$\chi_{c1}(3872)$

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

also known as $X(3872)$

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

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

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

[1] From simultaneous line shape fits of $e^+e^- \rightarrow \gamma\chi_{c1}(3872) \rightarrow \gamma[D^0\overline{D}^0\pi^0]$ 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 $D^0\overline{D}^0\pi^0$ threshold of 3864.66 MeV on the first sheet with respect to the $D^{*0}\overline{D}^0$ 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 $^{+1.8}_{-1.6}$ ±1.3	27	[3] DEL-AMO-SA...	10B	BABR	$B \rightarrow \omega J/\psi K$

3871.61	$\pm$ 0.16	$\pm$0.19	6k	[3,4] AALTONEN	09AU	CDF2	$p\overline{p} \rightarrow J/\psi \pi^+ \pi^- X$
3871.4	$\pm$ 0.6	$\pm$0.1	93.4	AUBERT	08Y	BABR	$B^+ \rightarrow K^+ J/\psi \pi^+ \pi^-$
3868.7	$\pm$ 1.5	$\pm$0.4	9.4	AUBERT	08Y	BABR	$B^0 \rightarrow K^0_S J/\psi \pi^+ \pi^-$
3871.8	$\pm$ 3.1	$\pm$3.0	522	[3,5] ABAZOV	04F	D0	$p\overline{p} \rightarrow J/\psi \pi^+ \pi^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •							
3871.57	$\pm$ 0.09		155	[6] AAIJ	23AP	LHCB	$B^0_s \rightarrow J/\psi 2(\pi^+ \pi^-)$
3871.695	$\pm$ 0.067	$\pm$0.068	15.6k	[7] AAIJ	20AD	LHCB	$p p \rightarrow J/\psi \pi^+ \pi^- X$
3871.59	$\pm$ 0.06	$\pm$0.03	4.2k	[8] AAIJ	20S	LHCB	$B^+ \rightarrow J/\psi \pi^+ \pi^- K^+$
3873.3	$\pm$ 1.1	$\pm$1.0	45	[9] ABLIKIM	19V	BES	$e^+ e^- \rightarrow \gamma \omega J/\psi$
3860.0	$\pm$10.4		13.6	[3,10] AGHASYAN	18A	COMP	$\gamma^* N \rightarrow X \pi^\pm N'$
3868.6	$\pm$ 1.2	$\pm$0.2	8	[11] AUBERT	06	BABR	$B^0 \rightarrow K^0_S J/\psi \pi^+ \pi^-$
3871.3	$\pm$ 0.6	$\pm$0.1	61	[11] AUBERT	06	BABR	$B^- \rightarrow K^- J/\psi \pi^+ \pi^-$
3873.4	$\pm$ 1.4		25	[12] AUBERT	05R	BABR	$B^+ \rightarrow K^+ J/\psi \pi^+ \pi^-$
3871.3	$\pm$ 0.7	$\pm$0.4	730	[3,13] ACOSTA	04	CDF2	$p\overline{p} \rightarrow J/\psi \pi^+ \pi^- X$
3872.0	$\pm$ 0.6	$\pm$0.5	36	[14] CHOI	03	BELL	$B \rightarrow K \pi^+ \pi^- J/\psi$
3836	$\pm$13		58	[3,15] ANTONIAZZI	94	E705	$300\ \pi^\pm \mathrm{Li} \rightarrow J/\psi \pi^+ \pi^- X$

[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 $\overline{D}^{*0} D^0$ 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	$B^0 \to D^0 \overline{D}^{*0} K^0$, $B^+ \to D^0 \overline{D}^{*0} K^+$
$3872.9\ ^{+0.6}_{-0.4}\ ^{+0.4}_{-0.5}$	50	[2,3] AUSHEV	10	BELL	$B \to \overline{D}^{*0} D^0 K$
$3875.1\ ^{+0.7}_{-0.5} \pm 0.5$	33 ± 6	[3] AUBERT	08B	BABR	$B \to \overline{D}^{*0} D^0 K$
$3875.2 \pm 0.7\ ^{+0.9}_{-1.8}$	24 ± 6	[3,4] GOKHROO	06	BELL	$B \to D^0 \overline{D}^0 \pi^0 K$

