

$\eta_c(1S)$

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

$\eta_c(1S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2983.9 ± 0.4	OUR AVERAGE	Error includes scale factor of 1.2.		
2983.9 ± 0.7 ± 0.1		¹ AAIJ	20H LHCb	$pp \rightarrow bX \rightarrow p\bar{p}X$
2985.9 ± 0.7 ± 2.1	1705	ABLIKIM	19AV BES3	$J/\psi \rightarrow \gamma\omega\omega$
2984.6 ± 0.7 ± 2.2	2673	XU	18 BELL	$e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
2986.7 ± 0.5 ± 0.9	11k	² AAIJ	17AD LHCb	$pp \rightarrow B^+X \rightarrow p\bar{p}K^+X$
2982.8 ± 1.0 ± 0.5	6.4k	³ AAIJ	17BB LHCb	$pp \rightarrow b\bar{b}X \rightarrow 2(K^+K^-)X$
2982.2 ± 1.5 ± 0.1	2.0k	⁴ AAIJ	15BI LHCb	$pp \rightarrow \eta_c(1S)X$
2983.5 ± 1.4 $\begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 1.6 \\ 3.6 \end{smallmatrix}$		⁵ ANASHIN	14 KEDR	$J/\psi \rightarrow \gamma\eta_c$
2979.8 ± 0.8 ± 3.5	4.5k	^{6,7} LEES	14E BABR	$\gamma\gamma \rightarrow K^+K^-\pi^0$
2984.1 ± 1.1 ± 2.1	900	^{6,7,8} LEES	14E BABR	$\gamma\gamma \rightarrow K^+K^-\eta$
2984.3 ± 0.6 ± 0.6		^{9,10} ABLIKIM	12F BES3	$\psi(2S) \rightarrow \gamma\eta_c$
2984.49 ± 1.16 ± 0.52	832	⁶ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma \text{ hadrons}$
2982.7 ± 1.8 ± 2.2	486	ZHANG	12A BELL	$e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
2984.5 ± 0.8 ± 3.1	11k	DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$
2985.4 ± 1.5 $\begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 0.5 \\ 2.0 \end{smallmatrix}$	920	¹⁰ VINOKUROVA	11 BELL	$B^\pm \rightarrow K^\pm(K_S^0 K^\pm\pi^\mp)$
2982.2 ± 0.4 ± 1.6	14k	¹¹ LEES	10 BABR	$10.6 e^+e^- \rightarrow e^+e^-K_S^0 K^\pm\pi^\mp$
2985.8 ± 1.5 ± 3.1	0.9k	AUBERT	08AB BABR	$B \rightarrow \eta_c(1S)K(*) \rightarrow K\bar{K}\pi K(*)$
2986.1 ± 1.0 ± 2.5	7.5k	UEHARA	08 BELL	$\gamma\gamma \rightarrow \eta_c \rightarrow \text{hadrons}$
2970 ± 5 ± 6	501	¹² ABE	07 BELL	$e^+e^- \rightarrow J/\psi(c\bar{c})$
2971 ± 3 $\begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 2 \\ 1 \end{smallmatrix}$	195	WU	06 BELL	$B^+ \rightarrow p\bar{p}K^+$
2974 ± 7 $\begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 2 \\ 1 \end{smallmatrix}$	20	WU	06 BELL	$B^+ \rightarrow \Lambda\bar{\Lambda}K^+$
2981.8 ± 1.3 ± 1.5	592	ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm\pi^\mp$
2984.1 ± 2.1 ± 1.0	190	¹³ AMBROGIANI	03 E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$
● ● ● 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	$\gamma\gamma \rightarrow K_S^0 K^\pm\pi^\mp$
2982.2 ± 0.6		¹⁵ MITCHELL	09 CLEO	$e^+e^- \rightarrow \gamma X$
2982 ± 5	270	¹⁶ AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
2982.5 ± 1.1 ± 0.9	2.5k	¹⁷ AUBERT	04D BABR	$\gamma\gamma \rightarrow \eta_c(1S) \rightarrow K\bar{K}\pi$
2977.5 ± 1.0 ± 1.2		^{15,18} BAI	03 BES	$J/\psi \rightarrow \gamma\eta_c$
2979.6 ± 2.3 ± 1.6	180	¹⁹ FANG	03 BELL	$B \rightarrow \eta_c K$
2976.3 ± 2.3 ± 1.2		^{15,20} BAI	00F BES	$J/\psi, \psi(2S) \rightarrow \gamma\eta_c$

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

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

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

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

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

⁵ Taking into account an asymmetric photon lineshape.

⁶ With floating width.

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

⁸ Using both, $\eta \rightarrow \gamma\gamma$ and $\eta \rightarrow \pi^+ \pi^- \pi^0$ 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 $\psi(2S) \rightarrow \gamma \eta_c$ and $J/\psi \rightarrow \gamma \eta_c$ 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 $\eta_c \rightarrow \phi\phi$.

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

$\eta_c(1S)$ WIDTH

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
32.0 ± 0.7 OUR FIT				
32.1 ± 0.8 OUR AVERAGE		Error includes scale factor of 1.1.		
33.8 ± 1.6 ± 4.1	1705	ABLIKIM	19AV BES3	$J/\psi \rightarrow \gamma\omega\omega$
30.8 ⁺ ₋ 2.3 ⁺ ₋ 2.2 ± 2.9	2673	XU	18 BELL	$e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
34.0 ± 1.9 ± 1.3	11k	AAIJ	17AD LHCB	$p\bar{p} \rightarrow B^+X \rightarrow p\bar{p}K^+X$
31.4 ± 3.5 ± 2.0	6.4k	¹ AAIJ	17BB LHCB	$p\bar{p} \rightarrow b\bar{b}X \rightarrow 2(K^+K^-)X$
27.2 ± 3.1 ⁺ ₋ 5.4 ⁺ ₋ 2.6		² ANASHIN	14 KEDR	$J/\psi \rightarrow \gamma\eta_c$
25.2 ± 2.6 ± 2.4	4.5k	^{3,4} LEES	14E BABR	$\gamma\gamma \rightarrow K^+K^-\pi^0$
34.8 ± 3.1 ± 4.0	900	^{3,4,5} LEES	14E BABR	$\gamma\gamma \rightarrow K^+K^-\eta$
32.0 ± 1.2 ± 1.0		^{6,7} ABLIKIM	12F BES3	$\psi(2S) \rightarrow \gamma\eta_c$
36.4 ± 3.2 ± 1.7	832	³ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma$ hadrons
37.8 ⁺ ₋ 5.8 ⁺ ₋ 5.3 ± 3.1	486	ZHANG	12A BELL	$e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
36.2 ± 2.8 ± 3.0	11k	DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$
35.1 ± 3.1 ⁺ ₋ 1.0 ⁺ ₋ 1.6	920	⁷ VINOKUROVA	11 BELL	$B^\pm \rightarrow K^\pm(K_S^0 K^\pm\pi^\mp)$
31.7 ± 1.2 ± 0.8	14k	⁸ LEES	10 BABR	10.6 $e^+e^- \rightarrow e^+e^-K_S^0 K^\pm\pi^\mp$
36.3 ⁺ ₋ 3.7 ⁺ ₋ 3.6 ± 4.4	0.9k	AUBERT	08AB BABR	$B \rightarrow \eta_c(1S)K(*) \rightarrow K\bar{K}\pi K(*)$
28.1 ± 3.2 ± 2.2	7.5k	UEHARA	08 BELL	$\gamma\gamma \rightarrow \eta_c \rightarrow$ hadrons
48 ⁺ ₋ 8 ⁺ ₋ 7 ± 5	195	WU	06 BELL	$B^+ \rightarrow p\bar{p}K^+$
40 ± 19 ± 5	20	WU	06 BELL	$B^+ \rightarrow \Lambda\bar{\Lambda}K^+$
24.8 ± 3.4 ± 3.5	592	ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm\pi^\mp$
20.4 ⁺ ₋ 7.7 ⁺ ₋ 6.7 ± 2.0	190	AMBROGIANI	03 E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$
23.9 ⁺ ₋ 12.6 ⁺ ₋ 7.1		ARMSTRONG	95F E760	$\bar{p}p \rightarrow \gamma\gamma$
● ● ● 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	$\gamma\gamma \rightarrow K_S^0 K^\pm\pi^\mp$
34.3 ± 2.3 ± 0.9	2.5k	¹⁰ AUBERT	04D BABR	$\gamma\gamma \rightarrow \eta_c(1S) \rightarrow K\bar{K}\pi$
17.0 ± 3.7 ± 7.4		¹¹ BAI	03 BES	$J/\psi \rightarrow \gamma\eta_c$
29 ± 8 ± 6	180	¹² FANG	03 BELL	$B \rightarrow \eta_c K$
11.0 ± 8.1 ± 4.1		¹³ BAI	00F BES	$J/\psi \rightarrow \gamma\eta_c$ and $\psi(2S) \rightarrow \gamma\eta_c$
27.0 ± 5.8 ± 1.4		¹⁴ BRANDENB...	00B CLE2	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0\pi^\mp$
7.0 ⁺ ₋ 7.5 ⁺ ₋ 7.0	12	BAGLIN	87B SPEC	$\bar{p}p \rightarrow \gamma\gamma$
10.1 ⁺ ₋ 33.0 ⁺ ₋ 8.2	23	¹⁵ BALTRUSAIT..	86 MRK3	$J/\psi \rightarrow \gamma p\bar{p}$
11.5 ± 4.5		GAISER	86 CBAL	$J/\psi \rightarrow \gamma X, \psi(2S) \rightarrow \gamma X$

