



$$I(J^P) = \frac{1}{2}(0^-)$$

Quantum numbers not measured. Values shown are quark-model predictions.

See also the B^\pm/B^0 ADMIXTURE and $B^\pm/B^0/B_s^0/b$ -baryon ADMIXTURE sections.

See the Note “Production and Decay of b -flavored Hadrons” at the beginning of the B^\pm Particle Listings and the Note on “ B^0 - \bar{B}^0 Mixing” near the end of the B^0 Particle Listings.

B^0 MASS

The fit uses m_{B^+} , ($m_{B^0} - m_{B^+}$), and m_{B^0} to determine m_{B^+} , m_{B^0} , and the mass difference.

| <u>VALUE (MeV)</u> | <u>EVTs</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|--------------------|-------------|-----------------------------------|
| 5279.66±0.12 OUR FIT | | | | |
| 5279.63±0.20 OUR AVERAGE | | | | |
| 5279.74±0.30±0.10 | | 1 AAIJ | 19U LHCB | pp at 7, 8, 13 TeV |
| 5279.6 ±0.2 ±1.0 | | 2 AAD | 13U ATLS | pp at 7 TeV |
| 5279.58±0.15±0.28 | | 3 AAIJ | 12E LHCB | pp at 7 TeV |
| 5279.63±0.53±0.33 | | 4 ACOSTA | 06 CDF | $p\bar{p}$ at 1.96 TeV |
| 5279.1 ±0.7 ±0.3 | 135 | 5 CSORNA | 00 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 5281.3 ±2.2 ±1.4 | 51 | ABE | 96B CDF | $p\bar{p}$ at 1.8 TeV |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 5279.2 ±0.54±2.0 | 340 | ALAM | 94 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 5278.0 ±0.4 ±2.0 | | BORTOLETTO92 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 5279.6 ±0.7 ±2.0 | 40 | 6 ALBRECHT | 90J ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 5278.2 ±1.0 ±3.0 | 40 | ALBRECHT | 87C ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 5279.5 ±1.6 ±3.0 | 7 | 7 ALBRECHT | 87D ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 5280.6 ±0.8 ±2.0 | | BEBEK | 87 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Uses $B^0 \rightarrow J/\psi p\bar{p}$ decays.

² Measured with $B_d^0 \rightarrow J/\psi(\mu^+\mu^-) K_S^0(\pi^+\pi^-)$ decays.

³ Uses $B^0 \rightarrow J/\psi K^0$ fully reconstructed decays.

⁴ Uses exclusively reconstructed final states containing a $J/\psi \rightarrow \mu^+\mu^-$ decays.

⁵ CSORNA 00 uses fully reconstructed 135 $B^0 \rightarrow J/\psi(^1)K_S^0$ events and invariant masses without beam constraint.

⁶ ALBRECHT 90J assumes 10580 for $\Upsilon(4S)$ mass. Supersedes ALBRECHT 87C and ALBRECHT 87D.

⁷ Found using fully reconstructed decays with J/ψ . ALBRECHT 87D assume $m_{\Upsilon(4S)} = 10577$ MeV.

$m_{B^0} - m_{B^+}$

| VALUE (MeV) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|-----------|-----------------------------------|
| 0.32±0.05 OUR FIT | | | |
| 0.33±0.05 OUR AVERAGE | | | |
| 0.57±0.49±0.10 | ¹ SIRUNYAN | 18DF CMS | pp at 8 TeV |
| 0.20±0.17±0.11 | ¹ AAIJ | 12E LHCb | pp at 7 TeV |
| 0.33±0.05±0.03 | ² AUBERT | 08AF BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.53±0.67±0.14 | ¹ ACOSTA | 06 CDF | $p\bar{p}$ at 1.96 TeV |
| 0.41±0.25±0.19 | ALAM | 94 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| -0.4 ±0.6 ±0.5 | BORTOLETTO92 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| -0.9 ±1.2 ±0.5 | ALBRECHT | 90J ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.0 ±1.1 ±0.3 | ³ BEBEK | 87 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ¹ Uses exclusively reconstructed final states containing a $J/\psi \rightarrow \mu^+\mu^-$ decay. | | | |
| ² Uses the B -momentum distributions in the e^+e^- rest frame. | | | |
| ³ BEBEK 87 actually measure the difference between half of E_{cm} and the B^\pm or B^0 mass, so the $m_{B^0} - m_{B^\pm}$ is more accurate. Assume $m_{\Upsilon(4S)} = 10580$ MeV. | | | |

$m_{B_H^0} - m_{B_L^0}$

See the $B^0-\bar{B}^0$ MIXING PARAMETERS section near the end of these B^0 Listings.

B^0 MEAN LIFE

See $B^\pm/B^0/B_s^0/b$ -baryon ADMIXTURE section for data on B -hadron mean life averaged over species of bottom particles.

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements and asymmetric lifetime errors.

| VALUE (10^{-12} s) | EVTS | DOCUMENT ID | TECN | COMMENT |
|--|---------------|-------------|----------|-----------------------------------|
| 1.519±0.004 OUR EVALUATION | | | | |
| 1.515±0.005±0.006 | ¹ | SIRUNYAN | 18BY CMS | pp at 8 TeV |
| 1.534±0.019±0.021 | ² | ABAZOV | 15A D0 | $p\bar{p}$ at 1.96 TeV |
| 1.499±0.013±0.005 | ³ | AAIJ | 14E LHCb | pp at 7 TeV |
| 1.524±0.006±0.004 | ⁴ | AAIJ | 14E LHCb | pp at 7 TeV |
| 1.524±0.011±0.004 | ⁵ | AAIJ | 14R LHCb | pp at 7 TeV |
| 1.509±0.012±0.018 | ⁶ | AAD | 13U ATLS | pp at 7 TeV |
| 1.508±0.025±0.043 | ³ | ABAZOV | 12U D0 | $p\bar{p}$ at 1.96 TeV |
| 1.507±0.010±0.008 | ⁷ | AALTONEN | 11 CDF | $p\bar{p}$ at 1.96 TeV |
| 1.414±0.018±0.034 | ⁸ | ABAZOV | 09E D0 | $p\bar{p}$ at 1.96 TeV |
| 1.504±0.013 ^{+0.018} _{-0.013} | ⁹ | AUBERT | 06G BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.534±0.008±0.010 | ¹⁰ | ABE | 05B BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.531±0.021±0.031 | ¹¹ | ABDALLAH | 04E DLPH | $e^+e^- \rightarrow Z$ |
| 1.523 ^{+0.024} _{-0.023} ±0.022 | ¹² | AUBERT | 03C BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

| | | | | | |
|---|-----|--------------------------|-----|------|---------------------------------------|
| $1.533 \pm 0.034 \pm 0.038$ | | ¹³ AUBERT | 03H | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $1.497 \pm 0.073 \pm 0.032$ | | ¹⁴ ACOSTA | 02C | CDF | $\rho\bar{\rho}$ at 1.8 TeV |
| $1.529 \pm 0.012 \pm 0.029$ | | ¹⁵ AUBERT | 02H | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $1.546 \pm 0.032 \pm 0.022$ | | ¹⁶ AUBERT | 01F | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $1.541 \pm 0.028 \pm 0.023$ | | ¹⁵ ABBIENDI,G | 00B | OPAL | $e^+e^- \rightarrow Z$ |
| $1.518 \pm 0.053 \pm 0.034$ | | ¹⁷ BARATE | 00R | ALEP | $e^+e^- \rightarrow Z$ |
| $1.523 \pm 0.057 \pm 0.053$ | | ¹⁸ ABBIENDI | 99J | OPAL | $e^+e^- \rightarrow Z$ |
| $1.474 \pm 0.039 \begin{smallmatrix} +0.052 \\ -0.051 \end{smallmatrix}$ | | ¹⁷ ABE | 98Q | CDF | $\rho\bar{\rho}$ at 1.8 TeV |
| $1.52 \pm 0.06 \pm 0.04$ | | ¹⁸ ACCIARRI | 98S | L3 | $e^+e^- \rightarrow Z$ |
| $1.64 \pm 0.08 \pm 0.08$ | | ¹⁸ ABE | 97J | SLD | $e^+e^- \rightarrow Z$ |
| $1.532 \pm 0.041 \pm 0.040$ | | ¹⁹ ABREU | 97F | DLPH | $e^+e^- \rightarrow Z$ |
| $1.25 \begin{smallmatrix} +0.15 \\ -0.13 \end{smallmatrix} \pm 0.05$ | 121 | ¹⁴ BUSKULIC | 96J | ALEP | $e^+e^- \rightarrow Z$ |
| $1.49 \begin{smallmatrix} +0.17 & +0.08 \\ -0.15 & -0.06 \end{smallmatrix}$ | | ²⁰ BUSKULIC | 96J | ALEP | $e^+e^- \rightarrow Z$ |
| $1.61 \begin{smallmatrix} +0.14 \\ -0.13 \end{smallmatrix} \pm 0.08$ | | ^{17,21} ABREU | 95Q | DLPH | $e^+e^- \rightarrow Z$ |
| $1.63 \pm 0.14 \pm 0.13$ | | ²² ADAM | 95 | DLPH | $e^+e^- \rightarrow Z$ |
| $1.53 \pm 0.12 \pm 0.08$ | | ^{17,23} AKERS | 95T | OPAL | $e^+e^- \rightarrow Z$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | | |
| $1.501 \begin{smallmatrix} +0.078 \\ -0.074 \end{smallmatrix} \pm 0.050$ | | ³ ABAZOV | 07S | D0 | Repl. by ABAZOV 12U |
| $1.524 \pm 0.030 \pm 0.016$ | | ³ ABULENCIA | 07A | CDF | Repl. by AALTONEN 11 |
| $1.473 \begin{smallmatrix} +0.052 \\ -0.050 \end{smallmatrix} \pm 0.023$ | | ⁸ ABAZOV | 05B | D0 | Repl. by ABAZOV 05W |
| $1.40 \begin{smallmatrix} +0.11 \\ -0.10 \end{smallmatrix} \pm 0.03$ | | ³ ABAZOV | 05C | D0 | Repl. by ABAZOV 07S |
| $1.530 \pm 0.043 \pm 0.023$ | | ⁸ ABAZOV | 05W | D0 | Repl. by ABAZOV 09E |
| $1.54 \pm 0.05 \pm 0.02$ | | ²⁴ ACOSTA | 05 | CDF | Repl. by AALTONEN 11 |
| $1.554 \pm 0.030 \pm 0.019$ | | ¹⁶ ABE | 02H | BELL | Repl. by ABE 05B |
| $1.58 \pm 0.09 \pm 0.02$ | | ¹⁴ ABE | 98B | CDF | Repl. by ACOSTA 02C |
| $1.54 \pm 0.08 \pm 0.06$ | | ¹⁷ ABE | 96C | CDF | Repl. by ABE 98Q |
| $1.55 \pm 0.06 \pm 0.03$ | | ²⁵ BUSKULIC | 96J | ALEP | $e^+e^- \rightarrow Z$ |
| $1.61 \pm 0.07 \pm 0.04$ | | ¹⁷ BUSKULIC | 96J | ALEP | Repl. by BARATE 00R |
| 1.62 ± 0.12 | | ²⁶ ADAM | 95 | DLPH | $e^+e^- \rightarrow Z$ |
| $1.57 \pm 0.18 \pm 0.08$ | 121 | ¹⁴ ABE | 94D | CDF | Repl. by ABE 98B |
| $1.17 \begin{smallmatrix} +0.29 \\ -0.23 \end{smallmatrix} \pm 0.16$ | 96 | ¹⁷ ABREU | 93D | DLPH | Sup. by ABREU 95Q |
| $1.55 \pm 0.25 \pm 0.18$ | 76 | ²² ABREU | 93G | DLPH | Sup. by ADAM 95 |
| $1.51 \begin{smallmatrix} +0.24 & +0.12 \\ -0.23 & -0.14 \end{smallmatrix}$ | 78 | ¹⁷ ACTON | 93C | OPAL | Sup. by AKERS 95T |
| $1.52 \begin{smallmatrix} +0.20 & +0.07 \\ -0.18 & -0.13 \end{smallmatrix}$ | 77 | ¹⁷ BUSKULIC | 93D | ALEP | Sup. by BUSKULIC 96J |
| $1.20 \begin{smallmatrix} +0.52 & +0.16 \\ -0.36 & -0.14 \end{smallmatrix}$ | 15 | ²⁷ WAGNER | 90 | MRK2 | $E_{\text{cm}}^{ee} = 29 \text{ GeV}$ |
| $0.82 \begin{smallmatrix} +0.57 \\ -0.37 \end{smallmatrix} \pm 0.27$ | | ²⁸ AVERILL | 89 | HRS | $E_{\text{cm}}^{ee} = 29 \text{ GeV}$ |

¹ Measured using $B^0 \rightarrow J/\psi K^*(892)^0$ and $B^0 \rightarrow J/\psi K_S^0$ decays.

² Measured using $B^0 \rightarrow D^- \mu^+ \nu X$ decays.

³ Measured mean life using $B^0 \rightarrow J/\psi K_S^0$ decays.

⁴ Measured using $B^0 \rightarrow J/\psi K^{*0}$ decays.

⁵ Measured using $B^0 \rightarrow K^+ \pi^-$ decays.

- 6 Measured with $B_d^0 \rightarrow J/\psi(\mu^+ \mu^-) K_S^0(\pi^+ \pi^-)$ decays.
- 7 Measured mean life using fully reconstructed decays ($J/\psi K^{(*)}$).
- 8 Measured mean life using $B^0 \rightarrow J/\psi K^{*0}$ decays.
- 9 Measured using a simultaneous fit of the B^0 lifetime and $\bar{B}^0 B^0$ oscillation frequency Δm_d in the partially reconstructed $B^0 \rightarrow D^{*-} \ell \nu$ decays.
- 10 Measurement performed using a combined fit of CP -violation, mixing and lifetimes.
- 11 Measurement performed using an inclusive reconstruction and B flavor identification technique.
- 12 AUBERT 03C uses a sample of approximately 14,000 exclusively reconstructed $B^0 \rightarrow D^*(2010)^- \ell \nu$ and simultaneously measures the lifetime and oscillation frequency.
- 13 Measurement performed with decays $B^0 \rightarrow D^{*-} \pi^+$ and $B^0 \rightarrow D^{*-} \rho^+$ using a partial reconstruction technique.
- 14 Measured mean life using fully reconstructed decays.
- 15 Data analyzed using partially reconstructed $\bar{B}^0 \rightarrow D^{*+} \ell^- \bar{\nu}$ decays.
- 16 Events are selected in which one B meson is fully reconstructed while the second B meson is reconstructed inclusively.
- 17 Data analyzed using $D/D^* \ell X$ event vertices.
- 18 Data analyzed using charge of secondary vertex.
- 19 Data analyzed using inclusive $D/D^* \ell X$.
- 20 Measured mean life using partially reconstructed $D^{*-} \pi^+ X$ vertices.
- 21 ABREU 95Q assumes $B(B^0 \rightarrow D^{*-} \ell^+ \nu_\ell) = 3.2 \pm 1.7\%$.
- 22 Data analyzed using vertex-charge technique to tag B charge.
- 23 AKERS 95T assumes $B(B^0 \rightarrow D_s^{(*)} D^0) = 5.0 \pm 0.9\%$ to find B^+ / B^0 yield.
- 24 Measured using the time-dependent angular analysis of $B_d^0 \rightarrow J/\psi K^{*0}$ decays.
- 25 Combined result of $D/D^* \ell X$ analysis, fully reconstructed B analysis, and partially reconstructed $D^{*-} \pi^+ X$ analysis.
- 26 Combined ABREU 95Q and ADAM 95 result.
- 27 WAGNER 90 tagged B^0 mesons by their decays into $D^{*-} e^+ \nu$ and $D^{*-} \mu^+ \nu$ where the D^{*-} is tagged by its decay into $\pi^- \bar{D}^0$.
- 28 AVERILL 89 is an estimate of the B^0 mean lifetime assuming that $B^0 \rightarrow D^{*+} + X$ always.

$\tau_{B^0} / \tau_{\bar{B}^0}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------------|------|--------------------|
| 1.000 ± 0.008 ± 0.009 | ¹ AAIJ | 14E | LHCB pp at 7 TeV |

¹ Measured using $B^0 \rightarrow J/\psi K^{*0}$ decays.

MEAN LIFE RATIO τ_{B^+} / τ_{B^0}

τ_{B^+} / τ_{B^0} (direct measurements)

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements and asymmetric lifetime errors.

| VALUE | EVTS | DOCUMENT ID | TECN | COMMENT |
|-------------------------------------|------|-----------------------|------|----------------------------|
| 1.076 ± 0.004 OUR EVALUATION | | | | |
| 1.074 ± 0.005 ± 0.003 | | ¹ AAIJ | 14E | LHCB pp at 7 TeV |
| 1.088 ± 0.009 ± 0.004 | | ² AALTONEN | 11 | CDF $p\bar{p}$ at 1.96 TeV |

| | | | | | |
|---|------|----------|-----|------|---------------------------------|
| $1.080 \pm 0.016 \pm 0.014$ | 3 | ABAZOV | 05D | D0 | $\rho\bar{p}$ at 1.96 TeV |
| $1.066 \pm 0.008 \pm 0.008$ | 4 | ABE | 05B | BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| $1.060 \pm 0.021 \pm 0.024$ | 5 | ABDALLAH | 04E | DLPH | $e^+e^- \rightarrow Z$ |
| $1.093 \pm 0.066 \pm 0.028$ | 6 | ACOSTA | 02C | CDF | $\rho\bar{p}$ at 1.8 TeV |
| $1.082 \pm 0.026 \pm 0.012$ | 7 | AUBERT | 01F | BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| $1.085 \pm 0.059 \pm 0.018$ | 3 | BARATE | 00R | ALEP | $e^+e^- \rightarrow Z$ |
| $1.079 \pm 0.064 \pm 0.041$ | 8 | ABBIENDI | 99J | OPAL | $e^+e^- \rightarrow Z$ |
| $1.110 \pm 0.056^{+0.033}_{-0.030}$ | 3 | ABE | 98Q | CDF | $\rho\bar{p}$ at 1.8 TeV |
| $1.09 \pm 0.07 \pm 0.03$ | 8 | ACCIARRI | 98S | L3 | $e^+e^- \rightarrow Z$ |
| $1.01 \pm 0.07 \pm 0.06$ | 8 | ABE | 97J | SLD | $e^+e^- \rightarrow Z$ |
| $1.27^{+0.23}_{-0.19} \pm 0.03_{-0.02}$ | 6 | BUSKULIC | 96J | ALEP | $e^+e^- \rightarrow Z$ |
| $1.00^{+0.17}_{-0.15} \pm 0.10$ | 3,9 | ABREU | 95Q | DLPH | $e^+e^- \rightarrow Z$ |
| $1.06^{+0.13}_{-0.11} \pm 0.10$ | 10 | ADAM | 95 | DLPH | $e^+e^- \rightarrow Z$ |
| $0.99 \pm 0.14^{+0.05}_{-0.04}$ | 3,11 | AKERS | 95T | OPAL | $e^+e^- \rightarrow Z$ |

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

| | | | | | | |
|---|-----|----------|----------|------|------------------------|----------------------|
| $1.091 \pm 0.023 \pm 0.014$ | 7 | ABE | 02H | BELL | Repl. by ABE 05B | |
| $1.06 \pm 0.07 \pm 0.02$ | 6 | ABE | 98B | CDF | Repl. by ACOSTA 02C | |
| $1.01 \pm 0.11 \pm 0.02$ | 3 | ABE | 96C | CDF | Repl. by ABE 98Q | |
| $1.03 \pm 0.08 \pm 0.02$ | 12 | BUSKULIC | 96J | ALEP | $e^+e^- \rightarrow Z$ | |
| $0.98 \pm 0.08 \pm 0.03$ | 3 | BUSKULIC | 96J | ALEP | Repl. by BARATE 00R | |
| $1.02 \pm 0.16 \pm 0.05$ | 269 | 6 | ABE | 94D | CDF | Repl. by ABE 98B |
| $1.11^{+0.51}_{-0.39} \pm 0.11$ | 188 | 3 | ABREU | 93D | DLPH | Sup. by ABREU 95Q |
| $1.01^{+0.29}_{-0.22} \pm 0.12$ | 253 | 10 | ABREU | 93G | DLPH | Sup. by ADAM 95 |
| $1.0^{+0.33}_{-0.25} \pm 0.08$ | 130 | | ACTON | 93C | OPAL | Sup. by AKERS 95T |
| $0.96^{+0.19}_{-0.15} \pm 0.18_{-0.12}$ | 154 | 3 | BUSKULIC | 93D | ALEP | Sup. by BUSKULIC 96J |

¹ Measured using $B \rightarrow J/\psi K^{(*)}$ decays.

