION

An overall fit to the total width, 10 combinations of partial widths obtained from integrated cross section, and 21 branching ratios uses 97 measurements and one constraint to determine 15 parameters. The overall fit has a $\chi^2 = 120.8$ for 83 degrees of freedom.

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

	x_1	x_5	x_8	x_{15}	x_{17}	x_{34}	x_{35}	x_{38}	x_{42}	x_{45}
x_5	13									
x_8	25	14								
x_{15}	10	5	10							
x_{17}	5	3	6	2						
x_{34}	30	17	35	13	7					
x_{35}	15	8	17	6	3	48				
x_{38}	16	9	17	7	3	21	10			
x_{42}	12	7	13	5	3	21	10	8		
x_{45}	18	10	20	8	4	24	12	13	10	
x_{48}	17	10	19	7	4	26	13	12	9	14
x_{50}	4	2	5	2	1	6	3	3	2	3
x_{56}	−45	−25	−50	−19	−10	−60	−29	−31	−24	−36
Γ	−2	−1	−2	−1	0	−3	−1	−2	−1	−2

	x_{48}	x_{50}	x_{56}
x_{50}	24		
x_{56}	−36	−9	
Γ	6	1	−28

	Mode	Rate (MeV)
Γ_1	$\eta'(958)\pi\pi$	0.60 ±0.08
Γ_5	$K^*(892)\overline{K}^*(892)$	0.20 ±0.04
Γ_8	$\phi\phi$	0.051 ±0.006
Γ_{15}	$\omega\omega$	0.066 ±0.015
Γ_{17}	$f_2(1270) f_2(1270)$	0.31 ±0.08
Γ_{34}	$K\overline{K}\pi$	2.25 ±0.14
Γ_{35}	$K\overline{K}\eta$	0.42 ±0.05
Γ_{38}	$K^+K^-\pi^+\pi^-$	0.206 ±0.032
Γ_{42}	$2(K^+K^-)$	0.044 ±0.009
Γ_{45}	$2(\pi^+\pi^-)$	0.277 ±0.035

Γ_{48}	$p\overline{p}$	0.043 ± 0.004
Γ_{50}	$\Lambda\overline{\Lambda}$	0.033 ± 0.007
Γ_{56}	$\gamma\gamma$	0.0054 ± 0.0004

$\eta_c(1S)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$ — Γ_{56}

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
5.4± 0.4 OUR FIT					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.8 ± 1.1	486	[1] ZHANG	12A	BELL	$e^+e^- \to e^+e^-\eta'\pi^+\pi^-$
5.2 ± 1.2	273 ± 43	[2,3] AUBERT	06E	BABR	$B^\pm \to K^\pm X_{c\overline{c}}$
$5.5 \pm 1.2 \pm 1.8$	157 ± 33	[4] KUO	05	BELL	$\gamma\gamma \to p\overline{p}$
$7.4 \pm 0.4 \pm 2.3$		[5] ASNER	04	CLEO	$\gamma\gamma \to \eta'_c \to K^0_S K^\pm\pi^\mp$
$13.9 \pm 2.0 \pm 3.0$	41	[6] ABDALLAH	03J	DLPH	$\gamma\gamma \to \eta_c$
$3.8^{+1.1}_{-1.0}{}^{+1.9}_{-1.0}$	190	[7] AMBROGIANI	03	E835	$\overline{p}p \to \eta_c \to \gamma\gamma$
$7.6 \pm 0.8 \pm 2.3$		[5,8] BRANDENB...	00B	CLE2	$\gamma\gamma \to \eta_c \to K^\pm K^0_S\pi^\mp$
$6.9 \pm 1.7 \pm 2.1$	76	[9] ACCIARRI	99T	L3	$e^+e^- \to e^+e^-\eta_c$
$27 \pm 16 \pm 10$	5	[5] SHIRAI	98	AMY	58 e^+e^-
$6.7^{+2.4}_{-1.7} \pm 2.3$		[4] ARMSTRONG	95F	E760	$\overline{p}p \to \gamma\gamma$
11.3 ± 4.2		[10] ALBRECHT	94H	ARG	$e^+e^- \to e^+e^-\eta_c$
$8.0 \pm 2.3 \pm 2.4$	17	[11] ADRIANI	93N	L3	$e^+e^- \to e^+e^-\eta_c$
$5.9^{+2.1}_{-1.8} \pm 1.9$		[7] CHEN	90B	CLEO	$e^+e^- \to e^+e^-\eta_c$
$6.4^{+5.0}_{-3.4}$		[12] AIHARA	88D	TPC	$e^+e^- \to e^+e^-X$
$4.3^{+3.4}_{-3.7} \pm 2.4$		[4] BAGLIN	87B	SPEC	$\overline{p}p \to \gamma\gamma$
28 ± 15		[5,13] BERGER	86	PLUT	$\gamma\gamma \to K\overline{K}\pi$

[1] Assuming there is no interference with the non-resonant background.
[2] Calculated by us using $\Gamma(\eta_c \to K\overline{K}\pi) \times \Gamma(\eta_c \to \gamma\gamma) / \Gamma = 0.44 \pm 0.05$ keV from PDG 06 and $B(\eta_c \to K\overline{K}\pi) = (8.5 \pm 1.8)\%$ from AUBERT 06E.
[3] Systematic errors not evaluated.
[4] Normalized to $B(\eta_c \to p\overline{p}) = (1.3 \pm 0.4) \times 10^{-3}$.
[5] Normalized to $B(\eta_c \to K^\pm K^0_S\pi^\mp)$.
[6] Average of $K^0_S K^\pm\pi^\mp$, $\pi^+\pi^-K^+K^-$, and $2(K^+K^-)$ decay modes.
[7] Normalized to the sum of $B(\eta_c \to K^\pm K^0_S\pi^\mp)$, $B(\eta_c \to K^+K^-\pi^+\pi^-)$, and $B(\eta_c \to 2\pi^+2\pi^-)$.
[8] Superseded by ASNER 04.
[9] Normalized to the sum of 9 branching ratios.
[10] Normalized to the sum of $B(\eta_c \to K^\pm K^0_S\pi^\mp)$, $B(\eta_c \to \phi\phi)$, $B(\eta_c \to K^+K^-\pi^+\pi^-)$, and $B(\eta_c \to 2\pi^+2\pi^-)$.
[11] Superseded by ACCIARRI 99T.
[12] Normalized to the sum of $B(\eta_c \to K^\pm K^0_S\pi^\mp)$, $B(\eta_c \to 2K^+2K^-)$, $B(\eta_c \to K^+K^-\pi^+\pi^-)$, and $B(\eta_c \to 2\pi^+2\pi^-)$.
[13] Re-evaluated by AIHARA 88D.

$\eta_c(1S)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\eta'(958)\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_1\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
101 ±12 OUR FIT					
98.1± 3.9±11.7	2673	XU	18	BELL	$e^+e^- \to e^+e^-\eta'\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$75.8^{+6.3}_{-6.2}\pm 8.4$	486	[1] ZHANG	12A	BELL	$e^+e^- \to e^+e^-\eta'\pi^+\pi^-$

[1] Superseded by XU 18.

$\Gamma(\rho\rho) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_3\Gamma_{56}/\Gamma$

VALUE (eV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<39	90	< 1556	UEHARA	08	BELL	$\gamma\gamma \to 2(\pi^+\pi^-)$

$\Gamma(K^*(892)\overline{K}^*(892)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_5\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
34 ±6 OUR FIT					
32.4±4.2±5.8	882 ± 115	UEHARA	08	BELL	$\gamma\gamma \to \pi^+\pi^-K^+K^-$

$\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_8\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
8.5 ±0.9 OUR FIT					
7.75±0.66±0.62	386 ± 31	[1] LIU	12B	BELL	$\gamma\gamma \to 2(K^+K^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
6.8 ±1.2 ±1.3	132 ± 23	UEHARA	08	BELL	$\gamma\gamma \to 2(K^+K^-)$

[1] Supersedes UEHARA 08. Using $B(\phi \to K^+K^-) = (48.9 \pm 0.5)\%$.

