

$\chi_{c1}(3872)$

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

also known as $X(3872)$

This state shows properties different from a conventional $q\bar{q}$ state. A candidate for an exotic structure. See the review on non- $q\bar{q}$ states.

First observed by CHOI 03 in $B \rightarrow K\pi^+\pi^- J/\psi(1S)$ decays as a narrow peak in the invariant mass distribution of the $\pi^+\pi^- J/\psi(1S)$ final state. Isovector hypothesis excluded by AUBERT 05B and CHOI 11.

AAIJ 13Q perform a full five-dimensional amplitude analysis of the angular correlations between the decay products in $B^+ \rightarrow \chi_{c1}(3872)K^+$ decays, where $\chi_{c1}(3872) \rightarrow J/\psi\pi^+\pi^-$ and $J/\psi \rightarrow \mu^+\mu^-$, which unambiguously gives the $J^{PC} = 1^{++}$ assignment under the assumption that the $\pi^+\pi^-$ and J/ψ are in an S -wave. AAIJ 15AO extend this analysis with more data to limit D -wave contributions to $< 4\%$ at 95% CL.

See the review on "Spectroscopy of Mesons Containing Two Heavy Quarks."

$\chi_{c1}(3872)$ MASS FROM $J/\psi X$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3871.64 ± 0.06	OUR AVERAGE			
3870.2 ± 0.7 ± 0.3	24.6	ABLIKIM	23W BES3	$e^+e^- \rightarrow J/\psi(1S)\pi^+\pi^- \omega$
3871.64 ± 0.06 ± 0.01	19.8k	¹ AAIJ	20S LHCB	$B^+ \rightarrow J/\psi\pi^+\pi^- K^+$
3871.9 ± 0.7 ± 0.2	20	ABLIKIM	14 BES3	$e^+e^- \rightarrow J/\psi\pi^+\pi^-\gamma$
3871.95 ± 0.48 ± 0.12	0.6k	AAIJ	12H LHCB	$p\bar{p} \rightarrow J/\psi\pi^+\pi^- X$
3871.85 ± 0.27 ± 0.19	170	² CHOI	11 BELL	$B \rightarrow K\pi^+\pi^- J/\psi$
3873 + 1.8 - 1.6 ± 1.3	27	³ DEL-AMO-SA..10B	BABR	$B \rightarrow \omega J/\psi K$
3871.61 ± 0.16 ± 0.19	6k	^{3,4} AALTONEN	09AU CDF2	$p\bar{p} \rightarrow J/\psi\pi^+\pi^- X$
3871.4 ± 0.6 ± 0.1	93.4	AUBERT	08Y BABR	$B^+ \rightarrow K^+ J/\psi\pi^+\pi^-$
3868.7 ± 1.5 ± 0.4	9.4	AUBERT	08Y BABR	$B^0 \rightarrow K_S^0 J/\psi\pi^+\pi^-$
3871.8 ± 3.1 ± 3.0	522	^{3,5} ABAZOV	04F D0	$p\bar{p} \rightarrow J/\psi\pi^+\pi^- X$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
3871.57 ± 0.09	155	⁶ AAIJ	23AP LHCB	$B_s^0 \rightarrow J/\psi 2(\pi^+\pi^-)$
3871.695 ± 0.067 ± 0.068	15.6k	⁷ AAIJ	20AD LHCB	$p\bar{p} \rightarrow J/\psi\pi^+\pi^- X$
3871.59 ± 0.06 ± 0.03	4.2k	⁸ AAIJ	20S LHCB	$B^+ \rightarrow J/\psi\pi^+\pi^- K^+$
3873.3 ± 1.1 ± 1.0	45	⁹ ABLIKIM	19V BES	$e^+e^- \rightarrow \gamma\omega J/\psi$
3860.0 ± 10.4	13.6	^{3,10} AGHASYAN	18A COMP	$\gamma^* N \rightarrow X\pi^\pm N'$

3868.6	± 1.2	± 0.2	8	¹¹	AUBERT	06	BABR	$B^0 \rightarrow K_S^0 J/\psi \pi^+ \pi^-$
3871.3	± 0.6	± 0.1	61	¹¹	AUBERT	06	BABR	$B^- \rightarrow K^- J/\psi \pi^+ \pi^-$
3873.4	± 1.4		25	¹²	AUBERT	05R	BABR	$B^+ \rightarrow K^+ J/\psi \pi^+ \pi^-$
3871.3	± 0.7	± 0.4	730	^{3,13}	ACOSTA	04	CDF2	$p\bar{p} \rightarrow J/\psi \pi^+ \pi^- X$
3872.0	± 0.6	± 0.5	36	¹⁴	CHOI	03	BELL	$B \rightarrow K \pi^+ \pi^- J/\psi$
3836	± 13		58	^{3,15}	ANTONIAZZI	94	E705	$300 \pi^\pm Li \rightarrow J/\psi \pi^+ \pi^- X$

¹ Calculated from $m_{\chi_{c1}(3872)} - m_{\psi(2S)} = 185.54 \pm 0.06$ MeV obtained by combining the data with $\chi_{c1}(3872)$ produced in B^+ decays from AAIJ 20S and inclusive b -hadron decays from AAIJ 20AD and using $m_{\psi(2S)} = 3686.097$ MeV. Breit-Wigner parametrization.

² The mass difference for the $\chi_{c1}(3872)$ produced in B^+ and B^0 decays is $(-0.71 \pm 0.96 \pm 0.19)$ MeV.

