$\eta_c(1S)$

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

$\eta_c(1S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2984.1 ± 0.4 OUR AVERAGE		Error includes scale factor of 1.2.		
2985.01 ± 0.17 ± 0.89	35k	AAIJ 23AH	LHCB	$B^+ \to K^+ (K^0_S K \pi)$
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 $\pm$ 2.9 $\pm$ 1.3	140	[15,21] BAI	00F	BES	$J/\psi \to \gamma\eta_c$
2980.4 $\pm$ 2.3 $\pm$ 0.6		[22] BRANDENB...	00B	CLE2	$\gamma\gamma \to \eta_c \to K^\pm K^0_S \pi^\mp$
2975.8 $\pm$ 3.9 $\pm$ 1.2		[21] BAI	99B	BES	Sup. by BAI 00F
2999 $\pm$ 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 $\pm$ 1.9		[15,23] BISELLO	91	DM2	$J/\psi \to \eta_c\gamma$
2969 $\pm$ 4 $\pm$ 4	80	[15] BAI	90B	MRK3	$J/\psi \to \gamma K^+K^-K^+K^-$
2956 $\pm$12 $\pm$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 $\pm$ 1.6		[15,23] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$
2984 $\pm$ 2.3 $\pm$ 4.0		[15] GAISER	86	CBAL	$J/\psi \to \gamma X$, $\psi(2S) \to \gamma X$
2976 $\pm$ 8		[15,24] BALTRUSAIT...	84	MRK3	$J/\psi \to 2\phi\gamma$
2982 $\pm$ 8	18	[25] HIMEL	80B	MRK2	e^+e^-
2980 $\pm$ 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
30.5± 0.5 OUR FIT Error includes scale factor of 1.2.					
30.5± 0.5 OUR AVERAGE Error includes scale factor of 1.1.					
29.7± 0.5±0.2	35k	AAIJ	23AH	LHCB	$B^+ \to K^+(K^0_S K\pi)$
33.8± 1.6±4.1	1705	ABLIKIM	19AV	BES3	$J/\psi \to \gamma\omega\omega$
$30.8^{+2.3}_{-2.2}\pm2.9$	2673	XU	18	BELL	$e^+e^- \to e^+e^-\eta'\pi^+\pi^-$
34.0± 1.9±1.3	11k	AAIJ	17AD	LHCB	$pp \to B^+X \to p\overline{p}K^+X$
31.4± 3.5±2.0	6.4k	[1] AAIJ	17BB	LHCB	$pp \to b\overline{b}X \to 2(K^+K^-)X$
$27.2\pm3.1^{+5.4}_{-2.6}$		[2] ANASHIN	14	KEDR	$J/\psi \to \gamma\eta_c$
25.2± 2.6±2.4	4.5k	[3,4] LEES	14E	BABR	$\gamma\gamma \to K^+K^-\pi^0$
34.8± 3.1±4.0	900	[3,4,5] LEES	14E	BABR	$\gamma\gamma \to K^+K^-\eta$
32.0± 1.2±1.0		[6,7] ABLIKIM	12F	BES3	$\psi(2S) \to \gamma\eta_c$
36.4± 3.2±1.7	832	[3] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma$ hadrons
$37.8^{+5.8}_{-5.3}\pm3.1$	486	ZHANG	12A	BELL	$e^+e^- \to e^+e^-\eta'\pi^+\pi^-$
36.2± 2.8±3.0	11k	DEL-AMO-SA...	11M	BABR	$\gamma\gamma \to K^+K^-\pi^+\pi^-\pi^0$
$35.1\pm3.1^{+1.0}_{-1.6}$	920	[7] VINOKUROVA	11	BELL	$B^\pm \to K^\pm(K^0_S K^\pm\pi^\mp)$
31.7± 1.2±0.8	14k	[8] LEES	10	BABR	10.6 $e^+e^- \to e^+e^-K^0_S K^\pm\pi^\mp$
$36.3^{+3.7}_{-3.6}\pm4.4$	0.9k	AUBERT	08AB	BABR	$B \to \eta_c(1S)K^{(*)} \to K\overline{K}\pi K^{(*)}$
28.1± 3.2±2.2	7.5k	UEHARA	08	BELL	$\gamma\gamma \to \eta_c \to$ hadrons
$48\ ^{+8}_{-7}\ \pm5$	195	WU	06	BELL	$B^+ \to p\overline{p}K^+$
40 ±19 ±5	20	WU	06	BELL	$B^+ \to \Lambda\overline{\Lambda}K^+$
24.8± 3.4±3.5	592	ASNER	04	CLEO	$\gamma\gamma \to \eta'_c \to K^0_S K^\pm\pi^\mp$
$20.4^{+7.7}_{-6.7}\pm2.0$	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± 1.1±1.3	12k	[9] DEL-AMO-SA...	11M	BABR	$\gamma\gamma \to K^0_S K^\pm\pi^\mp$
34.3± 2.3±0.9	2.5k	[10] AUBERT	04D	BABR	$\gamma\gamma \to \eta_c(1S) \to K\overline{K}\pi$
17.0± 3.7±7.4		[11] BAI	03	BES	$J/\psi \to \gamma\eta_c$
29 ± 8 ±6	180	[12] FANG	03	BELL	$B \to \eta_c K$
11.0± 8.1±4.1		[13] BAI	00F	BES	$J/\psi \to \gamma\eta_c$ and $\psi(2S) \to \gamma\eta_c$
27.0± 5.8±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)	Scale factor/ Confidence level
	Decays involving hadronic resonances		
Γ_1	$\eta'(958)\pi\pi$	(2.0 ± 0.4) %	S=1.4
Γ_2	$\eta'(958)K\overline{K}$	(1.73 ± 0.35) %	
Γ_3	$\eta'(958)\eta\eta$	$(3.4 \pm 0.6) \times 10^{-3}$	
Γ_4	$\rho\rho$	(1.8 ± 0.4) %	
Γ_5	$K^*(892)^0 K^-\pi^+ +$ c.c.	(1.8 ± 0.5) %	
Γ_6	$K^*(892)\overline{K}^*(892)$	$(7.0 \pm 1.2) \times 10^{-3}$	
Γ_7	$K^*(892)^0\overline{K}^*(892)^0\pi^+\pi^-$	(1.4 ± 0.6) %	
Γ_8	$\phi K^+ K^-$	$(3.3 {}^{+1.2}_{-1.1}) \times 10^{-3}$	
Γ_9	$\phi\phi$	$(1.8 \pm 0.4) \times 10^{-3}$	S=2.3
Γ_{10}	$\phi 2(\pi^+\pi^-)$	$< 4 \times 10^{-3}$	CL=90%
Γ_{11}	$a_0(980)\pi$	seen	
Γ_{12}	$a_2(1320)\pi$	seen	
Γ_{13}	$K^*(892)\overline{K} +$ c.c.	< 1.28 %	CL=90%
Γ_{14}	$f_2(1270)\eta$	seen	
Γ_{15}	$f_2(1270)\eta'$	seen	
Γ_{16}	$\omega\omega$	$(2.7 \pm 0.9) \times 10^{-3}$	S=2.1
Γ_{17}	$\omega\phi$	$< 2.5 \times 10^{-4}$	CL=90%
Γ_{18}	$f_2(1270)f_2(1270)$	(1.08 ± 0.27) %	
Γ_{19}	$f_2(1270)f'_2(1525)$	$(9.7 \pm 3.2) \times 10^{-3}$	
Γ_{20}	$f_0(500)\eta$	seen	
Γ_{21}	$f_0(500)\eta'$	seen	
Γ_{22}	$f_0(980)\eta$	seen	
Γ_{23}	$f_0(980)\eta'$	seen	
Γ_{24}	$f_0(1500)\eta$	seen	
Γ_{25}	$f_0(1710)\eta'$	seen	

Γ_{26}	$f_0(2100)\eta'$		seen	
Γ_{27}	$f_0(2200)\eta$		seen	
Γ_{28}	$a_0(1320)\pi$		seen	
Γ_{29}	$a_0(1450)\pi$		seen	
Γ_{30}	$a_2(1700)\pi$		seen	
Γ_{31}	$a_0(1710)\pi$		seen	
Γ_{32}	$a_0(1950)\pi$		seen	
Γ_{33}	$K_0^*(1430)\overline{K}$+ c.c.		seen	
Γ_{34}	$K_2^*(1430)\overline{K}$+ c.c.		seen	
Γ_{35}	$K_0^*(1950)\overline{K}$+ c.c.		seen	
Γ_{36}	$K_0^*(2600)\overline{K}$+ c.c.		seen	