² Measured mean life using fully reconstructed decays ($J/\psi K^{(*)}$).

³ Data analyzed using $D/D^* \mu X$ vertices.

⁴ Measurement performed using a combined fit of CP -violation, mixing and lifetimes.

⁵ Measurement performed using an inclusive reconstruction and B flavor identification technique.

⁶ Measured using fully reconstructed decays.

⁷ Events are selected in which one B meson is fully reconstructed while the second B meson is reconstructed inclusively.

⁸ Data analyzed using charge of secondary vertex.

⁹ ABREU 95Q assumes $B(B^0 \rightarrow D^{*-} \ell^+ \nu_\ell) = 3.2 \pm 1.7\%$.

¹⁰ Data analyzed using vertex-charge technique to tag B charge.

¹¹ AKERS 95T assumes $B(B^0 \rightarrow D_s^{(*)} D^0)^{(*)} = 5.0 \pm 0.9\%$ to find B^+/B^0 yield.

¹² Combined result of $D/D^* \ell X$ analysis and fully reconstructed B analysis.

τ_{B^+}/τ_{B^0} (inferred from branching fractions)

These measurements are inferred from the branching fractions for semileptonic decay or other spectator-dominated decays by assuming that the rates for such decays are equal for B^0 and B^+ . We do not use measurements which assume equal production of B^0 and B^+ because of the large uncertainty in the production ratio.

“OUR EVALUATION” has been obtained by the Heavy Flavor Averaging Group (HFLAV) by taking into account correlations between measurements.

| VALUE | CL% | EVTS | DOCUMENT ID | TECN | COMMENT |
|---|-----|------|-------------------------|------|--|
| 1.076±0.034 | | | | | OUR EVALUATION |
| 1.07 ±0.04 | | | | | OUR AVERAGE |
| 1.07 ±0.04 ±0.03 | | | URQUIJO | 07 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.067±0.041±0.033 | | | AUBERT,B | 06Y | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | | |
| 0.95 $^{+0.117}_{-0.080}$ ±0.091 | | | ¹ ARTUSO | 97 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.15 ±0.17 ±0.06 | | | ² JESSOP | 97 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.93 ±0.18 ±0.12 | | | ³ ATHANAS | 94 | CLE2 Sup. by ARTUSO 97 |
| 0.91 ±0.27 ±0.21 | | | ⁴ ALBRECHT | 92C | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.0 ±0.4 | 29 | | ^{4,5} ALBRECHT | 92G | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.89 ±0.19 ±0.13 | | | ⁴ FULTON | 91 | CLEO $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.00 ±0.23 ±0.14 | | | ⁴ ALBRECHT | 89L | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.49 to 2.3 | 90 | | ⁶ BEAN | 87B | CLEO $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ ARTUSO 97 uses partial reconstruction of $B \rightarrow D^* \ell \nu_\ell$ and independent of B^0 and B^+ production fraction.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ ATHANAS 94 uses events tagged by fully reconstructed B^- decays and partially or fully reconstructed B^0 decays.

⁴ Assumes equal production of B^0 and B^+ .

⁵ ALBRECHT 92G data analyzed using $B \rightarrow D_s \bar{D}, D_s \bar{D}^*, D_s^* \bar{D}, D_s^* \bar{D}^*$ events.

⁶ BEAN 87B assume the fraction of $B^0 \bar{B}^0$ events at the $\Upsilon(4S)$ is 0.41.

 $\Delta\Gamma_{B_d^0} / \Gamma_{B_d^0}$

$\Gamma_{B_d^0}$ and $\Delta\Gamma_{B_d^0}$ are the decay rate average and difference between two B_d^0 CP eigenstates (light – heavy). The λ_{CP} characterizes B^0 and \bar{B}^0 decays to states of charmonium plus K_L^0 , see the review on “CP Violation” in the reviews section.

“OUR EVALUATION” has been obtained by the Heavy Flavor Averaging Group (HFLAV) by taking into account correlations between measurements.

| VALUE (units 10^{-2}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-----------------------|------|-----------------------|
| 0.1 ±1.0 | | | | OUR EVALUATION |
| 0.1 ±1.0 | | | | OUR AVERAGE |
| 3.4 ±2.3 ±2.4 | | ¹ SIRUNYAN | 18BY | CMS pp at 8 TeV |
| – 0.1 ±1.1 ±0.9 | | ² AABOUD | 16G | ATLS pp at 7, 8 TeV |
| – 4.4 ±2.5 ±1.1 | | ³ AAIJ | 14E | LHCB pp at 7 TeV |

- | | | | | |
|-----------------------|-----------------------|-----|------|-----------------------------------|
| $1.7 \pm 1.8 \pm 1.1$ | ⁴ HIGUCHI | 12 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $0.8 \pm 3.7 \pm 1.8$ | ⁵ AUBERT,B | 04C | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0 ± 9 | ⁶ ABDALLAH | 03B | DLPH | $e^+e^- \rightarrow Z$ |
- • • We do not use the following data for averages, fits, limits, etc. • • •
- | | | | | |
|-----------------|----------------------|-----|------|-----------------------------------|
| 0.50 ± 1.38 | ABAZOV | 14 | D0 | $\rho\bar{p}$ at 1.96 TeV |
| < 80 | ⁷ BEHRENS | 00B | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
- ¹ Measured using $B^0 \rightarrow J/\psi K^*(892)^0$ and $B^0 \rightarrow J/\psi K_S^0$ decays, and assuming $\beta = 21.9 \pm 0.7$ degrees.
- ² Measured from the ratio of decay time distributions of $B^0 \rightarrow J/\psi K_S^0$ and $B^0 \rightarrow J/\psi K^{*0}$ decays.
- ³ Measured using the effective lifetimes of $B^0 \rightarrow J/\psi K_S^0$ and $B^0 \rightarrow J/\psi K^{*0}$ decays.
- ⁴ Reports $-\Delta\Gamma_d/\Gamma_d$ using $B^0 \rightarrow J/\psi K_S^0$, $J/\psi K_L^0$, $D^-\pi^+$, $D^{*-}\pi^+$, $D^{*-}\rho^+$, and $D^{*-}\ell^+\nu$ decays.
- ⁵ Corresponds to 90% confidence range $[-0.084, 0.068]$.
- ⁶ Used the measured $\tau_{B^0} = 1.55 \pm 0.03$ ps. Corresponds to an upper limit of < 0.18 at 95% C.L.
- ⁷ BEHRENS 00B uses high-momentum lepton tags and partially reconstructed $\bar{B}^0 \rightarrow D^{*+}\pi^-, \rho^-$ decays to determine the flavor of the B meson. Assumes $\Delta_{md}=0.478 \pm 0.018$ ps⁻¹ and $\tau_{B^0}=1.548 \pm 0.032$ ps.

B^0 DECAY MODES

\bar{B}^0 modes are charge conjugates of the modes below. Reactions indicate the weak decay vertex and do not include mixing. Modes which do not identify the charge state of the B are listed in the B^\pm/B^0 ADMIXTURE section.

The branching fractions listed below assume 50% $B^0\bar{B}^0$ and 50% B^+B^- production at the $\Upsilon(4S)$. We have attempted to bring older measurements up to date by rescaling their assumed $\Upsilon(4S)$ production ratio to 50:50 and their assumed D, D_S, D^* , and ψ branching ratios to current values whenever this would affect our averages and best limits significantly.

Indentation is used to indicate a subchannel of a previous reaction. All resonant subchannels have been corrected for resonance branching fractions to the final state so the sum of the subchannel branching fractions can exceed that of the final state.

For inclusive branching fractions, e.g., $B \rightarrow D^\pm X$, the values usually are multiplicities, not branching fractions. They can be greater than one.

| Mode | Fraction (Γ_i/Γ) | Scale factor/ Confidence level |
|----------------------------------|--------------------------------------|-----------------------------------|
| Γ_1 $\ell^+ \nu_\ell X$ | [a] (10.33 ± 0.28) % | |
| Γ_2 $e^+ \nu_e X_c$ | (10.1 ± 0.4) % | |
| Γ_3 $\ell^+ \nu_\ell X_u$ | (1.51 ± 0.19) $\times 10^{-3}$ | |
| Γ_4 $D\ell^+ \nu_\ell X$ | (9.3 ± 0.8) % | |
| Γ_5 $D^-\ell^+ \nu_\ell$ | [a] (2.24 ± 0.09) % | |
| Γ_6 $D^-\tau^+ \nu_\tau$ | (1.05 ± 0.23) % | |

| | | | | |
|---------------|--|-----|----------------------------------|--------|
| Γ_7 | $D^*(2010)^- \ell^+ \nu_\ell$ | [a] | $(4.97 \pm 0.12) \%$ | |
| Γ_8 | $D^*(2010)^- \tau^+ \nu_\tau$ | | $(1.58 \pm 0.09) \%$ | S=1.1 |
| Γ_9 | $\bar{D}^0 \pi^- \ell^+ \nu_\ell$ | | $(4.1 \pm 0.5) \times 10^{-3}$ | |
| Γ_{10} | $D_0^*(2300)^- \ell^+ \nu_\ell, D_0^{*-} \rightarrow \bar{D}^0 \pi^-$ | | $(3.0 \pm 1.2) \times 10^{-3}$ | S=1.8 |
| Γ_{11} | $D_2^*(2460)^- \ell^+ \nu_\ell, D_2^{*-} \rightarrow \bar{D}^0 \pi^-$ | | $(1.21 \pm 0.33) \times 10^{-3}$ | S=1.8 |
| Γ_{12} | $\bar{D}^{(*)} n \pi \ell^+ \nu_\ell (n \geq 1)$ | | $(2.3 \pm 0.5) \%$ | |
| Γ_{13} | $\bar{D}^{*0} \pi^- \ell^+ \nu_\ell$ | | $(5.8 \pm 0.8) \times 10^{-3}$ | S=1.4 |
| Γ_{14} | $D_1(2420)^- \ell^+ \nu_\ell, D_1^- \rightarrow \bar{D}^{*0} \pi^-$ | | $(2.80 \pm 0.28) \times 10^{-3}$ | |
| Γ_{15} | $D_1'(2430)^- \ell^+ \nu_\ell, D_1'^- \rightarrow \bar{D}^{*0} \pi^-$ | | $(3.1 \pm 0.9) \times 10^{-3}$ | |
| Γ_{16} | $D_2^*(2460)^- \ell^+ \nu_\ell, D_2^{*-} \rightarrow \bar{D}^{*0} \pi^-$ | | $(6.8 \pm 1.2) \times 10^{-4}$ | |
| Γ_{17} | $D^- \pi^+ \pi^- \ell^+ \nu_\ell$ | | $(1.3 \pm 0.5) \times 10^{-3}$ | |
| Γ_{18} | $D^{*-} \pi^+ \pi^- \ell^+ \nu_\ell$ | | $(1.4 \pm 0.5) \times 10^{-3}$ | |
| Γ_{19} | $\rho^- \ell^+ \nu_\ell$ | [a] | $(2.94 \pm 0.21) \times 10^{-4}$ | |
| Γ_{20} | $\pi^- \ell^+ \nu_\ell$ | [a] | $(1.50 \pm 0.06) \times 10^{-4}$ | |
| Γ_{21} | $\pi^- \mu^+ \nu_\mu$ | | | |
| Γ_{22} | $\pi^- \tau^+ \nu_\tau$ | | $< 2.5 \times 10^{-4}$ | CL=90% |

Inclusive modes

| | | | | |
|---------------|-----------------------|--|---------------------|--------|
| Γ_{23} | $K^\pm X$ | | $(78 \pm 8) \%$ | |
| Γ_{24} | $D^0 X$ | | $(8.1 \pm 1.5) \%$ | |
| Γ_{25} | $\bar{D}^0 X$ | | $(47.4 \pm 2.8) \%$ | |
| Γ_{26} | $D^+ X$ | | $< 3.9 \%$ | CL=90% |
| Γ_{27} | $D^- X$ | | $(36.9 \pm 3.3) \%$ | |
| Γ_{28} | $D_s^+ X$ | | $(10.3 \pm 2.1) \%$ | |
| Γ_{29} | $D_s^- X$ | | $< 2.6 \%$ | CL=90% |
| Γ_{30} | $\Lambda_c^+ X$ | | $< 3.1 \%$ | CL=90% |
| Γ_{31} | $\bar{\Lambda}_c^- X$ | | $(5.0 \pm 2.1) \%$ | |
| Γ_{32} | $\bar{c} X$ | | $(95 \pm 5) \%$ | |
| Γ_{33} | $c X$ | | $(24.6 \pm 3.1) \%$ | |
| Γ_{34} | $\bar{c}/c X$ | | $(119 \pm 6) \%$ | |

D, D*, or D_s modes

| | | | | |
|---------------|-----------------------|--|----------------------------------|--|
| Γ_{35} | $D^- \pi^+$ | | $(2.51 \pm 0.08) \times 10^{-3}$ | |
| Γ_{36} | $D^- \rho^+$ | | $(7.6 \pm 1.2) \times 10^{-3}$ | |
| Γ_{37} | $D^- K^0 \pi^+$ | | $(4.9 \pm 0.9) \times 10^{-4}$ | |
| Γ_{38} | $D^- K^*(892)^+$ | | $(4.5 \pm 0.7) \times 10^{-4}$ | |
| Γ_{39} | $D^- \omega \pi^+$ | | $(2.8 \pm 0.6) \times 10^{-3}$ | |
| Γ_{40} | $D^- K^+$ | | $(2.05 \pm 0.08) \times 10^{-4}$ | |
| Γ_{41} | $D^- K^+ \pi^+ \pi^-$ | | $(3.5 \pm 0.8) \times 10^{-4}$ | |

| | | | |
|---------------|---|---|--------|
| Γ_{42} | $D^- K^+ \bar{K}^0$ | $< 3.1 \times 10^{-4}$ | CL=90% |
| Γ_{43} | $D^- K^+ \bar{K}^*(892)^0$ | $(8.8 \pm 1.9) \times 10^{-4}$ | |
| Γ_{44} | $\bar{D}^0 \pi^+ \pi^-$ | $(8.8 \pm 0.5) \times 10^{-4}$ | |
| Γ_{45} | $D^*(2010)^- \pi^+$ | $(2.74 \pm 0.13) \times 10^{-3}$ | |
| Γ_{46} | $\bar{D}^0 K^+ K^-$ | $(6.1 \pm 0.5) \times 10^{-5}$ | |
| Γ_{47} | $D^- \pi^+ \pi^+ \pi^-$ | $(6.0 \pm 0.6) \times 10^{-3}$ | |
| Γ_{48} | $(D^- \pi^+ \pi^+ \pi^-)$ nonresonant | $(3.9 \pm 1.9) \times 10^{-3}$ | |
| Γ_{49} | $D^- \pi^+ \rho^0$ | $(1.1 \pm 1.0) \times 10^{-3}$ | |
| Γ_{50} | $D^- a_1(1260)^+$ | $(6.0 \pm 3.3) \times 10^{-3}$ | |
| Γ_{51} | $D^*(2010)^- \pi^+ \pi^0$ | $(1.5 \pm 0.5) \%$ | |
| Γ_{52} | $D^*(2010)^- \rho^+$ | $(6.8 \pm 0.9) \times 10^{-3}$ | |
| Γ_{53} | $D^*(2010)^- K^+$ | $(2.12 \pm 0.15) \times 10^{-4}$ | |
| Γ_{54} | $D^*(2010)^- K^0 \pi^+$ | $(3.0 \pm 0.8) \times 10^{-4}$ | |
| Γ_{55} | $D^*(2010)^- K^*(892)^+$ | $(3.3 \pm 0.6) \times 10^{-4}$ | |
| Γ_{56} | $D^*(2010)^- K^+ \bar{K}^0$ | $< 4.7 \times 10^{-4}$ | CL=90% |
| Γ_{57} | $D^*(2010)^- K^+ \bar{K}^*(892)^0$ | $(1.29 \pm 0.33) \times 10^{-3}$ | |
| Γ_{58} | $D^*(2010)^- \pi^+ \pi^+ \pi^-$ | $(7.21 \pm 0.29) \times 10^{-3}$ | |
| Γ_{59} | $(D^*(2010)^- \pi^+ \pi^+ \pi^-)$ non-resonant | $(0.0 \pm 2.5) \times 10^{-3}$ | |
| Γ_{60} | $D^*(2010)^- \pi^+ \rho^0$ | $(5.7 \pm 3.2) \times 10^{-3}$ | |
| Γ_{61} | $D^*(2010)^- a_1(1260)^+$ | $(1.30 \pm 0.27) \%$ | |
| Γ_{62} | $\bar{D}_1(2420)^0 \pi^- \pi^+, \bar{D}_1^0 \rightarrow D^{*-} \pi^+$ | $(1.47 \pm 0.35) \times 10^{-4}$ | |
| Γ_{63} | $D^*(2010)^- K^+ \pi^- \pi^+$ | $(4.7 \pm 0.4) \times 10^{-4}$ | |
| Γ_{64} | $D^*(2010)^- \pi^+ \pi^+ \pi^- \pi^0$ | $(1.76 \pm 0.27) \%$ | |
| Γ_{65} | $D^{*-} 3\pi^+ 2\pi^-$ | $(4.7 \pm 0.9) \times 10^{-3}$ | |
| Γ_{66} | $D^*(2010)^- \omega \pi^+$ | $(2.46 \pm 0.18) \times 10^{-3}$ | S=1.2 |
| Γ_{67} | $\bar{D}_1(2430)^0 \omega, \bar{D}_1^0 \rightarrow D^{*-} \pi^+$ | $(2.7 \pm_{0.4}^{0.8}) \times 10^{-4}$ | |
| Γ_{68} | $D^{*-} \rho(1450)^+, \rho^+ \rightarrow \omega \pi^+$ | $(1.07 \pm_{0.34}^{0.40}) \times 10^{-3}$ | |
| Γ_{69} | $\bar{D}_1(2420)^0 \omega, \bar{D}_1^0 \rightarrow D^{*-} \pi^+$ | $(7.0 \pm 2.2) \times 10^{-5}$ | |
| Γ_{70} | $\bar{D}_2^*(2460)^0 \omega, \bar{D}_2^0 \rightarrow D^{*-} \pi^+$ | $(4.0 \pm 1.4) \times 10^{-5}$ | |
| Γ_{71} | $D^{*-} b_1(1235)^+, b_1^+ \rightarrow \omega \pi^+$ | $< 7 \times 10^{-5}$ | CL=90% |
| Γ_{72} | $\bar{D}^{*-} \pi^+$ | [b] $(1.9 \pm 0.9) \times 10^{-3}$ | |
| Γ_{73} | $D_1(2420)^- \pi^+, D_1^- \rightarrow D^- \pi^+ \pi^-$ | $(9.9 \pm_{2.5}^{2.0}) \times 10^{-5}$ | |
| Γ_{74} | $D_1(2420)^- \pi^+, D_1^- \rightarrow D^{*-} \pi^+ \pi^-$ | $< 3.3 \times 10^{-5}$ | CL=90% |
| Γ_{75} | $\bar{D}_2^*(2460)^- \pi^+, (D_2^*)^- \rightarrow D^0 \pi^-$ | $(2.38 \pm 0.16) \times 10^{-4}$ | |
| Γ_{76} | $\bar{D}_0^*(2400)^- \pi^+, (D_0^*)^- \rightarrow D^0 \pi^-$ | $(7.6 \pm 0.8) \times 10^{-5}$ | |
| Γ_{77} | $D_2^*(2460)^- \pi^+, (D_2^*)^- \rightarrow D^{*-} \pi^+ \pi^-$ | $< 2.4 \times 10^{-5}$ | CL=90% |