³ Width consistent with detector resolution.

⁴ A possible equal mixture of two states with a mass difference greater than 3.6 MeV/ c^2 is excluded at 95% CL.

⁵ Calculated from the corresponding $m_{\chi_{c1}(3872)} - m_{J/\psi}$ using $m_{J/\psi} = 3096.916$ MeV.

⁶ From a fit of a relativistic S -wave Breit-Wigner convolved with the detector resolution. The width of $\chi_{c1}(3872)$ is constrained to the PDG 22 value. Systematic errors not evaluated.

⁷ Using $\chi_{c1}(3872)$ produced in inclusive b -hadron decays and $m_{\psi(2S)} = 3686.097 \pm 0.010$ MeV. Breit-Wigner parametrization. Superseded by the combined value in AAIJ 20S.

⁸ Using Breit-Wigner parametrization. Superseded by the combined value in AAIJ 20S.

⁹ Fit with fixed width and including two resonances, $\chi_{c0}(3915)$ and $X(3960)$.

¹⁰ Could be a different state.

¹¹ Calculated from the corresponding $m_{\chi_{c1}(3872)} - m_{\psi(2S)}$ using $m_{\psi(2S)} = 3686.093$ MeV. Superseded by AUBERT 08Y.

¹² Calculated from the corresponding $m_{\chi_{c1}(3872)} - m_{\psi(2S)}$ using $m_{\psi(2S)} = 3685.96$ MeV. Superseded by AUBERT 06.

¹³ Superseded by AALTONEN 09AU.

¹⁴ Superseded by CHOI 11.

¹⁵ A lower mass value can be due to an incorrect momentum scale for soft pions.

$\chi_{c1}(3872)$ MASS FROM $\bar{D}^{*0} D^0$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$3873.71^{+0.56}_{-0.50} \pm 0.13$		¹ HIRATA	23	BELL $B^0 \rightarrow D^0 \bar{D}^{*0} K^0$, $B^+ \rightarrow D^0 \bar{D}^{*0} K^+$
$3872.9^{+0.6}_{-0.4} \pm 0.4$ -0.5	50	^{2,3} AUSHEV	10	BELL $B \rightarrow \bar{D}^{*0} D^0 K$
$3875.1^{+0.7}_{-0.5} \pm 0.5$	33 ± 6	³ AUBERT	08B	BABR $B \rightarrow \bar{D}^{*0} D^0 K$
3875.2 ± 0.7 -1.8	24 ± 6	^{3,4} GOKHROO	06	BELL $B \rightarrow D^0 \bar{D}^0 \pi^0 K$

- ¹ From a fit of a Breit-Wigner function with energy dependent width.
² Calculated from the measured $m_{\chi_{c1}(3872)} - m_{D^{*0}} - m_{\bar{D}^0} = 1.1^{+0.6+0.1}_{-0.4-0.3}$ MeV.
³ Experiments report $D^{*0}\bar{D}^0$ invariant mass above $D^{*0}\bar{D}^0$ threshold because D^{*0} decay products are kinematically constrained to the D^{*0} mass, even though the D^{*0} may decay off-shell.
⁴ Superseded by AUSHEV 10.

$m_{\chi_{c1}(3872)} - m_{J/\psi}$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
774.9±3.1±3.0	522	ABAZOV	04F D0	$p\bar{p} \rightarrow J/\psi\pi^+\pi^-X$

$m_{\chi_{c1}(3872)} - m_{\psi(2S)}$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
185.598±0.067±0.068	15.6k	¹ AAIJ	20AD LHCb	$pp \rightarrow J/\psi\pi^+\pi^-X$
185.54 ±0.06	19.8k	² AAIJ	20S LHCb	$pp \rightarrow J/\psi\pi^+\pi^-X$
187.4 ±1.4	25	³ AUBERT	05R BABR	$B^+ \rightarrow K^+ J/\psi\pi^+\pi^-$

- ¹ Using $\chi_{c1}(3872)$ produced in inclusive b -hadron decays. Breit-Wigner parametrization. Superseded by the combined value in AAIJ 20S.
² Combining $m_{\chi_{c1}(3872)} - m_{\psi(2S)} = 185.49 \pm 0.06 \pm 0.03$ MeV from AAIJ 20S and the measured mass difference from AAIJ 20AD. Breit-Wigner parametrization.
³ Superseded by AUBERT 06.

$\chi_{c1}(3872)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.19±0.21 OUR AVERAGE			Error includes scale factor of 1.1.		
1.39±0.24±0.10	90	15.6k	¹ AAIJ	20AD LHCb	$pp \rightarrow J/\psi\pi^+\pi^-X$
0.96 ^{+0.19} _{-0.18} ±0.21	90	4.2k	² AAIJ	20S LHCb	$B^+ \rightarrow J/\psi\pi^+\pi^-K^+$

- ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●
- | | | | | | |
|------|----|----|-------------------|----------|---|
| <2.4 | 90 | | ABLIKIM | 14 BES3 | $e^+e^- \rightarrow J/\psi\pi^+\pi^-\gamma$ |
| <1.2 | 90 | | CHOI | 11 BELL | $B \rightarrow K\pi^+\pi^-J/\psi$ |
| <3.3 | 90 | | AUBERT | 08Y BABR | $B^+ \rightarrow K^+ J/\psi\pi^+\pi^-$ |
| <4.1 | 90 | 69 | AUBERT | 06 BABR | $B \rightarrow K\pi^+\pi^-J/\psi$ |
| <2.3 | 90 | 36 | ³ CHOI | 03 BELL | $B \rightarrow K\pi^+\pi^-J/\psi$ |
- ¹ Using $\chi_{c1}(3872)$ produced in inclusive b -hadron decays. Breit-Wigner parametrization.
² Using Breit-Wigner parametrization. Partially overlapping dataset with that of AAIJ 20AD.
³ Superseded by CHOI 11.