< 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, $\eta \rightarrow \gamma\gamma$ and $\eta \rightarrow \pi^+\pi^-\pi^0$ 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 $\psi(2S) \rightarrow \gamma\eta_c$ and $J/\psi(1S) \rightarrow \gamma\eta_c$ decays.

¹⁴ Superseded by ASNER 04.

¹⁵ Positive and negative errors correspond to 90% confidence level.

$\eta_c(1S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
Decays involving hadronic resonances		
Γ_1 $\eta'(958)\pi\pi$	(4.1 \pm 1.7) %	
Γ_2 $\eta'(958)K\bar{K}$	(3.5 \pm 1.5) %	
Γ_3 $\rho\rho$	(1.8 \pm 0.5) %	
Γ_4 $K^*(892)^0 K^- \pi^+ + \text{c.c.}$	(2.0 \pm 0.7) %	
Γ_5 $K^*(892)\bar{K}^*(892)$	(6.9 \pm 1.3) $\times 10^{-3}$	
Γ_6 $K^*(892)^0 \bar{K}^*(892)^0 \pi^+ \pi^-$	(1.1 \pm 0.5) %	
Γ_7 $\phi K^+ K^-$	(2.9 \pm 1.4) $\times 10^{-3}$	
Γ_8 $\phi\phi$	(1.74 \pm 0.19) $\times 10^{-3}$	
Γ_9 $\phi 2(\pi^+ \pi^-)$	< 4 $\times 10^{-3}$	90%
Γ_{10} $a_0(980)\pi$	seen	
Γ_{11} $a_2(1320)\pi$	< 2 %	90%
Γ_{12} $K^*(892)\bar{K} + \text{c.c.}$	< 1.28 %	90%
Γ_{13} $f_2(1270)\eta$	< 1.1 %	90%
Γ_{14} $f_2(1270)\eta'$	seen	
Γ_{15} $\omega\omega$	(2.9 \pm 0.8) $\times 10^{-3}$	
Γ_{16} $\omega\phi$	< 2.5 $\times 10^{-4}$	90%
Γ_{17} $f_2(1270)f_2(1270)$	(9.8 \pm 2.5) $\times 10^{-3}$	
Γ_{18} $f_2(1270)f_2'(1525)$	(9.5 \pm 3.2) $\times 10^{-3}$	
Γ_{19} $f_0(500)\eta$	seen	
Γ_{20} $f_0(500)\eta'$	seen	
Γ_{21} $f_0(980)\eta$	seen	
Γ_{22} $f_0(980)\eta'$	seen	
Γ_{23} $f_0(1500)\eta$	seen	

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

Decays into stable hadrons

Γ_{34}	$K\bar{K}\pi$	(7.3 \pm 0.4) %	
Γ_{35}	$K\bar{K}\eta$	(1.36 \pm 0.15) %	
Γ_{36}	$\eta\pi^+\pi^-$	(1.7 \pm 0.6) %	
Γ_{37}	$\eta 2(\pi^+\pi^-)$	(4.4 \pm 1.6) %	
Γ_{38}	$K^+K^-\pi^+\pi^-$	(6.6 \pm 1.1) $\times 10^{-3}$	
Γ_{39}	$K^+K^-\pi^+\pi^-\pi^0$	(3.5 \pm 0.6) %	
Γ_{40}	$K^0K^-\pi^+\pi^-\pi^+ + \text{c.c.}$	(5.6 \pm 1.9) %	
Γ_{41}	$K^+K^- 2(\pi^+\pi^-)$	(7.5 \pm 2.4) $\times 10^{-3}$	
Γ_{42}	$2(K^+K^-)$	(1.43 \pm 0.30) $\times 10^{-3}$	
Γ_{43}	$\pi^+\pi^-\pi^0$	< 5 $\times 10^{-4}$	90%
Γ_{44}	$\pi^+\pi^-\pi^0\pi^0$	(4.7 \pm 1.4) %	
Γ_{45}	$2(\pi^+\pi^-)$	(9.1 \pm 1.2) $\times 10^{-3}$	
Γ_{46}	$2(\pi^+\pi^-\pi^0)$	(15.8 \pm 2.3) %	
Γ_{47}	$3(\pi^+\pi^-)$	(1.7 \pm 0.4) %	
Γ_{48}	$p\bar{p}$	(1.44 \pm 0.14) $\times 10^{-3}$	
Γ_{49}	$p\bar{p}\pi^0$	(3.6 \pm 1.5) $\times 10^{-3}$	
Γ_{50}	$\Lambda\bar{\Lambda}$	(1.06 \pm 0.23) $\times 10^{-3}$	
Γ_{51}	$K^+\bar{p}\Lambda + \text{c.c.}$	(2.5 \pm 0.4) $\times 10^{-3}$	
Γ_{52}	$\bar{\Lambda}(1520)\Lambda + \text{c.c.}$	(3.1 \pm 1.3) $\times 10^{-3}$	
Γ_{53}	$\Sigma^+\bar{\Sigma}^-$	(2.1 \pm 0.6) $\times 10^{-3}$	
Γ_{54}	$\Xi^-\bar{\Xi}^+$	(9.0 \pm 2.6) $\times 10^{-4}$	
Γ_{55}	$\pi^+\pi^-p\bar{p}$	(5.3 \pm 2.1) $\times 10^{-3}$	

Radiative decays

Γ_{56}	$\gamma\gamma$	(1.61 \pm 0.12) $\times 10^{-4}$	
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Charge conjugation (C), Parity (P), Lepton family number (LF) violating modes

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

CONSTRAINED FIT INFORMATION

An overall fit to the total width, 8 combinations of partial widths obtained from integrated cross section, and 19 branching ratios uses 93 measurements and one constraint to determine 13 parameters. The overall fit has a $\chi^2 = 117.8$ for 81 degrees of freedom.

