

$\chi_{c1}(3872)$

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

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."

 $\chi_{c1}(3872)$ T-MATRIX POLE \sqrt{s} relative to $D^0 D^{*+}$ threshold

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$(0.01 \pm 0.15_{-0.08}^{+0.07} \pm 0.07) - i(0.19 \pm 0.08_{-0.19}^{+0.14})$ OUR ESTIMATE			
$(0.01 \pm 0.15_{-0.08}^{+0.07} \pm 0.07) - i(0.19 \pm 0.08_{-0.19}^{+0.14})$	1,2 ABLIKIM	24C BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$

¹From simultaneous line shape fits of $e^+e^- \rightarrow \gamma\chi_{c1}(3872) \rightarrow \gamma[D^0\bar{D}^0\pi^0]$ and $\gamma[J/\psi\pi^+\pi^-]$. The most prominent pole is reported at $7.04 \pm 0.15_{-0.08}^{+0.07}$ MeV above the $D^0\bar{D}^0\pi^0$ threshold of 3864.66 MeV on the first sheet with respect to the $D^{*0}\bar{D}^0$ channel. The uncertainty in the D^0 width is included in the uncertainty of the pole mass.

²The final uncertainty on the real part of the pole location comes from the uncertainty in the D^- and D^{*0} meson masses.

 $\chi_{c1}(3872)$ T-MATRIX POLE \sqrt{s}

Note that $\Gamma = -2 \text{Im}(\sqrt{s})$.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$(3871.70 \pm 0.15_{-0.08}^{+0.07}) - i(0.19 \pm 0.08_{-0.19}^{+0.14})$ OUR ESTIMATE			
$(3871.70 \pm 0.15_{-0.08}^{+0.07}) - i(0.19 \pm 0.08_{-0.19}^{+0.14})$	¹ ABLIKIM	24C BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$

¹From simultaneous line shape fits of $e^+e^- \rightarrow \gamma\chi_{c1}(3872) \rightarrow \gamma[D^0\bar{D}^0\pi^0]$ and $\gamma[J/\psi\pi^+\pi^-]$. The most prominent pole is reported at $7.04 \pm 0.15^{+0.07}_{-0.08}$ MeV above the $D^0\bar{D}^0\pi^0$ threshold of 3864.66 MeV on the first sheet with respect to the $D^{*0}\bar{D}^0$ channel. The uncertainty in the D^0 width is included in the uncertainty of the pole mass.

$\chi_{c1}(3872)$ 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	$pp \rightarrow J/\psi\pi^+\pi^-X$
3871.85 ± 0.27 ± 0.19	170	² CHOI	11 BELL	$B \rightarrow K\pi^+\pi^-J/\psi$
3873 $\begin{smallmatrix} + 1.8 \\ - 1.6 \end{smallmatrix}$ ± 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	$pp \rightarrow J/\psi\pi^+\pi^-X$
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	$300 \pi^\pm Li \rightarrow J/\psi\pi^+\pi^-X$

¹Calculated 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.

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

³Width 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	$B \rightarrow \bar{D}^{*0} D^0 K$
$3875.2 \pm 0.7^{+0.9}_{-1.8}$	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
$774.9 \pm 3.1 \pm 3.0$	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. ● ● ●				
$185.598 \pm 0.067 \pm 0.068$	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		15.6k	¹ AAIJ	20AD LHCb	$pp \rightarrow J/\psi \pi^+ \pi^- X$
0.96 ^{+0.19} _{-0.18} ± 0.21		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} ± 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} ± 0.9	33 ± 6	AUBERT	08B	BABR $B \rightarrow \bar{D}^{*0} D^0 K$

- 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 × 10 ⁻⁷	90%
Γ_2 $\pi^+ \pi^- \pi^0$	< 1.0 %	90%
Γ_3 $\pi^+ \pi^- J/\psi(1S)$	(4.3 ± 1.4) %	
Γ_4 $\pi^+ \pi^- \pi^0 J/\psi(1S)$	not seen	
Γ_5 $\omega \eta_c(1S)$	< 40 %	90%
Γ_6 $\rho(770)^0 J/\psi(1S)$	(3.4 ± 1.1) %	
Γ_7 $\omega J/\psi(1S)$	(5.0 ± 1.9) %	
Γ_8 $\phi \phi$	not seen	