$\chi_{c1}(3872)$ WIDTH FROM $\bar{D}^{*0} D^0$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
$5.2^{+2.2}_{-1.5} \pm 0.4$		¹ HIRATA	23	BELL $B^0 \rightarrow D^0 \bar{D}^{*0} K^0$, $B^+ \rightarrow D^0 \bar{D}^{*0} K^+$
$3.9^{+2.8+0.2}_{-1.4-1.1}$	50	² AUSHEV	10	BELL $B \rightarrow \bar{D}^{*0} D^0 K$
$3.0^{+1.9}_{-1.4} \pm 0.9$	33 ± 6	AUBERT	08B	BABR $B \rightarrow \bar{D}^{*0} D^0 K$

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

¹ From a fit of a Breit-Wigner function with energy dependent width.

² With a measured value of $B(B \rightarrow \chi_{c1}(3872) K) \times B(\chi_{c1}(3872) \rightarrow D^{*0} \bar{D}^0) = (0.80 \pm 0.20 \pm 0.10) \times 10^{-4}$, assumed to be equal for both charged and neutral modes.

$\chi_{c1}(3872)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 $e^+ e^-$	$< 2.7 \times 10^{-7}$	90%
Γ_2 $\pi^+ \pi^- \pi^0$	$< 8 \times 10^{-3}$	90%
Γ_3 $\pi^+ \pi^- J/\psi(1S)$	$(3.5 \pm 0.9) \%$	
Γ_4 $\pi^+ \pi^- \pi^0 J/\psi(1S)$	not seen	
Γ_5 $\omega \eta_c(1S)$	$< 30 \%$	90%
Γ_6 $\rho(770)^0 J/\psi(1S)$	$(2.8 \pm 0.7) \%$	
Γ_7 $\omega J/\psi(1S)$	$(4.1 \pm 1.4) \%$	
Γ_8 $\phi \phi$	not seen	
Γ_9 $D^0 \bar{D}^0 \pi^0$	$(45 \pm 21) \%$	
Γ_{10} $\bar{D}^{*0} D^0$	$(34 \pm 12) \%$	
Γ_{11} $\gamma \gamma$	$< 10 \%$	90%
Γ_{12} $D^0 \bar{D}^0$	$< 26 \%$	90%
Γ_{13} $D^+ D^-$	$< 17 \%$	90%
Γ_{14} $\pi^0 \chi_{c2}$	$< 4 \%$	90%
Γ_{15} $\pi^0 \chi_{c1}$	$(3.1^{+1.5}_{-1.3}) \%$	
Γ_{16} $\pi^0 \chi_{c0}$	$< 13 \%$	90%
Γ_{17} $\pi^+ \pi^- \eta_c(1S)$	$< 13 \%$	90%
Γ_{18} $\pi^0 \pi^0 \chi_{c0}$	$< 6 \%$	90%
Γ_{19} $\pi^+ \pi^- \chi_{c0}$	$< 2.0 \%$	90%
Γ_{20} $\pi^+ \pi^- \chi_{c1}$	$< 7 \times 10^{-3}$	90%
Γ_{21} $\rho \bar{p}$	$< 2.2 \times 10^{-5}$	95%

Radiative decays

Γ_{22} $\gamma D^+ D^-$	$< 3.5 \%$	90%
Γ_{23} $\gamma \bar{D}^0 D^0$	$< 6 \%$	90%
Γ_{24} $\gamma J/\psi$	$(7.8 \pm 2.9) \times 10^{-3}$	
Γ_{25} $\gamma \chi_{c1}$	$< 8 \times 10^{-3}$	90%
Γ_{26} $\gamma \chi_{c2}$	$< 2.9 \%$	90%
Γ_{27} $\gamma \psi(2S)$	possibly seen	

C-violating decays

$\Gamma_{28} \eta J/\psi$ < 1.7 % 90%

$\chi_{c1}(3872)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$ Γ_1

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
< 0.32	90	¹ ABLIKIM	230 BES3	$e^+e^- \rightarrow \pi^+\pi^- J/\psi$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
< 4.3	90	² ABLIKIM	15v BES3	4.0–4.4 $e^+e^- \rightarrow \pi^+\pi^- J/\psi$
< 280	90	³ YUAN	04 RVUE	$e^+e^- \rightarrow \pi^+\pi^- J/\psi$

¹ Fit to cross section using a total width value of 1.19 ± 0.21 MeV and $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S)) = (3.8 \pm 1.2)\%$ from PDG 20.

² ABLIKIM 15v reports this limit from the measurement of $\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S)) \times \Gamma(\chi_{c1}(3872) \rightarrow e^+e^-)/\Gamma < 0.13$ eV using $\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))/\Gamma = 3\%$.

³ Using BAI 98E data on $e^+e^- \rightarrow \pi^+\pi^-\ell^+\ell^-$. Assuming that $\Gamma(\pi^+\pi^- J/\psi)$ of $\chi_{c1}(3872)$ is the same as that of $\psi(2S)$ (85.4 keV).