[1] From a fit of a Breit-Wigner function with energy dependent width.
[2] Calculated from the measured $m_{\chi_{c1}(3872)} - m_{D^{*0}} - m_{\overline{D}^0} = 1.1^{+0.6}_{-0.4}{}^{+0.1}_{-0.3}$ MeV.
[3] Experiments report $D^{*0}\overline{D}^0$ invariant mass above $D^{*0}\overline{D}^0$ 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	$p\overline{p} \to J/\psi \pi^+ \pi^- X$

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

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	$pp \to J/\psi \pi^+ \pi^- X$
185.54 ± 0.06	19.8k	[2] AAIJ	20S	LHCB	$pp \to J/\psi \pi^+ \pi^- X$
187.4 ± 1.4	25	[3] AUBERT	05R	BABR	$B^+ \to K^+ J/\psi \pi^+ \pi^-$

[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.						
$1.39 \pm 0.24 \pm 0.10$		15.6k	[1] AAIJ	20AD	LHCB	$pp \to J/\psi \pi^+ \pi^- X$
$0.96^{+0.19}_{-0.18} \pm 0.21$		4.2k	[2] AAIJ	20S	LHCB	$B^+ \to J/\psi \pi^+ \pi^- K^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<2.4	90		ABLIKIM	14	BES3	$e^+ e^- \to J/\psi \pi^+ \pi^- \gamma$
<1.2	90		CHOI	11	BELL	$B \to K \pi^+ \pi^- J/\psi$

<3.3	90		AUBERT	08Y	BABR	$B^+ \to K^+ J/\psi \pi^+ \pi^-$
<4.1	90	69	AUBERT	06	BABR	$B \to K \pi^+ \pi^- J/\psi$
<2.3	90	36	[3] CHOI	03	BELL	$B \to K \pi^+ \pi^- J/\psi$

[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.

χ_{c1}(3872) WIDTH FROM $\overline{D}^{*0} D^0$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$5.2^{+2.2}_{-1.5} \pm 0.4$		[1] HIRATA	23	BELL	$B^0 \to D^0 \overline{D}^{*0} K^0$, $B^+ \to D^0 \overline{D}^{*0} K^+$
$3.9^{+2.8}_{-1.4}{}^{+0.2}_{-1.1}$	50	[2] AUSHEV	10	BELL	$B \to \overline{D}^{*0} D^0 K$
$3.0^{+1.9}_{-1.4} \pm 0.9$	33 ± 6	AUBERT	08B	BABR	$B \to \overline{D}^{*0} D^0 K$

[1] From a fit of a Breit-Wigner function with energy dependent width.
[2] With a measured value of B($B \to \chi_{c1}(3872) K$) × B($\chi_{c1}(3872) \to D^{*0} \overline{D}^0$) = $(0.80 \pm 0.20 \pm 0.10) \times 10^{-4}$, assumed to be equal for both charged and neutral modes.

χ_{c1}(3872) DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	$e^+ e^-$	$< 2.7 \times 10^{-7}$	90%
Γ_2	$\pi^+ \pi^- \pi^0$	< 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	$D^0 \overline{D}^0 \pi^0$	(55 ±28) %	
Γ_{10}	$\overline{D}^{*0} D^0$	(46 ±16) %	
Γ_{11}	$\gamma \gamma$	< 13 %	90%
Γ_{12}	$D^0 \overline{D}^0$	< 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}	$p\overline{p}$	< 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}	$\gamma \overline{D}^0 D^0$	< 7	%	90%
Γ_{27}	$\gamma J/\psi$	$(10 \pm 4) \times 10^{-3}$		
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%

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

$\Gamma(e^+e^-)$ — Γ_1

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
< 0.32	90	[1] ABLIKIM	23O	BES3	$e^+e^- \to \pi^+\pi^- J/\psi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 4.3	90	[2] ABLIKIM	15V	BES3	4.0–4.4 $e^+e^- \to \pi^+\pi^- J/\psi$
<280	90	[3] YUAN	04	RVUE	$e^+e^- \to \pi^+\pi^- J/\psi$