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|----------------|--|----------------------------------|--------|
| Γ_{78} | $\overline{D}_2^*(2460)^- \rho^+$ | $< 4.9 \times 10^{-3}$ | CL=90% |
| Γ_{79} | $D^0 \overline{D}^0$ | $(1.4 \pm 0.7) \times 10^{-5}$ | |
| Γ_{80} | $D^{*0} \overline{D}^0$ | $< 2.9 \times 10^{-4}$ | CL=90% |
| Γ_{81} | $D^- D^+$ | $(2.11 \pm 0.18) \times 10^{-4}$ | |
| Γ_{82} | $D^\pm D^{*\mp}$ (CP-averaged) | $(6.1 \pm 0.6) \times 10^{-4}$ | |
| Γ_{83} | $D^- D_s^+$ | $(7.2 \pm 0.8) \times 10^{-3}$ | |
| Γ_{84} | $D^*(2010)^- D_s^+$ | $(8.0 \pm 1.1) \times 10^{-3}$ | |
| Γ_{85} | $D^- D_s^{*+}$ | $(7.4 \pm 1.6) \times 10^{-3}$ | |
| Γ_{86} | $D^*(2010)^- D_s^{*+}$ | $(1.77 \pm 0.14) \%$ | |
| Γ_{87} | $D_{s0}(2317)^- K^+, D_{s0}^- \rightarrow D_s^- \pi^0$ | $(4.2 \pm 1.4) \times 10^{-5}$ | |
| Γ_{88} | $D_{s0}(2317)^- \pi^+, D_{s0}^- \rightarrow D_s^- \pi^0$ | $< 2.5 \times 10^{-5}$ | CL=90% |
| Γ_{89} | $D_{sJ}(2457)^- K^+, D_{sJ}^- \rightarrow D_s^- \pi^0$ | $< 9.4 \times 10^{-6}$ | CL=90% |
| Γ_{90} | $D_{sJ}(2457)^- \pi^+, D_{sJ}^- \rightarrow D_s^- \pi^0$ | $< 4.0 \times 10^{-6}$ | CL=90% |
| Γ_{91} | $D_s^- D_s^+$ | $< 3.6 \times 10^{-5}$ | CL=90% |
| Γ_{92} | $D_s^{*-} D_s^+$ | $< 1.3 \times 10^{-4}$ | CL=90% |
| Γ_{93} | $D_s^{*-} D_s^{*+}$ | $< 2.4 \times 10^{-4}$ | CL=90% |
| Γ_{94} | $D_{s0}^*(2317)^+ D^-, D_{s0}^{*+} \rightarrow D_s^+ \pi^0$ | $(1.06 \pm 0.16) \times 10^{-3}$ | S=1.1 |
| Γ_{95} | $D_{s0}(2317)^+ D^-, D_{s0}^+ \rightarrow D_s^{*+} \gamma$ | $< 9.5 \times 10^{-4}$ | CL=90% |
| Γ_{96} | $D_{s0}(2317)^+ D^*(2010)^-, D_{s0}^+ \rightarrow D_s^+ \pi^0$ | $(1.5 \pm 0.6) \times 10^{-3}$ | |
| Γ_{97} | $D_{sJ}(2457)^+ D^-$ | $(3.5 \pm 1.1) \times 10^{-3}$ | |
| Γ_{98} | $D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^+ \gamma$ | $(6.5 \pm 1.7) \times 10^{-4}$ | |
| Γ_{99} | $D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^{*+} \gamma$ | $< 6.0 \times 10^{-4}$ | CL=90% |
| Γ_{100} | $D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^+ \pi^+ \pi^-$ | $< 2.0 \times 10^{-4}$ | CL=90% |
| Γ_{101} | $D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^+ \pi^0$ | $< 3.6 \times 10^{-4}$ | CL=90% |
| Γ_{102} | $D^*(2010)^- D_{sJ}(2457)^+$ | $(9.3 \pm 2.2) \times 10^{-3}$ | |
| Γ_{103} | $D_{sJ}(2457)^+ D^*(2010), D_{sJ}^+ \rightarrow D_s^+ \gamma$ | $(2.3 \pm 0.9) \times 10^{-3}$ | |
| Γ_{104} | $D^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*0} K^+ + D^{*+} K^0$ | $(2.8 \pm 0.7) \times 10^{-4}$ | |
| Γ_{105} | $D^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*0} K^+$ | $(1.7 \pm 0.6) \times 10^{-4}$ | |

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|----------------|--|--|--------|
| Γ_{106} | $D^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*+} K^0$ | $(2.6 \pm 1.1) \times 10^{-4}$ | |
| Γ_{107} | $D^*(2010)^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*0} K^+ + D^{*+} K^0$ | $(5.0 \pm 1.4) \times 10^{-4}$ | |
| Γ_{108} | $D^*(2010)^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*0} K^+$ | $(3.3 \pm 1.1) \times 10^{-4}$ | |
| Γ_{109} | $D^{*-} D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*+} K^0$ | $(5.0 \pm 1.7) \times 10^{-4}$ | |
| Γ_{110} | $D^- D_{sJ}(2573)^+, D_{sJ}^+ \rightarrow D^0 K^+$ | $(3.4 \pm 1.8) \times 10^{-5}$ | |
| Γ_{111} | $D^*(2010)^- D_{sJ}(2573)^+, D_{sJ}^+ \rightarrow D^0 K^+$ | $< 2 \times 10^{-4}$ | CL=90% |
| Γ_{112} | $D^- D_{sJ}(2700)^+, D_{sJ}^+ \rightarrow D^0 K^+$ | $(7.1 \pm 1.2) \times 10^{-4}$ | |
| Γ_{113} | $D^+ \pi^-$ | $(7.3 \pm 1.2) \times 10^{-7}$ | |
| Γ_{114} | $D_s^+ \pi^-$ | $(2.03 \pm 0.18) \times 10^{-5}$ | |
| Γ_{115} | $D_s^{*+} \pi^-$ | $(2.1 \pm 0.4) \times 10^{-5}$ | S=1.4 |
| Γ_{116} | $D_s^+ \rho^-$ | $< 2.4 \times 10^{-5}$ | CL=90% |
| Γ_{117} | $D_s^{*+} \rho^-$ | $(4.1 \pm 1.3) \times 10^{-5}$ | |
| Γ_{118} | $D_s^+ a_0^-$ | $< 1.9 \times 10^{-5}$ | CL=90% |
| Γ_{119} | $D_s^{*+} a_0^-$ | $< 3.6 \times 10^{-5}$ | CL=90% |
| Γ_{120} | $D_s^+ a_1(1260)^-$ | $< 2.1 \times 10^{-3}$ | CL=90% |
| Γ_{121} | $D_s^{*+} a_1(1260)^-$ | $< 1.7 \times 10^{-3}$ | CL=90% |
| Γ_{122} | $D_s^+ a_2^-$ | $< 1.9 \times 10^{-4}$ | CL=90% |
| Γ_{123} | $D_s^{*+} a_2^-$ | $< 2.0 \times 10^{-4}$ | CL=90% |
| Γ_{124} | $D_s^- K^+$ | $(2.7 \pm 0.5) \times 10^{-5}$ | S=2.7 |
| Γ_{125} | $D_s^{*-} K^+$ | $(2.19 \pm 0.30) \times 10^{-5}$ | |
| Γ_{126} | $D_s^- K^*(892)^+$ | $(3.5 \pm 1.0) \times 10^{-5}$ | |
| Γ_{127} | $D_s^{*-} K^*(892)^+$ | $(3.2 \begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 1.5 \\ 1.3 \end{smallmatrix}) \times 10^{-5}$ | |
| Γ_{128} | $D_s^- \pi^+ K^0$ | $(9.7 \pm 1.4) \times 10^{-5}$ | |
| Γ_{129} | $D_s^{*-} \pi^+ K^0$ | $< 1.10 \times 10^{-4}$ | CL=90% |
| Γ_{130} | $D_s^- K^+ \pi^+ \pi^-$ | $(1.7 \pm 0.5) \times 10^{-4}$ | |
| Γ_{131} | $D_s^- \pi^+ K^*(892)^0$ | $< 3.0 \times 10^{-3}$ | CL=90% |
| Γ_{132} | $D_s^{*-} \pi^+ K^*(892)^0$ | $< 1.6 \times 10^{-3}$ | CL=90% |
| Γ_{133} | $\bar{D}^0 K^0$ | $(5.2 \pm 0.7) \times 10^{-5}$ | |
| Γ_{134} | $\bar{D}^0 K^+ \pi^-$ | $(8.8 \pm 1.7) \times 10^{-5}$ | |
| Γ_{135} | $\bar{D}^0 K^*(892)^0$ | $(4.5 \pm 0.6) \times 10^{-5}$ | |
| Γ_{136} | $\bar{D}^0 K^*(1410)^0$ | $< 6.7 \times 10^{-5}$ | CL=90% |
| Γ_{137} | $\bar{D}^0 K_0^*(1430)^0$ | $(7 \pm 7) \times 10^{-6}$ | |
| Γ_{138} | $\bar{D}^0 K_2^*(1430)^0$ | $(2.1 \pm 0.9) \times 10^{-5}$ | |

| | | | |
|----------------|---|----------------------------------|--------|
| Γ_{139} | $D_0^*(2300)^- K^+, D_0^{*-} \rightarrow \bar{D}^0 \pi^-$ | $(1.9 \pm 0.9) \times 10^{-5}$ | |
| Γ_{140} | $D_2^*(2460)^- K^+, D_2^{*-} \rightarrow \bar{D}^0 \pi^-$ | $(2.03 \pm 0.35) \times 10^{-5}$ | |
| Γ_{141} | $D_3^*(2760)^- K^+, D_3^{*-} \rightarrow \bar{D}^0 \pi^-$ | $< 1.0 \times 10^{-6}$ | CL=90% |
| Γ_{142} | $\bar{D}^0 K^+ \pi^-$ nonresonant | $< 3.7 \times 10^{-5}$ | CL=90% |
| Γ_{143} | $[K^+ K^-]_D K^*(892)^0$ | $(4.2 \pm 0.7) \times 10^{-5}$ | |
| Γ_{144} | $[\pi^+ \pi^-]_D K^*(892)^0$ | $(6.0 \pm 1.1) \times 10^{-5}$ | |
| Γ_{145} | $[\pi^+ K^-]_D K^*(892)^0$ | | |
| Γ_{146} | $[K^+ \pi^-]_D K^*(892)^0$ | | |
| Γ_{147} | $[\pi^+ \pi^- \pi^+ \pi^-]_D K^{*0}$ | $(4.6 \pm 0.9) \times 10^{-5}$ | |
| Γ_{148} | $[\pi^+ K^- \pi^+ \pi^-]_D K^{*0}$ | | |
| Γ_{149} | $[K^+ \pi^- \pi^+ \pi^-]_D K^{*0}$ | | |
| Γ_{150} | $\bar{D}^0 \pi^0$ | $(2.63 \pm 0.14) \times 10^{-4}$ | |
| Γ_{151} | $\bar{D}^0 \rho^0$ | $(3.21 \pm 0.21) \times 10^{-4}$ | |
| Γ_{152} | $\bar{D}^0 f_2$ | $(1.56 \pm 0.21) \times 10^{-4}$ | |
| Γ_{153} | $\bar{D}^0 \eta$ | $(2.36 \pm 0.32) \times 10^{-4}$ | S=2.5 |
| Γ_{154} | $\bar{D}^0 \eta'$ | $(1.38 \pm 0.16) \times 10^{-4}$ | S=1.3 |
| Γ_{155} | $\bar{D}^0 \omega$ | $(2.54 \pm 0.16) \times 10^{-4}$ | |
| Γ_{156} | $D^0 \phi$ | $< 2.3 \times 10^{-6}$ | CL=95% |
| Γ_{157} | $D^0 K^+ \pi^-$ | $(5.3 \pm 3.2) \times 10^{-6}$ | |
| Γ_{158} | $D^0 K^*(892)^0$ | $(3.0 \pm 0.6) \times 10^{-6}$ | |
| Γ_{159} | $\bar{D}^{*0} \gamma$ | $< 2.5 \times 10^{-5}$ | CL=90% |
| Γ_{160} | $\bar{D}^*(2007)^0 \pi^0$ | $(2.2 \pm 0.6) \times 10^{-4}$ | S=2.6 |
| Γ_{161} | $\bar{D}^*(2007)^0 \rho^0$ | $< 5.1 \times 10^{-4}$ | CL=90% |
| Γ_{162} | $\bar{D}^*(2007)^0 \eta$ | $(2.3 \pm 0.6) \times 10^{-4}$ | S=2.8 |
| Γ_{163} | $\bar{D}^*(2007)^0 \eta'$ | $(1.40 \pm 0.22) \times 10^{-4}$ | |
| Γ_{164} | $\bar{D}^*(2007)^0 \pi^+ \pi^-$ | $(6.2 \pm 2.2) \times 10^{-4}$ | |
| Γ_{165} | $\bar{D}^*(2007)^0 K^0$ | $(3.6 \pm 1.2) \times 10^{-5}$ | |
| Γ_{166} | $\bar{D}^*(2007)^0 K^*(892)^0$ | $< 6.9 \times 10^{-5}$ | CL=90% |
| Γ_{167} | $D^*(2007)^0 K^*(892)^0$ | $< 4.0 \times 10^{-5}$ | CL=90% |
| Γ_{168} | $D^*(2007)^0 \pi^+ \pi^+ \pi^- \pi^-$ | $(2.7 \pm 0.5) \times 10^{-3}$ | |
| Γ_{169} | $D^*(2010)^+ D^*(2010)^-$ | $(8.0 \pm 0.6) \times 10^{-4}$ | |
| Γ_{170} | $\bar{D}^*(2007)^0 \omega$ | $(3.6 \pm 1.1) \times 10^{-4}$ | S=3.1 |
| Γ_{171} | $D^*(2010)^+ D^-$ | $(6.1 \pm 1.5) \times 10^{-4}$ | S=1.6 |
| Γ_{172} | $D^*(2007)^0 \bar{D}^*(2007)^0$ | $< 9 \times 10^{-5}$ | CL=90% |
| Γ_{173} | $D^- D^0 K^+$ | $(1.07 \pm 0.11) \times 10^{-3}$ | |
| Γ_{174} | $D^- D^*(2007)^0 K^+$ | $(3.5 \pm 0.4) \times 10^{-3}$ | |
| Γ_{175} | $D^*(2010)^- D^0 K^+$ | $(2.47 \pm 0.21) \times 10^{-3}$ | |
| Γ_{176} | $D^*(2010)^- D^*(2007)^0 K^+$ | $(1.06 \pm 0.09) \%$ | |
| Γ_{177} | $D^- D^+ K^0$ | $(7.5 \pm 1.7) \times 10^{-4}$ | |
| Γ_{178} | $D^*(2010)^- D^+ K^0 + D^- D^*(2010)^+ K^0$ | $(6.4 \pm 0.5) \times 10^{-3}$ | |

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| Γ_{179} | $D^*(2010)^- D^*(2010)^+ K^0$ | $(8.1 \pm 0.7) \times 10^{-3}$ | |
| Γ_{180} | $D^{*-} D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*+} K^0$ | $(8.0 \pm 2.4) \times 10^{-4}$ | |
| Γ_{181} | $\bar{D}^0 D^0 K^0$ | $(2.7 \pm 1.1) \times 10^{-4}$ | |
| Γ_{182} | $D^0 \bar{D}^0 K^+ \pi^-$ | $(3.5 \pm 0.5) \times 10^{-4}$ | |
| Γ_{183} | $\bar{D}^0 D^*(2007)^0 K^0 + \bar{D}^*(2007)^0 D^0 K^0$ | $(1.1 \pm 0.5) \times 10^{-3}$ | |
| Γ_{184} | $\bar{D}^*(2007)^0 D^*(2007)^0 K^0$ | $(2.4 \pm 0.9) \times 10^{-3}$ | |
| Γ_{185} | $(\bar{D} + \bar{D}^*)(D + D^*)K$ | $(3.68 \pm 0.26) \%$ | |

Charmonium modes

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|----------------|---|--|--------|
| Γ_{186} | $\eta_c K^0$ | $(8.0 \pm 1.1) \times 10^{-4}$ | |
| Γ_{187} | $\eta_c(1S) K^+ \pi^-$ | $(6.0 \pm 0.7) \times 10^{-4}$ | |
| Γ_{188} | $\eta_c(1S) K^+ \pi^-$ (NR) | $(6.2 \pm 1.3) \times 10^{-5}$ | |
| Γ_{189} | $X(4100)^- K^+, X^- \rightarrow \eta_c \pi^-$ | $(2.0 \pm 1.0) \times 10^{-5}$ | |
| Γ_{190} | $\eta_c(1S) K^*(1410)^0$ | $(1.9 \pm 1.5) \times 10^{-4}$ | |
| Γ_{191} | $\eta_c(1S) K_0^*(1430)^0$ | $(1.6 \pm 0.4) \times 10^{-4}$ | |
| Γ_{192} | $\eta_c(1S) K_2^*(1430)^0$ | $(5.0 \pm_{-2.7}^{+2.3}) \times 10^{-5}$ | |
| Γ_{193} | $\eta_c(1S) K^*(1680)^0$ | $(3 \pm 4) \times 10^{-5}$ | |
| Γ_{194} | $\eta_c(1S) K_0^*(1950)^0$ | $(4.4 \pm_{-4.0}^{+3.0}) \times 10^{-5}$ | |
| Γ_{195} | $\eta_c K^*(892)^0$ | $(5.2 \pm_{-0.9}^{+0.8}) \times 10^{-4}$ | S=1.6 |
| Γ_{196} | $\eta_c(2S) K_S^0, \eta_c \rightarrow p\bar{p}\pi^+\pi^-$ | $(4.2 \pm_{-1.2}^{+1.4}) \times 10^{-7}$ | |
| Γ_{197} | $\eta_c(2S) K^{*0}$ | $< 3.9 \times 10^{-4}$ | CL=90% |
| Γ_{198} | $h_c(1P) K_S^0$ | $< 1.4 \times 10^{-5}$ | |
| Γ_{199} | $h_c(1P) K^{*0}$ | $< 4 \times 10^{-4}$ | CL=90% |
| Γ_{200} | $J/\psi(1S) K^0$ | $(8.91 \pm 0.21) \times 10^{-4}$ | |
| Γ_{201} | $J/\psi(1S) K^+ \pi^-$ | $(1.15 \pm 0.05) \times 10^{-3}$ | |
| Γ_{202} | $J/\psi(1S) K^*(892)^0$ | $(1.27 \pm 0.05) \times 10^{-3}$ | |
| Γ_{203} | $J/\psi(1S) \eta K_S^0$ | $(5.4 \pm 0.9) \times 10^{-5}$ | |
| Γ_{204} | $J/\psi(1S) \eta' K_S^0$ | $< 2.5 \times 10^{-5}$ | CL=90% |
| Γ_{205} | $J/\psi(1S) \phi K^0$ | $(4.9 \pm 1.0) \times 10^{-5}$ | S=1.3 |
| Γ_{206} | $J/\psi(1S) \omega K^0$ | $(2.3 \pm 0.4) \times 10^{-4}$ | |
| Γ_{207} | $\chi_{c0}(3915), \chi_{c0} \rightarrow J/\psi \omega$ | $(2.1 \pm 0.9) \times 10^{-5}$ | |
| Γ_{208} | $J/\psi(1S) K(1270)^0$ | $(1.3 \pm 0.5) \times 10^{-3}$ | |
| Γ_{209} | $J/\psi(1S) \pi^0$ | $(1.66 \pm 0.10) \times 10^{-5}$ | |
| Γ_{210} | $J/\psi(1S) \eta$ | $(1.08 \pm 0.23) \times 10^{-5}$ | S=1.5 |
| Γ_{211} | $J/\psi(1S) \pi^+ \pi^-$ | $(4.00 \pm 0.15) \times 10^{-5}$ | |
| Γ_{212} | $J/\psi(1S) \pi^+ \pi^-$ nonresonant | $< 1.2 \times 10^{-5}$ | CL=90% |
| Γ_{213} | $J/\psi(1S) f_0(500), f_0 \rightarrow \pi\pi$ | $(8.8 \pm_{-1.6}^{+1.2}) \times 10^{-6}$ | |
| Γ_{214} | $J/\psi(1S) f_2$ | $(3.3 \pm_{-0.6}^{+0.5}) \times 10^{-6}$ | S=1.5 |