$\chi_{c1}(3872) \Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

$\Gamma(\pi^+\pi^- J/\psi(1S)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_3\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
< 7.5×10^{-3}	90	¹ ABLIKIM	230 BES3	$e^+e^- \rightarrow \pi^+\pi^- J/\psi$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
< 0.13	90	ABLIKIM	15v BES3	4.0–4.4 $e^+e^- \rightarrow \pi^+\pi^- J/\psi$
< 6.2	90	^{2,3} AUBERT	05D BABR	10.6 $e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$
< 8.3	90	³ DOBBS	05 CLE3	$e^+e^- \rightarrow \pi^+\pi^- J/\psi$
< 10	90	⁴ YUAN	04 RVUE	$e^+e^- \rightarrow \pi^+\pi^- J/\psi$

¹ Fit to cross section using a total width value of 1.19 ± 0.21 MeV from PDG 20.

² Using $B(\chi_{c1}(3872) \rightarrow J/\psi\pi^+\pi^-) \cdot B(J/\psi \rightarrow \mu^+\mu^-) \cdot \Gamma(\chi_{c1}(3872) \rightarrow e^+e^-) < 0.37$ eV from AUBERT 05D and $B(J/\psi \rightarrow \mu^+\mu^-) = 0.0588 \pm 0.0010$ from the PDG 04.

³ Assuming $\chi_{c1}(3872)$ has $J^{PC} = 1^{--}$.

⁴ Using BAI 98E data on $e^+e^- \rightarrow \pi^+\pi^-\ell^+\ell^-$. From theoretical calculation of the production cross section and using $B(J/\psi \rightarrow \mu^+\mu^-) = (5.88 \pm 0.10)\%$.

$\chi_{c1}(3872) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\pi^+\pi^- J/\psi(1S)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_3\Gamma_{11}/\Gamma$

VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
$5.5^{+4.1}_{-3.8} \pm 0.7$		3	¹ TERAMOTO	21 BELL	$e^+e^- \rightarrow \gamma^*\gamma$ at $\Upsilon(\text{nS})$
< 12.9	90		² DOBBS	05 CLE3	$e^+e^- \rightarrow \pi^+\pi^- J/\psi\gamma$

¹ Measured in single-tag two-photon production assuming Q^2 dependence of a $c\bar{c}$ meson model. Here, $\Gamma(\chi_{c1}(3872) \rightarrow \gamma\gamma)$ is the reduced two-photon decay width, $\tilde{\Gamma}_{\gamma\gamma}$.

² Assuming $\chi_{c1}(3872)$ has positive C parity and spin 0.

$\Gamma(\omega J/\psi(1S)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_7\Gamma_{11}/\Gamma$

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

<1.7 90 ¹ LEES 12AD BABR $e^+e^- \rightarrow e^+e^- \omega J/\psi$

¹ Assuming $\chi_{c1}(3872)$ has spin 2.

$\Gamma(\pi^+\pi^-\eta_c(1S)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_{17}\Gamma_{11}/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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<11.1 90 LEES 12AE BABR $e^+e^- \rightarrow e^+e^-\pi^+\pi^-\eta_c$

$\chi_{c1}(3872)$ BRANCHING RATIOS

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT
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<0.8 90 ^{1,2} YIN 23 BELL $B^+ \rightarrow \chi_{c1}(3872) K^+$

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

<1.1 90 ^{2,3} YIN 23 BELL $B^0 \rightarrow \chi_{c1}(3872) K^0$

¹ YIN 23 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^-\pi^0)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 1.9 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.

² Assuming the decay products, $\pi^+\pi^-\pi^0$, are uniformly distributed in phase space. The limit is the 90% "credible" upper limit (i.e. Bayesian).

³ YIN 23 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^-\pi^0)/\Gamma_{\text{total}}] \times [B(B^0 \rightarrow \chi_{c1}(3872) K^0)] < 1.5 \times 10^{-6}$ which we divide by our best value $B(B^0 \rightarrow \chi_{c1}(3872) K^0) = 1.4 \times 10^{-4}$.

$\Gamma(\pi^+\pi^-J/\psi(1S))/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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0.035±0.009 OUR AVERAGE

0.035±0.002±0.009 ¹ AAIJ 20S LHCB $B^+ \rightarrow J/\psi \pi^+ \pi^- K^+$

0.038±0.004±0.010 ² CHOI 11 BELL $B^+ \rightarrow \pi^+ \pi^- J/\psi K^+$

0.037±0.007^{+0.009}_{-0.010} 93 ^{3,4} AUBERT 08Y BABR $B \rightarrow \chi_{c1}(3872) K$

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

seen 151 ⁵ BALA 15 BELL $B \rightarrow \chi_{c1}(3872) K \pi$

0.056±0.018^{+0.014}_{-0.015} 30 ⁶ AUBERT 05R BABR $B^+ \rightarrow K^+ \pi^+ \pi^- J/\psi$

0.060±0.013±0.016 36 ⁷ CHOI 03 BELL $B^+ \rightarrow K^+ \pi^+ \pi^- J/\psi$

¹ AAIJ 20S reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (7.95 \pm 0.15 \pm 0.33) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² CHOI 11 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (8.63 \pm 0.82 \pm 0.52) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ AUBERT 08Y reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (8.4 \pm 1.5 \pm 0.7) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow$

$\chi_{c1}(3872)K^+$) = $(2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ superseded by LEES 20C

⁵ BALA 15 reports $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi) \times B(B^0 \rightarrow \chi_{c1}(3872)K^+\pi^-)$
= $(7.9 \pm 1.3 \pm 0.4) \times 10^{-6}$ and $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi) \times B(B^+ \rightarrow \chi_{c1}(3872)K^0\pi^+) = (10.6 \pm 3.0 \pm 0.9) \times 10^{-6}$.