$\Gamma(\omega\omega) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_{15}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
11.0 ±2.5 OUR FIT					
8.67±2.86±0.96	85 ± 29	[1] LIU	12B	BELL	$\gamma\gamma \to 2(\pi^+\pi^-\pi^0)$

[1] Using $B(\omega \to \pi^+\pi^-\pi^0) = (89.2 \pm 0.7)\%$.

$\Gamma(\omega\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_{16}\Gamma_{56}/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.49	90	[1] LIU	12B	BELL	$\gamma\gamma \to K^+K^-\pi^+\pi^-\pi^0$

[1] Using $B(\phi \to K^+K^-) = (48.9 \pm 0.5)\%$ and $B(\omega \to \pi^+\pi^-\pi^0) = (89.2 \pm 0.7)\%$.

$\Gamma(f_2(1270)f_2(1270)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_{17}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
52±13 OUR FIT					
69±17±12	3182±766	UEHARA	08	BELL	$\gamma\gamma \to 2(\pi^+\pi^-)$

$\Gamma(f_2(1270)f'_2(1525)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_{18}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
49±9±13	1128±206	UEHARA	08	BELL	$\gamma\gamma \to \pi^+\pi^-K^+K^-$

$\Gamma(K\overline{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{34}\Gamma_{56}/\Gamma$

VALUE (keV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.378±0.021 OUR FIT						
0.407±0.027 OUR AVERAGE			Error includes scale factor of 1.2.			
0.374±0.009±0.031		14k	[1] LEES	10	BABR	10.6 $e^+e^- \rightarrow e^+e^- K^0_S K^\pm \pi^\mp$
0.407±0.022±0.028			[2,3] ASNER	04	CLEO	$\gamma\gamma \rightarrow \eta'_c \rightarrow K^0_S K^\pm \pi^\mp$
0.60 ±0.12 ±0.09		41	[3,4] ABDALLAH	03J	DLPH	$\gamma\gamma \rightarrow K^0_S K^\pm \pi^\mp$
1.47 ±0.87 ±0.27			[3] SHIRAI	98	AMY	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K^0_S \pi^\mp$
0.84 ±0.21			[3] ALBRECHT	94H	ARG	$\gamma\gamma \rightarrow K^\pm K^0_S \pi^\mp$
0.60 $^{+0.23}_{-0.20}$			[3] CHEN	90B	CLEO	$\gamma\gamma \rightarrow \eta_c K^\pm K^0_S \pi^\mp$
1.06 ±0.41 ±0.27		11	[3] BRAUNSCH...	89	TASS	$\gamma\gamma \rightarrow K\overline{K}\pi$
1.5 $^{+0.60}_{-0.45}$ ±0.3		7	[3] BERGER	86	PLUT	$\gamma\gamma \rightarrow K\overline{K}\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.386±0.008±0.021		12k	[5] DEL-AMO-SA...	11M	BABR	$\gamma\gamma \rightarrow K^0_S K^\pm \pi^\mp$
0.418±0.044±0.022			[3,6] BRANDENB...	00B	CLE2	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K^0_S \pi^\mp$
<0.63	95		[3] BEHREND	89	CELL	$\gamma\gamma \rightarrow K^0_S K^\pm \pi^\mp$
<4.4	95		ALTHOFF	85B	TASS	$\gamma\gamma \rightarrow K\overline{K}\pi$

[1] From the corrected and unfolded mass spectrum.
[2] Calculated by us from the value reported in ASNER 04 that assumes B($\eta_c \rightarrow K\overline{K}\pi$) = 5.5 ± 1.7%
[3] We have multiplied $K^\pm K^0_S \pi^\mp$ measurement by 3 to obtain $K\overline{K}\pi$.
[4] Calculated by us from the value reported in ABDALLAH 03J, which uses B($\eta_c \rightarrow K^0_S K^\pm \pi^\mp$) = (1.5 ± 0.4)%.
[5] Not independent from the measurements reported by LEES 10.
[6] Superseded by ASNER 04.

$\Gamma(K^+K^-\pi^+\pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{38}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
35 ± 5 OUR FIT					
27 ± 6 OUR AVERAGE					
25.7± 3.2± 4.9	2019±248	UEHARA	08	BELL	$\gamma\gamma \rightarrow \pi^+\pi^-K^+K^-$
280 ±100 ±60	42	[1] ABDALLAH	03J	DLPH	$\gamma\gamma \rightarrow \pi^+\pi^-K^+K^-$
170 ± 80 ±20	13.9 ± 6.6	ALBRECHT	94H	ARG	$\gamma\gamma \rightarrow \pi^+\pi^-K^+K^-$

[1] Calculated by us from the value reported in ABDALLAH 03J, which uses B($\eta_c \rightarrow \pi^+\pi^-K^+K^-$) = (2.0 ± 0.7)%.

$\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{39}\Gamma_{56}/\Gamma$

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.190±0.006±0.028	11k	[1] DEL-AMO-SA...	11M	BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$

[1] Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

$\Gamma(2(K^+K^-)) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{42}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
7.4± 1.5 OUR FIT					
5.8± 1.9 OUR AVERAGE					
5.6± 1.1± 1.6	216 ± 42	UEHARA	08	BELL	$\gamma\gamma \rightarrow 2(K^+K^-)$
350 ±90 ±60	46	[1] ABDALLAH	03J	DLPH	$\gamma\gamma \rightarrow 2(K^+K^-)$
231 ±90 ±23	9.1 ± 3.3	[2] ALBRECHT	94H	ARG	$\gamma\gamma \rightarrow 2(K^+K^-)$

[1] Calculated by us from the value reported in ABDALLAH 03J, which uses B($\eta_c \rightarrow$) $2(K^+K^-)$ = (2.1 ± 1.2)%.
[2] Includes all topological modes except $\eta_c \rightarrow \phi\phi$.

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{45}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
47 ± 5 OUR FIT					
42 ± 6 OUR AVERAGE					
40.7± 3.7± 5.3	5381±492	UEHARA	08	BELL	$\gamma\gamma \rightarrow 2(\pi^+\pi^-)$
180 ±70 ±20	21.4 ± 8.6	ALBRECHT	94H	ARG	$\gamma\gamma \rightarrow 2(\pi^+\pi^-)$

$\Gamma(p\overline{p}) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{48}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
7.3 ±0.7 OUR FIT					
$7.20\pm1.53^{+0.67}_{-0.75}$	157 ± 33	[1] KUO	05	BELL	$\gamma\gamma \rightarrow p\overline{p}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$4.6\ ^{+1.3}_{-1.1}\ \pm0.4$	190	[1] AMBROGIANI	03	E835	$\overline{p}p \rightarrow \gamma\gamma$
$8.1\ ^{+2.9}_{-2.0}$		[1] ARMSTRONG	95F	E760	$\overline{p}p \rightarrow \gamma\gamma$

[1] Not independent from the $\Gamma_{\gamma\gamma}$ reported by the same experiment.

$\Gamma(K^0_S K^0_S) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{60}\Gamma_{56}/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<1.6	90	[1] UEHARA	13	BELL	$\gamma\gamma \rightarrow K^0_S K^0_S$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.29	90	[2] UEHARA	13	BELL	$\gamma\gamma \rightarrow K^0_S K^0_S$

[1] Taking into account interference with the non-resonant continuum.
[2] Neglecting interference with the non-resonant continuum.

