# $\chi_{c2}(1P)$

$I^G(J^{PC}) = 0^+(2^{++})$

See the Review on "$\psi(2S)$ and $\chi_c$ branching ratios" before the $\chi_{c0}(1P)$ Listings.

## $\chi_{c2}(1P)$ MASS

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **3556.18± 0.13 OUR AVERAGE** | | | | | |
| 3559.9 ± 2.9 | | EISENSTEIN | 01 | CLE2 | $e^+e^- \to e^+e^-\chi_{c2}$ |
| 3556.4 ± 0.7 | | BAI | 99B | BES | $\psi(2S) \to \gamma X$ |
| 3556.15± 0.07±0.12 | 585 | ARMSTRONG | 92 | E760 | $\overline{p}p \to e^+e^-\gamma$ |
| 3556.9 ± 0.4 ±0.5 | 50 | BAGLIN | 86B | SPEC | $\overline{p}p \to e^+e^- X$ |
| 3557.8 ± 0.2 ±4 | | [1] GAISER | 86 | CBAL | $\psi(2S) \to \gamma X$ |
| 3553.4 ± 2.2 | 66 | [2] LEMOIGNE | 82 | GOLI | 190 $\pi^-$ Be $\to \gamma 2\mu$ |
| 3555.9 ± 0.7 | | [3] OREGLIA | 82 | CBAL | $e^+e^- \to J/\psi 2\gamma$ |
| 3557 ± 1.5 | 69 | [4] HIMEL | 80 | MRK2 | $e^+e^- \to J/\psi 2\gamma$ |
| 3551 ±11 | 15 | BRANDELIK | 79B | DASP | $e^+e^- \to J/\psi 2\gamma$ |
| 3553 ± 4 | | [4] BARTEL | 78B | CNTR | $e^+e^- \to J/\psi 2\gamma$ |
| 3553 ± 4 ±4 | | [4,5] TANENBAUM | 78 | MRK1 | $e^+e^-$ |
| 3563 ± 7 | 360 | [4] BIDDICK | 77 | CNTR | $e^+e^- \to \gamma X$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 3543 ±10 | 4 | WHITAKER | 76 | MRK1 | $e^+e^- \to J/\psi 2\gamma$ |

[1] Using mass of $\psi(2S) = 3686.0$ MeV.
[2] $J/\psi(1S)$ mass constrained to 3097 MeV.
[3] Assuming $\psi(2S)$ mass = 3686 MeV and $J/\psi(1S)$ mass = 3097 MeV.
[4] Mass value shifted by us by amount appropriate for $\psi(2S)$ mass = 3686 MeV and $J/\psi(1S)$ mass = 3097 MeV.
[5] From a simultaneous fit to radiative and hadronic decay channels.

## $\chi_{c2}(1P)$ WIDTH

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **2.11±0.17 OUR NEW UNCHECKED FIT** [2.08 ± 0.17 MeV OUR 2002 FIT] | | | | | |
| **2.00±0.18 OUR AVERAGE** | | | | | |
| 1.98±0.17±0.07 | 585 | ARMSTRONG | 92 | E760 | $\overline{p}p \to e^+e^-\gamma$ |
| $2.6\ ^{+1.4}_{-1.0}$ | 50 | BAGLIN | 86B | SPEC | $\overline{p}p \to e^+e^- X$ |
| $2.8\ ^{+2.1}_{-2.0}$ | | [6] GAISER | 86 | CBAL | $\psi(2S) \to \gamma X$ |

[6] Errors correspond to 90% confidence level; authors give only width range.