Decays into stable hadrons

Γ_{37}	$K\overline{K}\pi$		(7.1 ± 0.4) %	S=1.1
Γ_{38}	$K\overline{K}\eta$		(1.32 ± 0.15) %	
Γ_{39}	$\eta\pi^+\pi^-$		(1.6 ± 0.4) %	
Γ_{40}	$\eta 2(\pi^+\pi^-)$		(4.3 ± 1.3) %	
Γ_{41}	$K^+K^-\pi^+\pi^-$		$(8.3 \pm 1.8) \times 10^{-3}$	S=1.9
Γ_{42}	$K^+K^-\pi^+\pi^-\pi^0$		(3.4 ± 0.6) %	
Γ_{43}	$K^0K^-\pi^+\pi^-\pi^+$ + c.c.		(5.4 ± 1.5) %	
Γ_{44}	$K^+K^-2(\pi^+\pi^-)$		$(8.4 \pm 2.4) \times 10^{-3}$	
Γ_{45}	$2(K^+K^-)$		$(1.4 \pm 0.4) \times 10^{-3}$	S=1.4
Γ_{46}	$\pi^+\pi^-\pi^0$		$< 4 \times 10^{-4}$	CL=90%
Γ_{47}	$\pi^+\pi^-\pi^0\pi^0$		(4.6 ± 1.0) %	
Γ_{48}	$2(\pi^+\pi^-)$		$(9.6 \pm 1.5) \times 10^{-3}$	S=1.4
Γ_{49}	$2(\pi^+\pi^-\pi^0)$		(15.9 ± 2.0) %	
Γ_{50}	$3(\pi^+\pi^-)$		(1.89 ± 0.34) %	
Γ_{51}	$p\overline{p}$		$(1.33\pm0.11) \times 10^{-3}$	S=1.1
Γ_{52}	$p\overline{p}\pi^0$		$(3.4 \pm 1.3) \times 10^{-3}$	
Γ_{53}	$p\overline{p}\pi^+\pi^-$		$(3.7 \pm 0.5) \times 10^{-3}$	
Γ_{54}	$\Lambda\overline{\Lambda}$		$(1.10\pm0.28) \times 10^{-3}$	S=1.5
Γ_{55}	$K^+\overline{p}\Lambda$+ c.c.		$(2.5 \pm 0.4) \times 10^{-3}$	
Γ_{56}	$\overline{\Lambda}(1520)\Lambda$+ c.c.		$(3.0 \pm 1.3) \times 10^{-3}$	
Γ_{57}	$\Sigma^+\overline{\Sigma}^-$		$(2.6 \pm 0.5) \times 10^{-3}$	
Γ_{58}	$\Xi^-\overline{\Xi}^+$		$(1.07\pm0.24) \times 10^{-3}$	

Radiative decays

Γ_{59}	$\gamma\gamma$		$(1.66\pm0.13) \times 10^{-4}$	S=1.2

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

Γ_{60}	$\pi^+\pi^-$	*P,CP*	$< 1.3 \times 10^{-4}$	CL=90%
Γ_{61}	$\pi^0\pi^0$	*P,CP*	$< 4 \times 10^{-5}$	CL=90%
Γ_{62}	K^+K^-	*P,CP*	$< 7 \times 10^{-4}$	CL=90%
Γ_{63}	$K_S^0K_S^0$	*P,CP*	$< 4 \times 10^{-4}$	CL=90%

FIT INFORMATION

A multiparticle fit to $\eta_c(1S)$, $J/\psi(1S)$, $\psi(2S)$, $h_c(1P)$, and $B^{\pm}$ with the total width, 10 combinations of partial widths obtained from integrated cross section, and 38 branching ratios uses 113 measurements to determine 19 parameters. The overall fit has a $\chi^2 = 184.6$ for 94 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, $x_i \equiv \Gamma_i/\Gamma_{\text{total}}$.

x_6	14									
x_9	11	13								
x_{16}	7	8	8							
x_{18}	9	11	11	7						
x_{37}	25	25	22	12	17					
x_{38}	13	13	11	6	9	51				
x_{41}	7	7	6	4	5	15	8			
x_{45}	5	5	5	2	3	12	6	4		
x_{48}	13	17	17	10	15	26	13	8	5	
x_{51}	19	20	20	11	16	39	20	11	11	24
x_{53}	7	7	8	4	5	22	11	5	10	8
x_{54}	5	7	7	4	6	12	6	3	4	10
x_{59}	−38	−35	−27	−16	−22	−63	−32	−17	−12	−31
Γ	−1	−1	−1	0	−1	−2	−1	0	0	−1
	x_1	x_6	x_9	x_{16}	x_{18}	x_{37}	x_{38}	x_{41}	x_{45}	x_{48}

x_{53}	21			
x_{54}	13	9		
x_{59}	−47	−17	−11	
Γ	1	0	0	−20
	x_{51}	x_{53}	x_{54}	x_{59}

$\eta_c(1S)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$ — Γ_{59}

VALUE (keV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
5.1± 0.4 OUR FIT	Error includes scale factor of 1.2.			
• • • 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± 1.2± 1.8	157 ± 33	[4] KUO 05	BELL	$\gamma\gamma \to p\overline{p}$
7.4± 0.4± 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	$\gamma\gamma \to \eta_c$
$3.8^{+1.1+1.9}_{-1.0-1.0}$	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.

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

$\Gamma(\eta'(958)\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_1\Gamma_{59}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
102 ±18 OUR FIT Error includes scale factor of 1.5.					
$98.1 \pm 3.9 \pm 11.7$	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.

$\Gamma(\rho\rho) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_4\Gamma_{59}/\Gamma$

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	$\gamma\gamma \to 2(\pi^+\pi^-)$

$\Gamma(K^*(892)\overline{K}^*(892)) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_6\Gamma_{59}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
35 ±6 OUR FIT					
32.4±4.2±5.8	882 ± 115	UEHARA	08	BELL	$\gamma\gamma \to \pi^+\pi^- K^+ K^-$

$\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_9\Gamma_{59}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
9.2 ±2.2 OUR FIT Error includes scale factor of 2.7.					
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 ± 0.5)%.

$\Gamma(\omega\omega) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{16}\Gamma_{59}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
13 ±5 OUR FIT Error includes scale factor of 2.2.					
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 ± 0.7)%.

$\Gamma(\omega\phi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{17}\Gamma_{59}/\Gamma$

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 ± 0.5)% and B($\omega \to \pi^+\pi^-\pi^0$) = (89.2 ± 0.7)%.

$\Gamma(f_2(1270) f_2(1270)) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{18}\Gamma_{59}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
55±14 OUR FIT					
69±17±12	3182±766	UEHARA	08	BELL	$\gamma\gamma \to 2(\pi^+\pi^-)$

$\Gamma(f_2(1270) f'_2(1525)) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{19}\Gamma_{59}/\Gamma$

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

$\Gamma(K\overline{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{37}\Gamma_{59}/\Gamma$

VALUE (keV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.360±0.022 OUR FIT Error includes scale factor of 1.5.						
0.396±0.016 OUR AVERAGE						
0.386±0.008±0.021		12k	DEL-AMO-SA...	11M	BABR	$\gamma\gamma \to K^0_S K^\pm \pi^\mp$
0.374±0.009±0.031		14k	[1] LEES	10	BABR	10.6 $e^+ e^- \to e^+ e^- K^0_S K^\pm \pi^\mp$
0.407±0.022±0.028			[2,3] ASNER	04	CLEO	$\gamma\gamma \to \eta'_c \to K^0_S K^\pm \pi^\mp$
0.60 ±0.12 ±0.09		41	[3,4] ABDALLAH	03J	DLPH	$\gamma\gamma \to K^0_S K^\pm \pi^\mp$
1.47 ±0.87 ±0.27			[3] SHIRAI	98	AMY	$\gamma\gamma \to \eta_c \to K^\pm K^0_S \pi^\mp$

0.84 ±0.21		[3] ALBRECHT	94H	ARG	$\gamma\gamma \to K^\pm K^0_S \pi^\mp$
0.60 $^{+0.23}_{-0.20}$		[3] CHEN	90B	CLEO	$\gamma\gamma \to \eta_c K^\pm K^0_S \pi^\mp$
1.06 ±0.41 ±0.27	11	[3] BRAUNSCH...	89	TASS	$\gamma\gamma \to K\overline{K}\pi$
1.5 $^{+0.60}_{-0.45}$ ±0.3	7	[3] BERGER	86	PLUT	$\gamma\gamma \to K\overline{K}\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.418±0.044±0.022		[3,5] BRANDENB...	00B	CLE2	$\gamma\gamma \to \eta_c \to K^\pm K^0_S \pi^\mp$
<0.63	95	[3] BEHREND	89	CELL	$\gamma\gamma \to K^0_S K^\pm \pi^\mp$
<4.4	95	ALTHOFF	85B	TASS	$\gamma\gamma \to K\overline{K}\pi$

[1] From the corrected and unfolded mass spectrum.
[2] Calculated by us from the value reported in ASNER 04 that assumes B($\eta_c \to K\overline{K}\pi$) = 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($\eta_c \to K^0_S K^\pm \pi^\mp$) = (1.5 ± 0.4)%.
[5] Superseded by ASNER 04.