⁶ Superseded by AUBERT 08Y. AUBERT 05R reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] = (1.28 \pm 0.41) \times 10^{-5}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁷ CHOI 03 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] / [B(B^+ \rightarrow \psi(2S)K^+)] / [B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)] = 0.063 \pm 0.012 \pm 0.007$ which we multiply or divide by our best values $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = (2.3 \pm 0.6) \times 10^{-4}$, $B(B^+ \rightarrow \psi(2S)K^+) = (6.24 \pm 0.21) \times 10^{-4}$, $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (34.69 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(\pi^+\pi^-\pi^0 J/\psi(1S))/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	¹ WANG 11B	BELL	$\Upsilon(2S) \rightarrow \gamma X$
not seen	² SHEN 10A	BELL	$\Upsilon(1S) \rightarrow \gamma X$

¹ WANG 11B reports $B(\Upsilon(2S) \rightarrow \gamma\chi_{c1}(3872)) \times B(\chi_{c1} \rightarrow \pi^+\pi^-\pi^0 J/\psi) < 2.4 \times 10^{-6}$ at 95% CL.

² SHEN 10A reports $B(\Upsilon(1S) \rightarrow \gamma\chi_{c1}(3872)) \times B(\chi_{c1} \rightarrow \pi^+\pi^-\pi^0 J/\psi) < 2.8 \times 10^{-6}$ at 95% CL.

$\Gamma(\omega\eta_c(1S))/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.30	90	¹ VINOKUROVA 15	BELL	$B^+ \rightarrow \omega\eta_c K^+$

¹ VINOKUROVA 15 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \omega\eta_c(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] < 6.9 \times 10^{-5}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 2.3 \times 10^{-4}$.

$\Gamma(\rho(770)^0 J/\psi(1S))/\Gamma(\pi^+\pi^- J/\psi(1S))$ Γ_6/Γ_3

VALUE (%)	DOCUMENT ID	TECN	COMMENT
78.6 ± 2.3 ± 2.0	¹ AAIJ 23S	LHCB	$B^+ \rightarrow K^+ J/\psi \pi^+\pi^-$

¹ Assuming pure ρ contribution only, i.e. excluding the contribution from ρ - ω interference. Using $B(\rho^0 \rightarrow \pi^+\pi^-) = 100\%$.

$\Gamma(\omega J/\psi(1S))/\Gamma_{\text{total}}$ Γ_7/Γ

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

0.026 ± 0.010 ± 0.007 21 ± 7 ¹ DEL-AMO-SA..10B BABR $B^+ \rightarrow \omega J/\psi K^+$

¹ DEL-AMO-SANCHEZ 10B reports $[\Gamma(\chi_{c1}(3872) \rightarrow \omega J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] = (6 \pm 2 \pm 1) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. DEL-AMO-SANCHEZ 10B also reports $B(B^0 \rightarrow \chi_{c1}(3872)K^0) \times B(\chi_{c1}(3872) \rightarrow J/\psi\omega) = (6 \pm 3 \pm 1) \times 10^{-6}$.

$\Gamma(\omega J/\psi(1S))/\Gamma(\pi^+\pi^- J/\psi(1S))$ Γ_7/Γ_3

VALUE	DOCUMENT ID	TECN	COMMENT
1.16±0.24 OUR AVERAGE	Error includes scale factor of 1.2.		
1.24±0.33±0.10	^{1,2} AAIJ	23S	LHCB $B^+ \rightarrow K^+ J/\psi \pi^+ \pi^-$
1.6 ^{+0.4} _{-0.3} ±0.2	³ ABLIKIM	19V	BES $e^+e^- \rightarrow \gamma \omega J/\psi$
0.8 ±0.3	⁴ DEL-AMO-SA..10B	BABR	$B \rightarrow \omega J/\psi K$

¹ AAIJ 23S reports $[\Gamma(\chi_{c1}(3872) \rightarrow \omega J/\psi(1S))/\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))] \times [B(\omega(782) \rightarrow \pi^+\pi^-)] = (1.9 \pm 0.4 \pm 0.3) \times 10^{-2}$ which we divide by our best value $B(\omega(782) \rightarrow \pi^+\pi^-) = (1.53 \pm 0.12) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Excluding ρ - ω interference effects.

³ Fit with fixed width and including two resonances, $\chi_{c0}(3915)$ and $X(3960)$.

⁴ Statistical and systematic errors added in quadrature. Uses the values of $B(B \rightarrow \chi_{c1}(3872)K) \times B(\chi_{c1}(3872) \rightarrow J/\psi \pi^+ \pi^-)$ reported in AUBERT 08Y, taking into account the common systematics.

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

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	¹ AAIJ	17BB	LHCB pp at 7, 8 TeV

¹ AAIJ 17BB reports $B(b \rightarrow \chi_{c1}(3872) \text{ anything}) \times B(\chi_{c1}(3872) \rightarrow \phi\phi) < 4.5 \times 10^{-7}$ at 95% CL.