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

x_8	16										
x_{17}	3	5									
x_{34}	18	35	6								
x_{35}	9	17	3	47							
x_{38}	10	18	3	21	10						
x_{42}	7	13	2	21	10	8					
x_{45}	12	22	4	25	12	14	10				
x_{48}	11	20	4	27	13	12	10	15			
x_{50}	3	5	1	6	3	3	2	4	23		
x_{56}	-27	-51	-9	-59	-28	-32	-23	-38	-38	-9	
Γ	-1	-3	0	-3	-1	-2	-1	-2	6	1	
	x_5	x_8	x_{17}	x_{34}	x_{35}	x_{38}	x_{42}	x_{45}	x_{48}	x_{50}	
Γ	-27										
	x_{56}										

	Mode	Rate (MeV)
Γ_5	$K^*(892)\bar{K}^*(892)$	0.22 \pm 0.04
Γ_8	$\phi\phi$	0.056 \pm 0.006
Γ_{17}	$f_2(1270)f_2(1270)$	0.31 \pm 0.08
Γ_{34}	$K\bar{K}\pi$	2.32 \pm 0.14
Γ_{35}	$K\bar{K}\eta$	0.43 \pm 0.05
Γ_{38}	$K^+K^-\pi^+\pi^-$	0.210 \pm 0.035
Γ_{42}	$2(K^+K^-)$	0.046 \pm 0.010
Γ_{45}	$2(\pi^+\pi^-)$	0.29 \pm 0.04
Γ_{48}	$\rho\bar{\rho}$	0.046 \pm 0.005
Γ_{50}	$\Lambda\bar{\Lambda}$	0.034 \pm 0.008
Γ_{56}	$\gamma\gamma$	0.00515 \pm 0.00035

$\eta_c(1S)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$					Γ_{56}
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	
5.15 ± 0.35 OUR FIT					
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
5.8 ± 1.1	486	¹ ZHANG	12A BELL	$e^+e^- \rightarrow e^+e^-\eta' \pi^+\pi^-$	
5.2 ± 1.2	273 ± 43	^{2,3} AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$	
5.5 ± 1.2 ± 1.8	57 ± 33	⁴ KUO	05 BELL	$\gamma\gamma \rightarrow p\bar{p}$	
7.4 ± 0.4 ± 2.3		⁵ ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$	
13.9 ± 2.0 ± 3.0	41	⁶ ABDALLAH	03J DLPH	$\gamma\gamma \rightarrow \eta_c$	
3.8 + 1.1 + 1.9 - 1.0 - 1.0	190	⁷ AMBROGIANI	03 E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$	
7.6 ± 0.8 ± 2.3		^{5,8} BRANDENB...	00B CLE2	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$	
6.9 ± 1.7 ± 2.1	76	⁹ ACCIARRI	99T L3	$e^+e^- \rightarrow e^+e^-\eta_c$	
27 ± 16 ± 10	5	⁵ SHIRAI	98 AMY	58 e^+e^-	
6.7 + 2.4 - 1.7 ± 2.3		⁴ ARMSTRONG	95F E760	$\bar{p}p \rightarrow \gamma\gamma$	
11.3 ± 4.2		¹⁰ ALBRECHT	94H ARG	$e^+e^- \rightarrow e^+e^-\eta_c$	
8.0 ± 2.3 ± 2.4	17	¹¹ ADRIANI	93N L3	$e^+e^- \rightarrow e^+e^-\eta_c$	
5.9 + 2.1 - 1.8 ± 1.9		⁷ CHEN	90B CLEO	$e^+e^- \rightarrow e^+e^-\eta_c$	
6.4 + 5.0 - 3.4		¹² AIHARA	88D TPC	$e^+e^- \rightarrow e^+e^-X$	
4.3 + 3.4 - 3.7 ± 2.4		⁴ BAGLIN	87B SPEC	$\bar{p}p \rightarrow \gamma\gamma$	
28 ± 15		^{5,13} BERGER	86 PLUT	$\gamma\gamma \rightarrow K\bar{K}\pi$	
¹ Assuming there is no interference with the non-resonant background.					
² Calculated by us using $\Gamma(\eta_c \rightarrow K\bar{K}\pi) \times \Gamma(\eta_c \rightarrow \gamma\gamma) / \Gamma = 0.44 \pm 0.05$ keV from PDG 06 and $B(\eta_c \rightarrow K\bar{K}\pi) = (8.5 \pm 1.8)\%$ from AUBERT 06E.					
³ Systematic errors not evaluated.					
⁴ Normalized to $B(\eta_c \rightarrow p\bar{p}) = (1.3 \pm 0.4) \times 10^{-3}$.					
⁵ Normalized to $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$.					
⁶ Average of $K_S^0 K^\pm \pi^\mp$, $\pi^+ \pi^- K^+ K^-$, and $2(K^+ K^-)$ decay modes.					
⁷ Normalized to the sum of $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$, $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$, and $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$.					
⁸ Superseded by ASNER 04.					
⁹ Normalized to the sum of 9 branching ratios.					
¹⁰ Normalized to the sum of $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$, $B(\eta_c \rightarrow \phi\phi)$, $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$, and $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$.					
¹¹ Superseded by ACCIARRI 99T.					
¹² Normalized to the sum of $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$, $B(\eta_c \rightarrow 2K^+ 2K^-)$, $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$, and $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$.					
¹³ Re-evaluated by AIHARA 88D.					

$\eta_c(1S) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$ $\Gamma(\eta'(958)\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}} \quad \Gamma_1\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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98.1±3.9±11.7	2673	XU	18	BELL $e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

75.8 ^{+6.3} _{-6.2} ± 8.4	486	¹ ZHANG	12A	BELL $e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
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¹Superseded by XU 18.

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

VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<39	90	< 1556	UEHARA	08	BELL $\gamma\gamma \rightarrow 2(\pi^+\pi^-)$
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 $\Gamma(K^*(892)\bar{K}^*(892)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}} \quad \Gamma_5\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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36 ± 6 OUR FIT

32.4±4.2±5.8	882 ± 115	UEHARA	08	BELL $\gamma\gamma \rightarrow \pi^+\pi^-K^+K^-$
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 $\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}} \quad \Gamma_8\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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9.0 ± 0.8 OUR FIT

7.75±0.66±0.62	386 ± 31	¹ LIU	12B	BELL $\gamma\gamma \rightarrow 2(K^+K^-)$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

6.8 ± 1.2 ± 1.3	132 ± 23	UEHARA	08	BELL $\gamma\gamma \rightarrow 2(K^+K^-)$
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¹Supersedes UEHARA 08. Using $B(\phi \rightarrow K^+K^-) = (48.9 \pm 0.5)\%$.

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

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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8.67±2.86±0.96	85 ± 29	¹ LIU	12B	BELL $\gamma\gamma \rightarrow 2(\pi^+\pi^-\pi^0)$
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¹Using $B(\omega \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7)\%$.