$\Gamma(K^+K^-\pi^+\pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ $\Gamma_{41}\Gamma_{59}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
42 ± 9 OUR FIT Error includes scale factor of 2.1.					
27 ± 6 OUR AVERAGE					
25.7± 3.2± 4.9	2019±248	UEHARA	08	BELL	$\gamma\gamma \to \pi^+\pi^-K^+K^-$
280 ±100 ±60	42	[1] ABDALLAH	03J	DLPH	$\gamma\gamma \to \pi^+\pi^-K^+K^-$
170 ± 80 ±20	13.9 ± 6.6	ALBRECHT	94H	ARG	$\gamma\gamma \to \pi^+\pi^-K^+K^-$

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

$\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ $\Gamma_{42}\Gamma_{59}/\Gamma$

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.190±0.006±0.028	11k	DEL-AMO-SA..11M		BABR	$\gamma\gamma \to K^+K^-\pi^+\pi^-\pi^0$

$\Gamma(2(K^+K^-)) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ $\Gamma_{45}\Gamma_{59}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
7.2± 2.1 OUR FIT Error includes scale factor of 1.5.					
5.8± 1.9 OUR AVERAGE					
5.6± 1.1± 1.6	216 ± 42	UEHARA	08	BELL	$\gamma\gamma \to 2(K^+K^-)$
350 ±90 ±60	46	[1] ABDALLAH	03J	DLPH	$\gamma\gamma \to 2(K^+K^-)$
231 ±90 ±23	9.1 ± 3.3	[2] ALBRECHT	94H	ARG	$\gamma\gamma \to 2(K^+K^-)$

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

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ $\Gamma_{48}\Gamma_{59}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
48 ± 7 OUR FIT Error includes scale factor of 1.5.					
42 ± 6 OUR AVERAGE					
40.7± 3.7± 5.3	5381±492	UEHARA	08	BELL	$\gamma\gamma \to 2(\pi^+\pi^-)$
180 ±70 ±20	21.4 ± 8.6	ALBRECHT	94H	ARG	$\gamma\gamma \to 2(\pi^+\pi^-)$

$\Gamma(p\overline{p}) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{51}\Gamma_{59}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
6.7 ±0.6 OUR FIT Error includes scale factor of 1.1.					
$6.2^{+1.1}_{-1.0}$ OUR AVERAGE Error includes scale factor of 1.1.					
$7.20\pm1.53^{+0.67}_{-0.75}$	157 ± 33	[1] KUO	05	BELL	$\gamma\gamma \to p\overline{p}$
$4.6\ ^{+1.3}_{-1.1}\ \pm0.4$	190	AMBROGIANI	03	E835	$\overline{p}p \to \gamma\gamma$
$8.1\ ^{+2.9}_{-2.0}$		ARMSTRONG	95F	E760	$\overline{p}p \to \gamma\gamma$

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

$\eta_c(1S)$ BRANCHING RATIOS

HADRONIC DECAYS

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

$\Gamma(\eta'(958)\eta\eta)/\Gamma_{total}$ — Γ_3/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
3.4±0.5±0.3	[1] ABLIKIM	21C	BES3	$J/\psi(1S) \to \gamma\eta\eta\eta'$

[1] ABLIKIM 21C reports $[\Gamma(\eta_c(1S) \to \eta'(958)\eta\eta)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (4.86 \pm 0.62 \pm 0.45) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho\rho)/\Gamma_{total}$ — Γ_4/Γ

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1.1±0.5±0.1		72	[1] ABLIKIM	05L	BES2	$J/\psi \to \pi^+\pi^-\pi^+\pi^-\gamma$
2.3±0.5±0.2		113	[2,3] BISELLO	91	DM2	$J/\psi \to \gamma\rho^0\rho^0$
2.1±1.0±0.2		32	[4,5] BISELLO	91	DM2	$J/\psi \to \gamma\rho^+\rho^-$
<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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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_5/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.8 \pm 0.4 \pm 0.2$	63	[1] BALTRUSAIT...86	MRK3	$J/\psi \to \eta_c \gamma$

[1] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \to K^*(892)^0 K^- \pi^+ + \text{c.c.})/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (2.6 \pm 0.6) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)^0 \overline{K}^*(892)^0 \pi^+ \pi^-)/\Gamma_{total}$ — Γ_7/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$135 \pm 57 \pm 13$	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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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_8/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$2.9^{+0.9}_{-0.8} \pm 1.1$	$14.1^{+4.4}_{-3.7}$	[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 $B(\eta_c \to K\overline{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(\phi 2(\pi^+ \pi^-))/\Gamma_{total}$ — Γ_{10}/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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.41 \times 10^{-2}$.

$\Gamma(a_0(980)\pi)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
seen		AAIJ 23AH	LHCB	$B^+ \to K^+ (K^0_S K \pi)$
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 ± 0.0036.
[2] We are assuming B($a_0(980) \to \eta\pi$) >0.5.

$\Gamma(a_2(1320)\pi)/\Gamma_{total}$ — Γ_{12}/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 ± 0.0036.

$\Gamma(K^*(892)\overline{K}+\text{c.c.})/\Gamma_{total}$ — Γ_{13}/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 ± 0.0036.

$\Gamma(f_2(1270)\eta)/\Gamma_{total}$ — Γ_{14}/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 ± 0.0036.

$\Gamma(f_2(1270)\eta')/\Gamma_{total}$ — Γ_{15}/Γ

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

$\Gamma(\omega\phi)/\Gamma_{total}$ — Γ_{17}/Γ

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

[1] Using B($J/\psi \to \gamma\eta_c$)= 0.017 ± 0.004.
[2] The quoted branching ratio uses B($J/\psi(1S) \to \gamma \eta_c(1S)$) = 0.0127 ± 0.0036.

$\Gamma(f_0(500)\eta)/\Gamma_{total}$ — Γ_{20}/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_{21}/Γ

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

$\Gamma(f_0(980)\eta)/\Gamma_{\rm total}$ — Γ_{22}/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 $\eta_c \to K^+K^-\eta$

$\Gamma(f_0(980)\eta')/\Gamma_{\rm total}$ — Γ_{23}/Γ

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

$\Gamma(f_0(1500)\eta)/\Gamma_{\rm total}$ — Γ_{24}/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 $\eta_c \to K^+K^-\eta$

$\Gamma(f_0(1710)\eta')/\Gamma_{\rm total}$ — Γ_{25}/Γ

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

$\Gamma(f_0(2100)\eta')/\Gamma_{\rm total}$ — Γ_{26}/Γ

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

$\Gamma(f_0(2200)\eta)/\Gamma_{\rm total}$ — Γ_{27}/Γ

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

$\Gamma(a_0(1320)\pi)/\Gamma_{\rm total}$ — Γ_{28}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AAIJ	23AH	LHCB	$B^+ \to K^+(K^0_S K\pi)$
seen	LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\pi^0$

$\Gamma(a_0(1450)\pi)/\Gamma_{\rm total}$ — Γ_{29}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AAIJ	23AH	LHCB	$B^+ \to K^+(K^0_S K\pi)$
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta$
seen	LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\pi^0$

$\Gamma(a_2(1700)\pi)/\Gamma_{\rm total}$ — Γ_{30}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AAIJ	23AH	LHCB	$B^+ \to K^+(K^0_S K\pi)$

$\Gamma(a_0(1710)\pi)/\Gamma_{\rm total}$ — Γ_{31}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AAIJ	23AH	LHCB	$B^+ \to K^+(K^0_S K\pi)$
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to \pi^+\pi^-\eta'$

$\Gamma(a_0(1950)\pi)/\Gamma_{total}$ — Γ_{32}/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.