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

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

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

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

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

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
< 7.5 × 10^{-3}	90	[1] ABLIKIM	23O	BES3	$e^+e^- \to \pi^+\pi^- J/\psi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 0.13	90	ABLIKIM	15V	BES3	4.0–4.4 $e^+e^- \to \pi^+\pi^- J/\psi$
< 6.2	90	[2,3] AUBERT	05D	BABR	10.6 $e^+e^- \to K^+K^-\pi^+\pi^-\gamma$
< 8.3	90	[3] DOBBS	05	CLE3	$e^+e^- \to \pi^+\pi^- J/\psi$
<10	90	[4] YUAN	04	RVUE	$e^+e^- \to \pi^+\pi^- J/\psi$

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

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

[3] Assuming $\chi_{c1}(3872)$ has $J^{PC} = 1^{--}$.
[4] Using BAI 98E data on $e^+e^- \to \pi^+\pi^-\ell^+\ell^-$. From theoretical calculation of the production cross section and using B($J/\psi \to \mu^+\mu^-$) = (5.88 ± 0.10)%.

$\chi_{c1}(3872)$ Γ(i)Γ(γγ)/Γ(total)

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

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	$e^+e^- \to \gamma^*\gamma$ at Υ(nS)
<12.9	90		[2] DOBBS	05	CLE3	$e^+e^- \to \pi^+\pi^- J/\psi\gamma$

[1] Measured in single-tag two-photon production assuming Q^2 dependence of a $c\overline{c}$ meson model. Here, $\Gamma(\chi_{c1}(3872) \to \gamma\gamma)$ is the reduced two-photon decay width, $\widetilde{\Gamma}_{\gamma\gamma}$.
[2] Assuming $\chi_{c1}(3872)$ has positive C parity and spin 0.

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

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	$e^+e^- \to e^+e^-\omega J/\psi$

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

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

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

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

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

VALUE (%)	CL%	DOCUMENT ID		TECN	COMMENT
<1.0	90	[1,2] YIN	23	BELL	$B^+ \to \chi_{c1}(3872) K^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.3	90	[2,3] YIN	23	BELL	$B^0 \to \chi_{c1}(3872) K^0$

[1] YIN 23 reports $[\Gamma(\chi_{c1}(3872) \to \pi^+\pi^-\pi^0)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 1.9\times10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9\times10^{-4}$.
[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 $[\Gamma(\chi_{c1}(3872) \to \pi^+\pi^-\pi^0)/\Gamma_{total}] \times [B(B^0 \to \chi_{c1}(3872) K^0)] < 1.5\times10^{-6}$ which we divide by our best value $B(B^0 \to \chi_{c1}(3872) K^0) = 1.1\times10^{-4}$.

$\Gamma(\pi^+\pi^- J/\psi(1S))/\Gamma_{total}$ — 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	$B^+ \to J/\psi\pi^+\pi^- K^+$
0.047±0.005±0.015		[2] CHOI	11	BELL	$B^+ \to \pi^+\pi^- J/\psi K^+$
0.045±0.009±0.014	93	[3,4] AUBERT	08Y	BABR	$B \to \chi_{c1}(3872) K$

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

seen	151	[5] BALA	15	BELL	$B \to \chi_{c1}(3872) K \pi$
$0.069 \pm 0.022 \pm 0.022$	30	[6] AUBERT	05R	BABR	$B^+ \to K^+ \pi^+ \pi^- J/\psi$
$0.074 \pm 0.016 \pm 0.023$	36	[7] CHOI	03	BELL	$B^+ \to K^+ \pi^+ \pi^- J/\psi$

[1] AAIJ 20S reports $[\Gamma(\chi_{c1}(3872) \to \pi^+\pi^- J/\psi(1S))/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (7.95 \pm 0.15 \pm 0.33) \times 10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] CHOI 11 reports $[\Gamma(\chi_{c1}(3872) \to \pi^+\pi^- J/\psi(1S))/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (8.63 \pm 0.82 \pm 0.52) \times 10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] AUBERT 08Y reports $[\Gamma(\chi_{c1}(3872) \to \pi^+\pi^- J/\psi(1S))/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (8.4 \pm 1.5 \pm 0.7) \times 10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[4] superseded by LEES 20C