Γ_9	$D^0 \bar{D}^0 \pi^0$	(55 ± 28)	%	
Γ_{10}	$\bar{D}^{*0} D^0$	(46 ± 16)	%	
Γ_{11}	$\gamma\gamma$	< 13	%	90%
Γ_{12}	$D^0 \bar{D}^0$	< 32	%	90%
Γ_{13}	$D^+ D^-$	< 22	%	90%
Γ_{14}	$\pi^0 \chi_{c2}$	< 5	%	90%
Γ_{15}	$\pi^0 \chi_{c1}$	$(3.8^{+1.9}_{-1.7})$	%	
Γ_{16}	$\pi^0 \chi_{c0}$	< 16	%	90%
Γ_{17}	$\pi^+ \pi^- \eta_c(1S)$	< 16	%	90%
Γ_{18}	$\pi^0 \pi^0 \chi_{c0}$	< 7	%	90%
Γ_{19}	$\pi^0 \pi^0 \chi_{c1}$	< 5	%	90%
Γ_{20}	$\pi^0 \pi^0 \chi_{c2}$	< 2.2	%	90%
Γ_{21}	$\pi^+ \pi^- \chi_{c0}$	< 2.4	%	90%
Γ_{22}	$\pi^+ \pi^- \chi_{c1}$	< 8	$\times 10^{-3}$	90%
Γ_{23}	$p\bar{p}$	< 2.7	$\times 10^{-5}$	95%
Γ_{24}	$\pi^+ \pi^- \eta$	< 5	$\times 10^{-3}$	90%

Radiative decays

Γ_{25}	$\gamma D^+ D^-$	< 4	%	90%
Γ_{26}	$\gamma \bar{D}^0 D^0$	< 7	%	90%
Γ_{27}	$\gamma J/\psi$	(10 ± 4)	$\times 10^{-3}$	
Γ_{28}	$\gamma \chi_{c1}$	< 1.0	%	90%
Γ_{29}	$\gamma \chi_{c2}$	< 4	%	90%
Γ_{30}	$\gamma \psi(2S)$	possibly seen		
Γ_{31}	$\gamma \psi_2(3823)$	< 3.3	$\times 10^{-3}$	90%

C-violating decays

Γ_{32}	$\eta J/\psi$	< 2.1	%	90%
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$\chi_{c1}(3872)$ 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	$4.0\text{--}4.4 e^+ e^- \rightarrow \pi^+ \pi^- J/\psi$	
< 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).					

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

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

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
$< 7.5 \times 10^{-3}$	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	$4.0\text{--}4.4 e^+e^- \rightarrow \pi^+\pi^- J/\psi$
< 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 $B(J/\psi \rightarrow \mu^+\mu^-) = (5.88 \pm 0.10)\%$.

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

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

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 $\Upsilon(nS)$
< 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.

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

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
● ● ● 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.

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

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

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

$$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}} \quad \Gamma_2/\Gamma$$

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT
< 1.0	90	^{1,2} YIN	23 BELL	$B^+ \rightarrow \chi_{c1}(3872)K^+$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
< 1.3	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

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 (shown rounded) value $B(B^0 \rightarrow \chi_{c1}(3872) K^0) = 1.1 \times 10^{-4}$.

$\Gamma(\pi^+ \pi^- J/\psi(1S))/\Gamma_{\text{total}}$					Γ_3/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	

0.043±0.014 OUR AVERAGE

0.043±0.002±0.013		¹ AAIJ	20S	LHCB	$B^+ \rightarrow J/\psi \pi^+ \pi^- K^+$
0.047±0.005±0.015		² CHOI	11	BELL	$B^+ \rightarrow \pi^+ \pi^- J/\psi K^+$
0.045±0.009±0.014	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	$B \rightarrow \chi_{c1}(3872) K \pi$
0.069±0.022±0.022	30	⁶ AUBERT	05R	BABR	$B^+ \rightarrow K^+ \pi^+ \pi^- J/\psi$
0.074±0.016±0.023	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) 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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) 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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) 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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) 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 (shown rounded) values $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$, $B(B^+ \rightarrow \psi(2S) K^+) = (6.25 \pm 0.21) \times 10^{-4}$, $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (34.78 \pm 0.33) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) 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
<0.4	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 1.9 \times 10^{-4}$.

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
$78.6 \pm 2.3 \pm 2.0$	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. • • •

$0.032 \pm 0.012 \pm 0.010$ 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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) 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
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1.16 ± 0.24 OUR AVERAGE Error includes scale factor of 1.2.

$1.24 \pm 0.33 \pm 0.10$ ^{1,2} AAIJ 23S LHCB $B^+ \rightarrow K^+ J/\psi \pi^+ \pi^-$

$1.6^{+0.4}_{-0.3} \pm 0.2$ 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 (shown rounded) 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 (shown rounded) 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.

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

VALUE	CL%	EVTS	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.					