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| Γ_{215} | $J/\psi(1S)\rho^0$ | $(2.55^{+0.18}_{-0.16}) \times 10^{-5}$ | |
| Γ_{216} | $J/\psi(1S)f_0(980), f_0 \rightarrow \pi^+\pi^-$ | $< 1.1 \times 10^{-6}$ | CL=90% |
| Γ_{217} | $J/\psi(1S)\rho(1450)^0, \rho^0 \rightarrow \pi\pi$ | $(2.9^{+1.6}_{-0.7}) \times 10^{-6}$ | |
| Γ_{218} | $J/\psi\rho(1700)^0, \rho^0 \rightarrow \pi^+\pi^-$ | $(2.0 \pm 1.3) \times 10^{-6}$ | |
| Γ_{219} | $J/\psi(1S)\omega$ | $(1.8^{+0.7}_{-0.5}) \times 10^{-5}$ | |
| Γ_{220} | $J/\psi(1S)K^+K^-$ | $(2.54 \pm 0.35) \times 10^{-6}$ | |
| Γ_{221} | $J/\psi(1S)a_0(980), a_0 \rightarrow K^+K^-$ | $(4.7 \pm 3.4) \times 10^{-7}$ | |
| Γ_{222} | $J/\psi(1S)\phi$ | $< 1.1 \times 10^{-7}$ | CL=90% |
| Γ_{223} | $J/\psi(1S)\eta'(958)$ | $(7.6 \pm 2.4) \times 10^{-6}$ | |
| Γ_{224} | $J/\psi(1S)K^0\pi^+\pi^-$ | $(4.5 \pm 0.4) \times 10^{-4}$ | |
| Γ_{225} | $J/\psi(1S)K^0K^-\pi^+ + \text{c.c.}$ | $< 2.1 \times 10^{-5}$ | CL=90% |
| Γ_{226} | $J/\psi(1S)K^0K^+K^-$ | $(2.5 \pm 0.7) \times 10^{-5}$ | S=1.8 |
| Γ_{227} | $J/\psi(1S)K^0K^\pm\pi^\mp$ | | |
| Γ_{228} | $J/\psi(1S)K^0\rho^0$ | $(5.4 \pm 3.0) \times 10^{-4}$ | |
| Γ_{229} | $J/\psi(1S)K^*(892)^+\pi^-$ | $(8 \pm 4) \times 10^{-4}$ | |
| Γ_{230} | $J/\psi(1S)\pi^+\pi^-\pi^+\pi^-$ | $(1.44 \pm 0.12) \times 10^{-5}$ | |
| Γ_{231} | $J/\psi(1S)f_1(1285)$ | $(8.4 \pm 2.1) \times 10^{-6}$ | |
| Γ_{232} | $J/\psi(1S)K^*(892)^0\pi^+\pi^-$ | $(6.6 \pm 2.2) \times 10^{-4}$ | |
| Γ_{233} | $\eta_{c2}(1D)K_S^0, \eta_{c2} \rightarrow h_c\gamma$ | $< 3.5 \times 10^{-5}$ | CL=90% |
| Γ_{234} | $\eta_{c2}(1D)\pi^-K^+, \eta_{c2} \rightarrow h_c\gamma$ | $< 1.0 \times 10^{-4}$ | CL=90% |
| Γ_{235} | $\chi_{c1}(3872)^-K^+$ | $< 5 \times 10^{-4}$ | CL=90% |
| Γ_{236} | $\chi_{c1}(3872)^-K^+, \chi_{c1}(3872)^- \rightarrow J/\psi(1S)\pi^-\pi^0$ | $[c] < 4.2 \times 10^{-6}$ | CL=90% |
| Γ_{237} | $\chi_{c1}(3872)K^0$ | $(1.1 \pm 0.4) \times 10^{-4}$ | |
| Γ_{238} | $\chi_{c1}(3872)K^*(892)^0$ | $(1.0 \pm 0.5) \times 10^{-4}$ | |
| Γ_{239} | $\chi_{c1}(3872)K^+\pi^-$ | $(2.1 \pm 0.8) \times 10^{-4}$ | |
| Γ_{240} | $\chi_{c1}(3872)\gamma$ | $< 1.3 \times 10^{-5}$ | CL=90% |
| Γ_{241} | $Z_c(4430)^\pm K^\mp, Z_c^\pm \rightarrow \psi(2S)\pi^\pm$ | $(6.0^{+3.0}_{-2.4}) \times 10^{-5}$ | |
| Γ_{242} | $Z_c(4430)^\pm K^\mp, Z_c^\pm \rightarrow J/\psi\pi^\pm$ | $(5.4^{+4.0}_{-1.2}) \times 10^{-6}$ | |
| Γ_{243} | $Z_c(3900)^\pm K^\mp, Z_c^\pm \rightarrow J/\psi\pi^\pm$ | $< 9 \times 10^{-7}$ | |
| Γ_{244} | $Z_c(4200)^\pm K^\mp, X^\pm \rightarrow J/\psi\pi^\pm$ | $(2.2^{+1.3}_{-0.8}) \times 10^{-5}$ | |
| Γ_{245} | $J/\psi(1S)p\bar{p}$ | $(4.5 \pm 0.6) \times 10^{-7}$ | |
| Γ_{246} | $J/\psi(1S)\gamma$ | $< 1.5 \times 10^{-6}$ | CL=90% |
| Γ_{247} | $J/\psi(1S)\bar{D}^0$ | $< 1.3 \times 10^{-5}$ | CL=90% |
| Γ_{248} | $\psi(2S)\pi^0$ | $(1.17 \pm 0.19) \times 10^{-5}$ | |
| Γ_{249} | $\psi(2S)K^0$ | $(5.8 \pm 0.5) \times 10^{-4}$ | |
| Γ_{250} | $\psi(3770)K^0, \psi \rightarrow \bar{D}^0D^0$ | $< 1.23 \times 10^{-4}$ | CL=90% |

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|----------------|---|--|--------|
| Γ_{251} | $\psi(3770)K^0, \psi \rightarrow D^- D^+$ | $< 1.88 \times 10^{-4}$ | CL=90% |
| Γ_{252} | $\psi(2S)\pi^+\pi^-$ | $(2.24 \pm 0.35) \times 10^{-5}$ | |
| Γ_{253} | $\psi(2S)K^+\pi^-$ | $(5.8 \pm 0.4) \times 10^{-4}$ | |
| Γ_{254} | $\psi(2S)K^*(892)^0$ | $(5.9 \pm 0.4) \times 10^{-4}$ | |
| Γ_{255} | $\chi_{c0}K^0$ | $(1.9 \pm 0.4) \times 10^{-4}$ | |
| Γ_{256} | $\chi_{c0}K^*(892)^0$ | $(1.7 \pm 0.4) \times 10^{-4}$ | |
| Γ_{257} | $\chi_{c1}\pi^0$ | $(1.12 \pm 0.28) \times 10^{-5}$ | |
| Γ_{258} | $\chi_{c1}K^0$ | $(3.95 \pm 0.27) \times 10^{-4}$ | |
| Γ_{259} | $\chi_{c1}\pi^- K^+$ | $(4.97 \pm 0.30) \times 10^{-4}$ | |
| Γ_{260} | $\chi_{c1}K^*(892)^0$ | $(2.38 \pm 0.19) \times 10^{-4}$ | S=1.2 |
| Γ_{261} | $X(4051)^- K^+, X^- \rightarrow \chi_{c1}\pi^-$ | $(3.0 \pm_{-1.8}^{4.0}) \times 10^{-5}$ | |
| Γ_{262} | $X(4248)^- K^+, X^- \rightarrow \chi_{c1}\pi^-$ | $(4.0 \pm_{-1.0}^{20.0}) \times 10^{-5}$ | |
| Γ_{263} | $\chi_{c1}\pi^+\pi^- K^0$ | $(3.2 \pm 0.5) \times 10^{-4}$ | |
| Γ_{264} | $\chi_{c1}\pi^-\pi^0 K^+$ | $(3.5 \pm 0.6) \times 10^{-4}$ | |
| Γ_{265} | $\chi_{c2}K^0$ | $< 1.5 \times 10^{-5}$ | CL=90% |
| Γ_{266} | $\chi_{c2}K^*(892)^0$ | $(4.9 \pm 1.2) \times 10^{-5}$ | S=1.1 |
| Γ_{267} | $\chi_{c2}\pi^- K^+$ | $(7.2 \pm 1.0) \times 10^{-5}$ | |
| Γ_{268} | $\chi_{c2}\pi^+\pi^- K^0$ | $< 1.70 \times 10^{-4}$ | CL=90% |
| Γ_{269} | $\chi_{c2}\pi^-\pi^0 K^+$ | $< 7.4 \times 10^{-5}$ | CL=90% |
| Γ_{270} | $\psi(4660)K^0, \psi \rightarrow \Lambda_c^+ \Lambda_c^-$ | $< 2.3 \times 10^{-4}$ | CL=90% |
| Γ_{271} | $\psi(4230)^0 K^0, \psi^0 \rightarrow J/\psi \pi^+ \pi^-$ | $< 1.7 \times 10^{-5}$ | CL=90% |

K or K* modes

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|----------------|---|--|--------|
| Γ_{272} | $K^+\pi^-$ | $(1.96 \pm 0.05) \times 10^{-5}$ | |
| Γ_{273} | $K^0\pi^0$ | $(9.9 \pm 0.5) \times 10^{-6}$ | |
| Γ_{274} | $\eta' K^0$ | $(6.6 \pm 0.4) \times 10^{-5}$ | S=1.4 |
| Γ_{275} | $\eta' K^*(892)^0$ | $(2.8 \pm 0.6) \times 10^{-6}$ | |
| Γ_{276} | $\eta' K_0^*(1430)^0$ | $(6.3 \pm 1.6) \times 10^{-6}$ | |
| Γ_{277} | $\eta' K_2^*(1430)^0$ | $(1.37 \pm 0.32) \times 10^{-5}$ | |
| Γ_{278} | ηK^0 | $(1.23 \pm_{-0.24}^{0.27}) \times 10^{-6}$ | |
| Γ_{279} | $\eta K^*(892)^0$ | $(1.59 \pm 0.10) \times 10^{-5}$ | |
| Γ_{280} | $\eta K_0^*(1430)^0$ | $(1.10 \pm 0.22) \times 10^{-5}$ | |
| Γ_{281} | $\eta K_2^*(1430)^0$ | $(9.6 \pm 2.1) \times 10^{-6}$ | |
| Γ_{282} | ωK^0 | $(4.8 \pm 0.4) \times 10^{-6}$ | |
| Γ_{283} | $a_0(980)^0 K^0, a_0^0 \rightarrow \eta\pi^0$ | $< 7.8 \times 10^{-6}$ | CL=90% |
| Γ_{284} | $b_1^0 K^0, b_1^0 \rightarrow \omega\pi^0$ | $< 7.8 \times 10^{-6}$ | CL=90% |
| Γ_{285} | $a_0(980)^\pm K^\mp, a_0^\pm \rightarrow \eta\pi^\pm$ | $< 1.9 \times 10^{-6}$ | CL=90% |
| Γ_{286} | $b_1^- K^+, b_1^- \rightarrow \omega\pi^-$ | $(7.4 \pm 1.4) \times 10^{-6}$ | |
| Γ_{287} | $b_1^0 K^{*0}, b_1^0 \rightarrow \omega\pi^0$ | $< 8.0 \times 10^{-6}$ | CL=90% |

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|----------------|---|---------------------|------------------|--------|
| Γ_{288} | $b_1^- K^{*+}, b_1^- \rightarrow \omega \pi^-$ | < 5.0 | $\times 10^{-6}$ | CL=90% |
| Γ_{289} | $a_0(1450)^\pm K^\mp, a_0^\pm \rightarrow \eta \pi^\pm$ | < 3.1 | $\times 10^{-6}$ | CL=90% |
| Γ_{290} | $K_S^0 X^0$ (Familon) | < 5.3 | $\times 10^{-5}$ | CL=90% |
| Γ_{291} | $\omega K^*(892)^0$ | (2.0 ± 0.5) | $\times 10^{-6}$ | |
| Γ_{292} | $\omega (K\pi)_0^{*0}$ | (1.84 ± 0.25) | $\times 10^{-5}$ | |
| Γ_{293} | $\omega K_0^*(1430)^0$ | (1.60 ± 0.34) | $\times 10^{-5}$ | |
| Γ_{294} | $\omega K_2^*(1430)^0$ | (1.01 ± 0.23) | $\times 10^{-5}$ | |
| Γ_{295} | $\omega K^+ \pi^-$ nonresonant | (5.1 ± 1.0) | $\times 10^{-6}$ | |
| Γ_{296} | $K^+ \pi^- \pi^0$ | (3.78 ± 0.32) | $\times 10^{-5}$ | |
| Γ_{297} | $K^+ \rho^-$ | (7.0 ± 0.9) | $\times 10^{-6}$ | |
| Γ_{298} | $K^+ \rho(1450)^-$ | (2.4 ± 1.2) | $\times 10^{-6}$ | |
| Γ_{299} | $K^+ \rho(1700)^-$ | (6 ± 7) | $\times 10^{-7}$ | |
| Γ_{300} | $(K^+ \pi^- \pi^0)$ nonresonant | (2.8 ± 0.6) | $\times 10^{-6}$ | |
| Γ_{301} | $(K\pi)_0^{*+} \pi^-, (K\pi)_0^{*+} \rightarrow$ $K^+ \pi^0$ | (3.4 ± 0.5) | $\times 10^{-5}$ | |
| Γ_{302} | $(K\pi)_0^{*0} \pi^0, (K\pi)_0^{*0} \rightarrow$ $K^+ \pi^-$ | (8.6 ± 1.7) | $\times 10^{-6}$ | |
| Γ_{303} | $K_2^*(1430)^0 \pi^0$ | < 4.0 | $\times 10^{-6}$ | CL=90% |
| Γ_{304} | $K^*(1680)^0 \pi^0$ | < 7.5 | $\times 10^{-6}$ | CL=90% |
| Γ_{305} | $K_x^{*0} \pi^0$ | [d] (6.1 ± 1.6) | $\times 10^{-6}$ | |
| Γ_{306} | $K^0 \pi^+ \pi^-$ | (4.97 ± 0.18) | $\times 10^{-5}$ | |
| Γ_{307} | $K^0 \pi^+ \pi^-$ nonresonant | $(1.39^+_{-0.18})$ | $\times 10^{-5}$ | S=1.6 |
| Γ_{308} | $K^0 \rho^0$ | (3.4 ± 1.1) | $\times 10^{-6}$ | S=2.3 |
| Γ_{309} | $K^*(892)^+ \pi^-$ | (7.5 ± 0.4) | $\times 10^{-6}$ | |
| Γ_{310} | $K_0^*(1430)^+ \pi^-$ | (3.3 ± 0.7) | $\times 10^{-5}$ | S=2.0 |
| Γ_{311} | $K_x^{*+} \pi^-$ | [d] (5.1 ± 1.6) | $\times 10^{-6}$ | |
| Γ_{312} | $K^*(1410)^+ \pi^-, K^{*+} \rightarrow$ $K^0 \pi^+$ | < 3.8 | $\times 10^{-6}$ | CL=90% |
| Γ_{313} | $(K\pi)_0^{*+} \pi^-, (K\pi)_0^{*+} \rightarrow$ $K^0 \pi^+$ | (1.62 ± 0.13) | $\times 10^{-5}$ | |
| Γ_{314} | $f_0(980) K^0, f_0 \rightarrow \pi^+ \pi^-$ | (8.1 ± 0.8) | $\times 10^{-6}$ | S=1.3 |
| Γ_{315} | $K^0 f_0(500)$ | $(1.6^+_{-1.6})$ | $\times 10^{-7}$ | |
| Γ_{316} | $K^0 f_0(1500)$ | (1.3 ± 0.8) | $\times 10^{-6}$ | |
| Γ_{317} | $f_2(1270) K^0$ | $(2.7^+_{-1.2})$ | $\times 10^{-6}$ | |
| Γ_{318} | $f_x(1300) K^0, f_x \rightarrow \pi^+ \pi^-$ | (1.8 ± 0.7) | $\times 10^{-6}$ | |
| Γ_{319} | $K^*(892)^0 \pi^0$ | (3.3 ± 0.6) | $\times 10^{-6}$ | |
| Γ_{320} | $K_2^*(1430)^+ \pi^-$ | (3.65 ± 0.34) | $\times 10^{-6}$ | |
| Γ_{321} | $K^*(1680)^+ \pi^-$ | (1.41 ± 0.10) | $\times 10^{-5}$ | |
| Γ_{322} | $K^+ \pi^- \pi^+ \pi^-$ | [e] < 2.3 | $\times 10^{-4}$ | CL=90% |
| Γ_{323} | $\rho^0 K^+ \pi^-$ | (2.8 ± 0.7) | $\times 10^{-6}$ | |
| Γ_{324} | $f_0(980) K^+ \pi^-, f_0 \rightarrow \pi \pi$ | $(1.4^+_{-0.6})$ | $\times 10^{-6}$ | |