$\Gamma(K_0^*(1430)\overline{K}+c.c.)/\Gamma_{total}$ — Γ_{33}/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.

$\Gamma(K_2^*(1430)\overline{K}+c.c.)/\Gamma_{total}$ — Γ_{34}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AAIJ	23AH	LHCB	$B^+ \to K^+(K_S^0 K\pi)$
seen	LEES	21A	BABR	Dalitz anal. of $\eta_c \to K^+K^-\eta'$
seen	LEES	14E	BABR	Dalitz anal. of $\eta_c \to K^+K^-\pi^0$

$\Gamma(K_0^*(1950)\overline{K}+c.c.)/\Gamma_{total}$ — Γ_{35}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen		AAIJ	23AH	LHCB	$B^+ \to K^+(K_S^0 K\pi)$
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.

$\Gamma(K_0^*(2600)\overline{K}+c.c.)/\Gamma_{total}$ — Γ_{36}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AAIJ	23AH	LHCB	$B^+ \to K^+(K_S^0 K\pi)$

$\Gamma(K\overline{K}\pi)/\Gamma_{total}$ — Γ_{37}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
7.1±0.4 OUR FIT Error includes scale factor of 1.1.					
7.4±0.6 OUR AVERAGE					
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	$h_c \to \gamma\eta_c$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
6.1±1.2±0.6	55	[3,4] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K^+K^-\pi^0$
7.6±1.3±0.8	107	[5,6] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K_S^0 K^\mp\pi^\pm$
8.5±1.8		[7] AUBERT	06E	BABR	$B^\pm \to K^\pm X_{c\overline{c}}$
4.7±1.2±0.5	0.6k	[8,9] BAI	04	BES	$J/\psi \to \gamma K^\pm\pi^\mp K_S^0$
6.2±1.7±0.6	33	[10,11] BISELLO	91	DM2	$J/\psi \to \gamma K^+K^-\pi^0$
4.9±1.2±0.5	68	[12,13] BISELLO	91	DM2	$J/\psi \to \gamma K^\pm\pi^\mp K_S^0$
4.8±1.7	95	[14,15] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$

$5.5\pm2.1\pm0.5$	32	[16,17] BALTRUSAIT..86		MRK3	$J/\psi \to \gamma K^+ K^- \pi^0$
$4.0\pm1.1\pm0.4$	63	[18,19] BALTRUSAIT..86		MRK3	$J/\psi \to \gamma K^\pm \pi^\mp K^0_S$
$13\ ^{+7}_{-5}\ \pm2$		[20] HIMEL	80B	MRK2	$\psi(2S) \to \eta_c \gamma$
<10.7	90% CL	[15] 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 $B(\eta_c \to K^0_S K^\pm \pi^\mp) = (2.60 \pm 0.21 \pm 0.20) \times 10^{-2}$ 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 $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (27.24 \pm 4.56 \pm 2.88) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. 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 $B(\psi(2S) \to \pi^0 h_c) \cdot B(h_c \to \gamma\eta_c) \cdot B(\eta_c \to K^0_S K^\pm \pi^\mp) = (11.35 \pm 1.25 \pm 1.50) \times 10^{-6}$ which we multiply by 3 to account for isospin symmetry.

[6] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (34.05 \pm 3.75 \pm 4.50) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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] Average from $K^+ K^- \pi^0$ and $K^\pm K^0_S \pi^\mp$ decay channels.

[15] 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.

[16] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (7.8 \pm 3.0) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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 $B(J/\psi \to \gamma\eta_c) \cdot B(\eta_c \to K^+K^-\pi^0) = (1.3 \pm 0.5) \times 10^{-4}$ which we multiply by 6 to account for isospin symmetry.

[18] BALTRUSAITIS 86 reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (5.7 \pm 1.5) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[19] 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.

[20] HIMEL 80B reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\eta_c(1S))] = (4.5^{+2.4}_{-1.8}) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \to \gamma\eta_c(1S)) = (3.6 \pm 0.5) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\phi K^+K^-)/\Gamma(K\overline{K}\pi)$ — Γ_8/Γ_{37}

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_{38}/Γ

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$0.9\pm0.5\pm0.1$		7	[1,2] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma\eta K^+K^-$
<3.1	90		[3] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$

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

[2] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to K\overline{K}\eta)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (4.22 \pm 2.02 \pm 0.64) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(K\overline{K}\eta)/\Gamma(K\overline{K}\pi)$ — Γ_{38}/Γ_{37}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.186±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 $B(\eta_c(1S) \to K^+K^-\eta)/B(\eta_c(1S) \to K^+K^-\pi^0) = 0.571 \pm 0.025 \pm 0.051$, 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_{39}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.6±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 $[\Gamma(\eta_c(1S) \to \eta\pi^+\pi^-)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (7.22 \pm 1.47 \pm 1.11) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. 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_{40}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
4.3±1.2±0.4	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 $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K\overline{K}\pi)$ — Γ_{42}/Γ_{37}

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.

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
5.4±1.4±0.5	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 $[\Gamma(\eta_c(1S) \to K^0K^-\pi^+\pi^-\pi^+ + c.c.)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (24.02 \pm 4.44 \pm 4.08) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(K^+K^-2(\pi^+\pi^-))/\Gamma_{total}$ — Γ_{44}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
8.4±2.4 OUR AVERAGE				
8 ±4 ±1	10	[1] ABLIKIM 12N	BES3	$\psi(2S) \to \pi^0\gamma K^+K^- 2(\pi^+\pi^-)$
8.6±2.8±0.8	100	[2] ABLIKIM 06A	BES2	$J/\psi \to K^+K^- 2(\pi^+\pi^-)\gamma$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to K^+K^- 2(\pi^+\pi^-))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (3.60 \pm 1.71 \pm 0.64) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to$

$\gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. 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 $[\Gamma(\eta_c(1S) \to K^+K^-2(\pi^+\pi^-))/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (1.21\pm0.32\pm0.24)\times10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

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

[1] ABLIKIM 17AJ reports $[\Gamma(\eta_c(1S) \to \pi^+\pi^-\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to \gamma\eta_c(1S))] < 1.6\times10^{-6}$ which we divide by our best value $B(\psi(2S) \to \gamma\eta_c(1S)) = 3.6\times10^{-3}$.

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{total}$ — Γ_{47}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
4.6±0.9±0.5	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 $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5)\times10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(2(\pi^+\pi^-\pi^0))/\Gamma_{total}$ — Γ_{49}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
15.9±2.0 OUR AVERAGE					
15.3±1.8±1.8	333	ABLIKIM	19AP	BES3	$h_c \to \gamma\eta_c$
16.8±2.8±1.7	175	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma2(\pi^+\pi^-\pi^0)$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to 2(\pi^+\pi^-\pi^0))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (75.13 \pm 7.42 \pm 9.99) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5)\times10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. 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_{50}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
18.9±3.4 OUR AVERAGE					
20 ±5 ±2	51	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma3(\pi^+\pi^-)$
18 ±4 ±2	479	[2] ABLIKIM	06A	BES2	$J/\psi \to 3(\pi^+\pi^-)\gamma$

[1] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to 3(\pi^+\pi^-))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] \times [B(h_c(1P) \to \gamma\eta_c(1S))] = (8.82 \pm 1.57 \pm 1.59) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5)\times10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. 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 $[\Gamma(\eta_c(1S) \to 3(\pi^+\pi^-))/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (2.59 \pm 0.32 \pm 0.47)\times10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14)\times10^{-2}$. 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_{51}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
13.3± 1.1 OUR FIT	Error includes scale factor of 1.1.				
12.0± 2.6±1.5	34	ABLIKIM	19AP	BES3	$h_c \to \gamma\eta_c$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
15 ± 5 ±1	15	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma p\overline{p}$
$12.9^{+1.8}_{-2.1}\pm0.8$	195	[2] WU	06	BELL	$B^+ \to p\overline{p}K^+$
13.5± 3.0±1.3	213	[3] BAI	04	BES	$J/\psi \to \gamma p\overline{p}$
9.2± 3.5±0.9	18	[4] BISELLO	91	DM2	$J/\psi \to \gamma p\overline{p}$
10 ± 5 ±1	23	[5] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$
$22^{+22}_{-11}\pm3$		[6] HIMEL	80B	MRK2	$\psi(2S) \to \eta_c\gamma$