$\eta_c(1S)$ BRANCHING RATIOS

HADRONIC DECAYS

$\Gamma(\eta'(958)\pi\pi)/\Gamma_{total}$ — Γ_1/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.87±0.26 OUR FIT					
3.1 ±1.0 ±0.7	14	[1,2] BALTRUSAIT...86		MRK3	$J/\psi \rightarrow \eta_c\gamma$

[1] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \rightarrow \eta'(958)\pi\pi)/\Gamma_{total}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (5.25 \pm 1.65) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] The value reported by BALTRUSAITIS 86 has been multiplied by 3/2 to account for isospin symmetry.

$\Gamma(\rho\rho)/\Gamma_{total}$ Γ_3/Γ

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.5±0.4 OUR AVERAGE						
0.9±0.4±0.2		72	[1] ABLIKIM	05L	BES2	$J/\psi \to \pi^+\pi^-\pi^+\pi^-\gamma$
2.0±0.4±0.4		113	[2,3] BISELLO	91	DM2	$J/\psi \to \gamma\rho^0\rho^0$
1.8±0.8±0.4		32	[4,5] BISELLO	91	DM2	$J/\psi \to \gamma\rho^+\rho^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<14	90		[6] BALTRUSAIT...86		MRK3	$J/\psi \to \eta_c\gamma$

[1] ABLIKIM 05L reports $[\Gamma(\eta_c(1S) \to \rho\rho)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.6 \pm 0.6 \pm 0.4) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] BISELLO 91 reports $[\Gamma(\eta_c(1S) \to \rho\rho)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (3.30 \pm 0.30 \pm 0.60) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] The value reported by BISELLO 91 has been multiplied by 3 to account for isospin symmetry.

[4] BISELLO 91 reports $[\Gamma(\eta_c(1S) \to \rho\rho)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (3.0 \pm 1.3 \pm 0.6) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[5] The value reported by BISELLO 91 has been multiplied by 3/2 to account for isospin symmetry.

[6] Using $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(K^*(892)^0 K^-\pi^+ + c.c.)/\Gamma_{total}$ Γ_4/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.5±0.4±0.3	63	[1,2] BALTRUSAIT...86		MRK3	$J/\psi \to \eta_c\gamma$

[1] BALTRUSAITIS 86 has an error according to Partridge.

[2] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \to K^*(892)^0 K^-\pi^+ + c.c.)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (2.6 \pm 0.6) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)\overline{K}^*(892))/\Gamma_{total}$ Γ_5/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
63±12 OUR FIT					
69±23 OUR AVERAGE					
83±35±18	60	[1] ABLIKIM	05L	BES2	$J/\psi \to K^+K^-\pi^+\pi^-\gamma$
62±24±13	14	[2,3] BISELLO	91	DM2	$e^+e^- \to \gamma K^+K^-\pi^+\pi^-$
71±36±15	9	[4,5] BALTRUSAIT...86		MRK3	$J/\psi \to \eta_c\gamma$

[1] ABLIKIM 05L reports $[\Gamma(\eta_c(1S) \to K^*(892)\overline{K}^*(892))/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.4 \pm 0.3 \pm 0.5) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] BISELLO 91 reports $[\Gamma(\eta_c(1S) \to K^*(892)\overline{K}^*(892))/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.04 \pm 0.36 \pm 0.18) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] The value reported by BISELLO 91 has been multiplied by 2 to account for isospin symmetry.

[4] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \to K^*(892)\overline{K}^*(892))/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.2 \pm 0.6) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[5] The value reported by BALTRUSAITIS 86 has been multiplied by 2 to account for isospin symmetry.

$\Gamma(K^*(892)^0\overline{K}^*(892)^0\pi^+\pi^-)/\Gamma_{total}$ — Γ_6/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
113±47±24	45	[1] ABLIKIM	06A	BES2	$J/\psi \to K^{*0}\overline{K}^{*0}\pi^+\pi^-\gamma$

[1] ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \to K^*(892)^0\overline{K}^*(892)^0\pi^+\pi^-)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.91 \pm 0.64 \pm 0.48) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$2.9^{+0.9}_{-0.8}\pm1.1$	$14.1^{+4.4}_{-3.7}$	[1] HUANG	03	BELL	$B^+ \to (\phi K^+K^-)\,K^+$

[1] Using $B(B^+ \to \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \to K\overline{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(\phi\phi)/\Gamma_{total}$ — Γ_8/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
15.8± 1.9 OUR FIT					
25 ± 6 OUR AVERAGE					
$26\,^{+4}_{-8}\pm5$	1.2k	[1] ABLIKIM	17P	BES3	$J/\psi \to K^+K^-K^+K^-\gamma$
$20\pm5\pm4$	72	[2] ABLIKIM	05L	BES2	$J/\psi \to K^+K^-K^+K^-\gamma$
$23\pm7\pm5$	19	[3] BISELLO	91	DM2	$J/\psi \to \gamma K^+K^-K^+K^-$
$23\,^{+14}_{-10}\pm5$	5	[4] BISELLO	91	DM2	$J/\psi \to \gamma K^+K^-K^0_S K^0_L$
$55\pm15\pm12$	80	[5] BAI	90B	MRK3	$J/\psi \to \gamma K^+K^-K^+K^-$
$50\pm19\pm11$		[6] BAI	90B	MRK3	$J/\psi \to \gamma K^+K^-K^0_S K^0_L$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$20\pm5\pm4$	357	[7,8] BAI	04	BES	$J/\psi \to \gamma K^+K^-K^+K^-$
$18\,^{+8}_{-6}\pm7$	7	[9] HUANG	03	BELL	$B^+ \to (\phi\phi)\,K^+$

[1] ABLIKIM 17P reports $[\Gamma(\eta_c(1S) \to \phi\phi)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (4.3 \pm 0.5^{+0.5}_{-1.2}) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] ABLIKIM 05L reports $[\Gamma(\eta_c(1S) \to \phi\phi)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (3.3 \pm 0.6 \pm 0.6) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] BISELLO 91 reports $[\Gamma(\eta_c(1S) \to \phi\phi)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (0.39 \pm 0.09 \pm 0.07) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[4] BISELLO 91 reports $[\Gamma(\eta_c(1S) \to \phi\phi)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (0.38^{+0.23}_{-0.15} \pm 0.07) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[5] BAI 90B reports $[\Gamma(\eta_c(1S) \to \phi\phi)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (0.93 \pm 0.20 \pm 0.16) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[6] BAI 90B reports $[\Gamma(\eta_c(1S) \to \phi\phi)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (0.85 \pm 0.27 \pm 0.18) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[7] BAI 04 reports $[\Gamma(\eta_c(1S) \to \phi\phi)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (3.3 \pm 0.6 \pm 0.6) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[8] Superseded by ABLIKIM 05L.

[9] Using $B(B^+ \to \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \to K\overline{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(\phi\phi)/\Gamma(K\overline{K}\pi)$ — Γ_8/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0225±0.0025 OUR FIT					
$0.044^{+0.012}_{-0.010}$ OUR AVERAGE					
$0.055 \pm 0.014 \pm 0.005$		AUBERT,B	04B	BABR	$B^\pm \to K^\pm \eta_c$
$0.032^{+0.014}_{-0.010} \pm 0.009$	7	[1] HUANG	03	BELL	$B^\pm \to K^\pm \phi\phi$

[1] Using $B(B^+ \to \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \to K\overline{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(\phi\phi)/\Gamma(p\overline{p})$ — Γ_8/Γ_{48}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.79±0.14±0.32	6.4k	[1] AAIJ	17BB	LHCB	$pp \to b\overline{b}X \to 2(K^+K^-)X$

[1] Using inputs from AAIJ 15AS and AAIJ 15BI and $\Gamma(b \to J/\psi(1S)\,\text{anything}))/\Gamma_{total} = (1.16 \pm 0.10)\%$ and $\Gamma(J/\psi(1S) \to p\overline{p})/\Gamma_{total} = (2.120 \pm 0.029) \times 10^{-3}$ from PDG 16.