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

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.49	90	¹ LIU	12B	BELL $\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$
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¹Using $B(\phi \rightarrow K^+K^-) = (48.9 \pm 0.5)\%$ and $B(\omega \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7)\%$.

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

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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50±13 OUR FIT

69±17±12	3182 ± 766	UEHARA	08	BELL $\gamma\gamma \rightarrow 2(\pi^+\pi^-)$
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 $\Gamma(f_2(1270)f_2'(1525)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}} \quad \Gamma_{18}\Gamma_{56}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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49±9±13	1128 ± 206	UEHARA	08	BELL $\gamma\gamma \rightarrow \pi^+\pi^-K^+K^-$
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$$\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}} \qquad \Gamma_{34}\Gamma_{56}/\Gamma$$

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

¹ From the corrected and unfolded mass spectrum.

² Calculated by us from the value reported in ASNER 04 that assumes B(η_c → K[±]π) = 5.5 ± 1.7%

³ We have multiplied K[±]K_S⁰π[∓] measurement by 3 to obtain K[±]π.

⁴ Calculated by us from the value reported in ABDALLAH 03J, which uses B(η_c → K_S⁰K[±]π[∓]) = (1.5 ± 0.4)%.

⁵ Not independent from the measurements reported by LEES 10.

⁶ Superseded by ASNER 04.

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

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
34 ± 5 OUR FIT				
27 ± 6 OUR AVERAGE				
25.7± 3.2± 4.9	2019±248	UEHARA	08 BELL	γγ → π ⁺ π ⁻ K ⁺ K ⁻
280 ±100 ±60	42	¹ ABDALLAH	03J DLPH	γγ → π ⁺ π ⁻ K ⁺ K ⁻
170 ± 80 ±20	13.9 ± 6.6	ALBRECHT	94H ARG	γγ → π ⁺ π ⁻ K ⁺ K ⁻

¹ Calculated by us from the value reported in ABDALLAH 03J, which uses B(η_c → π⁺π⁻K⁺K⁻) = (2.0 ± 0.7)%.

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

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.190±0.006±0.028	11k	¹ DEL-AMO-SA..11M	BABR	γγ → K ⁺ K ⁻ π ⁺ π ⁻ π ⁰

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

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

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
7.3 ± 1.5 OUR FIT				
5.8 ± 1.9 OUR AVERAGE				
5.6 ± 1.1 ± 1.6	216 ± 42	UEHARA	08 BELL	$\gamma\gamma \rightarrow 2(K^+K^-)$
350 ± 90 ± 60	46	¹ ABDALLAH	03J DLPH	$\gamma\gamma \rightarrow 2(K^+K^-)$
231 ± 90 ± 23	9.1 ± 3.3	² ALBRECHT	94H ARG	$\gamma\gamma \rightarrow 2(K^+K^-)$

¹ Calculated by us from the value reported in ABDALLAH 03J, which uses $B(\eta_c \rightarrow 2(K^+K^-)) = (2.1 \pm 1.2)\%$.

² Includes all topological modes except $\eta_c \rightarrow \phi\phi$.

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

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

$$\Gamma(p\bar{p}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}} \qquad \Gamma_{48}\Gamma_{56}/\Gamma$$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
7.4 ± 0.7 OUR FIT				
7.20 ± 1.53^{+0.67}_{-0.75}	157 ± 33	¹ KUO	05 BELL	$\gamma\gamma \rightarrow p\bar{p}$

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

4.6^{+1.3}_{-1.1} ± 0.4 190 ¹ AMBROGIANI 03 E835 $\bar{p}p \rightarrow \gamma\gamma$

8.1^{+2.9}_{-2.0} ¹ ARMSTRONG 95F E760 $\bar{p}p \rightarrow \gamma\gamma$

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

$$\Gamma(K_S^0 K_S^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}} \qquad \Gamma_{60}\Gamma_{56}/\Gamma$$

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

¹ Taking into account interference with the non-resonant continuum.

² Neglecting interference with the non-resonant continuum.

$\eta_c(1S)$ BRANCHING RATIOS

HADRONIC DECAYS

$$\Gamma(\eta'(958)\pi\pi)/\Gamma_{\text{total}} \qquad \Gamma_1/\Gamma$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.041 ± 0.017	14	¹ BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$

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

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

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
18 ± 5 OUR AVERAGE					
12.6 ± 3.8 ± 5.1		72	¹ ABLIKIM	05L BES2	$J/\psi \rightarrow \pi^+ \pi^- \pi^+ \pi^- \gamma$
26.0 ± 2.4 ± 8.8		113	¹ BISELLO	91 DM2	$J/\psi \rightarrow \gamma \rho^0 \rho^0$
23.6 ± 10.6 ± 8.2		32	¹ BISELLO	91 DM2	$J/\psi \rightarrow \gamma \rho^+ \rho^-$

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

<14 90 ¹ BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c \gamma$

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

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.02 ± 0.007	63	^{1,2} BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$

¹ BALTRUSAITIS 86 has an error according to Partridge.

² The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$.

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
69 ± 13 OUR FIT				
91 ± 26 OUR AVERAGE				
108 ± 25 ± 44	60	¹ ABLIKIM	05L BES2	$J/\psi \rightarrow K^+ K^- \pi^+ \pi^- \gamma$
82 ± 28 ± 27	14	¹ BISELLO	91 DM2	$e^+ e^- \rightarrow \gamma K^+ K^- \pi^+ \pi^-$
90 ± 50	9	¹ BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$

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

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

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

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

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
2.9^{+0.9}_{-0.8} ± 1.1	14.1 ^{+4.4} _{-3.7}	¹ HUANG	03 BELL	$B^+ \rightarrow (\phi K^+ K^-) K^+$

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

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
17.4 ± 1.9 OUR FIT				
28 ± 4 OUR AVERAGE				

26	$\pm \frac{4}{8} \pm 5$	1.2k	¹ ABLIKIM	17P	BES3	$J/\psi \rightarrow K^+ K^- K^+ K^- \gamma$
25.3	$\pm 5.1 \pm 9.1$	72	² ABLIKIM	05L	BES2	$J/\psi \rightarrow K^+ K^- K^+ K^- \gamma$
26	± 9	357	² BAI	04	BES	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
31	$\pm 7 \pm 10$	19	² BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
30	$\pm \frac{18}{12} \pm 10$	5	² BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$
74	$\pm 18 \pm 24$	80	² BAI	90B	MRK3	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
67	$\pm 21 \pm 24$		² BAI	90B	MRK3	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$

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

18	$\pm \frac{8}{6} \pm 7$	7	³ HUANG	03	BELL	$B^+ \rightarrow (\phi\phi) K^+$
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¹ ABLIKIM 17P reports $[\Gamma(\eta_c(1S) \rightarrow \phi\phi)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (4.3 \pm 0.5^{+0.5}_{-1.2}) \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

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

$\Gamma(\phi\phi)/\Gamma(K\bar{K}\pi)$

Γ_8/Γ_{34}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0240 ± 0.0025 OUR FIT				

0.044 $\pm \frac{0.012}{-0.010}$ OUR AVERAGE

0.055	$\pm 0.014 \pm 0.005$		AUBERT,B	04B	BABR	$B^\pm \rightarrow K^\pm \eta_c$
0.032	$\pm \frac{0.014}{-0.010} \pm 0.009$	7	¹ HUANG	03	BELL	$B^\pm \rightarrow K^\pm \phi\phi$