$\Gamma(D^0\bar{D}^0\pi^0)/\Gamma_{total}$ Γ_9/Γ

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.45^{+0.16+0.11}_{-0.19-0.12}		17	¹ GOKHROO	06	BELL $B^+ \rightarrow D^0\bar{D}^0\pi^0 K^+$

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

<0.26 90 ² CHISTOV 04 BELL Sup. by GOKHROO 06

¹ GOKHROO 06 reports $[\Gamma(\chi_{c1}(3872) \rightarrow D^0\bar{D}^0\pi^0)/\Gamma_{total}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] = (1.02 \pm 0.31^{+0.21}_{-0.29}) \times 10^{-4}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² CHISTOV 04 reports $[\Gamma(\chi_{c1}(3872) \rightarrow D^0\bar{D}^0\pi^0)/\Gamma_{total}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] < 0.6 \times 10^{-4}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 2.3 \times 10^{-4}$.

$\Gamma(D^0\bar{D}^0\pi^0)/\Gamma(\pi^+\pi^- J/\psi(1S))$ Γ_9/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<1.16	90	ABLIKIM	20W	BES3 $e^+e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\bar{D}^{*0}D^0)/\Gamma_{total}$ Γ_{10}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.34±0.08±0.09	41 ⁺⁹ ₋₈	¹ AUSHEV	10	BELL $B^+ \rightarrow \bar{D}^{*0}D^0 K^+$

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

0.73±0.26±0.19 27 ± 6 ² AUBERT 08B BABR $B^+ \rightarrow \bar{D}^{*0}D^0 K^+$

¹ AUSHEV 10 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \bar{D}^{*0} D^0)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (0.77 \pm 0.16 \pm 0.10) \times 10^{-4}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² AUBERT 08B reports $[\Gamma(\chi_{c1}(3872) \rightarrow \bar{D}^{*0} D^0)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (1.67 \pm 0.36 \pm 0.47) \times 10^{-4}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\bar{D}^{*0} D^0)/\Gamma(\pi^+ \pi^- J/\psi(1S))$					Γ_{10}/Γ_3
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
11.77±3.09	50	ABLIKIM	20W	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					Γ_{11}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.10	90	¹ WICHT	08	BELL	$e^+ e^- \rightarrow \gamma(4S)$

¹ WICHT 08 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 2.4 \times 10^{-5}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.

$\Gamma(D^0 \bar{D}^0)/\Gamma_{\text{total}}$					Γ_{12}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.26	90	¹ CHISTOV	04	BELL	$B \rightarrow K D^0 \bar{D}^0$

¹ CHISTOV 04 reports $[\Gamma(\chi_{c1}(3872) \rightarrow D^0 \bar{D}^0)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 6 \times 10^{-5}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.

$\Gamma(D^+ D^-)/\Gamma_{\text{total}}$					Γ_{13}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.17	90	¹ CHISTOV	04	BELL	$B \rightarrow K D^+ D^-$

¹ CHISTOV 04 reports $[\Gamma(\chi_{c1}(3872) \rightarrow D^+ D^-)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 4 \times 10^{-5}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.

$\Gamma(\pi^0 \chi_{c2})/\Gamma(\pi^+ \pi^- J/\psi(1S))$					Γ_{14}/Γ_3
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<1.1	90	ABLIKIM	19U	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\pi^0 \chi_{c1})/\Gamma_{\text{total}}$					Γ_{15}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	

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

<0.035 90 ¹ BHARDWAJ 19 BELL $B^\pm \rightarrow \pi^0 \chi_{c1} K^\pm$
¹ BHARDWAJ 19 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^0 \chi_{c1})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 8.1 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.

$\Gamma(\pi^0 \chi_{c1})/\Gamma(\pi^+ \pi^- J/\psi(1S))$					Γ_{15}/Γ_3
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
88⁺³³₋₂₇±10	10.8	ABLIKIM	19U	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\pi^0 \chi_{c0})/\Gamma(\pi^+ \pi^- J/\psi(1S))$ Γ_{16}/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 3.6	90	ABLIKIM 22D	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
<19	90	ABLIKIM 19U	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\pi^+ \pi^- \eta_c(1S))/\Gamma_{total}$ Γ_{17}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.13	90	¹ VINOKUROVA 15	BELL	$B^+ \rightarrow \pi^+ \pi^- \eta_c K^+$
¹ VINOKUROVA 15 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+ \pi^- \eta_c(1S))/\Gamma_{total}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 3.0 \times 10^{-5}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.				

$\Gamma(\pi^0 \pi^0 \chi_{c0})/\Gamma(\pi^+ \pi^- J/\psi(1S))$ Γ_{18}/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<1.7	90	ABLIKIM 22D	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\pi^+ \pi^- \chi_{c0})/\Gamma(\pi^+ \pi^- J/\psi(1S))$ Γ_{19}/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.56	90	ABLIKIM 22D	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\pi^+ \pi^- \chi_{c1})/\Gamma_{total}$ Γ_{20}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<7 × 10 ⁻³	90	¹ BHARDWAJ 16	BELL	$B^+ \rightarrow \pi^+ \pi^- \chi_{c1} K^+$
¹ BHARDWAJ 16 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+ \pi^- \chi_{c1})/\Gamma_{total}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 1.5 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.				