$\Gamma(\phi 2(\pi^+\pi^-))/\Gamma_{total}$ — Γ_9/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<40	90	[1] ABLIKIM	06A	BES2	$J/\psi \to \phi 2(\pi^+\pi^-)\gamma$

[1] ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \to \phi 2(\pi^+\pi^-))/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] < 0.603 \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$.

$\Gamma(a_0(980)\pi)/\Gamma_{total}$ — Γ_{10}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
seen		LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta$
seen		LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.02	90	[1,2] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$

[1] The quoted branching ratio uses $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

[2] We are assuming $B(a_0(980) \to \eta\pi) > 0.5$.

$\Gamma(a_2(1320)\pi)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
seen		LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.02	90	[1] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$

[1] The quoted branching ratio uses $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(K^*(892)\overline{K} + c.c.)/\Gamma_{total}$ — Γ_{12}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0128	90	BISELLO	91	DM2	$J/\psi \to \gamma K^0_S K^\pm\pi^\mp$
<0.0132	90	[1] BISELLO	91	DM2	$J/\psi \to \gamma K^+K^-\pi^0$

[1] The quoted branching ratios use $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(f_2(1270)\eta)/\Gamma_{total}$ — Γ_{13}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
seen		LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.011	90	[1] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$

[1] The quoted branching ratio uses $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(f_2(1270)\eta')/\Gamma_{total}$ — Γ_{14}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta'$; $K^+K^-\eta'$

$\Gamma(\omega\omega)/\Gamma_{total}$ — Γ_{15}/Γ

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
2.1±0.5 OUR FIT						
2.9±0.5±0.6		1705	[1] ABLIKIM	19AV	BES3	$J/\psi \to \gamma\omega\omega$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<6.3	90		[2] ABLIKIM	05L	BES2	$J/\psi \to 2(\pi^+\pi^-\pi^0)\gamma$
<6.3	90		[2] BISELLO	91	DM2	$J/\psi \to \gamma\omega\omega$
<3.1	90		[2] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$

[1] ABLIKIM 19AV reports $[\Gamma(\eta_c(1S) \to \omega\omega)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (4.90 \pm 0.17 \pm 0.77) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.,

[2] The quoted branching ratios use $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

$\Gamma(\omega\phi)/\Gamma_{total}$ — Γ_{16}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
< 2.5 × 10^{-4}	90	[1] ABLIKIM	17P	BES3	$J/\psi \to \pi^+\pi^-\pi^0K^+K^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<17 × 10^{-4}	90	[2] ABLIKIM	05L	BES2	$J/\psi \to \pi^+\pi^-\pi^0K^+K^-\gamma$

[1] Using $B(J/\psi \to \gamma\eta_c) = 0.017 \pm 0.004$.

[2] The quoted branching ratio uses $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(f_2(1270)f_2(1270))/\Gamma_{total}$ — Γ_{17}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.97±0.25 OUR FIT					
$0.77^{+0.25}_{-0.30}\pm0.17$	91.2 ± 19.8	[1] ABLIKIM	04M	BES	$J/\psi \to \gamma 2\pi^+2\pi^-$

[1] ABLIKIM 04M reports $[\Gamma(\eta_c(1S) \to f_2(1270)f_2(1270))/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.3 \pm 0.3^{+0.3}_{-0.4}) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(f_0(500)\eta)/\Gamma_{total}$ — Γ_{19}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta$

$\Gamma(f_0(500)\eta')/\Gamma_{total}$ — Γ_{20}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c(1S) \to \pi^+\pi^-\eta'$

$\Gamma(f_0(980)\eta)/\Gamma_{total}$ — Γ_{21}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta$
seen	LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\eta$

$\Gamma(f_0(980)\eta')/\Gamma_{total}$ — Γ_{22}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta'$, $K^+K^-\eta'$

$\Gamma(f_0(1500)\eta)/\Gamma_{total}$ — Γ_{23}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta$
seen	LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\eta$

$\Gamma(f_0(1710)\eta')/\Gamma_{total}$ — Γ_{24}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to K^+K^-\eta'$

$\Gamma(f_0(2100)\eta')/\Gamma_{total}$ — Γ_{25}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta$

$\Gamma(f_0(2200)\eta)/\Gamma_{total}$ — Γ_{26}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\eta$

$\Gamma(a_0(1320)\pi)/\Gamma_{total}$ — Γ_{27}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\pi^0$

$\Gamma(a_0(1450)\pi)/\Gamma_{total}$ — Γ_{28}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta$
seen	LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\pi^0$

$\Gamma(a_0(1700)\pi)/\Gamma_{total}$ — Γ_{29}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta'$

$\Gamma(a_0(1950)\pi)/\Gamma_{total}$ — Γ_{30}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen		LEES	21A	BABR	Dalitz anal. of $\eta_c(1S) \to \pi^+\pi^-\eta'$
seen	12k	[1] LEES	16A	BABR	$\gamma\gamma \to \eta_c(1S) \to K\overline{K}\pi$

[1] From a model-independant partial wave analysis.

$\Gamma(K_0^*(1430)\overline{K})/\Gamma_{total}$ — Γ_{31}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	12k	[1] LEES	16A	BABR	$\gamma\gamma \to \eta_c(1S) \to K\overline{K}\pi$
seen		LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\eta/\pi^0$

[1] From a model-independant partial wave analysis.

$\Gamma(K_2^*(1430)\overline{K})/\Gamma_{total}$ — Γ_{32}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to K^+K^-\eta'$
seen	LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\pi^0$

$\Gamma(K_0^*(1950)\overline{K})/\Gamma_{total}$ — Γ_{33}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen		LEES	21A	BABR	Dalitz anal. of $\eta_c \to K^+K^-\eta'$
seen	12k	[1] LEES	16A	BABR	$\gamma\gamma \to \eta_c(1S) \to K\overline{K}\pi$
seen		LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\eta/\pi^0$

[1] From a Dalitz plot analysis using an isobar model.

$\Gamma(K\overline{K}\pi)/\Gamma_{total}$ — Γ_{34}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
7.0±0.4 OUR FIT					
6.7±0.5 OUR AVERAGE		Error includes scale factor of 1.1.			
6.9±0.7±0.6	146	[1] ABLIKIM	19AP	BES3	$h_c \to \gamma\eta_c$
7.8±0.6±0.6	267	[2] ABLIKIM	19AP	BES3	$h_c \to \gamma\eta_c$
6.5±1.3±0.8	55	[3,4] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K^+K^-\pi^0$
$8.1\pm1.4^{+0.9}_{-1.0}$	107	[5,6] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K_S^0K^\mp\pi^\pm$
8.5±1.8		[7] AUBERT	06E	BABR	$B^\pm \to K^\pm X_{c\overline{c}}$
3.9±1.0±0.8	0.6k	[8,9] BAI	04	BES	$J/\psi \to \gamma K^\pm\pi^\mp K_S^0$
5.2±1.5±1.1	33	[10,11] BISELLO	91	DM2	$J/\psi \to \gamma K^+K^-\pi^0$
4.1±1.0±0.9	68	[12,13] BISELLO	91	DM2	$J/\psi \to \gamma K^\pm\pi^\mp K_S^0$
4.6±1.8±1.0	32	[14,15] BALTRUSAIT...	86	MRK3	$J/\psi \to \gamma K^+K^-\pi^0$
3.4±0.9±0.7	63	[16,17] BALTRUSAIT...	86	MRK3	$J/\psi \to \gamma K^\pm\pi^\mp K_S^0$
$13\ ^{+7}_{-5}\ \pm2$		[18] HIMEL	80B	MRK2	$\psi(2S) \to \eta_c\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.8±1.7	95	[19,20] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$
<10.7 90% CL		[20] PARTRIDGE	80B	CBAL	$J/\psi \to \eta_c\gamma$

[1] ABLIKIM 19AP quotes $B(\eta_c \to K^+K^-\pi^0) = (1.15 \pm 0.12 \pm 0.10) \times 10^{-2}$ which we multiply by 6 to account for isospin symmetry.