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

[6] Superseded by AUBERT 08Y. AUBERT 05R reports $[\Gamma(\chi_{c1}(3872) \to \pi^+\pi^- J/\psi(1S))/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (1.28 \pm 0.41) \times 10^{-5}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[7] CHOI 03 reports $[\Gamma(\chi_{c1}(3872) \to \pi^+\pi^- J/\psi(1S))/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] / [B(B^+ \to \psi(2S) K^+)] / [B(\psi(2S) \to J/\psi(1S) \pi^+\pi^-)] = 0.063 \pm 0.012 \pm 0.007$ which we multiply or divide by our best values $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$, $B(B^+ \to \psi(2S) K^+) = (6.24 \pm 0.21) \times 10^{-4}$, $B(\psi(2S) \to J/\psi(1S) \pi^+\pi^-) = (34.69 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

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

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

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

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

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.4	90	[1] VINOKUROVA 15	BELL	$B^+ \to \omega \eta_c K^+$

[1] VINOKUROVA 15 reports $[\Gamma(\chi_{c1}(3872) \to \omega \eta_c(1S))/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 6.9 \times 10^{-5}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

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

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

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

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.032±0.012±0.010	21 ± 7	[1] DEL-AMO-SA...	10B	BABR	$B^+ \to \omega J/\psi K^+$

[1] DEL-AMO-SANCHEZ 10B reports $[\Gamma(\chi_{c1}(3872) \to \omega J/\psi(1S))/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (6 \pm 2 \pm 1) \times 10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. DEL-AMO-SANCHEZ 10B also reports $B(B^0 \to \chi_{c1}(3872) K^0) \times B(\chi_{c1}(3872) \to J/\psi\omega) = (6 \pm 3 \pm 1) \times 10^{-6}$.

$\Gamma(\omega J/\psi(1S))/\Gamma(\pi^+\pi^- J/\psi(1S))$ — 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	$B^+ \to K^+ J/\psi \pi^+\pi^-$
$1.6\ ^{+0.4}_{-0.3}\ \pm 0.2$	[3] ABLIKIM	19V	BES	$e^+e^- \to \gamma\omega J/\psi$
0.8 ±0.3	[4] DEL-AMO-SA...	10B	BABR	$B \to \omega J/\psi K$

[1] AAIJ 23S reports $[\Gamma(\chi_{c1}(3872) \to \omega J/\psi(1S))/\Gamma(\chi_{c1}(3872) \to \pi^+\pi^- J/\psi(1S))] \times [B(\omega(782) \to \pi^+\pi^-)] = (1.9 \pm 0.4 \pm 0.3) \times 10^{-2}$ which we divide by our best value $B(\omega(782) \to \pi^+\pi^-) = (1.53 \pm 0.12) \times 10^{-2}$. 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 $B(B \to \chi_{c1}(3872) K) \times B(\chi_{c1}(3872) \to J/\psi\pi^+\pi^-)$ 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 $B(b \to \chi_{c1}(3872)\,\text{anything}) \times B(\chi_{c1}(3872) \to \phi\phi) < 4.5 \times 10^{-7}$ at 95% CL.

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

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.55^{+0.20}_{-0.23}\pm0.17}$		17	[1] GOKHROO	06	BELL	$B^+ \to D^0 \overline{D}^0 \pi^0 K^+$
• • • 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 $[\Gamma(\chi_{c1}(3872) \to D^0 \overline{D}^0 \pi^0)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (1.02 \pm 0.31^{+0.21}_{-0.29}) \times 10^{-4}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] CHISTOV 04 reports $[\Gamma(\chi_{c1}(3872) \to D^0 \overline{D}^0 \pi^0)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 0.6 \times 10^{-4}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.16	90	ABLIKIM	20W	BES3	$e^+ e^- \to \gamma \chi_{c1}(3872)$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.46±0.16 OUR AVERAGE					
$0.52^{+0.13}_{-0.11} \pm 0.16$		[1,2] HIRATA	23	BELL	$e^+ e^- \to \Upsilon(4S)$
$0.42 \pm 0.10 \pm 0.13$	41^{+9}_{-8}	[3] AUSHEV	10	BELL	$B^+ \to D^{*0} \overline{D}^0 K^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.90 \pm 0.32 \pm 0.28$	27 ± 6	[4] AUBERT	08B	BABR	$B^+ \to \overline{D}^{*0} D^0 K^+$