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

$\Gamma(\phi\phi)/\Gamma(p\bar{p})$

Γ_8/Γ_{48}

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

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

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

Γ_9/Γ

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

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

$\Gamma(a_0(980)\pi)/\Gamma_{\text{total}}$

Γ_{10}/Γ

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

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

<0.02 90 ^{1,2} BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c \gamma$

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

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

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
seen		LEES	21A	BABR Dalitz anal. of $\eta_c \rightarrow \pi^+ \pi^- \eta$
<0.02	90	¹ BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$

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

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

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

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

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
seen		LEES	21A	BABR Dalitz anal. of $\eta_c \rightarrow \pi^+ \pi^- \eta$
<0.011	90	¹ BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$

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

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

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

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

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
2.9 ± 0.5 ± 0.6		1705	¹ ABLIKIM	19AV	BES3 $J/\psi \rightarrow \gamma \omega \omega$

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

<6.3 90 ² ABLIKIM 05L BES2 $J/\psi \rightarrow 2(\pi^+ \pi^- \pi^0) \gamma$

<6.3 90 ² BISELLO 91 DM2 $J/\psi \rightarrow \gamma \omega \omega$

<3.1 90 ² BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c \gamma$

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

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

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 2.5 \times 10^{-4}$	90	¹ ABLIKIM	17P BES3	$J/\psi \rightarrow \pi^+\pi^-\pi^0 K^+ K^-\gamma$
$< 17 \times 10^{-4}$	90	² ABLIKIM	05L BES2	$J/\psi \rightarrow \pi^+\pi^-\pi^0 K^+ K^-\gamma$

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

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

² The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
0.98 ± 0.25 OUR FIT				
$0.77^{+0.25}_{-0.30} \pm 0.17$	91.2 ± 19.8	¹ ABLIKIM	04M BES	$J/\psi \rightarrow \gamma 2\pi^+ 2\pi^-$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

¹ From a model-independent partial wave analysis.

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

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

¹ From a model-independent partial wave analysis.

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

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

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

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

¹ From a Dalitz plot analysis using an isobar model.

$\Gamma(K\bar{K}\pi)/\Gamma_{\text{total}}$ Γ_{34}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
7.3 ± 0.4 OUR FIT				
6.9 ± 0.5 OUR AVERAGE				
6.9 ± 0.7 ± 0.6	146	¹ ABLIKIM	19AP BES3	$h_c \rightarrow \gamma\eta_c$

7.8 ±0.6 ±0.6	267	² ABLIKIM	19AP BES3	$h_c \rightarrow \gamma \eta_c$
6.3 ±1.3 ±1.4	55	^{3,4} ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K^+ K^- \pi^0$
7.9 ±1.4 ±1.8	107	^{5,6} ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K_S^0 K^\mp \pi^\pm$
8.5 ±1.8		⁷ AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
5.1 ±2.1	0.6k	⁸ BAI	04 BES	$J/\psi \rightarrow \gamma K^\pm \pi^\mp K_S^0$
6.90±1.42±1.32	33	⁸ BISELLO	91 DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
5.43±0.94±0.94	68	⁸ BISELLO	91 DM2	$J/\psi \rightarrow \gamma K^\pm \pi^\mp K_S^0$
4.8 ±1.7	95	^{8,9} BALTRUSAITIS	.86 MRK3	$J/\psi \rightarrow \eta_c \gamma$
16.1 $\begin{smallmatrix} +9.2 \\ -7.3 \end{smallmatrix}$		^{10,11} HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c \gamma$

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

< 10.7 90% CL ^{8,12} PARTRIDGE 80B CBAL $J/\psi \rightarrow \eta_c \gamma$

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

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

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

⁴ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K \bar{K} \pi) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P) \pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (27.24 \pm 4.56 \pm 2.88) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P) \pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. 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 $B(\psi(2S) \rightarrow \pi^0 h_c) \cdot B(h_c \rightarrow \gamma \eta_c) \cdot B(\eta_c \rightarrow K_S^0 K^\pm \pi^\mp) = (11.35 \pm 1.25 \pm 1.50) \times 10^{-6}$ which we multiply by 3 to account for isospin symmetry.

⁶ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K \bar{K} \pi) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P) \pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (34.05 \pm 3.75 \pm 4.50) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P) \pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. 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 $B(B^\pm \rightarrow K^\pm \eta_c) B(\eta_c \rightarrow K \bar{K} \pi) = (7.4 \pm 0.5 \pm 0.7) \times 10^{-5}$ reported in AUBERT, B 04B and $B(B^\pm \rightarrow K^\pm \eta_c) = (8.7 \pm 1.5) \times 10^{-3}$ reported in AUBERT 06E.

⁸ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

⁹ Average from $K^+ K^- \pi^0$ and $K^\pm K_S^0 \pi^\mp$ decay channels.

¹⁰ $K^\pm K_S^0 \pi^\mp$ corrected to $K \bar{K} \pi$ by factor 3. KS, MR.

¹¹ Estimated using $B(\psi(2S) \rightarrow \gamma \eta_c(1S)) = 0.0028 \pm 0.0006$.

¹² $K^+ K^- \pi^0$ corrected to $K \bar{K} \pi$ by factor 6. KS, MR

$\Gamma(\phi K^+ K^-) / \Gamma(K \bar{K} \pi)$

Γ_7 / Γ_{34}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$0.052^{+0.016}_{-0.014} \pm 0.014$	7	¹ HUANG 03	BELL	$B^\pm \rightarrow K^\pm \phi$

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

$\Gamma(K\bar{K}\eta)/\Gamma_{\text{total}}$ Γ_{35}/Γ

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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1.36±0.15 OUR FIT

1.0 ±0.5 ±0.2 7 ^{1,2} ABLIKIM 12N BES3 $\psi(2S) \rightarrow \pi^0 \gamma \eta K^+ K^-$

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

<3.1 90 ³ BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c \gamma$

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

² ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K\bar{K}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (4.22 \pm 2.02 \pm 0.64) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. 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 $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$.

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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0.187±0.018 OUR FIT

0.190±0.008±0.017 5.4k ¹ LEES 14E BABR $\gamma\gamma \rightarrow K^+ K^- \eta/\pi^0$

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

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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1.7±0.4±0.4 33 ¹ ABLIKIM 12N BES3 $\psi(2S) \rightarrow \pi^0 \gamma \eta \pi^+ \pi^-$

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

5.4±2.0 75 ² BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c \gamma$

3.7±1.3±2.0 18 ² PARTRIDGE 80B CBAL $J/\psi \rightarrow \eta \pi^+ \pi^- \gamma$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (7.22 \pm 1.47 \pm 1.11) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. 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 $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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4.4±1.2±1.0 39 ¹ ABLIKIM 12N BES3 $\psi(2S) \rightarrow \pi^0 \gamma \eta 2(\pi^+\pi^-)$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \eta 2(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (19.17 \pm 3.77 \pm 3.72) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
6.6 ± 1.1 OUR FIT				
11.8 ± 2.3 OUR AVERAGE				
9.7 ± 2.2 ± 2.2	38	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K^+ K^- \pi^+ \pi^-$
12 ± 4	0.4k	² BAI	04 BES	$J/\psi \rightarrow \gamma K^+ K^- \pi^+ \pi^-$
21 ± 7	110	² BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$
14 $\begin{smallmatrix} +22 \\ -9 \end{smallmatrix}$		³ HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c \gamma$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K^+ K^- \pi^+ \pi^-) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P) \pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (4.16 \pm 0.76 \pm 0.59) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P) \pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. 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 $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

³ Estimated using $B(\psi(2S) \rightarrow \gamma \eta_c(1S)) = 0.0028 \pm 0.0006$.