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|----------------|---|---|--------|
| Γ_{325} | $K^+ \pi^- \pi^+ \pi^-$ nonresonant | $< 2.1 \times 10^{-6}$ | CL=90% |
| Γ_{326} | $K^*(892)^0 \pi^+ \pi^-$ | $(5.5 \pm 0.5) \times 10^{-5}$ | |
| Γ_{327} | $K^*(892)^0 \rho^0$ | $(3.9 \pm 1.3) \times 10^{-6}$ | S=1.9 |
| Γ_{328} | $K^*(892)^0 f_0(980), f_0 \rightarrow \pi \pi$ | $(3.9 \pm_{-1.8}^{2.1}) \times 10^{-6}$ | S=3.9 |
| Γ_{329} | $K_1(1270)^+ \pi^-$ | $< 3.0 \times 10^{-5}$ | CL=90% |
| Γ_{330} | $K_1(1400)^+ \pi^-$ | $< 2.7 \times 10^{-5}$ | CL=90% |
| Γ_{331} | $a_1(1260)^- K^+$ | [e] $(1.6 \pm 0.4) \times 10^{-5}$ | |
| Γ_{332} | $K^*(892)^+ \rho^-$ | $(1.03 \pm 0.26) \times 10^{-5}$ | |
| Γ_{333} | $K_0^*(1430)^+ \rho^-$ | $(2.8 \pm 1.2) \times 10^{-5}$ | |
| Γ_{334} | $K_1(1400)^0 \rho^0$ | $< 3.0 \times 10^{-3}$ | CL=90% |
| Γ_{335} | $K_0^*(1430)^0 \rho^0$ | $(2.7 \pm 0.6) \times 10^{-5}$ | |
| Γ_{336} | $K_0^*(1430)^0 f_0(980), f_0 \rightarrow \pi \pi$ | $(2.7 \pm 0.9) \times 10^{-6}$ | |
| Γ_{337} | $K_2^*(1430)^0 f_0(980), f_0 \rightarrow \pi \pi$ | $(8.6 \pm 2.0) \times 10^{-6}$ | |
| Γ_{338} | $K^+ K^-$ | $(7.8 \pm 1.5) \times 10^{-8}$ | |
| Γ_{339} | $K^0 \bar{K}^0$ | $(1.21 \pm 0.16) \times 10^{-6}$ | |
| Γ_{340} | $K^0 K^- \pi^+$ | $(6.7 \pm 0.5) \times 10^{-6}$ | |
| Γ_{341} | $K^*(892)^\pm K^\mp$ | $< 4 \times 10^{-7}$ | CL=90% |
| Γ_{342} | $\bar{K}^{*0} K^0 + K^{*0} \bar{K}^0$ | $< 9.6 \times 10^{-7}$ | CL=90% |
| Γ_{343} | $K^+ K^- \pi^0$ | $(2.2 \pm 0.6) \times 10^{-6}$ | |
| Γ_{344} | $K_S^0 K_S^0 \pi^0$ | $< 9 \times 10^{-7}$ | CL=90% |
| Γ_{345} | $K_S^0 K_S^0 \eta$ | $< 1.0 \times 10^{-6}$ | CL=90% |
| Γ_{346} | $K_S^0 K_S^0 \eta'$ | $< 2.0 \times 10^{-6}$ | CL=90% |
| Γ_{347} | $K^0 K^+ K^-$ | $(2.68 \pm 0.11) \times 10^{-5}$ | |
| Γ_{348} | $K^0 \phi$ | $(7.3 \pm 0.7) \times 10^{-6}$ | |
| Γ_{349} | $f_0(980) K^0, f_0 \rightarrow K^+ K^-$ | $(7.0 \pm_{-3.0}^{3.5}) \times 10^{-6}$ | |
| Γ_{350} | $f_0(1500) K^0$ | $(1.3 \pm_{-0.5}^{0.7}) \times 10^{-5}$ | |
| Γ_{351} | $f_2'(1525)^0 K^0$ | $(3 \pm_{-4}^5) \times 10^{-7}$ | |
| Γ_{352} | $f_0(1710) K^0, f_0 \rightarrow K^+ K^-$ | $(4.4 \pm 0.9) \times 10^{-6}$ | |
| Γ_{353} | $K^0 K^+ K^-$ nonresonant | $(3.3 \pm 1.0) \times 10^{-5}$ | |
| Γ_{354} | $K_S^0 K_S^0 K_S^0$ | $(6.0 \pm 0.5) \times 10^{-6}$ | S=1.1 |
| Γ_{355} | $f_0(980) K^0, f_0 \rightarrow K_S^0 K_S^0$ | $(2.7 \pm 1.8) \times 10^{-6}$ | |
| Γ_{356} | $f_0(1710) K^0, f_0 \rightarrow K_S^0 K_S^0$ | $(5.0 \pm_{-2.6}^{5.0}) \times 10^{-7}$ | |
| Γ_{357} | $f_2(2010) K^0, f_2 \rightarrow K_S^0 K_S^0$ | $(5 \pm 6) \times 10^{-7}$ | |
| Γ_{358} | $K_S^0 K_S^0 K_S^0$ nonresonant | $(1.33 \pm 0.31) \times 10^{-5}$ | |
| Γ_{359} | $K_S^0 K_S^0 K_L^0$ | $< 1.6 \times 10^{-5}$ | CL=90% |
| Γ_{360} | $K^*(892)^0 K^+ K^-$ | $(2.75 \pm 0.26) \times 10^{-5}$ | |
| Γ_{361} | $K^*(892)^0 \phi$ | $(1.00 \pm 0.05) \times 10^{-5}$ | |
| Γ_{362} | $K^+ K^- \pi^+ \pi^-$ nonresonant | $< 7.17 \times 10^{-5}$ | CL=90% |
| Γ_{363} | $K^*(892)^0 K^- \pi^+$ | $(4.5 \pm 1.3) \times 10^{-6}$ | |
| Γ_{364} | $K^*(892)^0 \bar{K}^*(892)^0$ | $(8.3 \pm 2.4) \times 10^{-7}$ | S=1.5 |

| | | | | |
|----------------|--|-------------------|------------------|--------|
| Γ_{365} | $K^+ K^+ \pi^- \pi^-$ nonresonant | < 6.0 | $\times 10^{-6}$ | CL=90% |
| Γ_{366} | $K^*(892)^0 K^+ \pi^-$ | < 2.2 | $\times 10^{-6}$ | CL=90% |
| Γ_{367} | $K^*(892)^0 K^*(892)^0$ | < 2 | $\times 10^{-7}$ | CL=90% |
| Γ_{368} | $K^*(892)^+ K^*(892)^-$ | < 2.0 | $\times 10^{-6}$ | CL=90% |
| Γ_{369} | $K_1(1400)^0 \phi$ | < 5.0 | $\times 10^{-3}$ | CL=90% |
| Γ_{370} | $\phi(K\pi)_0^{*0}$ | (4.3 ± 0.4) | $\times 10^{-6}$ | |
| Γ_{371} | $\phi(K\pi)_0^{*0} (1.60 < m_{K\pi} < 2.15)$ [f] | < 1.7 | $\times 10^{-6}$ | CL=90% |
| Γ_{372} | $K_0^*(1430)^0 K^- \pi^+$ | < 3.18 | $\times 10^{-5}$ | CL=90% |
| Γ_{373} | $K_0^*(1430)^0 \bar{K}^*(892)^0$ | < 3.3 | $\times 10^{-6}$ | CL=90% |
| Γ_{374} | $K_0^*(1430)^0 \bar{K}_0^*(1430)^0$ | < 8.4 | $\times 10^{-6}$ | CL=90% |
| Γ_{375} | $K_0^*(1430)^0 \phi$ | (3.9 ± 0.8) | $\times 10^{-6}$ | |
| Γ_{376} | $K_0^*(1430)^0 K^*(892)^0$ | < 1.7 | $\times 10^{-6}$ | CL=90% |
| Γ_{377} | $K_0^*(1430)^0 K_0^*(1430)^0$ | < 4.7 | $\times 10^{-6}$ | CL=90% |
| Γ_{378} | $K^*(1680)^0 \phi$ | < 3.5 | $\times 10^{-6}$ | CL=90% |
| Γ_{379} | $K^*(1780)^0 \phi$ | < 2.7 | $\times 10^{-6}$ | CL=90% |
| Γ_{380} | $K^*(2045)^0 \phi$ | < 1.53 | $\times 10^{-5}$ | CL=90% |
| Γ_{381} | $K_2^*(1430)^0 \rho^0$ | < 1.1 | $\times 10^{-3}$ | CL=90% |
| Γ_{382} | $K_2^*(1430)^0 \phi$ | (6.8 ± 0.9) | $\times 10^{-6}$ | S=1.2 |
| Γ_{383} | $K_0^0 \phi \phi$ | (3.7 ± 0.7) | $\times 10^{-6}$ | S=1.3 |
| Γ_{384} | $\eta' \eta' K^0$ | < 3.1 | $\times 10^{-5}$ | CL=90% |
| Γ_{385} | $\eta K^0 \gamma$ | (7.6 ± 1.8) | $\times 10^{-6}$ | |
| Γ_{386} | $\eta' K^0 \gamma$ | < 6.4 | $\times 10^{-6}$ | CL=90% |
| Γ_{387} | $K^0 \phi \gamma$ | (2.7 ± 0.7) | $\times 10^{-6}$ | |
| Γ_{388} | $K^+ \pi^- \gamma$ | (4.6 ± 1.4) | $\times 10^{-6}$ | |
| Γ_{389} | $K^*(892)^0 \gamma$ | (4.18 ± 0.25) | $\times 10^{-5}$ | S=2.1 |
| Γ_{390} | $K^*(1410) \gamma$ | < 1.3 | $\times 10^{-4}$ | CL=90% |
| Γ_{391} | $K^+ \pi^- \gamma$ nonresonant | < 2.6 | $\times 10^{-6}$ | CL=90% |
| Γ_{392} | $K^*(892)^0 X(214), X \rightarrow \mu^+ \mu^-$ [g] | < 2.26 | $\times 10^{-8}$ | CL=90% |
| Γ_{393} | $K^0 \pi^+ \pi^- \gamma$ | (1.99 ± 0.18) | $\times 10^{-5}$ | |
| Γ_{394} | $K^+ \pi^- \pi^0 \gamma$ | (4.1 ± 0.4) | $\times 10^{-5}$ | |
| Γ_{395} | $K_1(1270)^0 \gamma$ | < 5.8 | $\times 10^{-5}$ | CL=90% |
| Γ_{396} | $K_1(1400)^0 \gamma$ | < 1.2 | $\times 10^{-5}$ | CL=90% |
| Γ_{397} | $K_2^*(1430)^0 \gamma$ | (1.24 ± 0.24) | $\times 10^{-5}$ | |
| Γ_{398} | $K^*(1680)^0 \gamma$ | < 2.0 | $\times 10^{-3}$ | CL=90% |
| Γ_{399} | $K_3^*(1780)^0 \gamma$ | < 8.3 | $\times 10^{-5}$ | CL=90% |
| Γ_{400} | $K_4^*(2045)^0 \gamma$ | < 4.3 | $\times 10^{-3}$ | CL=90% |

Light unflavored meson modes

| | | | | |
|----------------|--|-------------------|------------------|--------|
| Γ_{401} | $\rho^0 \gamma$ | (8.6 ± 1.5) | $\times 10^{-7}$ | |
| Γ_{402} | $\rho^0 X(214), X \rightarrow \mu^+ \mu^-$ [g] | < 1.73 | $\times 10^{-8}$ | CL=90% |
| Γ_{403} | $\omega \gamma$ | (4.4 ± 1.8) | $\times 10^{-7}$ | |
| Γ_{404} | $\phi \gamma$ | < 1.0 | $\times 10^{-7}$ | CL=90% |
| Γ_{405} | $\pi^+ \pi^-$ | (5.12 ± 0.19) | $\times 10^{-6}$ | |

| | | | |
|----------------|---|--|--------|
| Γ_{406} | $\pi^0 \pi^0$ | $(1.59 \pm 0.26) \times 10^{-6}$ | S=1.4 |
| Γ_{407} | $\eta \pi^0$ | $(4.1 \pm 1.7) \times 10^{-7}$ | |
| Γ_{408} | $\eta \eta$ | $< 1.0 \times 10^{-6}$ | CL=90% |
| Γ_{409} | $\eta' \pi^0$ | $(1.2 \pm 0.6) \times 10^{-6}$ | S=1.7 |
| Γ_{410} | $\eta' \eta'$ | $< 1.7 \times 10^{-6}$ | CL=90% |
| Γ_{411} | $\eta' \eta$ | $< 1.2 \times 10^{-6}$ | CL=90% |
| Γ_{412} | $\eta' \rho^0$ | $< 1.3 \times 10^{-6}$ | CL=90% |
| Γ_{413} | $\eta' f_0(980), f_0 \rightarrow \pi^+ \pi^-$ | $< 9 \times 10^{-7}$ | CL=90% |
| Γ_{414} | $\eta \rho^0$ | $< 1.5 \times 10^{-6}$ | CL=90% |
| Γ_{415} | $\eta f_0(980), f_0 \rightarrow \pi^+ \pi^-$ | $< 4 \times 10^{-7}$ | CL=90% |
| Γ_{416} | $\omega \eta$ | $(9.4 \pm 4.0 \pm 3.1) \times 10^{-7}$ | |
| Γ_{417} | $\omega \eta'$ | $(1.0 \pm 0.5 \pm 0.4) \times 10^{-6}$ | |
| Γ_{418} | $\omega \rho^0$ | $< 1.6 \times 10^{-6}$ | CL=90% |
| Γ_{419} | $\omega f_0(980), f_0 \rightarrow \pi^+ \pi^-$ | $< 1.5 \times 10^{-6}$ | CL=90% |
| Γ_{420} | $\omega \omega$ | $(1.2 \pm 0.4) \times 10^{-6}$ | |
| Γ_{421} | $\phi \pi^0$ | $< 1.5 \times 10^{-7}$ | CL=90% |
| Γ_{422} | $\phi \eta$ | $< 5 \times 10^{-7}$ | CL=90% |
| Γ_{423} | $\phi \eta'$ | $< 5 \times 10^{-7}$ | CL=90% |
| Γ_{424} | $\phi \pi^+ \pi^-$ | $(1.8 \pm 0.5) \times 10^{-7}$ | |
| Γ_{425} | $\phi \rho^0$ | $< 3.3 \times 10^{-7}$ | CL=90% |
| Γ_{426} | $\phi f_0(980), f_0 \rightarrow \pi^+ \pi^-$ | $< 3.8 \times 10^{-7}$ | CL=90% |
| Γ_{427} | $\phi \omega$ | $< 7 \times 10^{-7}$ | CL=90% |
| Γ_{428} | $\phi \phi$ | $< 2.7 \times 10^{-8}$ | CL=90% |
| Γ_{429} | $a_0(980)^\pm \pi^\mp, a_0^\pm \rightarrow \eta \pi^\pm$ | $< 3.1 \times 10^{-6}$ | CL=90% |
| Γ_{430} | $a_0(1450)^\pm \pi^\mp, a_0^\pm \rightarrow \eta \pi^\pm$ | $< 2.3 \times 10^{-6}$ | CL=90% |
| Γ_{431} | $\pi^+ \pi^- \pi^0$ | $< 7.2 \times 10^{-4}$ | CL=90% |
| Γ_{432} | $\rho^0 \pi^0$ | $(2.0 \pm 0.5) \times 10^{-6}$ | |
| Γ_{433} | $\rho^\mp \pi^\pm$ | [h] $(2.30 \pm 0.23) \times 10^{-5}$ | |
| Γ_{434} | $\pi^+ \pi^- \pi^+ \pi^-$ | $< 1.12 \times 10^{-5}$ | CL=90% |
| Γ_{435} | $\rho^0 \pi^+ \pi^-$ | $< 8.8 \times 10^{-6}$ | CL=90% |
| Γ_{436} | $\rho^0 \rho^0$ | $(9.6 \pm 1.5) \times 10^{-7}$ | |
| Γ_{437} | $f_0(980) \pi^+ \pi^-, f_0 \rightarrow \pi^+ \pi^-$ | $< 3.0 \times 10^{-6}$ | CL=90% |
| Γ_{438} | $\rho^0 f_0(980), f_0 \rightarrow \pi^+ \pi^-$ | $(7.8 \pm 2.5) \times 10^{-7}$ | |
| Γ_{439} | $f_0(980) f_0(980), f_0 \rightarrow \pi^+ \pi^-, f_0 \rightarrow \pi^+ \pi^-$ | $< 1.9 \times 10^{-7}$ | CL=90% |
| Γ_{440} | $f_0(980) f_0(980), f_0 \rightarrow \pi^+ \pi^-, f_0 \rightarrow K^+ K^-$ | $< 2.3 \times 10^{-7}$ | CL=90% |
| Γ_{441} | $a_1(1260)^\mp \pi^\pm$ | [h] $(2.6 \pm 0.5) \times 10^{-5}$ | S=1.9 |
| Γ_{442} | $a_2(1320)^\mp \pi^\pm$ | [h] $< 6.3 \times 10^{-6}$ | CL=90% |
| Γ_{443} | $\pi^+ \pi^- \pi^0 \pi^0$ | $< 3.1 \times 10^{-3}$ | CL=90% |
| Γ_{444} | $\rho^+ \rho^-$ | $(2.77 \pm 0.19) \times 10^{-5}$ | |
| Γ_{445} | $a_1(1260)^0 \pi^0$ | $< 1.1 \times 10^{-3}$ | CL=90% |

| | | | | |
|----------------|---|-------------------|------------------|--------|
| Γ_{446} | $\omega\pi^0$ | < 5 | $\times 10^{-7}$ | CL=90% |
| Γ_{447} | $\pi^+\pi^+\pi^-\pi^-\pi^0$ | < 9.0 | $\times 10^{-3}$ | CL=90% |
| Γ_{448} | $a_1(1260)^+\rho^-$ | < 6.1 | $\times 10^{-5}$ | CL=90% |
| Γ_{449} | $a_1(1260)^0\rho^0$ | < 2.4 | $\times 10^{-3}$ | CL=90% |
| Γ_{450} | $b_1^\mp\pi^\pm, b_1^\mp \rightarrow \omega\pi^\mp$ | (1.09 ± 0.15) | $\times 10^{-5}$ | |
| Γ_{451} | $b_1^0\pi^0, b_1^0 \rightarrow \omega\pi^0$ | < 1.9 | $\times 10^{-6}$ | CL=90% |
| Γ_{452} | $b_1^-\rho^+, b_1^- \rightarrow \omega\pi^-$ | < 1.4 | $\times 10^{-6}$ | CL=90% |
| Γ_{453} | $b_1^0\rho^0, b_1^0 \rightarrow \omega\pi^0$ | < 3.4 | $\times 10^{-6}$ | CL=90% |
| Γ_{454} | $\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-$ | < 3.0 | $\times 10^{-3}$ | CL=90% |
| Γ_{455} | $a_1(1260)^+a_1(1260)^-, a_1^+ \rightarrow$ $2\pi^+\pi^-, a_1^- \rightarrow 2\pi^-\pi^+$ | (1.18 ± 0.31) | $\times 10^{-5}$ | |
| Γ_{456} | $\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^0$ | < 1.1 | % | CL=90% |