[1] HIRATA 23 reports $[\Gamma(\chi_{c1}(3872) \to \overline{D}^{*0} D^0)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (0.97^{+0.21}_{-0.18} \pm 0.10) \times 10^{-4}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
[2] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[3] AUSHEV 10 reports $[\Gamma(\chi_{c1}(3872) \to \overline{D}^{*0} D^0)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (0.77 \pm 0.16 \pm 0.10) \times 10^{-4}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
[4] AUBERT 08B reports $[\Gamma(\chi_{c1}(3872) \to \overline{D}^{*0} D^0)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (1.67 \pm 0.36 \pm 0.47) \times 10^{-4}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\overline{D}^{*0} D^0)/\Gamma(\pi^+ \pi^- J/\psi(1S))$ — Γ_{10}/Γ_3

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
11.77±3.09	50	ABLIKIM	20W	BES3	$e^+ e^- \to \gamma \chi_{c1}(3872)$

$\Gamma(\gamma\gamma)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.13	90	[1] WICHT	08	BELL	$e^+ e^- \to \Upsilon(4S)$

[1] WICHT 08 reports $[\Gamma(\chi_{c1}(3872) \to \gamma\gamma)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 2.4 \times 10^{-5}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.32	90	[1] CHISTOV	04	BELL	$B \to K D^0 \overline{D}^0$

[1] CHISTOV 04 reports $[\Gamma(\chi_{c1}(3872) \to D^0 \overline{D}^0)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 6 \times 10^{-5}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.22	90	[1] CHISTOV	04	BELL	$B \to K D^+ D^-$

[1] CHISTOV 04 reports $[\Gamma(\chi_{c1}(3872) \to D^+ D^-)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 4 \times 10^{-5}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

$\Gamma(\pi^0 \chi_{c2})/\Gamma(\pi^+ \pi^- J/\psi(1S))$ — Γ_{14}/Γ_3

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.1	90	ABLIKIM	19U	BES3	$e^+ e^- \to \gamma \chi_{c1}(3872)$

$\Gamma(\pi^0 \chi_{c1})/\Gamma_{total}$ — Γ_{15}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.04	90	[1] BHARDWAJ	19	BELL	$B^\pm \to \pi^0 \chi_{c1} K^\pm$

[1] BHARDWAJ 19 reports $[\Gamma(\chi_{c1}(3872) \to \pi^0 \chi_{c1})/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 8.1 \times 10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{88^{+33}_{-27} \pm 10}$	10.8	ABLIKIM	19U	BES3	$e^+ e^- \to \gamma \chi_{c1}(3872)$

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

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

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.16	90	[1] VINOKUROVA	15	BELL	$B^+ \to \pi^+ \pi^- \eta_c K^+$

[1] VINOKUROVA 15 reports $[\Gamma(\chi_{c1}(3872) \to \pi^+ \pi^- \eta_c(1S))/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 3.0 \times 10^{-5}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

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

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

$\Gamma(\pi^0 \pi^0 \chi_{c1})/\Gamma(\pi^+ \pi^- J/\psi(1S))$ — Γ_{19}/Γ_3

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.1	90	ABLIKIM	24BU	BES3	$e^+ e^- \to \gamma \chi_{c1}(3872)$

$\Gamma(\pi^0 \pi^0 \chi_{c2})/\Gamma(\pi^+ \pi^- J/\psi(1S))$ — Γ_{20}/Γ_3

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.5	90	ABLIKIM	24BU	BES3	$e^+ e^- \to \gamma \chi_{c1}(3872)$

$\Gamma(\pi^+\pi^-\chi_{c0})/\Gamma(\pi^+\pi^- J/\psi(1S))$ — Γ_{21}/Γ_3

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

$\Gamma(\pi^+\pi^-\chi_{c1})/\Gamma_{total}$ — Γ_{22}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<8 \times 10^{-3}$	90	[1] BHARDWAJ	16	BELL	$B^+ \to \pi^+\pi^-\chi_{c1} K^+$

[1] BHARDWAJ 16 reports $[\Gamma(\chi_{c1}(3872) \to \pi^+\pi^-\chi_{c1})/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 1.5 \times 10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

$\Gamma(p\overline{p})/\Gamma_{total}$ — Γ_{23}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.7 \times 10^{-5}$	95	[1] AAIJ	17AD	LHCB	$B^+ \to p\overline{p}K^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<9 \times 10^{-5}$	95	[2] AAIJ	13S	LHCB	$B^+ \to p\overline{p}K^+$

[1] AAIJ 17AD reports $[\Gamma(\chi_{c1}(3872) \to p\overline{p})/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 0.5 \times 10^{-8}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9 \times 10^{-4}$.