## $\chi_{c2}(1P)$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level |
|---|---|---|---|
| | **Hadronic decays** | | |
| $\Gamma_1$ | $2(\pi^+\pi^-)$ | ( 1.49±0.21) % | |
| $\Gamma_2$ | $\pi^+\pi^- K^+ K^-$ | (10 ±4 ) × $10^{-3}$ | S=2.0 |
| $\Gamma_3$ | $3(\pi^+\pi^-)$ | ( 9.2 ±2.2 ) × $10^{-3}$ | |
| $\Gamma_4$ | $\rho^0\pi^+\pi^-$ | ( 7 ±4 ) × $10^{-3}$ | |
| $\Gamma_5$ | $K^+\overline{K}^*(892)^0\pi^-$ + c.c. | ( 4.8 ±2.8 ) × $10^{-3}$ | |
| $\Gamma_6$ | $\phi\phi$ | ( 2.0 ±0.8 ) × $10^{-3}$ | |
| $\Gamma_7$ | $\pi^+\pi^-$ | ( 1.52±0.25) × $10^{-3}$ | |
| $\Gamma_8$ | $\pi^0\pi^0$ | (10 ±6 ) × $10^{-4}$ | |
| $\Gamma_9$ | $\eta\eta$ | < 1.37 × $10^{-3}$ | CL=90% |
| $\Gamma_{10}$ | $K^+K^-K^+K^-$ | ( 1.5 ±0.4 ) × $10^{-3}$ | |
| $\Gamma_{11}$ | $\pi^+\pi^- p\overline{p}$ | ( 1.4 ±0.6 ) × $10^{-3}$ | S=1.5 |
| $\Gamma_{12}$ | $K^+K^-$ | ( 8.1 ±1.9 ) × $10^{-4}$ | |
| $\Gamma_{13}$ | $K^0_S K^0_S$ | ( 6.1 ±2.3 ) × $10^{-4}$ | |
| $\Gamma_{14}$ | $p\overline{p}$ | ( 6.8 ±0.8 ) × $10^{-5}$ | |
| $\Gamma_{15}$ | $J/\psi(1S)\pi^+\pi^-\pi^0$ | < 1.5 % | CL=90% |
| $\Gamma_{16}$ | $K^0_S K^+\pi^-$ + c.c. | < 1.06 × $10^{-3}$ | CL=90% |
| | **Radiative decays** | | |
| $\Gamma_{17}$ | $\gamma J/\psi(1S)$ | (20.2 ±1.8 ) % | |
| $\Gamma_{18}$ | $\gamma\gamma$ | ( 2.46±0.23) × $10^{-4}$ | |

## $\chi_{c2}(1P)$ PARTIAL WIDTHS

### $\chi_{c2}(1P)$ Γ(i)Γ($\gamma J/\psi(1S)$)/Γ(total)

#### $\Gamma(p\overline{p})$ × $\Gamma(\gamma J/\psi(1S))/\Gamma_{total}$ $\Gamma_{14}\Gamma_{17}/\Gamma$

| *VALUE* (eV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **29.0±2.4 OUR NEW UNCHECKED FIT** [28.9 ± 2.4 eV OUR 2002 FIT] | | | | |
| **28.9±2.5 OUR AVERAGE** | | | | |
| 28.2±2.6 | [7] ARMSTRONG | 92 | E760 | $\overline{p}p \to e^+e^-\gamma$ |
| 36 ±8 | [7] BAGLIN | 86B | SPEC | $\overline{p}p \to e^+e^-$X |

#### $\Gamma(\gamma\gamma)$ × $\Gamma(\gamma J/\psi(1S))/\Gamma_{total}$ $\Gamma_{18}\Gamma_{17}/\Gamma$

| *VALUE* (eV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **105± 13 OUR NEW UNCHECKED FIT** [85 ± 19 eV OUR 2002 FIT] | | | | | |
| **121± 13 OUR NEW AVERAGE** [169 ± 40 eV OUR 2002 AVERAGE] | | | | | |
| 114± 11± 9 | 136± 13.3 | [8] ABE | 02T | BELL | $e^+e^- \to \chi_{c2}$ |
| 139± 55± 21 | | [9] ACCIARRI | 99E | L3 | $e^+e^- \to e^+e^-\chi_{c2}$ |
| 242± 65± 51 | | [10] ACKER..,K... | 98 | OPAL | $e^+e^- \to e^+e^-\chi_{c2}$ |
| 150± 42± 36 | | [11] DOMINICK | 94 | CLE2 | $e^+e^- \to e^+e^-\chi_{c2}$ |
| 470±240±120 | | [12] BAUER | 93 | TPC | $e^+e^- \to e^+e^-\chi_{c2}$ |

### $\Gamma(\gamma\gamma) \times \Gamma(2(\pi^+\pi^-))/\Gamma_{total}$ $\Gamma_{18}\Gamma_1/\Gamma$

| VALUE (eV) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|
| **7.7±1.1 OUR NEW UNCHECKED FIT** [6.4 ± 1.4 eV OUR 2002 FIT] | | | |
| **6.4±1.8±0.8** | EISENSTEIN 01 | CLE2 | $e^+e^- \to e^+e^-\chi_{c2}$ |