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

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$0.55^{+0.20}_{-0.23} \pm 0.17$		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. • • •
- <0.32 90 ² CHISTOV 04 BELL Sup. by GOKHROO 06
- ¹ GOKHROO 06 reports $[\Gamma(\chi_{c1}(3872) \rightarrow D^0\bar{D}^0\pi^0)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (1.02 \pm 0.31^{+0.21}_{-0.29}) \times 10^{-4}$ which we divide by our best (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.
- ² CHISTOV 04 reports $[\Gamma(\chi_{c1}(3872) \rightarrow D^0\bar{D}^0\pi^0)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] < 0.6 \times 10^{-4}$ which we divide by our best (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

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

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

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

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.46 ± 0.16 OUR AVERAGE					

- 0.52^{+0.13}_{-0.11} ± 0.16 ^{1,2} HIRATA 23 BELL $e^+e^- \rightarrow \gamma(4S)$
- 0.42 ± 0.10 ± 0.13 41⁺⁹₋₈ ³ AUSHEV 10 BELL $B^+ \rightarrow \bar{D}^{*0}D^0 K^+$
- • • We do not use the following data for averages, fits, limits, etc. • • •
- 0.90 ± 0.32 ± 0.28 27 ± 6 ⁴ AUBERT 08B BABR $B^+ \rightarrow \bar{D}^{*0}D^0 K^+$
- ¹ HIRATA 23 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \bar{D}^{*0}D^0)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (0.97^{+0.21}_{-0.18} \pm 0.10) \times 10^{-4}$ which we divide by our best (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.
- ² Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.
- ³ 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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.
- ⁴ 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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) 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
<0.13	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

 $\Gamma(D^0 \bar{D}^0)/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.32	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

 $\Gamma(D^+ D^-)/\Gamma_{\text{total}}$ Γ_{13}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.22	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

 $\Gamma(\pi^0 \chi_{c2})/\Gamma(\pi^+ \pi^- J/\psi(1S))$ 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
<0.04	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

 $\Gamma(\pi^0 \chi_{c1})/\Gamma(\pi^+ \pi^- J/\psi(1S))$ Γ_{15}/Γ_3

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
$88^{+33}_{-27} \pm 10$	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	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$
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$\Gamma(\pi^+\pi^-\eta_c(1S))/\Gamma_{\text{total}}$ Γ_{17}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<0.16	90	¹ VINOKUROVA 15	BELL	$B^+ \rightarrow \pi^+\pi^-\eta_c K^+$
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¹ VINOKUROVA 15 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^-\eta_c(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] < 3.0 \times 10^{-5}$ which we divide by our best (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 1.9 \times 10^{-4}$.

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<1.7	90	ABLIKIM 22D	BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$
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 $\Gamma(\pi^0\pi^0\chi_{c1})/\Gamma(\pi^+\pi^-J/\psi(1S))$ Γ_{19}/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<1.1	90	ABLIKIM 24BU	BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$
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 $\Gamma(\pi^0\pi^0\chi_{c2})/\Gamma(\pi^+\pi^-J/\psi(1S))$ Γ_{20}/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<0.5	90	ABLIKIM 24BU	BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$
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 $\Gamma(\pi^+\pi^-\chi_{c0})/\Gamma(\pi^+\pi^-J/\psi(1S))$ Γ_{21}/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<0.56	90	ABLIKIM 22D	BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$
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 $\Gamma(\pi^+\pi^-\chi_{c1})/\Gamma_{\text{total}}$ Γ_{22}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<8 × 10⁻³	90	¹ BHARDWAJ 16	BELL	$B^+ \rightarrow \pi^+\pi^-\chi_{c1}K^+$
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¹ BHARDWAJ 16 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \pi^+\pi^-\chi_{c1})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] < 1.5 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 1.9 \times 10^{-4}$.

 $\Gamma(p\bar{p})/\Gamma_{\text{total}}$ Γ_{23}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<2.7 × 10⁻⁵	95	¹ AAIJ 17AD	LHCB	$B^+ \rightarrow p\bar{p}K^+$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<9 × 10⁻⁵	95	² AAIJ 13S	LHCB	$B^+ \rightarrow p\bar{p}K^+$
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¹ AAIJ 17AD reports $[\Gamma(\chi_{c1}(3872) \rightarrow p\bar{p})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] < 0.5 \times 10^{-8}$ which we divide by our best (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 1.9 \times 10^{-4}$.

² AAIJ 13S reports $[\Gamma(\chi_{c1}(3872) \rightarrow p\bar{p})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] < 1.7 \times 10^{-8}$ which we divide by our best (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 1.9 \times 10^{-4}$.