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

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

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

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	$e^+e^- \to \gamma\chi_{c1}(3872)$

$\Gamma(\gamma \overline{D}^0 D^0)/\Gamma(\pi^+\pi^- J/\psi(1S))$ — Γ_{26}/Γ_3

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

$\Gamma(\gamma J/\psi)/\Gamma_{total}$ — 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	$B^\pm \to \gamma J/\psi K^\pm$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$15 \pm 4 \pm 5$	20	[2] AUBERT	09B	BABR	$B^+ \to \gamma J/\psi K^+$
$18 \pm 6 \pm 6$	19	[3] AUBERT,BE	06M	BABR	$B^+ \to \gamma J/\psi K^+$

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

[2] AUBERT 09B reports $[\Gamma(\chi_{c1}(3872) \to \gamma J/\psi)/\Gamma_{\rm total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (2.8 \pm 0.8 \pm 0.1) \times 10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] Superseded by AUBERT 09B. AUBERT,BE 06M reports $[\Gamma(\chi_{c1}(3872) \to \gamma J/\psi)/\Gamma_{\rm total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (3.3 \pm 1.0 \pm 0.3) \times 10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best 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±0.20±0.01	8 ± 4	ABLIKIM	24X	BES3	$e^+e^- \to \omega\chi_{c1}(3872)$
0.79±0.28		ABLIKIM	20W	BES3	$e^+e^- \to \gamma\chi_{c1}(3872)$

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.010	90	[1] BHARDWAJ	13	BELL	$B^\pm \to \chi_{c1}\gamma K^\pm$

[1] BHARDWAJ 13 reports $[\Gamma(\chi_{c1}(3872) \to \gamma\chi_{c1})/\Gamma_{\rm total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 1.9\times10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9\times10^{-4}$.

$\Gamma(\gamma\chi_{c1})/\Gamma(\pi^+\pi^- J/\psi(1S))$ — Γ_{28}/Γ_3

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.89	90	CHOI	03	BELL	$B \to K\pi^+\pi^- J/\psi$

$\Gamma(\gamma\chi_{c2})/\Gamma_{\rm total}$ — Γ_{29}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.04	90	[1] BHARDWAJ	13	BELL	$B^\pm \to \chi_{c2}\gamma K^\pm$

[1] BHARDWAJ 13 reports $[\Gamma(\chi_{c1}(3872) \to \gamma\chi_{c2})/\Gamma_{\rm total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] < 6.7\times10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = 1.9\times10^{-4}$.

$\Gamma(\gamma\psi(2S))/\Gamma_{\rm total}$ — Γ_{30}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
possibly seen	36 ± 9	[1] AAIJ	14AH	LHCB	$B^+ \to \gamma\psi(2S) K^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
not seen		[2] BHARDWAJ	11	BELL	$B^+ \to \gamma\psi(2S) K^+$
0.051±0.015±0.016	25 ± 7	[3] AUBERT	09B	BABR	$B^+ \to \gamma\psi(2S) K^+$

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

[2] BHARDWAJ 11 reports $B(B^+ \to K^+\chi_{c1}(3872)) \times B(\chi_{c1} \to \gamma\psi(2S)) < 3.45\times10^{-6}$ at 90% CL.

[3] AUBERT 09B reports $[\Gamma(\chi_{c1}(3872) \to \gamma\psi(2S))/\Gamma_{\rm total}] \times [B(B^+ \to \chi_{c1}(3872) K^+)] = (9.5 \pm 2.7 \pm 0.6) \times 10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872) K^+) = (1.9 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best 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	$e^+e^- \to \gamma\chi_{c1}(3872)$

$\Gamma(\pi^+\pi^-\chi_{c1})/\Gamma(\pi^+\pi^- J/\psi(1S))$ — Γ_{22}/Γ_3

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.18	90	ABLIKIM	24S	BES3	$e^+e^- \to \gamma\chi_{c1}(3872)$