Baryon modes

| | | | | |
|----------------|--|--------------------------|------------------|--------|
| Γ_{457} | $p\bar{p}$ | (1.25 ± 0.32) | $\times 10^{-8}$ | |
| Γ_{458} | $p\bar{p}\pi^+\pi^-$ | (2.87 ± 0.19) | $\times 10^{-6}$ | |
| Γ_{459} | $p\bar{p}K^+\pi^-$ | (6.3 ± 0.5) | $\times 10^{-6}$ | |
| Γ_{460} | $p\bar{p}K^0$ | (2.66 ± 0.32) | $\times 10^{-6}$ | |
| Γ_{461} | $\Theta(1540)^+\bar{p}, \Theta^+ \rightarrow pK_S^0$ | $[i] < 5$ | $\times 10^{-8}$ | CL=90% |
| Γ_{462} | $f_J(2220)K^0, f_J \rightarrow p\bar{p}$ | < 4.5 | $\times 10^{-7}$ | CL=90% |
| Γ_{463} | $p\bar{p}K^*(892)^0$ | $(1.24_{-0.25}^{+0.28})$ | $\times 10^{-6}$ | |
| Γ_{464} | $f_J(2220)K_0^*, f_J \rightarrow p\bar{p}$ | < 1.5 | $\times 10^{-7}$ | CL=90% |
| Γ_{465} | $p\bar{p}K^+K^-$ | (1.21 ± 0.32) | $\times 10^{-7}$ | |
| Γ_{466} | $p\bar{p}\pi^0$ | (5.0 ± 1.9) | $\times 10^{-7}$ | |
| Γ_{467} | $p\rho\bar{p}\bar{p}$ | < 2.0 | $\times 10^{-7}$ | CL=90% |
| Γ_{468} | $p\bar{\Lambda}\pi^-$ | (3.14 ± 0.29) | $\times 10^{-6}$ | |
| Γ_{469} | $p\bar{\Lambda}\pi^-\gamma$ | < 6.5 | $\times 10^{-7}$ | CL=90% |
| Γ_{470} | $p\bar{\Sigma}(1385)^-$ | < 2.6 | $\times 10^{-7}$ | CL=90% |
| Γ_{471} | $\Delta(1232)^+\bar{p} + \Delta(1232)^-p$ | < 1.6 | $\times 10^{-6}$ | |
| Γ_{472} | $\Delta^0\bar{\Lambda}$ | < 9.3 | $\times 10^{-7}$ | CL=90% |
| Γ_{473} | $p\bar{\Lambda}K^-$ | < 8.2 | $\times 10^{-7}$ | CL=90% |
| Γ_{474} | $p\bar{\Lambda}D^-$ | (2.5 ± 0.4) | $\times 10^{-5}$ | |
| Γ_{475} | $p\bar{\Lambda}D^{*-}$ | (3.4 ± 0.8) | $\times 10^{-5}$ | |
| Γ_{476} | $p\bar{\Sigma}^0\pi^-$ | < 3.8 | $\times 10^{-6}$ | CL=90% |
| Γ_{477} | $\bar{\Lambda}\Lambda$ | < 3.2 | $\times 10^{-7}$ | CL=90% |
| Γ_{478} | $\bar{\Lambda}\Lambda K^0$ | $(4.8_{-0.9}^{+1.0})$ | $\times 10^{-6}$ | |
| Γ_{479} | $\bar{\Lambda}\Lambda K^{*0}$ | $(2.5_{-0.8}^{+0.9})$ | $\times 10^{-6}$ | |
| Γ_{480} | $\bar{\Lambda}\Lambda D^0$ | $(1.00_{-0.26}^{+0.30})$ | $\times 10^{-5}$ | |
| Γ_{481} | $D^0\Sigma^0\bar{\Lambda} + \text{c.c.}$ | < 3.1 | $\times 10^{-5}$ | CL=90% |
| Γ_{482} | $\Delta^0\bar{\Delta}^0$ | < 1.5 | $\times 10^{-3}$ | CL=90% |
| Γ_{483} | $\Delta^{++}\bar{\Delta}^{--}$ | < 1.1 | $\times 10^{-4}$ | CL=90% |

| | | | |
|------------------|--|------------------------------------|--------|
| Γ ₄₈₄ | $\bar{D}^0 p \bar{p}$ | (1.04 ± 0.07) × 10 ⁻⁴ | |
| Γ ₄₈₅ | $D_s^- \bar{\Lambda} p$ | (2.8 ± 0.9) × 10 ⁻⁵ | |
| Γ ₄₈₆ | $\bar{D}^*(2007)^0 p \bar{p}$ | (9.9 ± 1.1) × 10 ⁻⁵ | |
| Γ ₄₈₇ | $D^*(2010)^- p \bar{n}$ | (1.4 ± 0.4) × 10 ⁻³ | |
| Γ ₄₈₈ | $D^- p \bar{p} \pi^+$ | (3.32 ± 0.31) × 10 ⁻⁴ | |
| Γ ₄₈₉ | $D^*(2010)^- p \bar{p} \pi^+$ | (4.7 ± 0.5) × 10 ⁻⁴ | S=1.2 |
| Γ ₄₉₀ | $\bar{D}^0 p \bar{p} \pi^+ \pi^-$ | (3.0 ± 0.5) × 10 ⁻⁴ | |
| Γ ₄₉₁ | $\bar{D}^{*0} p \bar{p} \pi^+ \pi^-$ | (1.9 ± 0.5) × 10 ⁻⁴ | |
| Γ ₄₉₂ | $\Theta_c \bar{p} \pi^+, \Theta_c \rightarrow D^- p$ | < 9 × 10 ⁻⁶ | CL=90% |
| Γ ₄₉₃ | $\Theta_c \bar{p} \pi^+, \Theta_c \rightarrow D^{*-} p$ | < 1.4 × 10 ⁻⁵ | CL=90% |
| Γ ₄₉₄ | $\bar{\Sigma}_c^{--} \Delta^{++}$ | < 8 × 10 ⁻⁴ | CL=90% |
| Γ ₄₉₅ | $\bar{\Lambda}_c^- p \pi^+ \pi^-$ | (1.02 ± 0.14) × 10 ⁻³ | S=1.3 |
| Γ ₄₉₆ | $\bar{\Lambda}_c^- p$ | (1.54 ± 0.18) × 10 ⁻⁵ | |
| Γ ₄₉₇ | $\bar{\Lambda}_c^- p \pi^0$ | (1.55 ± 0.19) × 10 ⁻⁴ | |
| Γ ₄₉₈ | $\bar{\Sigma}_c(2455)^- p$ | < 2.4 × 10 ⁻⁵ | |
| Γ ₄₉₉ | $\bar{\Lambda}_c^- p \pi^+ \pi^- \pi^0$ | < 5.07 × 10 ⁻³ | CL=90% |
| Γ ₅₀₀ | $\bar{\Lambda}_c^- p \pi^+ \pi^- \pi^+ \pi^-$ | < 2.74 × 10 ⁻³ | CL=90% |
| Γ ₅₀₁ | $\bar{\Lambda}_c^- p \pi^+ \pi^-$ (nonresonant) | (5.5 ± 1.0) × 10 ⁻⁴ | S=1.3 |
| Γ ₅₀₂ | $\bar{\Sigma}_c(2520)^{--} p \pi^+$ | (1.02 ± 0.18) × 10 ⁻⁴ | |
| Γ ₅₀₃ | $\bar{\Sigma}_c(2520)^0 p \pi^-$ | < 3.1 × 10 ⁻⁵ | CL=90% |
| Γ ₅₀₄ | $\bar{\Sigma}_c(2455)^0 p \pi^-$ | (1.08 ± 0.16) × 10 ⁻⁴ | |
| Γ ₅₀₅ | $\bar{\Sigma}_c(2455)^0 N^0, N^0 \rightarrow p \pi^-$ | (6.4 ± 1.7) × 10 ⁻⁵ | |
| Γ ₅₀₆ | $\bar{\Sigma}_c(2455)^{--} p \pi^+$ | (1.83 ± 0.24) × 10 ⁻⁴ | |
| Γ ₅₀₇ | $\Lambda_c^- p K^+ \pi^-$ | (3.4 ± 0.7) × 10 ⁻⁵ | |
| Γ ₅₀₈ | $\bar{\Sigma}_c(2455)^{--} p K^+, \bar{\Sigma}_c^{--} \rightarrow \bar{\Lambda}_c^- \pi^-$ | (8.8 ± 2.5) × 10 ⁻⁶ | |
| Γ ₅₀₉ | $\Lambda_c^- p K^*(892)^0$ | < 2.42 × 10 ⁻⁵ | CL=90% |
| Γ ₅₁₀ | $\Lambda_c^- p K^+ K^-$ | (2.0 ± 0.4) × 10 ⁻⁵ | |
| Γ ₅₁₁ | $\Lambda_c^- p \phi$ | < 1.0 × 10 ⁻⁵ | CL=90% |
| Γ ₅₁₂ | $\Lambda_c^- p \bar{p} p$ | < 2.8 × 10 ⁻⁶ | |
| Γ ₅₁₃ | $\bar{\Lambda}_c^- \Lambda K^+$ | (4.8 ± 1.1) × 10 ⁻⁵ | |
| Γ ₅₁₄ | $\bar{\Lambda}_c^- \Lambda_c^+$ | < 1.6 × 10 ⁻⁵ | CL=95% |
| Γ ₅₁₅ | $\bar{\Lambda}_c(2593)^- / \bar{\Lambda}_c(2625)^- p$ | < 1.1 × 10 ⁻⁴ | CL=90% |
| Γ ₅₁₆ | $\bar{\Xi}_c^- \Lambda_c^+$ | (1.2 ± 0.8) × 10 ⁻³ | |
| Γ ₅₁₇ | $\bar{\Xi}_c^- \Lambda_c^+, \bar{\Xi}_c^- \rightarrow \bar{\Xi}^+ \pi^- \pi^-$ | (2.4 ± 1.1) × 10 ⁻⁵ | S=1.8 |
| Γ ₅₁₈ | $\bar{\Xi}_c^- \Lambda_c^+, \bar{\Xi}_c^- \rightarrow \bar{p} K^+ \pi^-$ | (5.3 ± 1.7) × 10 ⁻⁶ | |
| Γ ₅₁₉ | $\Lambda_c^+ \Lambda_c^- K^0$ | (4.0 ± 0.9) × 10 ⁻⁴ | |
| Γ ₅₂₀ | $\bar{\Xi}_c(2930)^- \Lambda_c^+, \bar{\Xi}_c^- \rightarrow \Lambda_c^- K^0$ | (2.4 ± 0.6) × 10 ⁻⁴ | |

**Lepton Family number (LF) or Lepton number (L) or Baryon number (B)
violating modes, or/and $\Delta B = 1$ weak neutral current ($B1$) modes**

| | | | | | |
|----------------|---|------|---|-------------------|--------|
| Γ_{521} | $\gamma\gamma$ | $B1$ | < 3.2 | $\times 10^{-7}$ | CL=90% |
| Γ_{522} | e^+e^- | $B1$ | < 2.5 | $\times 10^{-9}$ | CL=90% |
| Γ_{523} | $e^+e^-\gamma$ | $B1$ | < 1.2 | $\times 10^{-7}$ | CL=90% |
| Γ_{524} | $\mu^+\mu^-$ | $B1$ | $(7 \begin{smallmatrix} +13 \\ -11 \end{smallmatrix})$ | $\times 10^{-11}$ | S=1.8 |
| Γ_{525} | $\mu^+\mu^-\gamma$ | $B1$ | < 2.0 | $\times 10^{-9}$ | CL=95% |
| Γ_{526} | $\mu^+\mu^-\mu^+\mu^-$ | $B1$ | < 6.9 | $\times 10^{-10}$ | CL=95% |
| Γ_{527} | $SP, S \rightarrow \mu^+\mu^-,$ $P \rightarrow \mu^+\mu^-$ | $B1$ | [l] < 6.0 | $\times 10^{-10}$ | CL=95% |
| Γ_{528} | $\tau^+\tau^-$ | $B1$ | < 2.1 | $\times 10^{-3}$ | CL=95% |
| Γ_{529} | $\pi^0\ell^+\ell^-$ | $B1$ | < 5.3 | $\times 10^{-8}$ | CL=90% |
| Γ_{530} | $\pi^0e^+e^-$ | $B1$ | < 8.4 | $\times 10^{-8}$ | CL=90% |
| Γ_{531} | $\pi^0\mu^+\mu^-$ | $B1$ | < 6.9 | $\times 10^{-8}$ | CL=90% |
| Γ_{532} | $\eta\ell^+\ell^-$ | $B1$ | < 6.4 | $\times 10^{-8}$ | CL=90% |
| Γ_{533} | ηe^+e^- | $B1$ | < 1.08 | $\times 10^{-7}$ | CL=90% |
| Γ_{534} | $\eta\mu^+\mu^-$ | $B1$ | < 1.12 | $\times 10^{-7}$ | CL=90% |
| Γ_{535} | $\pi^0\nu\bar{\nu}$ | $B1$ | < 9 | $\times 10^{-6}$ | CL=90% |
| Γ_{536} | $K^0\ell^+\ell^-$ | $B1$ | [a] (3.3 ± 0.6) | $\times 10^{-7}$ | |
| Γ_{537} | $K^0e^+e^-$ | $B1$ | $(2.5 \begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 1.1 \\ 0.9 \end{smallmatrix})$ | $\times 10^{-7}$ | S=1.3 |
| Γ_{538} | $K^0\mu^+\mu^-$ | $B1$ | (3.39 ± 0.35) | $\times 10^{-7}$ | S=1.1 |
| Γ_{539} | $K^0\nu\bar{\nu}$ | $B1$ | < 2.6 | $\times 10^{-5}$ | CL=90% |
| Γ_{540} | $\rho^0\nu\bar{\nu}$ | $B1$ | < 4.0 | $\times 10^{-5}$ | CL=90% |
| Γ_{541} | $K^*(892)^0\ell^+\ell^-$ | $B1$ | [a] $(9.9 \begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 1.2 \\ 1.1 \end{smallmatrix})$ | $\times 10^{-7}$ | |
| Γ_{542} | $K^*(892)^0e^+e^-$ | $B1$ | $(1.03 \begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 0.19 \\ 0.17 \end{smallmatrix})$ | $\times 10^{-6}$ | |
| Γ_{543} | $K^*(892)^0\mu^+\mu^-$ | $B1$ | (9.4 ± 0.5) | $\times 10^{-7}$ | |
| Γ_{544} | $K^*(892)^0\chi, \chi \rightarrow$ $\mu^+\mu^-$ | | | | |
| Γ_{545} | $\pi^+\pi^-\mu^+\mu^-$ | $B1$ | (2.1 ± 0.5) | $\times 10^{-8}$ | |
| Γ_{546} | $K^*(892)^0\nu\bar{\nu}$ | $B1$ | < 1.8 | $\times 10^{-5}$ | CL=90% |
| Γ_{547} | invisible | $B1$ | < 2.4 | $\times 10^{-5}$ | CL=90% |
| Γ_{548} | $\nu\bar{\nu}\gamma$ | $B1$ | < 1.6 | $\times 10^{-5}$ | CL=90% |
| Γ_{549} | $\phi\nu\bar{\nu}$ | $B1$ | < 1.27 | $\times 10^{-4}$ | CL=90% |
| Γ_{550} | $e^\pm\mu^\mp$ | LF | [h] < 1.0 | $\times 10^{-9}$ | CL=90% |
| Γ_{551} | $\pi^0e^\pm\mu^\mp$ | LF | < 1.4 | $\times 10^{-7}$ | CL=90% |
| Γ_{552} | $K^0e^\pm\mu^\mp$ | LF | < 3.8 | $\times 10^{-8}$ | CL=90% |
| Γ_{553} | $K^*(892)^0e^+\mu^-$ | LF | < 1.6 | $\times 10^{-7}$ | CL=90% |
| Γ_{554} | $K^*(892)^0e^-\mu^+$ | LF | < 1.2 | $\times 10^{-7}$ | CL=90% |
| Γ_{555} | $K^*(892)^0e^\pm\mu^\mp$ | LF | < 1.8 | $\times 10^{-7}$ | CL=90% |
| Γ_{556} | $e^\pm\tau^\mp$ | LF | [h] < 1.6 | $\times 10^{-5}$ | CL=90% |

| | | | | | |
|----------------|---------------------|--------|-------------|------------------|--------|
| Γ_{557} | $\mu^\pm \tau^\mp$ | LF | $[h] < 1.4$ | $\times 10^{-5}$ | CL=95% |
| Γ_{558} | $\Lambda_c^+ \mu^-$ | L, B | < 1.4 | $\times 10^{-6}$ | CL=90% |
| Γ_{559} | $\Lambda_c^+ e^-$ | L, B | < 4 | $\times 10^{-6}$ | CL=90% |

- [a] An ℓ indicates an e or a μ mode, not a sum over these modes.
- [b] \bar{D}^{**} represents an excited state with mass $2.2 < M < 2.8 \text{ GeV}/c^2$.
- [c] $\chi_{c1}(3872)^+$ is a hypothetical charged partner of the $\chi_{c1}(3872)$.
- [d] Stands for the possible candidates of $K^*(1410)$, $K_0^*(1430)$ and $K_2^*(1430)$.
- [e] B^0 and B_S^0 contributions not separated. Limit is on weighted average of the two decay rates.
- [f] This decay refers to the coherent sum of resonant and nonresonant $J^P = 0^+ K\pi$ components with $1.60 < m_{K\pi} < 2.15 \text{ GeV}/c^2$.
- [g] $X(214)$ is a hypothetical particle of mass $214 \text{ MeV}/c^2$ reported by the HyperCP experiment, Physical Review Letters **94** 021801 (2005)
- [h] The value is for the sum of the charge states or particle/antiparticle states indicated.
- [i] $\Theta(1540)^+$ denotes a possible narrow pentaquark state.
- [j] Here S and P are the hypothetical scalar and pseudoscalar particles with masses of $2.5 \text{ GeV}/c^2$ and $214.3 \text{ MeV}/c^2$, respectively.

CONSTRAINED FIT INFORMATION

An overall fit to 36 branching ratios uses 93 measurements and one constraint to determine 23 parameters. The overall fit has a $\chi^2 = 63.5$ for 71 degrees of freedom.

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

| | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|----|
| x8 | 40 | | | | | | | | | | |
| x35 | 0 | 0 | | | | | | | | | |
| x47 | 0 | 0 | 28 | | | | | | | | |
| x73 | 0 | 0 | 4 | 13 | | | | | | | |
| x114 | 0 | 0 | 19 | 6 | 1 | | | | | | |
| x124 | 0 | 0 | 7 | 2 | 0 | 1 | | | | | |
| x200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| x202 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| x249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| x254 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| x260 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 |
| x266 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| x272 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| x306 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| x340 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| x347 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| x361 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| x405 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| x436 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| x538 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| x543 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 |
| | x7 | x8 | x35 | x47 | x73 | x114 | x124 | x200 | x202 | x249 | |
| x260 | 0 | | | | | | | | | | |
| x266 | 0 | 22 | | | | | | | | | |
| x272 | 0 | 0 | 0 | | | | | | | | |
| x306 | 0 | 0 | 0 | 0 | | | | | | | |
| x340 | 0 | 0 | 0 | 0 | 16 | | | | | | |
| x347 | 0 | 0 | 0 | 0 | 27 | 4 | | | | | |
| x361 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| x405 | 0 | 0 | 0 | 27 | 0 | 0 | 0 | 0 | | | |
| x436 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | | |
| x538 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| x543 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | x254 | x260 | x266 | x272 | x306 | x340 | x347 | x361 | x405 | x436 | |
| x543 | 0 | | | | | | | | | | |
| | x538 | | | | | | | | | | |

B^0 BRANCHING RATIOS

For branching ratios in which the charge of the decaying B is not determined, see the B^\pm section.

 $\Gamma(\ell^+ \nu_\ell X)/\Gamma_{\text{total}}$ **Γ_1/Γ**

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements.

| <u>VALUE (units 10^{-2})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
|---|--------------------|-------------|----------------|

10.33±0.28 OUR EVALUATION**10.14±0.30 OUR AVERAGE** Error includes scale factor of 1.1.

| | | | |
|-----------------|-----------------------|-----|--------------------------------------|
| 10.46±0.30±0.23 | ¹ URQUIJO | 07 | BELL $e^+e^- \rightarrow \gamma(4S)$ |
| 9.64±0.27±0.33 | ² AUBERT,B | 06Y | BABR $e^+e^- \rightarrow \gamma(4S)$ |
| 10.78±0.60±0.69 | ³ ARTUSO | 97 | CLE2 $e^+e^- \rightarrow \gamma(4S)$ |
| 9.3 ±1.1 ±1.5 | ALBRECHT | 94 | ARG $e^+e^- \rightarrow \gamma(4S)$ |
| 9.9 ±3.0 ±0.9 | HENDERSON | 92 | CLEO $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-----------------|--------------------|----|--------------------------|
| 10.32±0.36±0.35 | ⁴ OKABE | 05 | BELL Repl. by URQUIJO 07 |
| 10.9 ±0.7 ±1.1 | ATHANAS | 94 | CLE2 Sup. by ARTUSO 97 |

¹ URQUIJO 07 report a measurement of $(9.80 \pm 0.29 \pm 0.21)\%$ for the partial branching fraction of $B \rightarrow e\nu_e X_C$ decay with electron energy above 0.6 GeV. We converted the result to $B \rightarrow e\nu_e X$ branching fraction.