[7] Calculated by us using B($J/\psi(1S) \to e^+e^-$) = 0.0593 ± 0.0010.
[8] Using B($J/\psi \to \ell^+\ell^-$) = 0.1181 ± 0.0020. All systematic errors added in quadrature.
[9] The value for $\Gamma(\chi_{c2} \to \gamma\gamma)$ reported in ACCIARRI 99E is derived using B($\chi_{c2} \to \gamma J/\psi(1S)$)×B($J/\psi(1S) \to \ell^+\ell^-$) = 0.0162 ± 0.0014. Calculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = 0.1181 ± 0.0020.
[10] The value for $\Gamma(\chi_{c2} \to \gamma\gamma)$ reported in ACKERSTAFF,K 98 is derived using B($\chi_{c2} \to \gamma J/\psi(1S)$) = 0.135 ± 0.011 and B($J/\psi(1S) \to \ell^+\ell^-$) = 0.1203 ± 0.0038. Calculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = 0.1181 ± 0.0020.
[11] The value for $\Gamma(\chi_{c2} \to \gamma\gamma)$ reported in DOMINICK 94 is derived using B($\chi_{c2} \to \gamma J/\psi(1S)$)= 0.135 ± 0.011, B($J/\psi(1S) \to e^+e^-$) = 0.0627 ± 0.0020, and B($J/\psi(1S) \to \mu^+\mu^-$) = 0.0597 ± 0.0025. Calculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = 0.1181 ± 0.0020.
[12] The value for $\Gamma(\chi_{c2} \to \gamma\gamma)$ reported in BAUER 93 is derived using B($\chi_{c2} \to \gamma J/\psi(1S)$)= 0.135 ± 0.011, B($J/\psi(1S) \to e^+e^-$) = 0.0627 ± 0.0020, and B($J/\psi(1S) \to \mu^+\mu^-$) = 0.0597 ± 0.0025. Calculated by us using B($J/\psi(1S) \to \ell^+\ell^-$) = 0.1181 ± 0.0020.

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## $\chi_{c2}(1P)$ BRANCHING RATIOS

### HADRONIC DECAYS

### $\Gamma(2(\pi^+\pi^-))/\Gamma_{total}$ $\Gamma_1/\Gamma$

| VALUE | DOCUMENT ID |
|---|---|
| **0.0149±0.0021 OUR NEW UNCHECKED FIT** [0.0141 ± 0.0020 OUR 2002 FIT] | |

### $\Gamma(\pi^+\pi^- K^+K^-)/\Gamma_{total}$ $\Gamma_2/\Gamma$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|
| **0.010 ±0.004 OUR AVERAGE** | Error includes scale factor of 2.0. | | |
| 0.0079±0.0006±0.0021 | [13] BAI 99B | BES | $\psi(2S) \to \gamma\chi_{c2}$ |
| 0.019 ±0.005 | [14] TANENBAUM 78 | MRK1 | $\psi(2S) \to \gamma\chi_{c2}$ |

### $\Gamma(3(\pi^+\pi^-))/\Gamma_{total}$ $\Gamma_3/\Gamma$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|
| **0.0092±0.0022 OUR AVERAGE** | | | |
| 0.009 ±0.001 ±0.002 | [13] BAI 99B | BES | $\psi(2S) \to \gamma\chi_{c2}$ |
| 0.012 ±0.008 | [14] TANENBAUM 78 | MRK1 | $\psi(2S) \to \gamma\chi_{c2}$ |

### $\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{total}$ $\Gamma_4/\Gamma$

| VALUE (units $10^{-4}$) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|
| **68±40** | [14] TANENBAUM 78 | MRK1 | $\psi(2S) \to \gamma\chi_{c2}$ |

### $\Gamma(K^+\overline{K}^*(892)^0\pi^- + \text{c.c.})/\Gamma_{total}$ $\Gamma_5/\Gamma$

| VALUE (units $10^{-4}$) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|
| **48±28** | [14] TANENBAUM 78 | MRK1 | $\psi(2S) \to \gamma\chi_{c2}$ |