[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 $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[2] WU 06 reports $[\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total}] \times [B(B^+ \to \eta_c K^+)] = (1.42\pm0.11^{+0.16}_{-0.20})\times 10^{-6}$ which we divide by our best value $B(B^+ \to \eta_c K^+) = (1.10 \pm 0.07) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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 $[\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total}] \times [B(J/\psi(1S) \to \gamma\eta_c(1S))] = (0.13 \pm 0.04 \pm 0.03) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[5] 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[6] 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 $B(\psi(2S) \to \gamma\eta_c(1S)) = (3.6 \pm 0.5) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\overline{p})/\Gamma_{total} \times \Gamma(\phi\phi)/\Gamma_{total}$ $\Gamma_{51}/\Gamma \times \Gamma_9/\Gamma$

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
0.24±0.07 OUR FIT	Error includes scale factor of 1.9.			
$\mathbf{4.0^{+3.5}_{-3.2}}$	BAGLIN	89	SPEC	$\overline{p}p \to K^+K^-K^+K^-$

$\Gamma(p\overline{p}\pi^0)/\Gamma_{total}$ Γ_{52}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.34±0.12±0.03	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 $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$, $B(h_c(1P) \to \gamma\eta_c(1S)) = (60 \pm 4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(K^+\overline{p}\Lambda + \text{c.c.})/\Gamma_{total}$ — Γ_{55}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{2.46^{+0.33}_{-0.32}\pm0.16}$	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 $[\Gamma(\eta_c(1S) \to K^+\overline{p}\Lambda + \text{c.c.})/\Gamma_{total}] \times [B(B^+ \to \eta_c K^+)]$ assuming $B(B^+ \to \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$, which we rescale to our best value $B(B^+ \to \eta_c K^+) = (1.10 \pm 0.07) \times 10^{-3}$. 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_{56}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{3.0\pm1.3\pm0.2}$	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 $B(B^+ \to \eta_c K^+) = (1.10 \pm 0.07) \times 10^{-3}$. 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_{57}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2.6\pm0.4\pm0.2$	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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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_{58}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.07\pm0.22\pm0.10$	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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

RADIATIVE DECAYS

$\Gamma(\gamma\gamma)/\Gamma_{total}$ — Γ_{59}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.66±0.13 OUR FIT Error includes scale factor of 1.2.					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$3.2 \pm 1.0 \pm 0.3$			[1] ABLIKIM 13I	BES3	
$0.9\,^{+1.9}_{-0.8} \pm 0.1$		$1.2\,^{+2.8}_{-1.1}$	[2] ADAMS 08	CLEO	$\psi(2S) \to \pi^+\pi^- J/\psi$
$2.0\,^{+0.9}_{-0.7} \pm 0.1$		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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = (1.41 \pm 0.14) \times 10^{-2}$. 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 $B(B^+ \to \eta_c K^+) = (1.10 \pm 0.07) \times 10^{-3}$. 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(p\overline{p})/\Gamma_{total} \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{51}/\Gamma \times \Gamma_{59}/\Gamma$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
0.221±0.019 OUR FIT Error includes scale factor of 1.2.				
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_{60}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<13	90	[1] ABLIKIM 11G	BES3	$J/\psi \to \gamma\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<80	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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.41\times10^{-2}$.
[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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.41\times10^{-2}$.

$\Gamma(\pi^0\pi^0)/\Gamma_{total}$ — Γ_{61}/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. • • •					
<50	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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.41\times10^{-2}$.
[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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.41\times10^{-2}$.

$\Gamma(K^+K^-)/\Gamma_{total}$ — Γ_{62}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<70	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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.41\times10^{-2}$.

$\Gamma(K^0_S K^0_S)/\Gamma_{total}$ — Γ_{63}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<40	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	[2,3] UEHARA	13	BELL	$\gamma\gamma \to K^0_S K^0_S$
< 5.6	90	[4,5] 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 $B(J/\psi(1S) \to \gamma\eta_c(1S)) = 1.41\times10^{-2}$.
[2] Using $\Gamma(\gamma\gamma)(\eta_c) = 5.3 \pm 0.5$ keV. UEHARA 13 reports $\Gamma(\gamma\gamma)\times B(K^0_S K^0_S) < 1.6$ eV.
[3] Taking into account interference with the non-resonant continuum.
[4] Using $\Gamma(\gamma\gamma)(\eta_c) = 5.3 \pm 0.5$ keV. UEHARA 13 reports $\Gamma(\gamma\gamma)\times B(K^0_S K^0_S) < 0.29$ eV.
[5] Neglecting interference with the non-resonant continuum.

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

$\Gamma(\eta_c(1S) \to \eta'(958)\pi\pi)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ — $\Gamma_1/\Gamma \times \Gamma^{J/\psi(1S)}_{237}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.8 ±0.5 OUR FIT	Error includes scale factor of 1.4.			
5.25±1.65	14	[1] BALTRUSAIT...86	MRK3	$J/\psi \to \eta_c\gamma$

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

$\Gamma(\eta_c(1S) \to \rho\rho)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_4/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.6 ±0.6 OUR AVERAGE	Error includes scale factor of 1.2.				
1.6 ±0.6 ±0.4	72	ABLIKIM	05L	BES2	$J/\psi \to \pi^+\pi^-\pi^+\pi^-\gamma$
3.30±0.30±0.60	113	[1] BISELLO	91	DM2	$J/\psi \to \gamma\rho^0\rho^0$
3.0 ±1.3 ±0.6	32	[2] BISELLO	91	DM2	$J/\psi \to \gamma\rho^+\rho^-$

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

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

$\Gamma(\eta_c(1S) \to K^*(892)^0 K^-\pi^+ + c.c.)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_5/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.6±0.6	63	BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$

$\Gamma(\eta_c(1S) \to K^*(892)\overline{K}^*(892))/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_6/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.99±0.17 OUR FIT					
1.17±0.29 OUR AVERAGE					
1.4 ±0.3 ±0.5	60	ABLIKIM	05L	BES2	$J/\psi \to K^+K^-\pi^+\pi^-\gamma$
1.04±0.36±0.18	14	[1] BISELLO	91	DM2	$e^+e^- \to \gamma K^+K^-\pi^+\pi^-$
1.2 ±0.6	9	[1] BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$

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

$\Gamma(\eta_c(1S) \to K^*(892)^0\overline{K}^*(892)^0\pi^+\pi^-)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_7/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.91±0.64±0.48	45	ABLIKIM	06A	BES2	$J/\psi \to K^{*0}\overline{K}^{*0}\pi^+\pi^-\gamma$

$\Gamma(\eta_c(1S) \to \phi K^+K^-)/\Gamma_{total} \times \Gamma(B^+ \to \eta_c K^+)/\Gamma_{total}$ $\Gamma_8/\Gamma \times \Gamma_{253}^{B^\pm}/\Gamma^{B^\pm}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
$3.6^{+1.1}_{-0.9}$±0.8	$14.1^{+4.4}_{-3.7}$	HUANG	03	BELL	$B^+ \to (\phi K^+K^-) K^+$

$\Gamma(\eta_c(1S) \to \phi\phi)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_9/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
2.6±0.6 OUR FIT	Error includes scale factor of 2.2.				
4.1±0.6 OUR AVERAGE	Error includes scale factor of 1.2.				
$4.3\pm0.5^{+0.5}_{-1.2}$	1.2k	ABLIKIM	17P	BES3	$J/\psi \to \gamma K^+K^-K^+K^-$
3.3±0.6±0.6	72	ABLIKIM	05L	BES2	$J/\psi \to \gamma K^+K^-K^+K^-$
3.9±0.9±0.7	19	BISELLO	91	DM2	$J/\psi \to \gamma K^+K^-K^+K^-$

$3.8^{+2.3}_{-1.5}\pm0.7$	5	BISELLO	91	DM2	$J/\psi \to \gamma K^+ K^- K^0_S K^0_L$
$9.3\pm2.0\pm1.6$	80	BAI	90B	MRK3	$J/\psi \to \gamma K^+ K^- K^+ K^-$
$8.5\pm2.7\pm1.8$		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. • • •					
$3.3\pm0.6\pm0.6$	357	[1] BAI	04	BES	$J/\psi \to \gamma K^+ K^- K^+ K^-$

[1] Superseded by ABLIKIM 05L.