[2] ABLIKIM 19AP quotes $B(\eta_c \to K_S^0K^\pm\pi^\mp) = (2.60 \pm 0.21 \pm 0.20) \times 10^{-2}$ which we multiply by 3 to account for isospin symmetry.

[3] ABLIKIM 12N quotes $B(\psi(2S) \to \pi^0 h_c) \cdot B(h_c \to \gamma\eta_c) \cdot B(\eta_c \to K^+K^-\pi^0) = (4.54 \pm 0.76 \pm 0.48) \times 10^{-6}$ which we multiply by 6 to account for isospin symmetry.

[4] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (27.24 \pm 4.56 \pm 2.88) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[5] ABLIKIM 12N quotes $B(\psi(2S) \to \pi^0 h_c) \cdot B(h_c \to \gamma\eta_c) \cdot B(\eta_c \to K_S^0K^\pm\pi^\mp) = (11.35 \pm 1.25 \pm 1.50) \times 10^{-6}$ which we multiply by 3 to account for isospin symmetry.

[6] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (34.05 \pm 3.75 \pm 4.50) \times 10^{-6}$ which we divide by our

best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[7] Determined from the ratio of $B(B^\pm \to K^\pm\eta_c)$ $B(\eta_c \to K\overline{K}\pi) = (7.4 \pm 0.5 \pm 0.7) \times 10^{-5}$ reported in AUBERT,B 04B and $B(B^\pm \to K^\pm\eta_c) = (8.7 \pm 1.5) \times 10^{-3}$ reported in AUBERT 06E.

[8] BAI 04 reports $B(J/\psi \to \gamma\eta_c) \cdot B(\eta_c \to K^\pm K^0_S \pi^\mp) = (2.2 \pm 0.3 \pm 0.5) \times 10^{-4}$ which we multiply by 3 to account for isospin symmetry.

[9] BAI 04 reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (6.6 \pm 0.9 \pm 1.5) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[10] BISELLO 91 reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (8.76 \pm 1.80 \pm 1.68) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[11] BISELLO 91 reports $B(J/\psi \to \gamma\eta_c) \cdot B(\eta_c \to K^+ K^- \pi^0) = (1.46 \pm 0.30 \pm 0.28) \times 10^{-4}$ which we multiply by 6 to account for isospin symmetry.

[12] BISELLO 91 reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (6.9 \pm 1.2 \pm 1.2) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[13] BISELLO 91 reports $B(J/\psi \to \gamma\eta_c) \cdot B(\eta_c \to K^\pm K^0_S \pi^\mp) = (2.3 \pm 0.4 \pm 0.4) \times 10^{-4}$ which we multiply by 3 to account for isospin symmetry.

[14] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (7.8 \pm 3.0) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[15] BALTRUSAITIS 86 reports $B(J/\psi \to \gamma\eta_c) \cdot B(\eta_c \to K^+ K^- \pi^0) = (1.3 \pm 0.5) \times 10^{-4}$ which we multiply by 6 to account for isospin symmetry.

[16] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (5.7 \pm 1.5) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[17] BALTRUSAITIS 86 reports $B(J/\psi \to \gamma\eta_c) \cdot B(\eta_c \to K^\pm K^0_S \pi^\mp) = (1.9 \pm 0.5) \times 10^{-4}$ which we multiply by 3 to account for isospin symmetry.

[18] HIMEL 80B reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to \gamma\eta_c(1S))] = (4.5^{+2.4}_{-1.8}) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \to \gamma\eta_c(1S)) = (3.4 \pm 0.5) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[19] Average from $K^+ K^- \pi^0$ and $K^\pm K^0_S \pi^\mp$ decay channels.

[20] The quoted branching ratios use $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

$\Gamma(\phi K^+ K^-)/\Gamma(K\overline{K}\pi)$ — Γ_7/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.052^{+0.016}_{-0.014}\pm0.014$	7	[1] HUANG	03	BELL	$B^\pm \to K^\pm \phi\phi$

[1] Using B($B^+ \to \eta_c K^+$) = $(1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and B($\eta_c \to K\overline{K}\pi$) = $(5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(K\overline{K}\eta)/\Gamma_{total}$ — Γ_{35}/Γ

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.32±0.15 OUR FIT						
1.0 ±0.5 ±0.1		7	[1,2] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0 \gamma\eta K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<3.1	90		[3] BALTRUSAIT...86		MRK3	$J/\psi \to \eta_c \gamma$

[1] ABLIKIM 12N quotes B($\psi(2S) \to \pi^0 h_c$) · B($h_c \to \gamma\eta_c$) · B($\eta_c \to K^+ K^- \eta$) = $(2.11 \pm 1.01 \pm 0.32) \times 10^{-6}$ which we multiply by 2 to account for isospin symmetry.

[2] ABLIKIM 12N reports [$\Gamma(\eta_c(1S) \to K\overline{K}\eta)/\Gamma_{total}$] × [B($\psi(2S) \to h_c(1P)\pi^0$)] × [B($h_c(1P) \to \gamma\eta_c(1S)$)] = $(4.22 \pm 2.02 \pm 0.64) \times 10^{-6}$ which we divide by our best values B($\psi(2S) \to h_c(1P)\pi^0$) = $(7.4 \pm 0.5) \times 10^{-4}$, B($h_c(1P) \to \gamma\eta_c(1S)$) = $(57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[3] The quoted branching ratios use B($J/\psi(1S) \to \gamma\eta_c(1S)$) = 0.0127 ± 0.0036.

$\Gamma(K\overline{K}\eta)/\Gamma(K\overline{K}\pi)$ — Γ_{35}/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.187±0.018 OUR FIT					
0.190±0.008±0.017	5.4k	[1] LEES	14E	BABR	$\gamma\gamma \to K^+ K^- \eta/\pi^0$

[1] LEES 14E reports B($\eta_c(1S) \to K^+ K^- \eta$)/B($\eta_c(1S) \to K^+ K^- \pi^0$) = 0.571 ± 0.025 ± 0.051, which we divide by 3 to account for isospin symmetry. It uses both $\eta \to \gamma\gamma$ and $\eta \to \pi^+ \pi^- \pi^0$ decays.