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

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

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

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
5.6 ± 1.4 ± 1.3	43	^{1,2} ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K_S^0 K^\mp \pi^\mp 2\pi^\pm$

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

² ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K^0 K^- \pi^+ \pi^- \pi^+ + \text{c.c.}) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P) \pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (24.02 \pm 4.44 \pm 4.08) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P) \pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
7.5 ± 2.4 OUR AVERAGE				

8 ± 4 ± 2	10	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K^+ K^- 2(\pi^+ \pi^-)$
7.2 ± 2.4 ± 1.5	100	² ABLIKIM	06A BES2	$J/\psi \rightarrow K^+ K^- 2(\pi^+ \pi^-) \gamma$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K^+ K^- 2(\pi^+ \pi^-)) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P) \pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (3.60 \pm 1.71 \pm 0.64) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P) \pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

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

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.43 ± 0.30 OUR FIT				
2.2 ± 0.9 ± 0.5	7	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma 2(K^+ K^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.4 \begin{smallmatrix} +0.5 \\ -0.4 \end{smallmatrix} \pm 0.6$	$14.5 \begin{smallmatrix} +4.6 \\ -3.0 \end{smallmatrix}$	² HUANG	03 BELL	$B^+ \rightarrow 2(K^+ K^-) K^+$
21 ± 10 ± 6		³ ALBRECHT	94H ARG	$\gamma \gamma \rightarrow K^+ K^- K^+ K^-$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 2(K^+ K^-))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P) \pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (0.94 \pm 0.37 \pm 0.14) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P) \pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

² Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12 \begin{smallmatrix} +0.10 \\ -0.12 \end{smallmatrix}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K \bar{K} \pi) = (5.5 \pm 1.7) \times 10^{-2}$.

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

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.020 ± 0.004 OUR FIT				
0.024 ± 0.007 OUR AVERAGE				
$0.023 \pm 0.007 \pm 0.006$		AUBERT,B	04B BABR	$B^\pm \rightarrow K^\pm \eta_c$
$0.026 \begin{smallmatrix} +0.009 \\ -0.007 \end{smallmatrix} \pm 0.007$	15	¹ HUANG	03 BELL	$B^\pm \rightarrow K^\pm (2K^+ 2K^-)$

¹ Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12 \begin{smallmatrix} +0.10 \\ -0.12 \end{smallmatrix}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K \bar{K} \pi) = (5.5 \pm 1.7) \times 10^{-2}$.

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

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

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

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 5 × 10⁻⁴	90	¹ ABLIKIM	17AJ BES3	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- \pi^0$

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

$$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}} \qquad \Gamma_{44}/\Gamma$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
4.7±0.9±1.1	118	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma\pi^+\pi^-2\pi^0$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma\eta_c(1S))] = (20.31 \pm 2.20 \pm 3.33) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma\eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$$\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}} \qquad \Gamma_{45}/\Gamma$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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0.91±0.12 OUR FIT

1.27±0.23 OUR AVERAGE

1.7 ±0.3 ±0.4	100	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma 2(\pi^+\pi^-)$
1.0 ±0.5	542 ± 75	² BAI	04 BES	$J/\psi \rightarrow \gamma 2(\pi^+\pi^-)$
1.05±0.17±0.34	137	² BISELLO	91 DM2	$J/\psi \rightarrow \gamma 2\pi^+ 2\pi^-$
1.3 ±0.6	25	² BALTRUSAIT..	86 MRK3	$J/\psi \rightarrow \eta_c\gamma$
2.0 ^{+1.5} _{-1.0}		³ HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c\gamma$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma\eta_c(1S))] = (7.51 \pm 0.85 \pm 1.11) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma\eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. 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 $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

³ Estimated using $B(\psi(2S) \rightarrow \gamma\eta_c(1S)) = 0.0028 \pm 0.0006$.

$$\Gamma(2(\pi^+\pi^-\pi^0))/\Gamma_{\text{total}} \qquad \Gamma_{46}/\Gamma$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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15.8±2.3 OUR AVERAGE

15.3±1.8±1.8	333	ABLIKIM	19AP BES3	$h_c \rightarrow \gamma\eta_c$
17 ±3 ±4	175	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma 2(\pi^+\pi^-\pi^0)$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+\pi^-\pi^0))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma\eta_c(1S))] = (75.13 \pm 7.42 \pm 9.99) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma\eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$$\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}} \qquad \Gamma_{47}/\Gamma$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
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17 ±4 OUR AVERAGE

20 ±5 ±5	51	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma 3(\pi^+\pi^-)$
15.4±3.4±3.3	479	² ABLIKIM	06A BES2	$J/\psi \rightarrow 3(\pi^+\pi^-)\gamma$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 3(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma\eta_c(1S))] = (8.82 \pm 1.57 \pm 1.59) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma\eta_c(1S)) =$

$(50 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

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

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$		Γ_{48}/Γ			
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
14.4 ± 1.4 OUR FIT					
12.6 ± 2.1 OUR AVERAGE					
12.0 ± 2.6 ± 1.5	34	ABLIKIM	19APBES3	$h_c \rightarrow \gamma \eta_c$	
15 ± 5 ± 3	15	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma p\bar{p}$	
15 ± 6	213 ± 33	² BAI	04 BES	$J/\psi \rightarrow \gamma p\bar{p}$	
10 ± 3 ± 4	18	² BISELLO	91 DM2	$J/\psi \rightarrow \gamma p\bar{p}$	
11 ± 6	23	² BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$	
29 +29 -15		³ HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c \gamma$	

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

13.1 +1.8 -2.1 ± 0.9	195	⁴ WU	06 BELL	$B^+ \rightarrow p\bar{p}K^+$	
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¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow p\bar{p})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (0.65 \pm 0.19 \pm 0.10) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. 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 $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

³ Estimated using $B(\psi(2S) \rightarrow \gamma \eta_c(1S)) = 0.0028 \pm 0.0006$.

⁴ WU 06 reports $[\Gamma(\eta_c(1S) \rightarrow p\bar{p})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)] = (1.42 \pm 0.11 +0.16
-0.20) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \eta_c K^+) = (1.09 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p})/\Gamma(K\bar{K}\pi)$		Γ_{48}/Γ_{34}			
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.0198 ± 0.0019 OUR FIT					
0.021 ± 0.002 +0.004 -0.006	195	¹ WU	06 BELL	$B^\pm \rightarrow K^\pm p\bar{p}$	

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

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\phi\phi)/\Gamma_{\text{total}}$		$\Gamma_{48}/\Gamma \times \Gamma_8/\Gamma$			
VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT		
0.25 ± 0.04 OUR FIT					
4.0 +3.5 -3.2	BAGLIN	89	SPEC	$\bar{p}p \rightarrow K^+ K^- K^+ K^-$	

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
0.36\pm0.13\pm0.08	14	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma \rho\bar{p}\pi^0$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \rho\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma\eta_c(1S))] = (1.53 \pm 0.49 \pm 0.23) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma\eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

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

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
10.6\pm2.3 OUR FIT					
11.8\pm2.3\pm2.5			¹ ABLIKIM	12B BES3	

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

$8.7^{+2.4}_{-2.3} \pm 0.6$	20	² WU	06 BELL	$B^+ \rightarrow \Lambda\bar{\Lambda}K^+$
<20	90	³ BISELLO	91 DM2	$e^+e^- \rightarrow \gamma\Lambda\bar{\Lambda}$

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

² WU 06 reports $[\Gamma(\eta_c(1S) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)] = (0.95^{+0.25+0.08}_{-0.22-0.11}) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \eta_c K^+) = (1.09 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

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

VALUE	DOCUMENT ID	TECN	COMMENT
0.74\pm0.16 OUR FIT			
0.67$^{+0.19}_{-0.16}$ \pm0.12	¹ WU	06 BELL	$B^+ \rightarrow \rho\bar{p}K^+, \Lambda\bar{\Lambda}K^+$

¹ Not independent from other $\eta_c \rightarrow \Lambda\bar{\Lambda}, \rho\bar{p}$ branching ratios reported by WU 06.