## $\Gamma(\phi\phi)/\Gamma_{total}$ $\Gamma_6/\Gamma$

| VALUE (units $10^{-3}$) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **2.00±0.55±0.61** | [13] BAI | 99B | BES | $\psi(2S) \to \gamma\chi_{c2}$ |

## $\Gamma(\pi^+\pi^-)/\Gamma_{total}$ $\Gamma_7/\Gamma$

| VALUE (units $10^{-3}$) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **1.52±0.25 OUR AVERAGE** | | | | | |
| 1.49±0.14±0.22 | 185±16 | [13] BAI | 98I | BES | $\psi(2S) \to \gamma\chi_{c2}$ |
| 1.9 ±1.0 | 4 | [14] BRANDELIK | 79C | DASP | $\psi(2S) \to \gamma\chi_{c2}$ |

## $[\Gamma(\pi^+\pi^-)+\Gamma(K^+K^-)]/\Gamma_{total}$ $(\Gamma_7+\Gamma_{12})/\Gamma$

| VALUE (units $10^{-4}$) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **24±10** | [14] TANENBAUM | 78 | MRK1 | $\psi(2S) \to \gamma\chi_{c2}$ |

## $\Gamma(K^+K^-K^+K^-)/\Gamma_{total}$ $\Gamma_{10}/\Gamma$

| VALUE (units $10^{-3}$) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **1.48±0.26±0.32** | [13] BAI | 99B | BES | $\psi(2S) \to \gamma\chi_{c2}$ |

## $\Gamma(\pi^+\pi^- p\bar{p})/\Gamma_{total}$ $\Gamma_{11}/\Gamma$

| VALUE (units $10^{-4}$) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **14 ± 6 OUR AVERAGE** Error includes scale factor of 1.5. | | | | |
| 12.3± 2.0±3.5 | [13] BAI | 99B | BES | $\psi(2S) \to \gamma\chi_{c2}$ |
| 33 ±13 | [14] TANENBAUM | 78 | MRK1 | $\psi(2S) \to \gamma\chi_{c2}$ |

## $\Gamma(K^+K^-)/\Gamma_{total}$ $\Gamma_{12}/\Gamma$

| VALUE (units $10^{-3}$) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **0.81±0.19 OUR AVERAGE** | | | | | |
| 0.79±0.14±0.13 | 115±13 | [13] BAI | 98I | BES | $\psi(2S) \to \gamma\chi_{c2}$ |
| 1.5 ±1.1 | 2 | [14] BRANDELIK | 79C | DASP | $\psi(2S) \to \gamma\chi_{c2}$ |

## $\Gamma(K^0_S K^0_S)/\Gamma_{total}$ $\Gamma_{13}/\Gamma$

| VALUE (units $10^{-3}$) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **0.61±0.17±0.16** | [13] BAI | 99B | BES | $\psi(2S) \to \gamma\chi_{c2}$ |

## $\Gamma(p\bar{p})/\Gamma_{total}$ $\Gamma_{14}/\Gamma$

| VALUE (units $10^{-4}$) | DOCUMENT ID |
|---|---|
| **0.68±0.08 OUR NEW UNCHECKED FIT** [$(0.74 \pm 0.10) \times 10^{-4}$ OUR 2002 FIT] | |

## $\Gamma(\pi^0\pi^0)/\Gamma_{total}$ $\Gamma_8/\Gamma$

| VALUE (units $10^{-3}$) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **1.0 ±0.6 OUR NEW AVERAGE** [$(1.10 \pm 0.28) \times 10^{-3}$ OUR 1996 AVERAGE] | | | | | |
| **0.98±0.27±0.56** | 20.8±5.8 | [15] BAI | 03C | BES | $\psi(2S) \to \gamma\pi^0\pi^0 \to 5\gamma$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 1.1 ±0.2 ±0.2 | | [13] LEE | 85 | CBAL | $\psi' \to$ photons |

### $\Gamma(\eta\eta)/\Gamma_{total}$ $\Gamma_9/\Gamma$

| *VALUE* (units $10^{-4}$) | *CL%* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **<13.7** | 90 | [15] BAI | 03C | BES | $\psi(2S) \to \gamma\eta\eta \to 5\gamma$ |

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

| | | | | |
|---|---|---|---|---|
| $7.9 \pm 4.1 \pm 2.4$ | [13] LEE | 85 | CBAL | $\psi' \to$ photons |