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.7±0.4±0.2	33	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0 \gamma\eta\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.4±2.0	75	[2] BALTRUSAIT...86		MRK3	$J/\psi \to \eta_c \gamma$
3.7±1.3±2.0	18	[2] PARTRIDGE	80B	CBAL	$J/\psi \to \eta\pi^+\pi^-\gamma$

[1] ABLIKIM 12N reports [$\Gamma(\eta_c(1S) \to \eta\pi^+\pi^-)/\Gamma_{total}$] × [B($\psi(2S) \to h_c(1P)\pi^0$)] × [B($h_c(1P) \to \gamma\eta_c(1S)$)] = $(7.22 \pm 1.47 \pm 1.11) \times 10^{-6}$ which we divide by our best values B($\psi(2S) \to h_c(1P)\pi^0$) = $(7.4 \pm 0.5) \times 10^{-4}$, B($h_c(1P) \to \gamma\eta_c(1S)$) = $(57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[2] The quoted branching ratios use B($J/\psi(1S) \to \gamma\eta_c(1S)$) = 0.0127 ± 0.0036. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

$\Gamma(\eta 2(\pi^+\pi^-))/\Gamma_{total}$ Γ_{37}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
4.6±1.3±0.5	39	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma\eta 2(\pi^+\pi^-)$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to \eta 2(\pi^+\pi^-))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (19.17 \pm 3.77 \pm 3.72) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(K^+K^-\pi^+\pi^-)/\Gamma_{total}$ Γ_{38}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
6.5± 1.0 OUR FIT					
10.6± 1.9 OUR AVERAGE					
9.9± 2.3±1.2	38	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K^+K^-\pi^+\pi^-$
8.9± 1.7±1.9	0.4k	[2] BAI	04	BES	$J/\psi \to \gamma K^+K^-\pi^+\pi^-$
16.0± 2.4±3.4	110	[3] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$
$12\ {}^{+17}_{-\ 7}\ \pm 2$		[4] HIMEL	80B	MRK2	$\psi(2S) \to \eta_c\gamma$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to K^+K^-\pi^+\pi^-)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (4.16 \pm 0.76 \pm 0.59) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[2] BAI 04 reports $[\Gamma(\eta_c(1S) \to K^+K^-\pi^+\pi^-)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.5 \pm 0.2 \pm 0.2) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \to K^+K^-\pi^+\pi^-)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (2.7 \pm 0.4) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[4] HIMEL 80B reports $[\Gamma(\eta_c(1S) \to K^+K^-\pi^+\pi^-)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\eta_c(1S))] = (4.0^{+6.0}_{-2.5}) \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \to \gamma\eta_c(1S)) = (3.4 \pm 0.5) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K\overline{K}\pi)$ Γ_{39}/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.477±0.017±0.070	11k	[1] DEL-AMO-SA...	11M	BABR	$\gamma\gamma \to K^+K^-\pi^+\pi^-\pi^0$

[1] We have multiplied the value of $\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K^0_S K^\pm\pi^\mp)$ reported in DEL-AMO-SANCHEZ 11M by a factor 1/3 to obtain $\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K\overline{K}\pi)$. Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

$\Gamma(K^0 K^- \pi^+ \pi^- \pi^+ +\text{c.c.})/\Gamma_{\text{total}}$ — Γ_{40}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
5.7±1.4±0.7	43	[1,2] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0 \gamma K^0_S K^\mp \pi^\mp 2\pi^\pm$

[1] ABLIKIM 12N quotes $B(\psi(2S) \to \pi^0 h_c) \cdot B(h_c \to \gamma \eta_c) \cdot B(\eta_c \to K^0_S K^- \pi^- 2\pi^+) = (12.01 \pm 2.22 \pm 2.04) \times 10^{-6}$ which we multiply by 2 to take c.c. into account.

[2] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to K^0 K^- \pi^+ \pi^- \pi^+ +\text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma \eta_c(1S))] = (24.02 \pm 4.44 \pm 4.08) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma \eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}$ — Γ_{41}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
7.6±2.4 OUR AVERAGE					
9 ±4 ±1	10	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0 \gamma K^+ K^- 2(\pi^+ \pi^-)$
7.2±2.4±1.5	100	[2] ABLIKIM	06A	BES2	$J/\psi \to K^+ K^- 2(\pi^+ \pi^-)\gamma$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma \eta_c(1S))] = (3.60 \pm 1.71 \pm 0.64) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma \eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[2] ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \to K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \to \gamma \eta_c(1S))] = (1.21 \pm 0.32 \pm 0.24) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma \eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2(K^+ K^-))/\Gamma_{\text{total}}$ — Γ_{42}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.38± 0.29 OUR FIT					
2.2 ± 0.9 ±0.3	7	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0 \gamma 2(K^+ K^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.4 \,^{+0.5}_{-0.4} \pm 0.6$	$14.5^{+4.6}_{-3.0}$	[2] HUANG	03	BELL	$B^+ \to 2(K^+ K^-) K^+$
21 ±10 ±6		[3] ALBRECHT	94H	ARG	$\gamma\gamma \to K^+ K^- K^+ K^-$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to 2(K^+ K^-))/\Gamma_{\text{total}}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma \eta_c(1S))] = (0.94 \pm 0.37 \pm 0.14) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma \eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[2] Using $B(B^+ \to \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \to K \overline{K} \pi) = (5.5 \pm 1.7) \times 10^{-2}$.

[3] Normalized to the sum of $B(\eta_c \to K^\pm K^0_S \pi^\mp)$, $B(\eta_c \to \phi\phi)$, $B(\eta_c \to K^+ K^- \pi^+ \pi^-)$, and $B(\eta_c \to 2\pi^+ 2\pi^-)$.

$\Gamma(2(K^+K^-))/\Gamma(K\overline{K}\pi)$ — Γ_{42}/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.020±0.004 OUR FIT					
0.024±0.007 OUR AVERAGE					
0.023±0.007±0.006		AUBERT,B	04B	BABR	$B^\pm \to K^\pm \eta_c$
$0.026^{+0.009}_{-0.007}\pm0.007$	15	[1] HUANG	03	BELL	$B^\pm \to K^\pm(2K^+2K^-)$

[1] Using B($B^+ \to \eta_c K^+$) = $(1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and B($\eta_c \to K\overline{K}\pi$) = $(5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(\eta'(958)K\overline{K})/\Gamma(\eta'(958)\pi\pi)$ — Γ_2/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
0.859±0.052±0.043	[1] LEES	21A	BABR	$\gamma\gamma \to \eta' K^+K^-$, $\eta'\pi^+\pi^-$

[1] Based on Dalitz-plot analysis of the $\eta_c \to \eta' K^+K^-$, $\eta'\pi^+\pi^-$ final states where the fit fractions and relative phases are determined for numerous two-body intermediate states.

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{43}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5 \times 10^{-4}$	90	[1] ABLIKIM	17AJ	BES3	$\psi(2S) \to \gamma\pi^+\pi^-\pi^0$

[1] ABLIKIM 17AJ reports $[\Gamma(\eta_c(1S) \to \pi^+\pi^-\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\eta_c(1S))] < 1.6 \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to \gamma\eta_c(1S)) = 3.4 \times 10^{-3}$.