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
2.50$^{+0.34+0.17}_{-0.32-0.18}$	157	¹ LU	19 BELL	$B^+ \rightarrow \bar{p}\Lambda K^+ K^+$

¹ LU 19 reports $(2.83^{+0.36}_{-0.34} \pm 0.35) \times 10^{-3}$ from a measurement of $[\Gamma(\eta_c(1S) \rightarrow K^+\bar{p}\Lambda + \text{c.c.})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)]$ assuming $B(B^+ \rightarrow \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$, which we rescale to our best value $B(B^+ \rightarrow \eta_c K^+) = (1.09 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.1 \pm 1.3 \pm 0.2$	43	¹ LU	19	BELL $B^+ \rightarrow \bar{p}\Lambda K^+ K^+$

¹ LU 19 reports $(3.48 \pm 1.48 \pm 0.46) \times 10^{-3}$ from a measurement of $[\Gamma(\eta_c(1S) \rightarrow \bar{\Lambda}(1520)\Lambda + \text{c.c.})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)]$ assuming $B(B^+ \rightarrow \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$, which we rescale to our best value $B(B^+ \rightarrow \eta_c K^+) = (1.09 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

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

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

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

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

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

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

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$5.3 \pm 1.7 \pm 1.2$		19	¹ ABLIKIM	12N	BES3 $\psi(2S) \rightarrow \pi^0 \gamma p \bar{p} \pi^+ \pi^-$

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

<12 90 HIMEL 80B MRK2 $\psi(2S) \rightarrow \eta_c \gamma$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \pi^+ \pi^- p \bar{p})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow h_c(1P)\pi^0)] \times [B(h_c(1P) \rightarrow \gamma \eta_c(1S))] = (2.30 \pm 0.65 \pm 0.36) \times 10^{-6}$ which we divide by our best values $B(\psi(2S) \rightarrow h_c(1P)\pi^0) = (8.6 \pm 1.3) \times 10^{-4}$, $B(h_c(1P) \rightarrow \gamma \eta_c(1S)) = (50 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

————— RADIATIVE DECAYS —————

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

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.61 ± 0.12 OUR FIT					

$1.9^{+0.7}_{-0.6}$ OUR AVERAGE

$2.7 \pm 0.8 \pm 0.6$			¹ ABLIKIM	13I	BES3
$1.4^{+0.7}_{-0.5} \pm 0.3$		$1.2^{+2.8}_{-1.1}$	² ADAMS	08	CLEO $\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$

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

2.0 $^{+0.9}_{-0.7} \pm 0.1$	13	³ WICHT	08	BELL	$B^\pm \rightarrow K^\pm \gamma \gamma$
2.80 $^{+0.67}_{-0.58} \pm 1.0$		⁴ ARMSTRONG	95F	E760	$\bar{p} p \rightarrow \gamma \gamma$
< 9	90	⁵ BISELLO	91	DM2	$J/\psi \rightarrow \gamma \gamma \gamma$
6 $^{+4}_{-3} \pm 4$		⁴ BAGLIN	87B	SPEC	$\bar{p} p \rightarrow \gamma \gamma$
< 18	90	⁶ BLOOM	83	CBAL	$J/\psi \rightarrow \eta_c \gamma$

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

² ADAMS 08 reports $[\Gamma(\eta_c(1S) \rightarrow \gamma \gamma)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))] = (2.4^{+1.1}_{-0.8} \pm 0.3) \times 10^{-6}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ WICHT 08 reports $[\Gamma(\eta_c(1S) \rightarrow \gamma \gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)] = (2.2^{+0.9+0.4}_{-0.7-0.2}) \times 10^{-7}$ which we divide by our best value $B(B^+ \rightarrow \eta_c K^+) = (1.09 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

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

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

$\Gamma(\gamma \gamma)/\Gamma(K \bar{K} \pi)$

Γ_{56}/Γ_{34}

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.22 ± 0.25 OUR FIT				
3.2 $^{+1.3}_{-1.0} \pm 0.8$	13	¹ WICHT	08	BELL $B^\pm \rightarrow K^\pm \gamma \gamma$

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

$\Gamma(p \bar{p})/\Gamma_{\text{total}} \times \Gamma(\gamma \gamma)/\Gamma_{\text{total}}$

$\Gamma_{48}/\Gamma \times \Gamma_{56}/\Gamma$

<u>VALUE (units 10^{-6})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.232 ± 0.022 OUR FIT				
0.26 ± 0.05 OUR AVERAGE				Error includes scale factor of 1.4.
0.224 $^{+0.038}_{-0.037} \pm 0.020$	190	AMBROGIANI 03	E835	$\bar{p} p \rightarrow \eta_c \rightarrow \gamma \gamma$
0.336 $^{+0.080}_{-0.070}$		ARMSTRONG 95F	E760	$\bar{p} p \rightarrow \gamma \gamma$
0.68 $^{+0.42}_{-0.31}$	12	BAGLIN 87B	SPEC	$\bar{p} p \rightarrow \gamma \gamma$

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

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

Γ_{57}/Γ

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

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

<70 90 ² ABLIKIM 06B BES2 $J/\psi \rightarrow \pi^+ \pi^- \gamma$
¹ ABLIKIM 11G reports $[\Gamma(\eta_c(1S) \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))]$
 $< 1.82 \times 10^{-6}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 1.7 \times 10^{-2}$.
² ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))]$
 $< 1.1 \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 1.7 \times 10^{-2}$.

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

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 4	90	¹ ABLIKIM 11G	BES3	$J/\psi \rightarrow \gamma \pi^0 \pi^0$

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

<40 90 ² ABLIKIM 06B BES2 $J/\psi \rightarrow \pi^0 \pi^0 \gamma$
¹ ABLIKIM 11G reports $[\Gamma(\eta_c(1S) \rightarrow \pi^0 \pi^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))]$
 $< 6.0 \times 10^{-7}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 1.7 \times 10^{-2}$.
² ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \rightarrow \pi^0 \pi^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))]$
 $< 0.71 \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 1.7 \times 10^{-2}$.

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

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

¹ ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \rightarrow K^+ K^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))]$
 $< 0.96 \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 1.7 \times 10^{-2}$.

$\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{60}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<31	90	¹ ABLIKIM 06B	BES2	$J/\psi \rightarrow K_S^0 K_S^0 \gamma$

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

<32 90 ² UEHARA 13 BELL $\gamma\gamma \rightarrow K_S^0 K_S^0$
< 5.6 90 ³ UEHARA 13 BELL $\gamma\gamma \rightarrow K_S^0 K_S^0$
¹ ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))]$
 $< 0.53 \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 1.7 \times 10^{-2}$.
² Taking into account interference with the non-resonant continuum.
³ Neglecting interference with the non-resonant continuum.