### $\Gamma(J/\psi(1S)\pi^+\pi^-\pi^0)/\Gamma_{total}$ $\Gamma_{15}/\Gamma$

| *VALUE* | *CL%* | *DOCUMENT ID* | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **<0.015** | 90 | BARATE | 81 SPEC | 190 GeV $\pi^-$ Be $\to$ $2\pi 2\mu$ |

### $\Gamma(K_S^0 K^+\pi^- + \text{c.c.})/\Gamma_{total}$ $\Gamma_{16}/\Gamma$

| *VALUE* (units $10^{-3}$) | *CL%* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **<1.06** | 90 | [13] BAI | 99B | BES | $\psi(2S) \to \gamma\chi_{c2}$ |

[13] Calculated using $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 0.078 \pm 0.008$.

[14] Estimated using $B(\psi(2S) \to \gamma\chi_{c2}(1P)) = 0.078$; the errors do not contain the uncertainty in the $\psi(2S)$ decay.

[15] Derived using $B(\psi(1S) \to \gamma\chi_{c0}) = 0.087 \pm 0.008$ and $B(\psi(2S) \to J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

## RADIATIVE DECAYS

### $\Gamma(\gamma J/\psi(1S))/\Gamma_{total}$ $\Gamma_{17}/\Gamma$

| *VALUE* | *DOCUMENT ID* |
|---|---|
| **0.202±0.018 OUR NEW UNCHECKED FIT** | [0.187 ± 0.020 OUR 2002 FIT] |

### $\Gamma(\gamma\gamma)/\Gamma_{total}$ $\Gamma_{18}/\Gamma$

| *VALUE* (units $10^{-4}$) | *DOCUMENT ID* |
|---|---|
| **2.46±0.23 OUR NEW UNCHECKED FIT** | [$(2.19 \pm 0.32) \times 10^{-4}$ OUR 2002 FIT] |

### $\Gamma(\gamma\gamma)/\Gamma(\gamma J/\psi(1S))$ $\Gamma_{18}/\Gamma_{17}$

| *VALUE* (units $10^{-3}$) | *DOCUMENT ID* | *TECN* | *COMMENT* |
|---|---|---|---|
| **1.21±0.17 OUR NEW UNCHECKED FIT** | [$(1.17 \pm 0.26) \times 10^{-3}$ OUR 2002 FIT] | | |
| **0.99±0.18** | [16] AMBROGIANI 00B | E835 | $\overline{p}p \to \chi_{c2} \to \gamma\gamma$, $\gamma J/\psi$ |

### $\Gamma(\gamma\gamma) \times \Gamma(p\overline{p})/\Gamma_{total}^2$ $\Gamma_{18}\Gamma_{14}/\Gamma^2$

| *VALUE* (units $10^{-8}$) | *DOCUMENT ID* | *TECN* | *COMMENT* |
|---|---|---|---|
| **1.66±0.24 OUR NEW UNCHECKED FIT** | [$(1.63 \pm 0.24) \times 10^{-8}$ OUR 2002 FIT] | | |
| **1.7 ±0.4 OUR AVERAGE** | | | |
| $1.60 \pm 0.42$ | ARMSTRONG 93 | E760 | $\overline{p}p \to \gamma\gamma X$ |
| $9.9 \pm 4.5$ | BAGLIN 87B | SPEC | $\overline{p}p \to \gamma\gamma X$ |

[16] Calculated by us using $B(J/\psi(1S) \to e^+e^-) = 0.0593 \pm 0.0010$.