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{total}$ — Γ_{44}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
4.8±1.0±0.6	118	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma\pi^+\pi^-2\pi^0$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to \pi^+\pi^-\pi^0\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (20.31 \pm 2.20 \pm 3.33) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(2(\pi^+\pi^-))/\Gamma_{total}$ — Γ_{45}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.87±0.11 OUR FIT					
1.08±0.22 OUR AVERAGE		Error includes scale factor of 1.2.			
1.79±0.33±0.21	100	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma 2(\pi^+\pi^-)$
0.77±0.27±0.17	0.5k	[2] BAI	04	BES	$J/\psi \to \gamma\, 2(\pi^+\pi^-)$
0.79±0.18±0.17	137	[3] BISELLO	91	DM2	$J/\psi \to \gamma 2\pi^+2\pi^-$
0.9 ±0.4 ±0.2	25	[4] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$
$1.7^{+1.1}_{-0.7}\pm0.2$		[5] HIMEL	80B	MRK2	$\psi(2S) \to \eta_c\gamma$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to 2(\pi^+\pi^-))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (7.51 \pm 0.85 \pm 1.11) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[2] BAI 04 reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+\pi^-))/\Gamma_{total}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (1.3 \pm 0.2 \pm 0.4) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] BISELLO 91 reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+\pi^-))/\Gamma_{total}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (1.33 \pm 0.22 \pm 0.20) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[4] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+\pi^-))/\Gamma_{total}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (1.6 \pm 0.6) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[5] HIMEL 80B reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+\pi^-))/\Gamma_{total}] \times [B(\psi(2S) \rightarrow \gamma\eta_c(1S))] = (5.7^{+3.9}_{-2.4}) \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\eta_c(1S)) = (3.4 \pm 0.5) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2(\pi^+\pi^-\pi^0))/\Gamma_{total}$ — Γ_{46}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
16.2±2.1 OUR AVERAGE					
15.3±1.8±1.8	333	ABLIKIM	19AP	BES3	$h_c \rightarrow \gamma\eta_c$
17.9±3.0±2.1	175	[1] ABLIKIM	12N	BES3	$\psi(2S) \rightarrow \pi^0\gamma 2(\pi^+\pi^-\pi^0)$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+\pi^-\pi^0))/\Gamma_{total}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma\eta_c(1S))] = (75.13 \pm 7.42 \pm 9.99) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(3(\pi^+\pi^-))/\Gamma_{total}$ — Γ_{47}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
18 ±4 OUR AVERAGE					
21 ±5 ±2	51	[1] ABLIKIM	12N	BES3	$\psi(2S) \rightarrow \pi^0\gamma 3(\pi^+\pi^-)$
15.4±3.4±3.3	479	[2] ABLIKIM	06A	BES2	$J/\psi \rightarrow 3(\pi^+\pi^-)\gamma$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 3(\pi^+\pi^-))/\Gamma_{total}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma\eta_c(1S))] = (8.82 \pm 1.57 \pm 1.59) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[2] ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \rightarrow 3(\pi^+\pi^-))/\Gamma_{total}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (2.59 \pm 0.32 \pm 0.47) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
13.5± 1.3 OUR FIT					
11.5± 1.9 OUR AVERAGE					
12.0± 2.6±1.5	34	ABLIKIM	19AP	BES3	$h_c \rightarrow \gamma\eta_c$
15 ± 5 ±2	15	[1] ABLIKIM	12N	BES3	$\psi(2S) \rightarrow \pi^0\gamma p\overline{p}$

$11.3 \pm 2.5 \pm 2.4$	213	[2] BAI	04	BES	$J/\psi \to \gamma p \overline{p}$
$7.7 \pm 3.0 \pm 1.7$	18	[3] BISELLO	91	DM2	$J/\psi \to \gamma p \overline{p}$
$8 \pm 4 \pm 2$	23	[4] BALTRUSAIT...86		MRK3	$J/\psi \to \eta_c \gamma$
$23 {}^{+23}_{-12} \pm 3$		[5] HIMEL	80B	MRK2	$\psi(2S) \to \eta_c \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$13.1 {}^{+1.8}_{-2.1} \pm 1.0$	195	[6] WU	06	BELL	$B^+ \to p \overline{p} K^+$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (0.65 \pm 0.19 \pm 0.10) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[2] BAI 04 reports $[\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.9 \pm 0.3 \pm 0.3) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] BISELLO 91 reports $[\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (0.13 \pm 0.04 \pm 0.03) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[4] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.4 \pm 0.7) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[5] HIMEL 80B reports $[\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\eta_c(1S))] = (8{}^{+8}_{-4}) \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to \gamma\eta_c(1S)) = (3.4 \pm 0.5) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[6] WU 06 reports $[\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total}] \times [B(B^+ \to \eta_c K^+)] = (1.42 \pm 0.11 {}^{+0.16}_{-0.20}) \times 10^{-6}$ which we divide by our best value $B(B^+ \to \eta_c K^+) = (1.08 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\overline{p})/\Gamma(K\overline{K}\pi)$ — Γ_{48}/Γ_{34}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0192±0.0019 OUR FIT					
$0.021 \pm 0.002 {}^{+0.004}_{-0.006}$	195	[1] WU	06	BELL	$B^\pm \to K^\pm p \overline{p}$

[1] Using $B(B^+ \to \eta_c K^+) = (1.25 \pm 0.12 {}^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \to K\overline{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(p\overline{p})/\Gamma_{total} \times \Gamma(\phi\phi)/\Gamma_{total}$ — $\Gamma_{48}/\Gamma \times \Gamma_8/\Gamma$

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
0.214±0.035 OUR FIT				
$4.0 {}^{+3.5}_{-3.2}$	BAGLIN	89	SPEC	$\overline{p} p \to K^+ K^- K^+ K^-$

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
0.36±0.13±0.04	14	[1] ABLIKIM 12N	BES3	$\psi(2S) \to \pi^0 \gamma p\overline{p}\pi^0$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to p\overline{p}\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (1.53 \pm 0.49 \pm 0.23) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(\Lambda\overline{\Lambda})/\Gamma_{total}$ Γ_{50}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
10.2±2.3 OUR FIT					
11.8±2.3±2.5			[1] ABLIKIM 12B	BES3	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$8.8^{+2.4}_{-2.3}\pm0.7$		20	[2] WU 06	BELL	$B^+ \to \Lambda\overline{\Lambda}K^+$
<20	90		[3] BISELLO 91	DM2	$e^+e^- \to \gamma\Lambda\overline{\Lambda}$

[1] ABLIKIM 12B reports $[\Gamma(\eta_c(1S) \to \Lambda\overline{\Lambda})/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (0.198 \pm 0.021 \pm 0.032) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] WU 06 reports $[\Gamma(\eta_c(1S) \to \Lambda\overline{\Lambda})/\Gamma_{total}] \times [B(B^+ \to \eta_c K^+)] = (0.95^{+0.25}_{-0.22}{}^{+0.08}_{-0.11}) \times 10^{-6}$ which we divide by our best value $B(B^+ \to \eta_c K^+) = (1.08 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] The quoted branching ratios use $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(\Lambda\overline{\Lambda})/\Gamma(p\overline{p})$ Γ_{50}/Γ_{48}

VALUE	DOCUMENT ID	TECN	COMMENT
0.76±0.17 OUR FIT			
$\mathbf{0.67^{+0.19}_{-0.16}\pm0.12}$	[1] WU 06	BELL	$B^+ \to p\overline{p}K^+$, $\Lambda\overline{\Lambda}K^+$

[1] Not independent from other $\eta_c \to \Lambda\overline{\Lambda}$, $p\overline{p}$ branching ratios reported by WU 06.

$\Gamma(K^+\overline{p}\Lambda + c.c.)/\Gamma_{total}$ Γ_{51}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$\mathbf{2.51^{+0.34}_{-0.32}\pm0.19}$	157	[1] LU 19	BELL	$B^+ \to \overline{p}\Lambda K^+ K^+$

[1] LU 19 reports $(2.83^{+0.36}_{-0.34} \pm 0.35) \times 10^{-3}$ from a measurement of $[\Gamma(\eta_c(1S) \to K^+\overline{p}\Lambda + c.c.)/\Gamma_{total}] \times [B(B^+ \to \eta_c K^+)]$ assuming $B(B^+ \to \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$, which we rescale to our best value $B(B^+ \to \eta_c K^+) = (1.08 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\overline{\Lambda}(1520)\Lambda+\text{c.c.})/\Gamma_{total}$ Γ_{52}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
3.1±1.3±0.2	43	[1] LU	19	BELL	$B^+ \to \overline{p}\Lambda K^+ K^+$

[1] LU 19 reports $(3.48 \pm 1.48 \pm 0.46) \times 10^{-3}$ from a measurement of $[\Gamma(\eta_c(1S) \to \overline{\Lambda}(1520)\Lambda+\text{c.c.})/\Gamma_{total}] \times [B(B^+ \to \eta_c K^+)]$ assuming $B(B^+ \to \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$, which we rescale to our best value $B(B^+ \to \eta_c K^+) = (1.08 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Sigma^+\overline{\Sigma}^-)/\Gamma_{total}$ Γ_{53}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
2.1±0.3±0.5	112	[1] ABLIKIM	13C	BES3	$J/\psi \to \gamma p\overline{p}\pi^0\pi^0$