$\Gamma(p\bar{p})/\Gamma_{total}$ Γ_{21}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<2.2 × 10 ⁻⁵	95	¹ AAIJ 17AD	LHCB	$B^+ \rightarrow p\bar{p} K^+$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
<7 × 10 ⁻⁵	95	² AAIJ 13S	LHCB	$B^+ \rightarrow p\bar{p} K^+$
¹ AAIJ 17AD reports $[\Gamma(\chi_{c1}(3872) \rightarrow p\bar{p})/\Gamma_{total}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 0.5 \times 10^{-8}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.				
² AAIJ 13S reports $[\Gamma(\chi_{c1}(3872) \rightarrow p\bar{p})/\Gamma_{total}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 1.7 \times 10^{-8}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.				

———— Radiative decays ————

$\Gamma(\gamma D^+ D^-)/\Gamma(\pi^+ \pi^- J/\psi(1S))$ Γ_{22}/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.99	90	ABLIKIM 20W	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\gamma \bar{D}^0 D^0)/\Gamma(\pi^+ \pi^- J/\psi(1S))$ Γ_{23}/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<1.58	90	ABLIKIM 20W	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\gamma J/\psi)/\Gamma_{\text{total}}$					Γ_{24}/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
$7.8_{-2.0}^{+2.2} \pm 2.0$		¹ BHARDWAJ 11	BELL	$B^\pm \rightarrow \gamma J/\psi K^\pm$	

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

$12.2 \pm 3.5 \pm 3.2$	20	² AUBERT 09B	BABR	$B^+ \rightarrow \gamma J/\psi K^+$
$14 \pm 5 \pm 4$	19	³ AUBERT, BE 06M	BABR	$B^+ \rightarrow \gamma J/\psi K^+$

¹ BHARDWAJ 11 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \gamma J/\psi)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (1.78_{-0.44}^{+0.48} \pm 0.12) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² AUBERT 09B reports $[\Gamma(\chi_{c1}(3872) \rightarrow \gamma J/\psi)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (2.8 \pm 0.8 \pm 0.1) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ Superseded by AUBERT 09B. AUBERT, BE 06M reports $[\Gamma(\chi_{c1}(3872) \rightarrow \gamma J/\psi)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (3.3 \pm 1.0 \pm 0.3) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\gamma J/\psi)/\Gamma(\pi^+ \pi^- J/\psi(1S))$					Γ_{24}/Γ_3
VALUE		DOCUMENT ID	TECN	COMMENT	
0.79 ± 0.28		ABLIKIM 20W	BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$	

$\Gamma(\gamma \chi_{c1})/\Gamma_{\text{total}}$					Γ_{25}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$< 8 \times 10^{-3}$	90	¹ BHARDWAJ 13	BELL	$B^\pm \rightarrow \chi_{c1} \gamma K^\pm$	

¹ BHARDWAJ 13 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \gamma \chi_{c1})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 1.9 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.

$\Gamma(\gamma \chi_{c1})/\Gamma(\pi^+ \pi^- J/\psi(1S))$					Γ_{25}/Γ_3
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
< 0.89	90	CHOI 03	BELL	$B \rightarrow K \pi^+ \pi^- J/\psi$	

$\Gamma(\gamma \chi_{c2})/\Gamma_{\text{total}}$					Γ_{26}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
< 0.029	90	¹ BHARDWAJ 13	BELL	$B^\pm \rightarrow \chi_{c2} \gamma K^\pm$	

¹ BHARDWAJ 13 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \gamma \chi_{c2})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 6.7 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 2.3 \times 10^{-4}$.

$\Gamma(\gamma \psi(2S))/\Gamma_{\text{total}}$					Γ_{27}/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
possibly seen	36 ± 9	¹ AAIJ	14AH	LHCB	$B^+ \rightarrow \gamma \psi(2S) K^+$

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

not seen		² BHARDWAJ 11	BELL	$B^+ \rightarrow \gamma \psi(2S) K^+$
$0.042 \pm 0.012 \pm 0.011$	25 ± 7	³ AUBERT 09B	BABR	$B^+ \rightarrow \gamma \psi(2S) K^+$

- ¹ From 36.4 ± 9.0 events of $\chi_{c1}(3872) \rightarrow J/\psi\gamma$ decays with a statistical significance of 4.4σ .
² BHARDWAJ 11 reports $B(B^+ \rightarrow K^+ \chi_{c1}(3872)) \times B(\chi_{c1} \rightarrow \gamma\psi(2S)) < 3.45 \times 10^{-6}$ at 90% CL.
³ AUBERT 09B reports $[\Gamma(\chi_{c1}(3872) \rightarrow \gamma\psi(2S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] = (9.5 \pm 2.7 \pm 0.6) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = (2.3 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\gamma\psi(2S))/\Gamma(\pi^+\pi^- J/\psi(1S))$					Γ_{27}/Γ_3
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.42	90	ABLIKIM	20W BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$	

$\Gamma(\gamma\psi(2S))/\Gamma(\gamma J/\psi)$					Γ_{27}/Γ_{24}
VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<0.59	90		ABLIKIM	20W BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$
$2.46 \pm 0.64 \pm 0.29$	36 ± 9		¹ AAIJ	14AH LHCb	$B^+ \rightarrow \gamma\psi(2S)K^+$
<2.1	90		BHARDWAJ	11 BELL	$B^+ \rightarrow \gamma\psi(2S)K^+$
3.4 ± 1.4			AUBERT	09B BABR	$B^+ \rightarrow \gamma c\bar{c}K^l$

- ¹ From 36.4 ± 9.0 events of $\chi_{c1}(3872) \rightarrow J/\psi\gamma$ decays with a statistical significance of 4.4σ .