 $\Gamma(\pi^+\pi^-\eta)/\Gamma(\pi^+\pi^-J/\psi(1S))$ Γ_{24}/Γ_3

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<0.12	90	ABLIKIM 24K	BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$
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———— Radiative decays ————

$\Gamma(\gamma D^+ D^-)/\Gamma(\pi^+ \pi^- J/\psi(1S))$ Γ_{25}/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_{26}/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_{27}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$9.6^{+2.7}_{-2.5} \pm 3.0$		¹ BHARDWAJ	11 BELL	$B^\pm \rightarrow \gamma J/\psi K^\pm$

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

15 $\pm 4 \pm 5$ 20 ² AUBERT 09B BABR $B^+ \rightarrow \gamma J/\psi K^+$

18 $\pm 6 \pm 6$ 19 ³ AUBERT, BE 06M BABR $B^+ \rightarrow \gamma J/\psi K^+$

¹ BHARDWAJ 11 reports $[\Gamma(\chi_{c1}(3872) \rightarrow \gamma J/\psi)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c1}(3872) K^+)] = (1.78^{+0.48}_{-0.44} \pm 0.12) \times 10^{-6}$ which we divide by our best (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) 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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) 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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

$\Gamma(\gamma J/\psi)/\Gamma(\pi^+ \pi^- J/\psi(1S))$ Γ_{27}/Γ_3

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.52 ± 0.19 OUR AVERAGE				Error includes scale factor of 1.2.
$0.38 \pm 0.20 \pm 0.01$	8 ± 4	ABLIKIM	24X BES3	$e^+ e^- \rightarrow \omega \chi_{c1}(3872)$
0.79 ± 0.28		ABLIKIM	20W BES3	$e^+ e^- \rightarrow \gamma \chi_{c1}(3872)$

$\Gamma(\gamma \chi_{c1})/\Gamma_{\text{total}}$ Γ_{28}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.010	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

$\Gamma(\gamma \chi_{c1})/\Gamma(\pi^+ \pi^- J/\psi(1S))$ Γ_{28}/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_{29}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.04	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = 1.9 \times 10^{-4}$.					

$\Gamma(\gamma\psi(2S))/\Gamma_{\text{total}}$					Γ_{30}/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	$B^+ \rightarrow \gamma\psi(2S)K^+$	
$0.051 \pm 0.015 \pm 0.016$	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.					

$\Gamma(\gamma\psi(2S))/\Gamma(\pi^+\pi^-J/\psi(1S))$					Γ_{30}/Γ_3
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.42	90	ABLIKIM 20W	BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$	

$\Gamma(\pi^+\pi^-\chi_{c1})/\Gamma(\pi^+\pi^-J/\psi(1S))$					Γ_{22}/Γ_3
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.18	90	ABLIKIM 24s	BES3	$e^+e^- \rightarrow \gamma\chi_{c1}(3872)$	

$\Gamma(\gamma\psi(2S))/\Gamma(\gamma J/\psi)$					Γ_{30}/Γ_{27}
VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$1.67 \pm 0.21 \pm 0.13$			¹ AAIJ 24AD	LHCB	$B^+ \rightarrow \gamma\psi(2S)K^+$ and $\gamma J/\psi K^+$

● ● ● 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	² 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	$B^+ \rightarrow \gamma c\bar{c}K^+$	
¹ AAIJ 24AD reports this ratio as $1.67 \pm 0.21 \pm 0.12 \pm 0.04$ where the last uncertainty is due to the uncertainties of the branching fractions of $\psi(2S)$ and J/ψ mesons. We have added the last two uncertainties in quadrature.					
² From 36.4 ± 9.0 events of $\chi_{c1}(3872) \rightarrow J/\psi\gamma$ decays with a statistical significance of 4.4σ . Superseded by AAIJ 24AD.					

$\Gamma(\gamma\psi_2(3823))/\Gamma(\pi^+\pi^-J/\psi(1S))$					Γ_{31}/Γ_3
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.075	90	¹ ABLIKIM 24Z	BES3	$e^+e^- \rightarrow \gamma\psi_2(3823)$	
¹ Using $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = 0.343 \pm 0.010$. We have assumed that $B(\psi_2(3823) \rightarrow \gamma\chi_{c1}) = 1$.					

————— C-violating decays —————

$\Gamma(\eta J/\psi)/\Gamma_{\text{total}}$					Γ_{32}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.021	90	1,2 IWASHITA	14	BELL	$B \rightarrow K \eta J/\psi$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<0.04	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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.					
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 (shown rounded) value $B(B^+ \rightarrow \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.					

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ABLIKIM	24K	PR D109 L011102	M. Ablikim <i>et al.</i>	(BESIII Collab.)
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