² The measurements are obtained for charged and neutral B mesons partial rates of semileptonic decay to electrons with momentum above 0.6 GeV/c in the B rest frame. The best precision on the ratio is achieved for a momentum threshold of 1.0 GeV: $B(B^+ \rightarrow e^+ \nu_e X) / B(B^0 \rightarrow e^+ \nu_e X) = 1.074 \pm 0.041 \pm 0.026$.

³ ARTUSO 97 uses partial reconstruction of $B \rightarrow D^* \ell \nu_\ell$ and inclusive semileptonic branching ratio from BARISH 96B ($0.1049 \pm 0.0017 \pm 0.0043$).

⁴ The measurements are obtained for charged and neutral B mesons partial rates of semileptonic decay to electrons with momentum above 0.6 GeV/c in the B rest frame, and their ratio of $B(B^+ \rightarrow e^+ \nu_e X)/B(B^0 \rightarrow e^+ \nu_e X) = 1.08 \pm 0.05 \pm 0.02$.

 $\Gamma(e^+ \nu_e X_C)/\Gamma_{\text{total}}$ **Γ_2/Γ**

| <u>VALUE (units 10^{-2})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
|---|--------------------|-------------|----------------|

10.08±0.30±0.22 ¹ URQUIJO 07 BELL $e^+e^- \rightarrow \gamma(4S)$

¹ Measure the independent B^+ and B^0 partial branching fractions with electron threshold energies of 0.4 GeV.

 $\Gamma(\ell^+ \nu_\ell X_U)/\Gamma_{\text{total}}$ **Γ_3/Γ**

Requires $E_\ell^* > 1$ GeV, where E_ℓ^* is lepton energy in B rest frame.

| <u>VALUE (units 10^{-3})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
|---|--------------------|-------------|----------------|

1.51±0.10±0.16 ¹ CAO 21A BELL $e^+e^- \rightarrow \gamma(4S)$

¹ The correlation of 50% with $B(B^+ \rightarrow \ell^+ \nu_\ell X_U)$ (lepton energy in B rest frame $E_\ell^* > 1$ GeV) was reported.

$\Gamma(D^- \ell^+ \nu_\ell) / \Gamma_{\text{total}}$

ℓ denotes e or μ , not the sum.

Γ_5 / Γ

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements.

| <u>VALUE (%)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------------|-------------|------------------------------------|
| 2.24 ± 0.09 OUR EVALUATION | | | |
| 2.25 ± 0.08 OUR AVERAGE | | | |
| 2.31 ± 0.03 ± 0.11 | ¹ GLATTAUER 16 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 2.21 ± 0.11 ± 0.11 | ² AUBERT 10 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 2.09 ± 0.13 ± 0.18 | ³ BARTELT 99 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 2.35 ± 0.20 ± 0.44 | ⁴ BUSKULIC 97 | ALEP | $e^+ e^- \rightarrow Z$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 2.21 ± 0.11 ± 0.12 | ² AUBERT 08Q | BABR | Repl. by AUBERT 10 |
| 2.13 ± 0.12 ± 0.39 | ABE 02E | BELL | Repl. by GLATTAUER 16 |
| 1.87 ± 0.15 ± 0.32 | ⁵ ATHANAS 97 | CLE2 | Repl. by BARTELT 99 |
| 1.8 ± 0.6 ± 0.3 | ⁶ FULTON 91 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 2.0 ± 0.7 ± 0.6 | ⁷ ALBRECHT 89J | ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

- ¹ Uses a fully reconstructed B meson as a tag on the recoil side while the other, on the signal side, is partially reconstructed from $B \rightarrow D \ell \nu$.
- ² Uses a fully reconstructed B meson as a tag on the recoil side.
- ³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
- ⁴ BUSKULIC 97 assumes fraction (B^+) = fraction (B^0) = $(37.8 \pm 2.2)\%$ and PDG 96 values for B lifetime and branching ratio of D^* and D decays.
- ⁵ ATHANAS 97 uses missing energy and missing momentum to reconstruct neutrino.
- ⁶ FULTON 91 assumes assuming equal production of B^0 and B^+ at the $\Upsilon(4S)$ and uses Mark III D and D^* branching ratios.
- ⁷ ALBRECHT 89J reports $0.018 \pm 0.006 \pm 0.005$. We rescale using the method described in STONE 94 but with the updated PDG 94 $B(D^0 \rightarrow K^- \pi^+)$.

$\Gamma(D^- \ell^+ \nu_\ell) / \Gamma(\ell^+ \nu_\ell X)$

Γ_5 / Γ_1

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|------------------------------|------------------------|-------------|------------------------------------|
| 0.230 ± 0.011 ± 0.011 | ¹ AUBERT 10 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

- ¹ Uses a fully reconstructed B meson on the recoil side.

$\Gamma(D^- \ell^+ \nu_\ell) / \Gamma(D \ell^+ \nu_\ell X)$

Γ_5 / Γ_4

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|------------------------------|--------------------------|-------------|------------------------------------|
| 0.215 ± 0.016 ± 0.013 | ¹ AUBERT 07AN | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

- ¹ Uses a fully reconstructed B meson on the recoil side.

$\Gamma(D^- \tau^+ \nu_\tau) / \Gamma_{\text{total}}$

Γ_6 / Γ

| <u>VALUE (units 10^{-2})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------|-------------|---------------------|
| 1.04 ± 0.35 ± 0.18 | ¹ AUBERT 08N | BABR | Repl. by AUBERT 09s |

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

- ¹ Uses a fully reconstructed B meson as a tag on the recoil side.

$$\Gamma(D^- \tau^+ \nu_\tau) / \Gamma(D^- \ell^+ \nu_\ell) \qquad \Gamma_6 / \Gamma_5$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------------|---------------------|----------|------------------------------------|
| 0.469 ± 0.084 ± 0.053 | 1,2 LEES | 12D BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.489 ± 0.165 ± 0.069 | ¹ AUBERT | 09S BABR | Repl. by LEES 12D |

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

¹ Uses a fully reconstructed B meson as a tag on the recoil side.

² Uses $\tau^+ \rightarrow e^+ \nu_e \bar{\nu}_\tau$ and $\tau^+ \rightarrow \mu^+ \nu_\mu \bar{\nu}_\tau$ and e^+ or μ^+ as ℓ^+ .

$$\Gamma(D^{*(2010)-} \ell^+ \nu_\ell) / \Gamma_{\text{total}} \qquad \Gamma_7 / \Gamma$$

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements.

| VALUE (%) | EVTS | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|------|--------------------------------------|------|---------|
| 4.97 ± 0.12 OUR EVALUATION | | This value assumes isospin symmetry. | | |

5.14 ± 0.15 OUR FIT Error includes scale factor of 1.3.

5.16 ± 0.16 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.

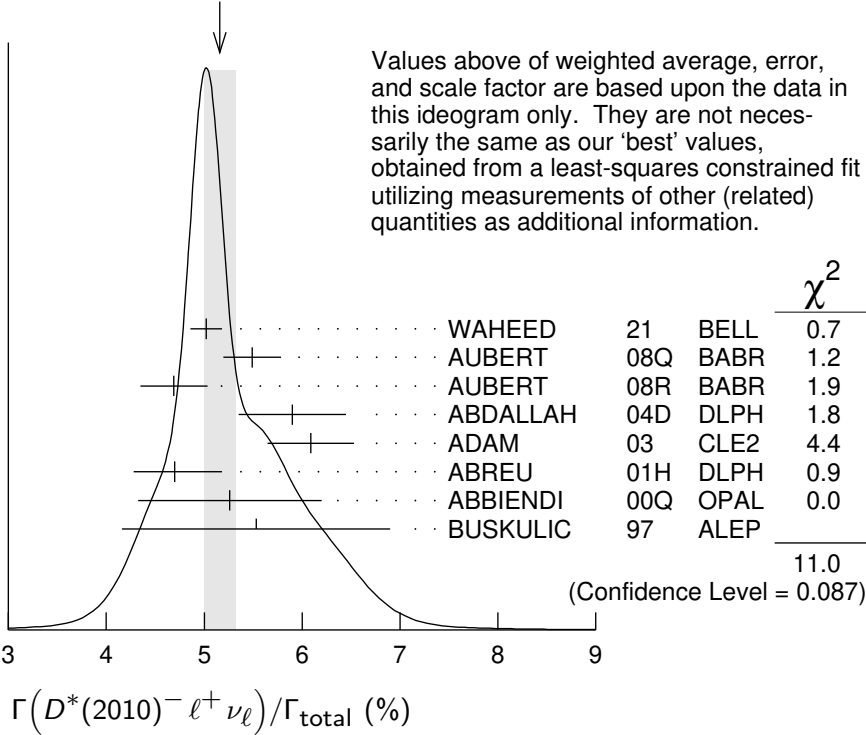
| | | | | |
|---|-----|--------------------------|----------|------------------------------------|
| 5.02 ± 0.02 ± 0.16 | | ¹ WAHEED | 21 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 5.49 ± 0.16 ± 0.25 | | ² AUBERT | 08Q BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 4.69 ± 0.04 ± 0.34 | | ³ AUBERT | 08R BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 5.90 ± 0.22 ± 0.50 | | ⁴ ABDALLAH | 04D DLPH | $e^+ e^- \rightarrow Z^0$ |
| 6.09 ± 0.19 ± 0.40 | | ⁵ ADAM | 03 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 4.70 ± 0.13 ^{+0.36} _{-0.31} | | ⁶ ABREU | 01H DLPH | $e^+ e^- \rightarrow Z$ |
| 5.26 ± 0.20 ± 0.46 | | ⁷ ABBIENDI | 00Q OPAL | $e^+ e^- \rightarrow Z$ |
| 5.53 ± 0.26 ± 0.52 | | ⁸ BUSKULIC | 97 ALEP | $e^+ e^- \rightarrow Z$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 4.90 ± 0.02 ± 0.16 | | ¹ WAHEED | 19 BELL | Repl. by WAHEED 21 |
| 4.58 ± 0.03 ± 0.26 | | ¹ DUNGEL | 10 BELL | Repl. by WAHEED 19 |
| 4.90 ± 0.07 ^{+0.36} _{-0.35} | | ⁴ AUBERT | 05E BABR | Repl. by AUBERT 08R |
| 5.39 ± 0.11 ± 0.34 | | ⁹ ABDALLAH | 04D DLPH | $e^+ e^- \rightarrow Z^0$ |
| 4.59 ± 0.23 ± 0.40 | | ¹⁰ ABE | 02F BELL | Repl. by DUNGEL 10 |
| 6.09 ± 0.19 ± 0.40 | | ¹¹ BRIERE | 02 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 5.08 ± 0.21 ± 0.66 | | ¹² ACKERSTAFF | 97G OPAL | Repl. by ABBIENDI 00Q |
| 5.52 ± 0.17 ± 0.68 | | ¹³ ABREU | 96P DLPH | Repl. by ABREU 01H |
| 4.49 ± 0.32 ± 0.39 | 376 | ¹⁴ BARISH | 95 CLE2 | Repl. by ADAM 03 |
| 5.18 ± 0.30 ± 0.62 | 410 | ¹⁵ BUSKULIC | 95N ALEP | Sup. by BUSKULIC 97 |
| 4.5 ± 0.3 ± 0.4 | | ¹⁶ ALBRECHT | 94 ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 4.7 ± 0.5 ± 0.5 | 235 | ¹⁷ ALBRECHT | 93 ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| seen | 398 | ¹⁸ SANGHERA | 93 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 7.0 ± 1.8 ± 1.4 | | ¹⁹ ANTREASYAN | 90B CBAL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| | | ²⁰ ALBRECHT | 89C ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 6.0 ± 1.0 ± 1.4 | | ²¹ ALBRECHT | 89J ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 4.0 ± 0.4 ± 0.6 | | ²² BORTOLETTO | 89B CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 7.0 ± 1.2 ± 1.9 | 47 | ²³ ALBRECHT | 87J ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ WAHEED 21 uses fully reconstructed $D^{*-} \ell^+ \nu$ events ($\ell = e$ or μ).

² Uses a fully reconstructed B meson as a tag on the recoil side.

- ³ Measured using fully reconstructed D^* sample and a simultaneous fit to the Caprini-Lellouch-Neubert form factor parameters: $\rho^2 = 1.191 \pm 0.048 \pm 0.028$, $R_1(1) = 1.429 \pm 0.061 \pm 0.044$, and $R_2(1) = 0.827 \pm 0.038 \pm 0.022$.
- ⁴ Measured using fully reconstructed D^* sample.
- ⁵ Uses the combined fit of both $B^0 \rightarrow D^*(2010)^- \ell \nu$ and $B^+ \rightarrow \bar{D}^*(2007)^0 \ell \nu$ samples.
- ⁶ ABREU 01H measured using about 5000 partial reconstructed D^* sample.
- ⁷ ABBIENDI 00Q assumes the fraction $B(b \rightarrow B^0) = (39.7^{+1.8}_{-2.2})\%$. This result is an average of two methods using exclusive and partial D^* reconstruction.
- ⁸ BUSKULIC 97 assumes fraction $(B^+) = \text{fraction}(B^0) = (37.8 \pm 2.2)\%$ and PDG 96 values for B lifetime and D^* and D branching fractions.
- ⁹ Combines with previous partial reconstructed D^* measurement.
- ¹⁰ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
- ¹¹ The results are based on the same analysis and data sample reported in ADAM 03.
- ¹² ACKERSTAFF 97G assumes fraction $(B^+) = \text{fraction}(B^0) = (37.8 \pm 2.2)\%$ and PDG 96 values for B lifetime and branching ratio of D^* and D decays.
- ¹³ ABREU 96P result is the average of two methods using exclusive and partial D^* reconstruction.
- ¹⁴ BARISH 95 use $B(D^0 \rightarrow K^- \pi^+) = (3.91 \pm 0.08 \pm 0.17)\%$ and $B(D^{*+} \rightarrow D^0 \pi^+) = (68.1 \pm 1.0 \pm 1.3)\%$.
- ¹⁵ BUSKULIC 95N assumes fraction $(B^+) = \text{fraction}(B^0) = 38.2 \pm 1.3 \pm 2.2\%$ and $\tau_{B^0} = 1.58 \pm 0.06$ ps. $\Gamma(D^{*-} \ell^+ \nu_\ell)/\text{total} = [5.18 - 0.13(\text{fraction}(B^0) - 38.2) - 1.5(\tau_{B^0} - 1.58)]\%$.
- ¹⁶ ALBRECHT 94 assumes $B(D^{*+} \rightarrow D^0 \pi^+) = 68.1 \pm 1.0 \pm 1.3\%$. Uses partial reconstruction of D^{*+} and is independent of D^0 branching ratios.
- ¹⁷ ALBRECHT 93 reports $0.052 \pm 0.005 \pm 0.006$. We rescale using the method described in STONE 94 but with the updated PDG 94 $B(D^0 \rightarrow K^- \pi^+)$. We have taken their average e and μ value. They also obtain $\alpha = 2 * \Gamma^0 / (\Gamma^- + \Gamma^+) - 1 = 1.1 \pm 0.4 \pm 0.2$, $A_{AF} = 3/4 * (\Gamma^- - \Gamma^+) / \Gamma = 0.2 \pm 0.08 \pm 0.06$ and a value of $|V_{cb}| = 0.036 - 0.045$ depending on model assumptions.
- ¹⁸ Combining $\bar{D}^{*0} \ell^+ \nu_\ell$ and $\bar{D}^{*-} \ell^+ \nu_\ell$ SANGHERA 93 test $V-A$ structure and fit the decay angular distributions to obtain $A_{FB} = 3/4 * (\Gamma^- - \Gamma^+) / \Gamma = 0.14 \pm 0.06 \pm 0.03$. Assuming a value of V_{cb} , they measure V , A_1 , and A_2 , the three form factors for the $D^* \ell \nu_\ell$ decay, where results are slightly dependent on model assumptions.
- ¹⁹ ANTREASYAN 90B is average over B and $\bar{D}^*(2010)$ charge states.
- ²⁰ The measurement of ALBRECHT 89C suggests a D^* polarization γ_L/γ_T of 0.85 ± 0.45 . or $\alpha = 0.7 \pm 0.9$.
- ²¹ ALBRECHT 89J is ALBRECHT 87J value rescaled using $B(D^*(2010)^- \rightarrow D^0 \pi^-) = 0.57 \pm 0.04 \pm 0.04$. Superseded by ALBRECHT 93.
- ²² We have taken average of the the BORTOLETTO 89B values for electrons and muons, $0.046 \pm 0.005 \pm 0.007$. We rescale using the method described in STONE 94 but with the updated PDG 94 $B(D^0 \rightarrow K^- \pi^+)$. The measurement suggests a D^* polarization parameter value $\alpha = 0.65 \pm 0.66 \pm 0.25$.
- ²³ ALBRECHT 87J assume μ - e universality, the $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 0.45$, the $B(D^0 \rightarrow K^- \pi^+) = (0.042 \pm 0.004 \pm 0.004)$, and the $B(D^*(2010)^- \rightarrow D^0 \pi^-) = 0.49 \pm 0.08$. Superseded by ALBRECHT 89J.

WEIGHTED AVERAGE
5.16±0.16 (Error scaled by 1.4)



$\Gamma(D^*(2010)^- \ell^+ \nu_\ell) / \Gamma(D \ell^+ \nu_\ell X)$ Γ_7 / Γ_4

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|---------------------|-----------|----------------------------------|
| 0.537±0.031±0.036 | ¹ AUBERT | 07AN BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Uses a fully reconstructed B meson on the recoil side.

$\Gamma(D^*(2010)^- \tau^+ \nu_\tau) / \Gamma_{total}$ Γ_8 / Γ

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------------------------------|----------|----------------------------------|
| 1.58±0.09 OUR FIT | Error includes scale factor of 1.1. | | |
| 1.48±0.18 OUR AVERAGE | Error includes scale factor of 1.1. | | |
| 1.42±0.094±0.140 | ¹ AAIJ | 18D LHCb | pp at 7, 8 TeV |
| 2.02 ^{+0.40} _{-0.37} ±0.37 | ² MATYJA | 07 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-----------------|---------------------|----------|---------------------|
| 1.11±0.51 ±0.06 | ³ AUBERT | 08N BABR | Repl. by AUBERT 09s |
|-----------------|---------------------|----------|---------------------|

¹ Normalizes to $B(B^0 \rightarrow D^*(2010)^- \pi^+ \pi^- \pi^+) = (7.214 \pm 0.28) \times 10^{-3}$.

² Observed in the recoil of the accompanying B meson.

³ Uses a fully reconstructed B meson as a tag on the recoil side.

$\Gamma(D^*(2010)^- \tau^+ \nu_\tau) / \Gamma(D^*(2010)^- \ell^+ \nu_\ell)$ Γ_8 / Γ_7

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|---------------------|----------|----------------------------------|
| 0.308±0.016 OUR FIT | | | |
| 0.315±0.018 OUR AVERAGE | | | |
| 0.291±0.019±0.029 | ¹ AAIJ | 18D LHCb | pp at 7, 8 TeV |
| 0.302±0.030±0.011 | ² SATO | 16B BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| 0.336±0.027±0.030 | ³ AAIJ | 15Q LHCb | pp at 7, 8 TeV |
| 0.355±0.039±0.021 | ^{4,5} LEES | 12D BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

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

0.207 ± 0.095 ± 0.008 ⁴ AUBERT 09S BABR Repl. by LEES 12D

¹ Uses $\tau^+ \rightarrow \pi^+ \pi^- \pi^+ \bar{\nu}_\tau$ and $\tau^+ \rightarrow \pi^+ \pi^- \pi^+ \pi^0 \bar{\nu}_\tau$, and μ^+ as ℓ^+ .

² Uses semileptonic B decay events for tagging and $\tau^+ \rightarrow \ell^+ \nu_\ell \bar{\nu}_\tau$ mode.