$\Gamma(\eta_c(1S) \to \phi\phi)/\Gamma_{total} \times \Gamma(B^+ \to \eta_c K^+)/\Gamma_{total}$ $\Gamma_9/\Gamma \times \Gamma^{B^\pm}_{253}/\Gamma^{B^\pm}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
2.0±0.5 OUR FIT Error includes scale factor of 2.2.					
$3.3^{+1.2}_{-1.0}$ OUR AVERAGE Error includes scale factor of 1.5.					
$4.7\pm1.2\pm0.5$		AUBERT,B	04B	BABR	$B^\pm \to K^\pm \eta_c$
$2.2^{+1.0}_{-0.7}\pm0.5$	7	HUANG	03	BELL	$B^\pm \to K^\pm \phi\phi$

$\Gamma(\eta_c(1S) \to \omega\omega)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{16}/\Gamma \times \Gamma^{J/\psi(1S)}_{237}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
3.7 ±1.2 OUR FIT Error includes scale factor of 2.1.					
4.90±0.17±0.77	1705	ABLIKIM	19AV	BES3	$J/\psi \to \gamma\omega\omega$

$\Gamma(\eta_c(1S) \to f_2(1270) f_2(1270))/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{18}/\Gamma \times \Gamma^{J/\psi(1S)}_{237}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.5±0.4 OUR FIT					
$1.3\pm0.3^{+0.3}_{-0.4}$	91.2 ± 19.8	ABLIKIM	04M	BES	$J/\psi \to \gamma 2\pi^+ 2\pi^-$

$\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{37}/\Gamma \times \Gamma^{J/\psi(1S)}_{237}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
10.1 ±0.9 OUR FIT Error includes scale factor of 1.5.					
6.7 ±0.8 OUR AVERAGE					
6.6 ±0.9 ±1.5	0.6k	[1] BAI	04	BES	$J/\psi \to \gamma K^\pm \pi^\mp K^0_S$
8.76±1.80±1.68	33	[2] BISELLO	91	DM2	$J/\psi \to \gamma K^+ K^- \pi^0$
6.9 ±1.2 ±1.2	68	[3] BISELLO	91	DM2	$J/\psi \to \gamma K^\pm \pi^\mp K^0_S$
7.8 ±3.0	32	[4] BALTRUSAIT...	86	MRK3	$J/\psi \to \gamma K^+ K^- \pi^0$
5.7 ±1.5	63	[5] BALTRUSAIT...	86	MRK3	$J/\psi \to \gamma K^\pm \pi^\mp K^0_S$

[1] 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.

[2] 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.

[3] 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.

[4] 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.

[5] 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.

$\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}} \times \Gamma(B^+ \to \eta_c K^+)/\Gamma_{\text{total}}$ $\Gamma_{37}/\Gamma \times \Gamma^{B^\pm}_{253}/\Gamma^{B^\pm}$

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
7.9 ±0.5 OUR FIT Error includes scale factor of 1.1.				
7.5 ±0.8 OUR AVERAGE				
$8.01\pm0.42^{+1.71}_{-1.65}$	[1] VINOKUROVA	11	BELL	$e^+e^- \to \Upsilon(4S)$
$7.4 \pm0.5 \pm0.7$	AUBERT,B	04B	BABR	$B^\pm \to K^\pm\eta_c$

[1] VINOKUROVA 11 reports B($B^+ \to \eta_c K^+$, $\eta_c \to K^0_S K^\pm \pi^\mp$) = $(26.7 \pm 1.4^{+2.9}_{-2.6} \pm 4.9) \times 10^{-6}$, where the first uncertainty is statistical, the second is due to systematics, and the third comes from interference of $\eta_c(1S) \to K^0_S K^\pm\pi^\mp$ with nonresonant $K^0_S K^\pm\pi^\mp$. We combined both systematic uncertainties to single values. We multiply the reported result by 3 to account for isospin symmetry.

$\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \to \gamma\eta_c(1S))/\Gamma_{\text{total}}$ $\Gamma_{37}/\Gamma \times \Gamma^{\psi(2S)}_{182}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
2.6±0.4 OUR FIT Error includes scale factor of 1.3.				
$\mathbf{4.5^{+2.4}_{-1.8}}$	HIMEL	80B	MRK2	$\psi(2S) \to \eta_c\gamma$

$\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{\text{total}}$ $\Gamma_{37}/\Gamma \times \Gamma^{h_c(1P)}_{25}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
4.28±0.34 OUR FIT					
4.1 ±0.6 OUR AVERAGE					
$3.7 \pm0.7 \pm0.3$	55	[1,2] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K^+K^-\pi^0$
$4.6 \pm0.8 \pm0.3$	107	[3,4] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K^0_S K^\mp\pi^\pm$

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

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

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

[4] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \to K\overline{K}\pi)/\Gamma_{\text{total}} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{\text{total}}] \times [\text{B}(\psi(2S) \to h_c(1P)\pi^0)] = (34.05 \pm 3.75 \pm 4.50) \times 10^{-6}$ which we divide by our best value B($\psi(2S) \to h_c(1P)\pi^0$) = $(7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\eta_c(1S) \to K\overline{K}\eta)/\Gamma_{\text{total}} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{\text{total}}$ $\Gamma_{38}/\Gamma \times \Gamma^{h_c(1P)}_{25}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
7.9±1.0 OUR FIT					
5.7±2.9±0.4	7	[1,2] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma\eta K^+K^-$

[1] ABLIKIM 12N quotes B($\psi(2S) \rightarrow \pi^0 h_c$) · B($h_c \rightarrow \gamma \eta_c$) · B($\eta_c \rightarrow K^+ K^- \eta$) = $(2.11 \pm 1.01 \pm 0.32) \times 10^{-6}$ which we multiply by 2 to account for isospin symmetry.
[2] ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K\overline{K}\eta)/\Gamma_{total} \times \Gamma(h_c(1P) \rightarrow \gamma\eta_c(1S))/\Gamma_{total}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] = (4.22 \pm 2.02 \pm 0.64) \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\eta_c(1S) \rightarrow \eta\pi^+\pi^-)/\Gamma_{total} \times \Gamma(h_c(1P) \rightarrow \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{39}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
9.7±2.5±0.7	33	[1] ABLIKIM	12N	BES3	$\psi(2S) \rightarrow \pi^0\gamma\eta\pi^+\pi^-$

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

$\Gamma(\eta_c(1S) \rightarrow \eta\pi^+\pi^-)/\Gamma_{total} \times \Gamma(J/\psi(1S) \rightarrow \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{39}/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
4.2±0.9 OUR AVERAGE					
4.6±1.1	75	BALTRUSAIT...86		MRK3	$J/\psi \rightarrow \eta_c\gamma$
3.1±1.1±1.5	18	PARTRIDGE	80B	CBAL	$J/\psi \rightarrow \eta\pi^+\pi^-\gamma$

$\Gamma(\eta_c(1S) \rightarrow \eta 2(\pi^+\pi^-))/\Gamma_{total} \times \Gamma(h_c(1P) \rightarrow \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{40}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.6±0.7±0.2	39	[1] ABLIKIM	12N	BES3	$\psi(2S) \rightarrow \pi^0\gamma\eta 2(\pi^+\pi^-)$

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

$\Gamma(\eta_c(1S) \rightarrow K^+K^-\pi^+\pi^-)/\Gamma_{total} \times \Gamma(J/\psi(1S) \rightarrow \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{41}/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.17±0.26 OUR FIT Error includes scale factor of 2.0.					
1.9 ±0.6 OUR AVERAGE Error includes scale factor of 2.4.					
1.5 ±0.2 ±0.2	0.4k	BAI	04	BES	$J/\psi \rightarrow \gamma K^+K^-\pi^+\pi^-$
2.7 ±0.4	110	BALTRUSAIT...86		MRK3	$J/\psi \rightarrow \eta_c\gamma$

$\Gamma(\eta_c(1S) \rightarrow K^+K^-\pi^+\pi^-)/\Gamma_{total} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{41}/\Gamma \times \Gamma_{182}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
3.0±0.8 OUR FIT Error includes scale factor of 1.7.				
$4.0^{+6.0}_{-2.5}$	HIMEL	80B	MRK2	$\psi(2S) \rightarrow \eta_c\gamma$