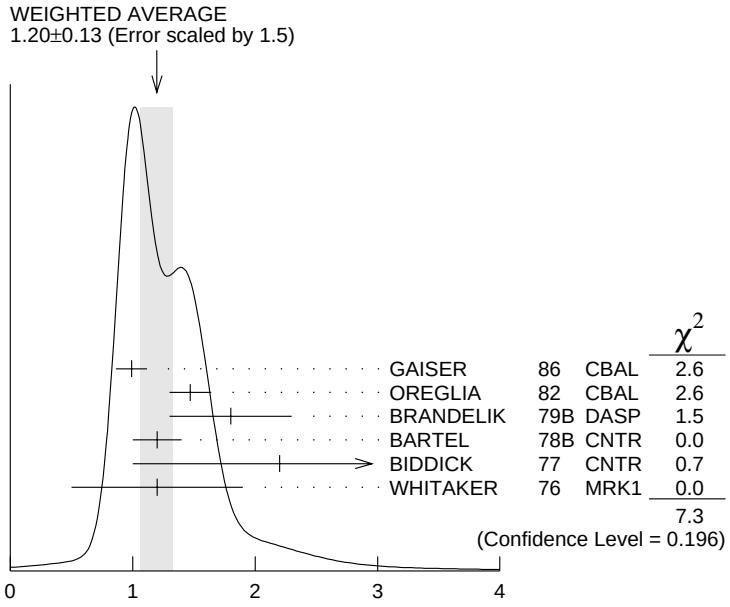
## $\chi_{c2}(1P)$ CROSS-PARTICLE BRANCHING RATIOS

$$B(\chi_{c2}(1P) \rightarrow p\overline{p}) \times \frac{\Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}$$

| *VALUE* (units $10^{-5}$) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **1.37±0.24 OUR NEW UNCHECKED FIT** | [$(1.7 \pm 0.4) \times 10^{-5}$ OUR 2002 FIT] | | | |
| **1.4 ±1.1** | [17] BAI | 98I | BES | $\psi(2S) \rightarrow \gamma\chi_{c2} \rightarrow \gamma\overline{p}p$ |

$$B(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) \times B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))$$

| *VALUE* (units $10^{-2}$) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **1.30±0.08 OUR NEW UNCHECKED FIT** | [$(1.27 \pm 0.08) \times 10^{-2}$ OUR 2002 FIT] | | | |
| **1.20±0.13 OUR AVERAGE** | Error includes scale factor of 1.5. See the ideogram below. | | | |
| 0.99±0.10±0.08 | GAISER | 86 | CBAL | $\psi(2S) \rightarrow \gamma X$ |
| 1.47±0.17 | [18] OREGLIA | 82 | CBAL | $\psi(2S) \rightarrow \gamma\chi_{c2}$ |
| 1.8 ±0.5 | [19] BRANDELIK | 79B | DASP | $\psi(2S) \rightarrow \gamma\chi_{c2}$ |
| 1.2 ±0.2 | [19] BARTEL | 78B | CNTR | $\psi(2S) \rightarrow \gamma\chi_{c2}$ |
| 2.2 ±1.2 | [20] BIDDICK | 77 | CNTR | $e^+e^- \rightarrow \gamma X$ |
| 1.2 ±0.7 | [18] WHITAKER | 76 | MRK1 | $e^+e^-$ |




$$B(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) \times B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))$$

$$\mathbf{B(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) \times \frac{\Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}}$$

| *VALUE* (units $10^{-2}$) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **4.09±0.28 OUR NEW UNCHECKED FIT** | [$(4.2 \pm 0.4) \times 10^{-2}$ OUR 2002 FIT] | | | |
| **3.9 ±1.2** | [21] HIMEL | 80 | MRK2 | $\psi(2S) \rightarrow \gamma\chi_{c2}$ |

$$\mathbf{B(\chi_{c2}(1P) \rightarrow \gamma\gamma) \times B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))}$$

| *VALUE* (units $10^{-5}$) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **1.58±0.19 OUR NEW UNCHECKED FIT** | [$(1.49 \pm 0.20) \times 10^{-5}$ OUR 2002 FIT] | | | |
| **7.0 ±2.1 ±2.0** | LEE | 85 | CBAL | $\psi(2S) \rightarrow \gamma\chi_{c2}$ |

$$\mathbf{B(\chi_{c2}(1P) \rightarrow 2(\pi^+\pi^-)) \times \frac{\Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}}$$

| *VALUE* (units $10^{-3}$) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **3.0±0.4 OUR NEW UNCHECKED FIT** | [$(3.1 \pm 0.5) \times 10^{-3}$ OUR 2002 FIT] | | | |
| **3.1±1.0 OUR AVERAGE** | Error includes scale factor of 2.5. | | | |
| 2.3±0.1±0.5 | [22] BAI | 99B | BES | $\psi(2S) \rightarrow \gamma\chi_{c2}$ |
| 4.3±0.6 | [23] TANENBAUM | 78 | MRK1 | $\psi(2S) \rightarrow \gamma\chi_{c2}$ |

[17] Calculated by us. The value for $B(\chi_{c2} \rightarrow p\overline{p})$ reported in BAI 98I is derived using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

[18] Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.