$\Gamma(\gamma\psi(2S))/\Gamma(\gamma J/\psi)$ — Γ_{30}/Γ_{27}

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.67±0.21±0.13			[1] AAIJ	24AD	LHCB	$B^+ \to \gamma\psi(2S)K^+$ and $\gamma J/\psi K^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.59	90		ABLIKIM	20W	BES3	$e^+e^- \to \gamma\chi_{c1}(3872)$
2.46±0.64±0.29		36 ± 9	[2] AAIJ	14AH	LHCB	$B^+ \to \gamma\psi(2S)K^+$
<2.1	90		BHARDWAJ	11	BELL	$B^+ \to \gamma\psi(2S)K^+$
3.4 ±1.4			AUBERT	09B	BABR	$B^+ \to \gamma c\overline{c}K'$

[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 $\chi_{c1}(3872) \to J/\psi\gamma$ 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	$e^+e^- \to \gamma\psi_2(3823)$

[1] Using $B(\chi_{c1}(1P) \to \gamma J/\psi(1S)) = 0.343 \pm 0.010$. We have assumed that $B(\psi_2(3823) \to \gamma\chi_{c1}) = 1$.

C-violating decays

$\Gamma(\eta J/\psi)/\Gamma_{total}$ — Γ_{32}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.021	90	[1,2] IWASHITA	14	BELL	$B \to K\eta J/\psi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.04	90	[3] AUBERT	04Y	BABR	$B \to K\eta J/\psi$

[1] IWASHITA 14 reports $[\Gamma(\chi_{c1}(3872) \to \eta J/\psi)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872)K^+)] < 3.8\times10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872)K^+) = 1.9\times10^{-4}$.

[2] IWASHITA 14 also scans the $\eta J/\psi$ mass range 3.8–4.75 GeV and sets upper limits for $B(B^\pm \to \chi_{c1}(3872)K^\pm)\times B(\chi_{c1}(3872) \to \eta J/\psi)$ in 5 MeV intervals.

[3] AUBERT 04Y reports $[\Gamma(\chi_{c1}(3872) \to \eta J/\psi)/\Gamma_{total}] \times [B(B^+ \to \chi_{c1}(3872)K^+)] < 7.7\times10^{-6}$ which we divide by our best value $B(B^+ \to \chi_{c1}(3872)K^+) = 1.9\times10^{-4}$.