$\Gamma(\eta_c(1S) \to K^+K^-\pi^+\pi^-)/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{41}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
5.0±1.0 OUR FIT	Error includes scale factor of 1.7.				
5.6±1.3±0.4	38	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K^+K^-\pi^+\pi^-$

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

$\Gamma(\eta_c(1S) \to K^0K^-\pi^+\pi^-\pi^+ + c.c.)/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{43}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
3.2±0.8±0.2	[1,2] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K_S^0 K^\mp\pi^\mp 2\pi^\pm$

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

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

$\Gamma(\eta_c(1S) \to K^+K^-2(\pi^+\pi^-))/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{44}/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.21±0.32±0.24	100	ABLIKIM	06A	BES2	$J/\psi \to K^+K^-2(\pi^+\pi^-)\gamma$

$\Gamma(\eta_c(1S) \to K^+K^-2(\pi^+\pi^-))/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{44}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
4.8±2.5±0.3	10	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma K^+K^-2(\pi^+\pi^-)$

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

$\Gamma(\eta_c(1S) \to 2(K^+K^-))/\Gamma_{total} \times \Gamma(B^+ \to \eta_c K^+)/\Gamma_{total}$ $\Gamma_{45}/\Gamma \times \Gamma_{253}^{B^\pm}/\Gamma^{B^\pm}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
1.6±0.4 OUR FIT	Error includes scale factor of 1.4.				
$\mathbf{1.8^{+0.6}_{-0.5}}$	$14.5^{+4.6}_{-3.0}$	HUANG	03	BELL	$B^+ \to 2(K^+K^-)K^+$

$\Gamma(\eta_c(1S) \to 2(K^+K^-))/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{45}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
0.85±0.24 OUR FIT Error includes scale factor of 1.3.					
1.3 ±0.5 ±0.1	7	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma 2(K^+K^-)$

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

$\Gamma(\eta_c(1S) \to \pi^+\pi^-\pi^0\pi^0)/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{47}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.7±0.5±0.2	118	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma\pi^+\pi^-2\pi^0$

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

$\Gamma(\eta_c(1S) \to 2(\pi^+\pi^-))/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{48}/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.35±0.19 OUR FIT Error includes scale factor of 1.3.					
1.36±0.23 OUR AVERAGE					
1.3 ±0.2 ±0.4	0.5k	BAI	04	BES	$J/\psi \to \gamma 2(\pi^+\pi^-)$
1.33±0.22±0.20	137	BISELLO	91	DM2	$J/\psi \to \gamma 2(\pi^+\pi^-)$
1.6 ±0.6	25	BALTRUSAIT...	86	MRK3	$J/\psi \to \gamma\eta_c$

$\Gamma(\eta_c(1S) \to 2(\pi^+\pi^-))/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{48}/\Gamma \times \Gamma_{182}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
3.4±0.7 OUR FIT Error includes scale factor of 1.3.				
$5.7^{+3.9}_{-2.4}$	HIMEL	80B	MRK2	$\psi(2S) \to \eta_c\gamma$

$\Gamma(\eta_c(1S) \to 2(\pi^+\pi^-))/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{48}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.57±0.09 OUR FIT Error includes scale factor of 1.3.					
1.01±0.19±0.07	100	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma 2(\pi^+\pi^-)$

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

$\Gamma(\eta_c(1S) \to 2(\pi^+\pi^-\pi^0))/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{49}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
10.1±1.7±0.7	175	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma 2(\pi^+\pi^-\pi^0)$

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

$\Gamma(\eta_c(1S) \to 3(\pi^+\pi^-))/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{50}/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.59±0.32±0.47	471	ABLIKIM	06A	BES2	$J/\psi \to 3(\pi^+\pi^-)\gamma$

$\Gamma(\eta_c(1S) \to 3(\pi^+\pi^-))/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{50}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.19±0.30±0.08	51	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma 3(\pi^+\pi^-)$

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

$\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{51}/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
1.88±0.18 OUR FIT Error includes scale factor of 1.2.					
1.61±0.29 OUR AVERAGE					
1.9 ±0.3 ±0.3	213	BAI	04	BES	$J/\psi \to \gamma p\overline{p}$
1.3 ±0.4 ±0.3	18	BISELLO	91	DM2	$J/\psi \to \gamma p\overline{p}$
1.4 ±0.7	23	BALTRUSAIT...	86	MRK3	$J/\psi \to \eta_c\gamma$

$\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$

$\Gamma_{51}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
8.0±0.8 OUR FIT					
8.7±2.9±0.6	15	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma p\overline{p}$

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

$\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total} \times \Gamma(\psi(2S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{51}/\Gamma \times \Gamma_{182}^{\psi(2S)}/\Gamma^{\psi(2S)}$

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
4.8±0.7 OUR FIT Error includes scale factor of 1.2.				
8 $^{+8}_{-4}$	HIMEL	80B	MRK2	$\psi(2S) \to \eta_c\gamma$

$\Gamma(\eta_c(1S) \to p\overline{p})/\Gamma_{total} \times \Gamma(B^+ \to \eta_c K^+)/\Gamma_{total}$ $\Gamma_{51}/\Gamma \times \Gamma_{253}^{B^\pm}/\Gamma^{B^\pm}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
1.47±0.12 OUR FIT Error includes scale factor of 1.1.					
1.54±0.19 OUR AVERAGE Error includes scale factor of 1.1.					
$1.42\pm0.11^{+0.16}_{-0.20}$	195	WU	06	BELL	$B^+ \to p\overline{p}K^+$
$1.8\ ^{+0.3}_{-0.2}\ \pm0.2$		AUBERT,B	05L	BABR	$e^+e^- \to \Upsilon(4S)$

$\Gamma(\eta_c(1S) \to p\overline{p}\pi^0)/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{52}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
2.1±0.7±0.1	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma p\overline{p}\pi^0$

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

$\Gamma(\eta_c(1S) \to p\overline{p}\pi^+\pi^-)/\Gamma_{total} \times \Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{53}/\Gamma \times \Gamma_{25}^{h_c(1P)}/\Gamma^{h_c(1P)}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
2.19±0.30 OUR FIT					
3.1 ±1.0 ±0.2	19	[1] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma p\overline{p}\pi^+\pi^-$

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

$\Gamma(\eta_c(1S) \to p\overline{p}\pi^+\pi^-)/\Gamma_{total} \times \Gamma(B^+ \to \eta_c K^+)/\Gamma_{total}$ $\Gamma_{53}/\Gamma \times \Gamma_{253}^{B^\pm}/\Gamma^{B^\pm}$

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
4.0 ±0.4 OUR FIT				
$3.94^{+0.41+0.22}_{-0.39-0.18}$	CHILIKIN	19	BELL	$e^+e^- \to \Upsilon(4S)$

$\Gamma(\eta_c(1S) \to \Lambda\overline{\Lambda})/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ $\Gamma_{54}/\Gamma \times \Gamma_{237}^{J/\psi(1S)}/\Gamma^{J/\psi(1S)}$

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
1.5 ±0.4 OUR FIT Error includes scale factor of 1.5.				
1.98±0.21±0.32	ABLIKIM	12B	BES3	$J/\psi \to \Lambda\overline{\Lambda}\gamma$

$\Gamma(\eta_c(1S) \to \Lambda\overline{\Lambda})/\Gamma_{total} \times \Gamma(B^+ \to \eta_c K^+)/\Gamma_{total}$ **$\Gamma_{54}/\Gamma \times \Gamma^{B^\pm}_{253}/\Gamma^{B^\pm}$**

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
1.21±0.30 OUR FIT Error includes scale factor of 1.5.					
$0.95^{+0.25+0.08}_{-0.22-0.11}$	20	WU	06	BELL	$B^+ \to \Lambda\overline{\Lambda}K^+$

$\Gamma(\eta_c(1S) \to \Sigma^+\overline{\Sigma}^-)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ **$\Gamma_{57}/\Gamma \times \Gamma^{J/\psi(1S)}_{237}/\Gamma^{J/\psi(1S)}$**

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
3.60±0.48±0.31	112	ABLIKIM	13C	BES3	$J/\psi \to \gamma p\overline{p}\pi^0\pi^0$

$\Gamma(\eta_c(1S) \to \Xi^-\overline{\Xi}^+)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ **$\Gamma_{58}/\Gamma \times \Gamma^{J/\psi(1S)}_{237}/\Gamma^{J/\psi(1S)}$**