C-violating decays

$\Gamma(\eta J/\psi)/\Gamma_{\text{total}}$					Γ_{28}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.017	90	^{1,2} IWASHITA	14 BELL	$B \rightarrow K\eta J/\psi$	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<0.034	90	³ AUBERT	04Y BABR	$B \rightarrow K\eta J/\psi$	

- ¹ IWASHITA 14 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \eta J/\psi)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] < 3.8 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 2.3 \times 10^{-4}$.
² IWASHITA 14 also scans the $\eta J/\psi$ mass range 3.8–4.75 GeV and sets upper limits for $B(B^\pm \rightarrow \chi_{c1}(3872)K^\pm) \times B(\chi_{c1}(3872) \rightarrow \eta J/\psi)$ in 5 MeV intervals.
³ AUBERT 04Y reports $[\Gamma(\chi_{c1}(3872) \rightarrow \eta J/\psi)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] < 7.7 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 2.3 \times 10^{-4}$.

$\chi_{c1}(3872)$ REFERENCES

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AAIJ	23S	PR D108 L011103	R. Aaij <i>et al.</i>	(LHCb Collab.)
ABLIKIM	23O	PR D107 032007	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	23W	PRL 130 151904	M. Ablikim <i>et al.</i>	(BESIII Collab.)
HIRATA	23	PR D107 112011	H. Hirata <i>et al.</i>	(BELLE Collab.)
YIN	23	PR D107 052004	J.H. Yin <i>et al.</i>	(BELLE Collab.)
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TERAMOTO	21	PRL 126 122001	Y. Teramoto <i>et al.</i>	(BELLE Collab.)
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AAIJ	17AD	PL B769 305	R. Aaij <i>et al.</i>	(LHCb Collab.)
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ABLIKIM	15V	PL B749 414	M. Ablikim <i>et al.</i>	(BESIII Collab.)
BALA	15	PR D91 051101	A. Bala <i>et al.</i>	(BELLE Collab.)
VINOKUROVA	15	JHEP 1506 132	A. Vinokurova <i>et al.</i>	(BELLE Collab.)
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AAIJ	14AH	NP B886 665	R. Aaij <i>et al.</i>	(LHCb Collab.)
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IWASHITA	14	PTEP 2014 043C01	T. Iwashita <i>et al.</i>	(BELLE Collab.)
AAIJ	13Q	PRL 110 222001	R. Aaij <i>et al.</i>	(LHCb Collab.) JP
AAIJ	13S	EPJ C73 2462	R. Aaij <i>et al.</i>	(LHCb Collab.)
BHARDWAJ	13	PRL 111 032001	V. Bhardwaj <i>et al.</i>	(BELLE Collab.)
AAIJ	12H	EPJ C72 1972	R. Aaij <i>et al.</i>	(LHCb Collab.)
LEES	12AD	PR D86 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	12AE	PR D86 092005	J.P. Lees <i>et al.</i>	(BABAR Collab.)
BHARDWAJ	11	PRL 107 091803	V. Bhardwaj <i>et al.</i>	(BELLE Collab.)
CHOI	11	PR D84 052004	S.-K. Choi <i>et al.</i>	(BELLE Collab.)
WANG	11B	PR D84 071107	X.L. Wang <i>et al.</i>	(BELLE Collab.)
AUSHEV	10	PR D81 031103	T. Aushev <i>et al.</i>	(BELLE Collab.)
DEL-AMO-SA...	10B	PR D82 011101	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
SHEN	10A	PR D82 051504	C.P. Shen <i>et al.</i>	(BELLE Collab.)
AALTONEN	09AU	PRL 103 152001	T. Aaltonen <i>et al.</i>	(CDF Collab.)
AUBERT	09B	PRL 102 132001	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	08B	PR D77 011102	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	08Y	PR D77 111101	B. Aubert <i>et al.</i>	(BABAR Collab.)
WICHT	08	PL B662 323	J. Wicht <i>et al.</i>	(BELLE Collab.)
AUBERT	06	PR D73 011101	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,BE	06M	PR D74 071101	B. Aubert <i>et al.</i>	(BABAR Collab.)
GOKHROO	06	PRL 97 162002	G. Gokhroo <i>et al.</i>	(BELLE Collab.)
AUBERT	05B	PR D71 031501	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	05D	PR D71 052001	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	05R	PR D71 071103	B. Aubert <i>et al.</i>	(BABAR Collab.)
DOBBS	05	PRL 94 032004	S. Dobbs <i>et al.</i>	(CLEO Collab.)
ABAZOV	04F	PRL 93 162002	V.M. Abazov <i>et al.</i>	(D0 Collab.)
ACOSTA	04	PRL 93 072001	D. Acosta <i>et al.</i>	(CDF Collab.)
AUBERT	04Y	PRL 93 041801	B. Aubert <i>et al.</i>	(BABAR Collab.)
CHISTOV	04	PRL 93 051803	R. Chistov <i>et al.</i>	(BELLE Collab.)
PDG	04	PL B592 1	S. Eidelman <i>et al.</i>	(PDG Collab.)
YUAN	04	PL B579 74	C.Z. Yuan <i>et al.</i>	
CHOI	03	PRL 91 262001	S.-K. Choi <i>et al.</i>	(BELLE Collab.)
BAI	98E	PR D57 3854	J.Z. Bai <i>et al.</i>	(BES Collab.)
ANTONIAZZI	94	PR D50 4258	L. Antoniazzi <i>et al.</i>	(E705 Collab.)