[1] ABLIKIM 13C reports $[\Gamma(\eta_c(1S) \to \Sigma^+\overline{\Sigma}^-)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (3.60 \pm 0.48 \pm 0.31) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Xi^-\overline{\Xi}^+)/\Gamma_{total}$ Γ_{54}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.90±0.18±0.19	78	[1] ABLIKIM	13C	BES3	$J/\psi \to \gamma\Lambda\overline{\Lambda}\pi^+\pi^-$

[1] ABLIKIM 13C reports $[\Gamma(\eta_c(1S) \to \Xi^-\overline{\Xi}^+)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.51 \pm 0.27 \pm 0.14) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
5.5±1.8±0.6		19	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma p\overline{p}\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<12	90		HIMEL	80B	MRK2	$\psi(2S) \to \eta_c\gamma$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to \pi^+\pi^- p\overline{p})/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (2.30 \pm 0.65 \pm 0.36) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (57 \pm 5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

RADIATIVE DECAYS

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

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.68±0.12 OUR FIT						
2.2 $^{+0.9}_{-0.6}$ OUR AVERAGE						
2.7 ±0.8 ±0.6			[1] ABLIKIM	13I	BES3	
0.7 $^{+1.6}_{-0.7}$ ±0.2		$1.2^{+2.8}_{-1.1}$	[2] ADAMS	08	CLEO	$\psi(2S) \to \pi^+\pi^- J/\psi$

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

$2.0\ ^{+0.9}_{-0.7}\ \pm 0.2$		13	[3] WICHT	08	BELL	$B^{\pm} \to K^{\pm}\gamma\gamma$
$2.80^{+0.67}_{-0.58}\pm 1.0$			[4] ARMSTRONG	95F	E760	$\overline{p}p \to \gamma\gamma$
<9	90		[5] BISELLO	91	DM2	$J/\psi \to \gamma\gamma\gamma$
$6\ ^{+4}_{-3}\ \pm 4$			[4] BAGLIN	87B	SPEC	$\overline{p}p \to \gamma\gamma$
<18	90		[6] BLOOM	83	CBAL	$J/\psi \to \eta_c\gamma$

[1] ABLIKIM 13I reports $[\Gamma(\eta_c(1S) \to \gamma\gamma)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (4.5 \pm 1.2 \pm 0.6) \times 10^{-6}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] ADAMS 08 reports $[\Gamma(\eta_c(1S) \to \gamma\gamma)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.2^{+2.7}_{-1.1} \pm 0.3) \times 10^{-6}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] WICHT 08 reports $[\Gamma(\eta_c(1S) \to \gamma\gamma)/\Gamma_{total}] \times [B(B^+ \to \eta_c K^+)] = (2.2^{+0.9}_{-0.7}{}^{+0.4}_{-0.2}) \times 10^{-7}$ which we divide by our best value $B(B^+ \to \eta_c K^+) = (1.08 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[4] Not independent from the values of the total and two-photon width quoted by the same experiment.

[5] The quoted branching ratios use $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

[6] Using $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(\gamma\gamma)/\Gamma(K\overline{K}\pi)$ — Γ_{56}/Γ_{34}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
2.40±0.28 OUR FIT					
$\mathbf{3.2\ ^{+1.3}_{-1.0}\ ^{+0.8}_{-0.6}}$	13	[1] WICHT	08	BELL	$B^{\pm} \to K^{\pm}\gamma\gamma$

[1] Using $B(B^+ \to \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \to K\overline{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(p\overline{p})/\Gamma_{total} \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{48}/\Gamma \times \Gamma_{56}/\Gamma$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
0.228±0.022 OUR FIT					
0.26 ±0.05 OUR AVERAGE Error includes scale factor of 1.4.					
$0.224^{+0.038}_{-0.037}\pm 0.020$	190	AMBROGIANI	03	E835	$\overline{p}p \to \eta_c \to \gamma\gamma$
$0.336^{+0.080}_{-0.070}$		ARMSTRONG	95F	E760	$\overline{p}p \to \gamma\gamma$
$0.68\ ^{+0.42}_{-0.31}$	12	BAGLIN	87B	SPEC	$\overline{p}p \to \gamma\gamma$

Charge conjugation (C), Parity (P), Lepton family number (LF) violating modes

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ — Γ_{57}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<11	90	[1] ABLIKIM	11G	BES3	$J/\psi \to \gamma\pi^+\pi^-$

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

<70	90	[2] ABLIKIM	06B	BES2	$J/\psi \to \pi^+\pi^-\gamma$

[1] ABLIKIM 11G reports $[\Gamma(\eta_c(1S) \to \pi^+\pi^-)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] < 1.82\times10^{-6}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.7\times10^{-2}$.

[2] ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \to \pi^+\pi^-)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] < 1.1\times10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.7\times10^{-2}$.

$\Gamma(\pi^0\pi^0)/\Gamma_{total}$ — Γ_{58}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
< 4	90	[1] ABLIKIM	11G	BES3	$J/\psi \to \gamma\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<40	90	[2] ABLIKIM	06B	BES2	$J/\psi \to \pi^0\pi^0\gamma$

[1] ABLIKIM 11G reports $[\Gamma(\eta_c(1S) \to \pi^0\pi^0)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] < 6.0\times10^{-7}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.7\times10^{-2}$.

[2] ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \to \pi^0\pi^0)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] < 0.71\times10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.7\times10^{-2}$.

$\Gamma(K^+K^-)/\Gamma_{total}$ — Γ_{59}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<60	90	[1] ABLIKIM	06B	BES2	$J/\psi \to K^+K^-\gamma$

[1] ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \to K^+K^-)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] < 0.96\times10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.7\times10^{-2}$.

$\Gamma(K^0_S K^0_S)/\Gamma_{total}$ — Γ_{60}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<31	90	[1] ABLIKIM	06B	BES2	$J/\psi \to K^0_S K^0_S\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<32	90	[2] UEHARA	13	BELL	$\gamma\gamma \to K^0_S K^0_S$
< 5.6	90	[3] UEHARA	13	BELL	$\gamma\gamma \to K^0_S K^0_S$

[1] ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \to K^0_S K^0_S)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] < 0.53\times10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.7\times10^{-2}$.

[2] Taking into account interference with the non-resonant continuum.

[3] Neglecting interference with the non-resonant continuum.

$\eta_c(1S)$ CROSS-PARTICLE BRANCHING RATIOS

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BRAUNSCH...	89	ZPHY C41 533	W. Braunschweig *et al.*	(TASSO Collab.)
AIHARA	88D	PRL 60 2355	H. Aihara *et al.*	(TPC Collab.)
BAGLIN	87B	PL B187 191	C. Baglin *et al.*	(R704 Collab.)
BALTRUSAIT...	86	PR D33 629	R.M. Baltrusaitis *et al.*	(Mark III Collab.)
BERGER	86	PL 167B 120	C. Berger *et al.*	(PLUTO Collab.)
GAISER	86	PR D34 711	J. Gaiser *et al.*	(Crystal Ball Collab.)
ALTHOFF	85B	ZPHY C29 189	M. Althoff *et al.*	(TASSO Collab.)
BALTRUSAIT...	84	PRL 52 2126	R.M. Baltrusaitis *et al.*	(CIT, UCSC+) JP
BLOOM	83	ARNS 33 143	E.D. Bloom, C. Peck	(SLAC, CIT)
HIMEL	80B	PRL 45 1146	T.M. Himel *et al.*	(SLAC, LBL, UCB)
PARTRIDGE	80B	PRL 45 1150	R. Partridge *et al.*	(CIT, HARV, PRIN+)