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
1.51±0.27±0.14	78	ABLIKIM	13C	BES3	$J/\psi \to \gamma\Lambda\overline{\Lambda}\pi^+\pi^-$

$\Gamma(\eta_c(1S) \to \gamma\gamma)/\Gamma_{total} \times \Gamma(J/\psi(1S) \to \gamma\eta_c(1S))/\Gamma_{total}$ **$\Gamma_{59}/\Gamma \times \Gamma^{J/\psi(1S)}_{237}/\Gamma^{J/\psi(1S)}$**

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
2.34±0.35 OUR FIT Error includes scale factor of 1.2.					
$3.8^{+1.3}_{-1.0}$ OUR AVERAGE Error includes scale factor of 1.1.					
4.5 ±1.2 ±0.6		ABLIKIM	13I	BES3	
$1.2^{+2.7}_{-1.1}$ ±0.3	$1.2^{+2.8}_{-1.1}$	ADAMS	08	CLEO	$\psi(2S) \to \pi^+\pi^- J/\psi$

$\Gamma(\eta_c(1S) \to \gamma\gamma)/\Gamma_{total} \times \Gamma(B^+ \to \eta_c K^+)/\Gamma_{total}$ **$\Gamma_{59}/\Gamma \times \Gamma^{B^\pm}_{253}/\Gamma^{B^\pm}$**

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
0.183±0.022 OUR FIT Error includes scale factor of 1.2.					
$0.22^{+0.09}_{-0.07}{}^{+0.04}_{-0.02}$	13	WICHT	08	BELL	$B^\pm \to K^\pm\gamma\gamma$

$\eta_c(1S)$ REFERENCES

AAIJ	23AH	PR D108 032010	R. Aaij et al.	(LHCb Collab.)
ABLIKIM	21C	PR D103 012009	M. Ablikim et al.	(BESIII Collab.)
LEES	21A	PR D104 072002	J.P. Lees et al.	(BABAR Collab.)
AAIJ	20H	EPJ C80 191	R. Aaij et al.	(LHCb Collab.)
ABLIKIM	19AP	PR D100 012003	M. Ablikim et al.	(BESIII Collab.)
ABLIKIM	19AV	PR D100 052012	M. Ablikim et al.	(BESIII Collab.)
CHILIKIN	19	PR D100 012001	K. Chilikin et al.	(BELLE Collab.)
LU	19	PR D99 032003	P.-C. Lu et al.	(BELLE Collab.)
XU	18	PR D98 072001	Q.N. Xu et al.	(BELLE Collab.)
AAIJ	17AD	PL B769 305	R. Aaij et al.	(LHCb Collab.)
AAIJ	17BB	EPJ C77 609	R. Aaij et al.	(LHCb Collab.)
ABLIKIM	17AJ	PR D96 112008	M. Ablikim et al.	(BESIII Collab.)
ABLIKIM	17P	PR D95 092004	M. Ablikim et al.	(BESIII Collab.)
LEES	16A	PR D93 012005	J.P. Lees et al.	(BABAR Collab.)
AAIJ	15BI	EPJ C75 311	R. Aaij et al.	(LHCb Collab.)
ANASHIN	14	PL B738 391	V.V. Anashin et al.	(KEDR Collab.)
LEES	14E	PR D89 112004	J.P. Lees et al.	(BABAR Collab.)
ABLIKIM	13C	PR D87 012003	M. Ablikim et al.	(BESIII Collab.)
ABLIKIM	13I	PR D87 032003	M. Ablikim et al.	(BESIII Collab.)
UEHARA	13	PTEP 2013 123C01	S. Uehara et al.	(BELLE Collab.)

ABLIKIM	12B	PR D86 032008	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	12F	PRL 108 222002	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	12N	PR D86 092009	M. Ablikim *et al.*	(BESIII Collab.)
LIU	12B	PRL 108 232001	Z.Q. Liu *et al.*	(BELLE Collab.)
ZHANG	12A	PR D86 052002	C.C. Zhang *et al.*	(BELLE Collab.)
ABLIKIM	11G	PR D84 032006	M. Ablikim *et al.*	(BESIII Collab.)
DEL-AMO-SA...	11M	PR D84 012004	P. del Amo Sanchez *et al.*	(BABAR Collab.)
VINOKUROVA	11	PL B706 139	A. Vinokurova *et al.*	(BELLE Collab.)
LEES	10	PR D81 052010	J.P. Lees *et al.*	(BABAR Collab.)
MITCHELL	09	PRL 102 011801	R.E. Mitchell *et al.*	(CLEO Collab.)
ADAMS	08	PRL 101 101801	G.S. Adams *et al.*	(CLEO Collab.)
AUBERT	08AB	PR D78 012006	B. Aubert *et al.*	(BABAR Collab.)
UEHARA	08	EPJ C53 1	S. Uehara *et al.*	(BELLE Collab.)
WICHT	08	PL B662 323	J. Wicht *et al.*	(BELLE Collab.)
ABE	07	PRL 98 082001	K. Abe *et al.*	(BELLE Collab.)
ABLIKIM	06A	PL B633 19	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	06B	EPJ C45 337	M. Ablikim *et al.*	(BES Collab.)
AUBERT	06E	PRL 96 052002	B. Aubert *et al.*	(BABAR Collab.)
PDG	06	JP G33 1	W.-M. Yao *et al.*	(PDG Collab.)
WU	06	PRL 97 162003	C.-H. Wu *et al.*	(BELLE Collab.)
ABLIKIM	05L	PR D72 072005	M. Ablikim *et al.*	(BES Collab.)
AUBERT,B	05L	PR D72 051101	B. Aubert *et al.*	(BABAR Collab.)
KUO	05	PL B621 41	C.C. Kuo *et al.*	(BELLE Collab.)
ABE	04G	PR D70 071102	K. Abe *et al.*	(BELLE Collab.)
ABLIKIM	04M	PR D70 112008	M. Ablikim *et al.*	(BES Collab.)
ASNER	04	PRL 92 142001	D.M. Asner *et al.*	(CLEO Collab.)
AUBERT	04D	PRL 92 142002	B. Aubert *et al.*	(BABAR Collab.)
AUBERT,B	04B	PR D70 011101	B. Aubert *et al.*	(BABAR Collab.)
BAI	04	PL B578 16	J.Z. Bai *et al.*	(BES Collab.)
ABDALLAH	03J	EPJ C31 481	J. Abdallah *et al.*	(DELPHI Collab.)
AMBROGIANI	03	PL B566 45	M. Ambrogiani *et al.*	(FNAL E835 Collab.)
BAI	03	PL B555 174	J.Z. Bai *et al.*	(BES Collab.)
FANG	03	PRL 90 071801	F. Fang *et al.*	(BELLE Collab.)
HUANG	03	PRL 91 241802	H.-C. Huang *et al.*	(BELLE Collab.)
ABE,K	02	PRL 89 142001	K. Abe *et al.*	(BELLE Collab.)
BAI	00F	PR D62 072001	J.Z. Bai *et al.*	(BES Collab.)
BRANDENB...	00B	PRL 85 3095	G. Brandenburg *et al.*	(CLEO Collab.)
ACCIARRI	99T	PL B461 155	M. Acciarri *et al.*	(L3 Collab.)
BAI	99B	PR D60 072001	J.Z. Bai *et al.*	(BES Collab.)
ABREU	98O	PL B441 479	P. Abreu *et al.*	(DELPHI Collab.)
SHIRAI	98	PL B424 405	M. Shirai *et al.*	(AMY Collab.)
ARMSTRONG	95F	PR D52 4839	T.A. Armstrong *et al.*	(FNAL, FERR, GENO+)
ALBRECHT	94H	PL B338 390	H. Albrecht *et al.*	(ARGUS Collab.)
ADRIANI	93N	PL B318 575	O. Adriani *et al.*	(L3 Collab.)
BISELLO	91	NP B350 1	D. Bisello *et al.*	(DM2 Collab.)
BAI	90B	PRL 65 1309	Z. Bai *et al.*	(Mark III Collab.)
CHEN	90B	PL B243 169	W.Y. Chen *et al.*	(CLEO Collab.)
BAGLIN	89	PL B231 557	C. Baglin, S. Baird, G. Bassompierre	(R704 Collab.)
BEHREND	89	ZPHY C42 367	H.J. Behrend *et al.*	(CELLO Collab.)
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+)