$\eta_c(1S)$ REFERENCES

LEES	21A	PR D104 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
AAIJ	20H	EPJ C80 191	R. Aaij <i>et al.</i>	(LHCb Collab.)
ABLIKIM	19AP	PR D100 012003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	19AV	PR D100 052012	M. Ablikim <i>et al.</i>	(BESIII Collab.)
LU	19	PR D99 032003	P.-C. Lu <i>et al.</i>	(BELLE Collab.)
XU	18	PR D98 072001	Q.N. Xu <i>et al.</i>	(BELLE Collab.)
AAIJ	17AD	PL B769 305	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	17BB	EPJ C77 609	R. Aaij <i>et al.</i>	(LHCb Collab.)
ABLIKIM	17AJ	PR D96 112008	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	17P	PR D95 092004	M. Ablikim <i>et al.</i>	(BESIII Collab.)
LEES	16A	PR D93 012005	J.P. Lees <i>et al.</i>	(BABAR Collab.)
PDG	16	CP C40 100001	C. Patrignani <i>et al.</i>	(PDG Collab.)
AAIJ	15AS	JHEP 1510 053	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	15BI	EPJ C75 311	R. Aaij <i>et al.</i>	(LHCb Collab.)

ANASHIN	14	PL B738 391	V.V. Anashin <i>et al.</i>	(KEDR Collab.)
LEES	14E	PR D89 112004	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ABLIKIM	13C	PR D87 012003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	13I	PR D87 032003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
UEHARA	13	PTEP 2013 123C01	S. Uehara <i>et al.</i>	(BELLE Collab.)
ABLIKIM	12B	PR D86 032008	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	12F	PRL 108 222002	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	12N	PR D86 092009	M. Ablikim <i>et al.</i>	(BESIII Collab.)
LIU	12B	PRL 108 232001	Z.Q. Liu <i>et al.</i>	(BELLE Collab.)
ZHANG	12A	PR D86 052002	C.C. Zhang <i>et al.</i>	(BELLE Collab.)
ABLIKIM	11G	PR D84 032006	M. Ablikim <i>et al.</i>	(BESIII Collab.)
DEL-AMO-SA...	11M	PR D84 012004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
VINOKUROVA	11	PL B706 139	A. Vinokurova <i>et al.</i>	(BELLE Collab.)
LEES	10	PR D81 052010	J.P. Lees <i>et al.</i>	(BABAR Collab.)
MITCHELL	09	PRL 102 011801	R.E. Mitchell <i>et al.</i>	(CLEO Collab.)
ADAMS	08	PRL 101 101801	G.S. Adams <i>et al.</i>	(CLEO Collab.)
AUBERT	08AB	PR D78 012006	B. Aubert <i>et al.</i>	(BABAR Collab.)
UEHARA	08	EPJ C53 1	S. Uehara <i>et al.</i>	(BELLE Collab.)
WICHT	08	PL B662 323	J. Wicht <i>et al.</i>	(BELLE Collab.)
ABE	07	PRL 98 082001	K. Abe <i>et al.</i>	(BELLE Collab.)
ABLIKIM	06A	PL B633 19	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06B	EPJ C45 337	M. Ablikim <i>et al.</i>	(BES Collab.)
AUBERT	06E	PRL 96 052002	B. Aubert <i>et al.</i>	(BABAR Collab.)
PDG	06	JP G33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
WU	06	PRL 97 162003	C.-H. Wu <i>et al.</i>	(BELLE Collab.)
ABLIKIM	05L	PR D72 072005	M. Ablikim <i>et al.</i>	(BES Collab.)
KUO	05	PL B621 41	C.C. Kuo <i>et al.</i>	(BELLE Collab.)
ABE	04G	PR D70 071102	K. Abe <i>et al.</i>	(BELLE Collab.)
ABLIKIM	04M	PR D70 112008	M. Ablikim <i>et al.</i>	(BES Collab.)
ASNER	04	PRL 92 142001	D.M. Asner <i>et al.</i>	(CLEO Collab.)
AUBERT	04D	PRL 92 142002	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,B	04B	PR D70 011101	B. Aubert <i>et al.</i>	(BABAR Collab.)
BAI	04	PL B578 16	J.Z. Bai <i>et al.</i>	(BES Collab.)
ABDALLAH	03J	EPJ C31 481	J. Abdallah <i>et al.</i>	(DELPHI Collab.)
AMBROGIANI	03	PL B566 45	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)
BAI	03	PL B555 174	J.Z. Bai <i>et al.</i>	(BES Collab.)
FANG	03	PRL 90 071801	F. Fang <i>et al.</i>	(BELLE Collab.)
HUANG	03	PRL 91 241802	H.-C. Huang <i>et al.</i>	(BELLE Collab.)
ABE,K	02	PRL 89 142001	K. Abe <i>et al.</i>	(BELLE Collab.)
BAI	00F	PR D62 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)
BRANDENB...	00B	PRL 85 3095	G. Brandenburg <i>et al.</i>	(CLEO Collab.)
ACCIARRI	99T	PL B461 155	M. Acciarri <i>et al.</i>	(L3 Collab.)
BAI	99B	PR D60 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)
ABREU	98O	PL B441 479	P. Abreu <i>et al.</i>	(DELPHI Collab.)
SHIRAI	98	PL B424 405	M. Shirai <i>et al.</i>	(AMY Collab.)
ARMSTRONG	95F	PR D52 4839	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
ALBRECHT	94H	PL B338 390	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ADRIANI	93N	PL B318 575	O. Adriani <i>et al.</i>	(L3 Collab.)
BISELLO	91	NP B350 1	D. Bisello <i>et al.</i>	(DM2 Collab.)
BAI	90B	PRL 65 1309	Z. Bai <i>et al.</i>	(Mark III Collab.)
CHEN	90B	PL B243 169	W.Y. Chen <i>et al.</i>	(CLEO Collab.)
BAGLIN	89	PL B231 557	C. Baglin, S. Baird, G. Bassompierre	(R704 Collab.)
BEHREND	89	ZPHY C42 367	H.J. Behrend <i>et al.</i>	(CELLO Collab.)
BRAUNSCH...	89	ZPHY C41 533	W. Braunschweig <i>et al.</i>	(TASSO Collab.)
AIHARA	88D	PRL 60 2355	H. Aihara <i>et al.</i>	(TPC Collab.)
BAGLIN	87B	PL B187 191	C. Baglin <i>et al.</i>	(R704 Collab.)
BALTRUSAIT...	86	PR D33 629	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)
BERGER	86	PL 167B 120	C. Berger <i>et al.</i>	(PLUTO Collab.)
GAISER	86	PR D34 711	J. Gaiser <i>et al.</i>	(Crystal Ball Collab.)
ALTHOFF	85B	ZPHY C29 189	M. Althoff <i>et al.</i>	(TASSO Collab.)
BALTRUSAIT...	84	PRL 52 2126	R.M. Baltrusaitis <i>et al.</i>	(CIT, UCSC+) JP
BLOOM	83	ARNS 33 143	E.D. Bloom, C. Peck	(SLAC, CIT)
HIMEL	80B	PRL 45 1146	T.M. Himel <i>et al.</i>	(SLAC, LBL, UCB)
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