χ_{c1}(3872) REFERENCES

AAIJ	24AD	JHEP 2411 121	R. Aaij *et al.*	(LHCb Collab.)
ABLIKIM	24BU	PR D110 072015	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	24C	PRL 132 151903	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	24K	PR D109 L011102	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	24S	PR D109 L071101	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	24X	PR D110 012006	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	24Z	PR D110 012012	M. Ablikim *et al.*	(BESIII Collab.)
AAIJ	23AP	JHEP 2307 084	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	23S	PR D108 L011103	R. Aaij *et al.*	(LHCb Collab.)
ABLIKIM	23O	PR D107 032007	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	23W	PRL 130 151904	M. Ablikim *et al.*	(BESIII Collab.)
HIRATA	23	PR D107 112011	H. Hirata *et al.*	(BELLE Collab.)
YIN	23	PR D107 052004	J.H. Yin *et al.*	(BELLE Collab.)
ABLIKIM	22D	PR D105 072009	M. Ablikim *et al.*	(BESIII Collab.)
PDG	22	PTEP 2022 083C01	R.L. Workman *et al.*	(PDG Collab.)
TERAMOTO	21	PRL 126 122001	Y. Teramoto *et al.*	(BELLE Collab.)
AAIJ	20AD	PR D102 092005	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	20S	JHEP 2008 123	R. Aaij *et al.*	(LHCb Collab.)
ABLIKIM	20W	PRL 124 242001	M. Ablikim *et al.*	(BESIII Collab.)
LEES	20C	PRL 124 152001	J.P. Lees *et al.*	(BABAR Collab.)
PDG	20	PTEP 2020 083C01	P.A. Zyla *et al.*	(PDG Collab.)
ABLIKIM	19U	PRL 122 202001	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19V	PRL 122 232002	M. Ablikim *et al.*	(BESIII Collab.)
BHARDWAJ	19	PR D99 111101	V. Bhardwaj *et al.*	(BELLE Collab.)
AGHASYAN	18A	PL B783 334	M. Aghasyan *et al.*	(COMPASS Collab.)
AAIJ	17AD	PL B769 305	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	17BB	EPJ C77 609	R. Aaij *et al.*	(LHCb Collab.)
BHARDWAJ	16	PR D93 052016	V. Bhardwaj *et al.*	(BELLE Collab.)
AAIJ	15AO	PR D92 011102	R. Aaij *et al.*	(LHCb Collab.)
ABLIKIM	15V	PL B749 414	M. Ablikim *et al.*	(BESIII Collab.)
BALA	15	PR D91 051101	A. Bala *et al.*	(BELLE Collab.)
VINOKUROVA	15	JHEP 1506 132	A. Vinokurova *et al.*	(BELLE Collab.)
Also		JHEP 1702 088 (errat.)	A. Vinokurava *et al.*	(BELLE Collab.)
AAIJ	14AH	NP B886 665	R. Aaij *et al.*	(LHCb Collab.)
ABLIKIM	14	PRL 112 092001	M. Ablikim *et al.*	(BESIII Collab.)
IWASHITA	14	PTEP 2014 043C01	T. Iwashita *et al.*	(BELLE Collab.)
AAIJ	13Q	PRL 110 222001	R. Aaij *et al.*	(LHCb Collab.) JP
AAIJ	13S	EPJ C73 2462	R. Aaij *et al.*	(LHCb Collab.)
BHARDWAJ	13	PRL 111 032001	V. Bhardwaj *et al.*	(BELLE Collab.)
AAIJ	12H	EPJ C72 1972	R. Aaij *et al.*	(LHCb Collab.)
LEES	12AD	PR D86 072002	J.P. Lees *et al.*	(BABAR Collab.)
LEES	12AE	PR D86 092005	J.P. Lees *et al.*	(BABAR Collab.)
BHARDWAJ	11	PRL 107 091803	V. Bhardwaj *et al.*	(BELLE Collab.)
CHOI	11	PR D84 052004	S.-K. Choi *et al.*	(BELLE Collab.)
WANG	11B	PR D84 071107	X.L. Wang *et al.*	(BELLE Collab.)
AUSHEV	10	PR D81 031103	T. Aushev *et al.*	(BELLE Collab.)
DEL-AMO-SA...	10B	PR D82 011101	P. del Amo Sanchez *et al.*	(BABAR Collab.)
SHEN	10A	PR D82 051504	C.P. Shen *et al.*	(BELLE Collab.)
AALTONEN	09AU	PRL 103 152001	T. Aaltonen *et al.*	(CDF Collab.)
AUBERT	09B	PRL 102 132001	B. Aubert *et al.*	(BABAR Collab.)
AUBERT	08B	PR D77 011102	B. Aubert *et al.*	(BABAR Collab.)
AUBERT	08Y	PR D77 111101	B. Aubert *et al.*	(BABAR Collab.)
WICHT	08	PL B662 323	J. Wicht *et al.*	(BELLE Collab.)
AUBERT	06	PR D73 011101	B. Aubert *et al.*	(BABAR Collab.)
AUBERT,BE	06M	PR D74 071101	B. Aubert *et al.*	(BABAR Collab.)
GOKHROO	06	PRL 97 162002	G. Gokhroo *et al.*	(BELLE Collab.)
AUBERT	05B	PR D71 031501	B. Aubert *et al.*	(BABAR Collab.)
AUBERT	05D	PR D71 052001	B. Aubert *et al.*	(BABAR Collab.)
AUBERT	05R	PR D71 071103	B. Aubert *et al.*	(BABAR Collab.)
DOBBS	05	PRL 94 032004	S. Dobbs *et al.*	(CLEO Collab.)
ABAZOV	04F	PRL 93 162002	V.M. Abazov *et al.*	(D0 Collab.)
ACOSTA	04	PRL 93 072001	D. Acosta *et al.*	(CDF Collab.)
AUBERT	04Y	PRL 93 041801	B. Aubert *et al.*	(BABAR Collab.)
CHISTOV	04	PRL 93 051803	R. Chistov *et al.*	(BELLE Collab.)
PDG	04	PL B592 1	S. Eidelman *et al.*	(PDG Collab.)
YUAN	04	PL B579 74	C.Z. Yuan *et al.*	
CHOI	03	PRL 91 262001	S.-K. Choi *et al.*	(BELLE Collab.)
BAI	98E	PR D57 3854	J.Z. Bai *et al.*	(BES Collab.)
ANTONIAZZI	94	PR D50 4258	L. Antoniazzi *et al.*	(E705 Collab.)