[19] Recalculated by us using $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = 0.0588 \pm 0.0010$.

[20] Assumes isotropic gamma distribution.

[21] The value for $B(\psi(2S) \rightarrow \gamma\chi_{c2}) \times B(\chi_{c2} \rightarrow \gamma J/\psi(1S))$ reported in HIMEL 80 is derived using $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (33 \pm 3)\%$ and $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.138 \pm 0.018$. Calculated by us using $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = (0.1181 \pm 0.0020)$.

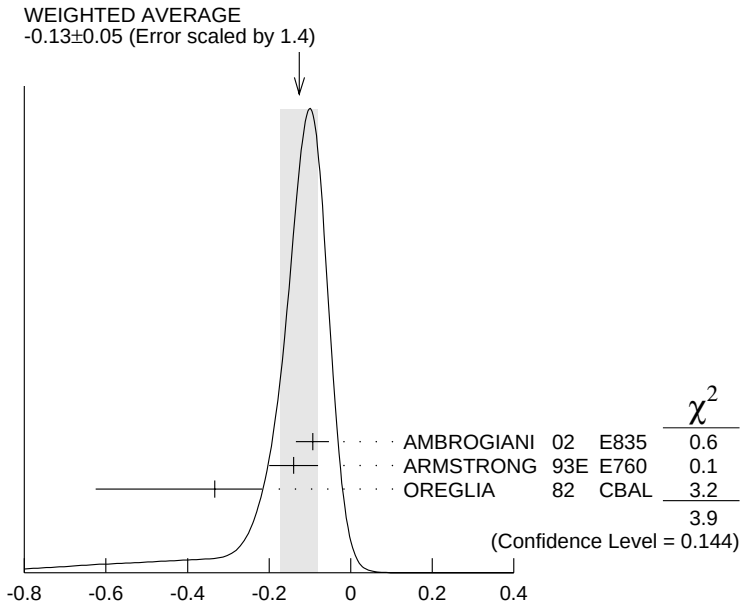
[22] Calculated by us. The value for $B(\chi_{c2} \rightarrow 2\pi^+2\pi^-)$ reported in BAI 99B is derived using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

[23] The value for $B(\psi(2S) \rightarrow \gamma\chi_{c2}) \times B(\chi_{c2} \rightarrow 2\pi^+\pi^-)$ reported in TANENBAUM 78 is derived using $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times B(J/\psi(1S)\ell^+\ell^-) = (4.6 \pm 0.7)\%$. Calculated by us using $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.

## MULTIPOLE AMPLITUDES IN $\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)$ RADIATIVE DECAY

### $a_2 = M2/\sqrt{E1^2 + M2^2 + E3^2}$ Magnetic quadrupole fractional transition amplitude

| *VALUE* | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **−0.13 ±0.05 OUR NEW AVERAGE** | Error includes scale factor of 1.4. See the ideogram below. [−0.140 ± 0.006 OUR 2002 AVERAGE] | | | | |
| $-0.093^{+0.039}_{-0.041} \pm 0.006$ | 5908 | [24] AMBROGIANI | 02 | E835 | $p\overline{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$ |
| −0.14 ±0.06 | 1904 | [24] ARMSTRONG | 93E | E760 | $p\overline{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$ |
| $-0.333^{+0.116}_{-0.292}$ | 441 | [24] OREGLIA | 82 | CBAL | $\psi(2S) \rightarrow \chi_{c1}\gamma \rightarrow J/\psi\gamma\gamma$ |




$a_2 = M2/\sqrt{E1^2 + M2^2 + E3^2}$

**$a_3 = M2/\sqrt{E1^2 + M2^2 + E3^2}$ Electric octupole fractional transition amplitude**

| *VALUE* | *EVTS* | *DOCUMENT ID* | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **$0.011^{+0.041}_{-0.033}$ OUR AVERAGE** | | | | |
| $0.020^{+0.055}_{-0.044}\pm0.009$ | 5908 | AMBROGIANI 02 | E835 | $p\overline{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$ |
| $0.00\ ^{+0.06}_{-0.05}$ | 1904 | ARMSTRONG 93E | E760 | $p\overline{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$ |

[24] Assuming $a_3$=0.

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