³ Uses $\tau^+ \rightarrow \mu^+ \nu_\mu \bar{\nu}_\tau$ and μ^+ as ℓ^+ .

⁴ Uses a fully reconstructed B meson as a tag on the recoil side.

⁵ Uses $\tau^+ \rightarrow e^+ \nu_e \bar{\nu}_\tau$ and $\tau^+ \rightarrow \mu^+ \nu_\mu \bar{\nu}_\tau$ and e^+ or μ^+ as ℓ^+ .

$\Gamma(D^*(2010)^- \tau^+ \nu_\tau) / \Gamma(D^*(2010)^- \pi^+ \pi^+ \pi^-)$ Γ_8 / Γ_{58}

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------------|------|-----------------------|
| 1.97 ± 0.13 ± 0.18 | ¹ AAIJ | 18D | LHCB pp at 7, 8 TeV |

¹ Uses $\tau^+ \rightarrow \pi^+ \pi^- \pi^+ \bar{\nu}_\tau$ and $\tau^+ \rightarrow \pi^+ \pi^- \pi^+ \pi^0 \bar{\nu}_\tau$ modes.

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

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------|------|---------|
| 4.1 ± 0.5 OUR AVERAGE | | | |

4.05 ± 0.36 ± 0.41 VOSSSEN 18 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

4.3 ± 0.8 ± 0.3 ¹ AUBERT 08Q BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

4.4 ± 0.9 ± 0.2 ^{1,2} LIVENTSEV 08 BELL Repl. by VOSSSEN 18

3.4 ± 1.0 ± 0.1 ³ LIVENTSEV 05 BELL Repl. by LIVENTSEV 08

¹ Uses a fully reconstructed B meson as a tag on the recoil side.

² LIVENTSEV 08 reports $(4.2 \pm 0.7 \pm 0.6) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{D}^0 \pi^- \ell^+ \nu_\ell) / \Gamma_{\text{total}}] / [B(B^0 \rightarrow D^- \ell^+ \nu_\ell)]$ assuming $B(B^0 \rightarrow D^- \ell^+ \nu_\ell) = (2.12 \pm 0.20) \times 10^{-2}$, which we rescale to our best value $B(B^0 \rightarrow D^- \ell^+ \nu_\ell) = (2.24 \pm 0.09) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ LIVENTSEV 05 reports $[\Gamma(B^0 \rightarrow \bar{D}^0 \pi^- \ell^+ \nu_\ell) / \Gamma_{\text{total}}] / [B(B^+ \rightarrow \bar{D}^0 \ell^+ \nu_\ell)] = 0.15 \pm 0.03 \pm 0.03$ which we multiply by our best value $B(B^+ \rightarrow \bar{D}^0 \ell^+ \nu_\ell) = (2.30 \pm 0.09) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_0^*(2300)^- \ell^+ \nu_\ell, D_0^{*-} \rightarrow \bar{D}^0 \pi^-) / \Gamma_{\text{total}}$ Γ_{10} / Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------|------|-------------------------------------|
| 3.0 ± 1.2 OUR AVERAGE | | | Error includes scale factor of 1.8. |

4.4 ± 0.8 ± 0.6 ¹ AUBERT 08BL BABR $e^+ e^- \rightarrow \Upsilon(4S)$

2.0 ± 0.7 ± 0.5 ¹ LIVENTSEV 08 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Uses a fully reconstructed B meson as a tag on the recoil side.

$\Gamma(D_2^*(2460)^- \ell^+ \nu_\ell, D_2^{*-} \rightarrow \bar{D}^0 \pi^-) / \Gamma_{\text{total}}$ Γ_{11} / Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|------|-------------------------------------|
| 1.21 ± 0.33 OUR AVERAGE | | | Error includes scale factor of 1.8. |

1.10 ± 0.17 ± 0.08 ¹ AUBERT 09Y BABR $e^+ e^- \rightarrow \Upsilon(4S)$

2.2 ± 0.4 ± 0.4 ² LIVENTSEV 08 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Uses a simultaneous fit of all B semileptonic decays without full reconstruction of events. AUBERT 09Y reports $B(B^0 \rightarrow \bar{D}_2^*(2460)^- \ell^+ \nu_\ell) \cdot B(\bar{D}_2^*(2460)^- \rightarrow \bar{D}^{(*)0} \pi^-) = (1.77 \pm 0.26 \pm 0.11) \times 10^{-3}$ and the authors have provided us the individual measurement.

² Uses a fully reconstructed B meson as a tag on the recoil side.

$\Gamma(\bar{D}^{*0} n \pi \ell^+ \nu_\ell (n \geq 1)) / \Gamma(D \ell^+ \nu_\ell X)$ Γ_{12} / Γ_4

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------------|---------------------|-----------|------------------------------------|
| 0.248 ± 0.032 ± 0.030 | ¹ AUBERT | 07AN BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses a fully reconstructed B meson on the recoil side.

$\Gamma(\bar{D}^{*0} \pi^- \ell^+ \nu_\ell) / \Gamma_{\text{total}}$ Γ_{13} / Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------------------------------|------|---------|
| 5.8 ± 0.8 OUR AVERAGE | Error includes scale factor of 1.4. | | |

| | | | |
|--------------------|---------------------|----------|------------------------------------|
| 6.46 ± 0.53 ± 0.52 | VOSSSEN | 18 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 4.8 ± 0.8 ± 0.4 | ¹ AUBERT | 08Q BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|-----------------|--------------------------|---------|-----------------------|
| 5.9 ± 2.3 ± 0.2 | ^{1,2} LIVENTSEV | 08 BELL | Repl. by VOSSSEN 18 |
| 5.6 ± 1.2 ± 0.2 | ^{3,4} LIVENTSEV | 05 BELL | Repl. by LIVENTSEV 08 |

¹ Uses a fully reconstructed B meson as a tag on the recoil side.

² LIVENTSEV 08 reports $(5.6 \pm 2.1 \pm 0.8) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{D}^{*0} \pi^- \ell^+ \nu_\ell) / \Gamma_{\text{total}}] / [B(B^0 \rightarrow D^- \ell^+ \nu_\ell)]$ assuming $B(B^0 \rightarrow D^- \ell^+ \nu_\ell) = (2.12 \pm 0.20) \times 10^{-2}$, which we rescale to our best value $B(B^0 \rightarrow D^- \ell^+ \nu_\ell) = (2.24 \pm 0.09) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ Excludes D^{*+} contribution to $D\pi$ modes.

⁴ LIVENTSEV 05 reports $[\Gamma(B^0 \rightarrow \bar{D}^{*0} \pi^- \ell^+ \nu_\ell) / \Gamma_{\text{total}}] / [B(B^+ \rightarrow \bar{D}^*(2007)^0 \ell^+ \nu_\ell)] = 0.10 \pm 0.02 \pm 0.01$ which we multiply by our best value $B(B^+ \rightarrow \bar{D}^*(2007)^0 \ell^+ \nu_\ell) = (5.58 \pm 0.22) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_1(2420)^- \ell^+ \nu_\ell, D_1^- \rightarrow \bar{D}^{*0} \pi^-) / \Gamma_{\text{total}}$ Γ_{14} / Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|------|---------|
| 2.80 ± 0.28 OUR AVERAGE | | | |

| | | | |
|--------------------|------------------------|-----------|------------------------------------|
| 2.78 ± 0.24 ± 0.25 | ¹ AUBERT | 09Y BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 2.7 ± 0.4 ± 0.3 | ² AUBERT | 08BL BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 5.4 ± 1.9 ± 0.9 | ² LIVENTSEV | 08 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses a simultaneous measurement of all B semileptonic decays without full reconstruction of events.

² Uses a fully reconstructed B meson as a tag on the recoil side.

$\Gamma(D_1'(2430)^- \ell^+ \nu_\ell, D_1'^- \rightarrow \bar{D}^{*0} \pi^-) / \Gamma_{\text{total}}$ Γ_{15} / Γ

| VALUE (units 10^{-3}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|------------------------------------|
| 3.1 ± 0.7 ± 0.5 | | ¹ AUBERT | 08BL BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|------|----|------------------------|---------|------------------------------------|
| <5.0 | 90 | ¹ LIVENTSEV | 08 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------|----|------------------------|---------|------------------------------------|

¹ Uses a fully reconstructed B meson as a tag on the recoil side.

$\Gamma(D_2^*(2460)^- \ell^+ \nu_\ell, D_2^{*-} \rightarrow \bar{D}^{*0} \pi^-) / \Gamma_{\text{total}}$ Γ_{16} / Γ

| VALUE (units 10^{-3}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-----|-------------|------|---------|
| 0.68 ± 0.12 OUR AVERAGE | | | | |

| | | | |
|--------------------|---------------------|-----------|------------------------------------|
| 0.67 ± 0.12 ± 0.05 | ¹ AUBERT | 09Y BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.7 ± 0.2 ± 0.2 | ² AUBERT | 08BL BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

<3.0 90 ² LIVENTSEV 08 BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ Uses a simultaneous fit of all B semileptonic decays without full reconstruction of events. AUBERT 09Y reports $B(B^0 \rightarrow \bar{D}_2^*(2460)^- \ell^+ \nu_\ell) \cdot B(\bar{D}_2^*(2460)^- \rightarrow \bar{D}^{(*)0} \pi^-) = (1.77 \pm 0.26 \pm 0.11) \times 10^{-3}$ and the authors have provided us the individual measurement.

² Uses a fully reconstructed B meson as a tag on the recoil side.

$\Gamma(D^- \pi^+ \pi^- \ell^+ \nu_\ell) / \Gamma(D^- \ell^+ \nu_\ell)$ Γ_{17} / Γ_5

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|------|--|
| 5.8 ± 1.8 ± 1.2 | ¹ LEES | 16 | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Measurement used electrons and muons as leptons.

$\Gamma(D^{*-} \pi^+ \pi^- \ell^+ \nu_\ell) / \Gamma(D^*(2010)^- \ell^+ \nu_\ell)$ Γ_{18} / Γ_7

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|------|--|
| 2.8 ± 0.8 ± 0.6 | ¹ LEES | 16 | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Measurement used electrons and muons as leptons.

$\Gamma(\rho^- \ell^+ \nu_\ell) / \Gamma_{\text{total}}$ Γ_{19} / Γ

$\ell = e$ or μ , not sum over e and μ modes.

“OUR EVALUATION” has been obtained by the Heavy Flavor Averaging Group (HFLAV) by including both B^0 and B^+ decays. The average assumes equality of the semileptonic decay width for these isospin conjugate states.

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------|------|---------|
| 2.94 ± 0.11 ± 0.18 OUR EVALUATION | | | | |

2.45 ± 0.32 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.

3.22 ± 0.27 ± 0.24 ¹ SIBIDANOV 13 BELL $e^+e^- \rightarrow \Upsilon(4S)$

1.75 ± 0.15 ± 0.27 ² DEL-AMO-SA..11C BABR $e^+e^- \rightarrow \Upsilon(4S)$

2.93 ± 0.37 ± 0.37 ³ ADAM 07 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$

2.17 ± 0.54 ± 0.32 ⁴ HOKUUE 07 BELL $e^+e^- \rightarrow \Upsilon(4S)$

2.57 ± 0.29 ^{+0.53}_{-0.62} ⁵ BEHRENS 00 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$

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

2.14 ± 0.21 ± 0.56 ² AUBERT,B 050 BABR Repl. by DEL-AMO-SANCHEZ 11C

2.17 ± 0.34 ^{+0.62}_{-0.68} ⁶ ATHAR 03 CLE2 Repl. by ADAM 07

3.29 ± 0.42 ± 0.72 ⁷ AUBERT 03E BABR Repl. by AUBERT,B 050

2.69 ± 0.41 ^{+0.61}_{-0.64} ⁸ BEHRENS 00 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$

2.5 ± 0.4 ^{+0.7}_{-0.9} ⁹ ALEXANDER 96T CLE2 Repl. by BEHRENS 00

<4.1 90 ¹⁰ BEAN 93B CLE2 $e^+e^- \rightarrow \Upsilon(4S)$

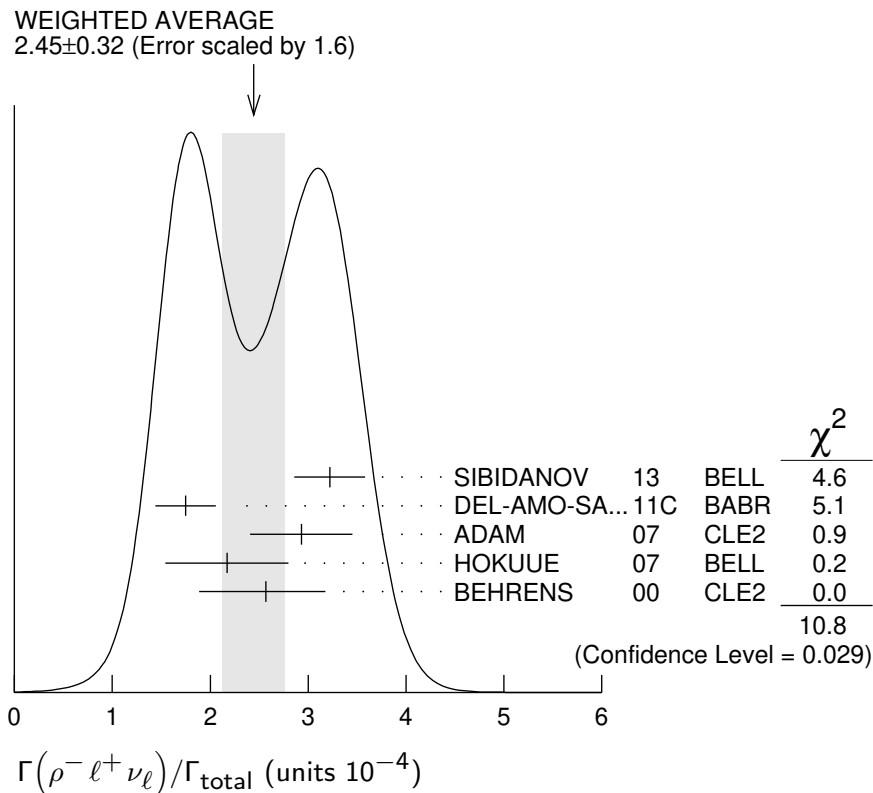
¹ The signal events are tagged by a second B meson reconstructed in the fully hadronic decays.

² B^+ and B^0 decays combined assuming isospin symmetry. Systematic errors include both experimental and form-factor uncertainties.

³ The B^0 and B^+ results are combined assuming the isospin, B lifetimes, and relative charged/neutral B production at the $\Upsilon(4S)$.

⁴ The signal events are tagged by a second B meson reconstructed in the semileptonic mode $B \rightarrow D^{(*)} \ell \nu_\ell$.

- ⁵ Averaging with ALEXANDER 96T results including experimental and theoretical correlations considered, BEHRENS 00 reports systematic errors $^{+0.33}_{-0.46} \pm 0.41$, where the second error is theoretical model dependence. We combine these in quadrature.
- ⁶ ATHAR 03 reports systematic errors $^{+0.47}_{-0.50} \pm 0.41 \pm 0.01$, which are experimental systematic, systematic due to residual form-factor uncertainties in the signal, and systematic due to residual form-factor uncertainties in the cross-feed modes, respectively. We combine these in quadrature.
- ⁷ Uses isospin constraints and extrapolation to all electron energies according to five different form-factor calculations. The second error combines the systematic and theoretical uncertainties in quadrature.
- ⁸ BEHRENS 00 reports $^{+0.35}_{-0.40} \pm 0.50$, where the second error is the theoretical model dependence. We combine these in quadrature. B^+ and B^0 decays combined using isospin symmetry: $\Gamma(B^0 \rightarrow \rho^- \ell^+ \nu) = 2\Gamma(B^+ \rightarrow \rho^0 \ell^+ \nu) \approx 2\Gamma(B^+ \rightarrow \omega \ell^+ \nu)$. No evidence for $\omega \ell \nu$ is reported.
- ⁹ ALEXANDER 96T reports $^{+0.5}_{-0.7} \pm 0.5$ where the second error is the theoretical model dependence. We combine these in quadrature. B^+ and B^0 decays combined using isospin symmetry: $\Gamma(B^0 \rightarrow \rho^- \ell^+ \nu) = 2\Gamma(B^+ \rightarrow \rho^0 \ell^+ \nu) \approx 2\Gamma(B^+ \rightarrow \omega \ell^+ \nu)$. No evidence for $\omega \ell \nu$ is reported.
- ¹⁰ BEAN 93B limit set using ISGW Model. Using isospin and the quark model to combine $\Gamma(\rho^0 \ell^+ \nu_\ell)$ and $\Gamma(\omega \ell^+ \nu_\ell)$ with this result, they obtain a limit $<(1.6-2.7) \times 10^{-4}$ at 90% CL for $B^+ \rightarrow (\omega \text{ or } \rho^0) \ell^+ \nu_\ell$. The range corresponds to the ISGW, WSB, and KS models. An upper limit on $|V_{ub}/V_{cb}| < 0.08-0.13$ at 90% CL is derived as well.



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

Γ_{20} / Γ

“OUR EVALUATION” is provided by the Heavy Flavor Averaging Group (HFLAV) and the procedure is described at <https://hflav.web.cern.ch/>.

| <u>VALUE (units 10^{-4})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------|-------------|------------------------------------|
| 1.50 ± 0.06 OUR EVALUATION | | | |
| 1.46 ± 0.04 OUR AVERAGE | | | |
| 1.49 ± 0.09 ± 0.07 | ¹ SIBIDANOV 13 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 1.47 ± 0.05 ± 0.06 | ^{2,3} LEES 12AA | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 1.41 ± 0.05 ± 0.07 | ⁴ DEL-AMO-SA...11C | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 1.49 ± 0.04 ± 0.07 | ² HA 11 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 1.54 ± 0.17 ± 0.09 | ⁴ AUBERT 08AV | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 1.37 ± 0.15 ± 0.11 | ^{5,6} ADAM 07 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 1.38 ± 0.19 ± 0.14 | ⁷ HOKUUE 07 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 1.42 ± 0.05 ± 0.08 | ² DEL-AMO-SA...11F | BABR | Repl. by LEES 12AA |
| 1.46 ± 0.07 ± 0.08 | ⁸ AUBERT 07J | BABR | Repl. by DEL-AMO-SANCHEZ 11F |
| 1.33 ± 0.17 ± 0.11 | ⁹ AUBERT,B 06K | BABR | Repl. by AUBERT 08AV |
| 1.38 ± 0.10 ± 0.18 | ¹⁰ AUBERT,B 05O | BABR | Repl. by DEL-AMO-SANCHEZ 11C |
| 1.33 ± 0.18 ± 0.13 | ¹¹ ATHAR 03 | CLE2 | Repl. by ADAM 07 |
| 1.8 ± 0.4 ± 0.4 | ¹² ALEXANDER 96T | CLE2 | Repl. by ATHAR 03 |

¹ The signal events are tagged by a second B meson reconstructed in the fully hadronic decays.

² Uses loose neutrino reconstruction technique. Assumes $B(\Upsilon(4S) \rightarrow B^+ B^-) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = (48.4 \pm 0.6)\%$.

³ Reports also a branching fraction value $B(B^0 \rightarrow \pi^- \ell^+ \nu) = (1.45 \pm 0.04 \pm 0.06) \times 10^{-4}$ from the decays of B^+ and B^0 that are combined using the isospin symmetry relation.

⁴ Using the isospin symmetry relation, B^+ and B^0 branching fractions are combined.

⁵ The B^0 and B^+ results are combined assuming the isospin, B lifetimes, and relative charged/neutral B production at the $\Upsilon(4S)$.

⁶ Also report the rate for $q^2 > 16 \text{ GeV}^2$ of $(0.41 \pm 0.08 \pm 0.04) \times 10^{-4}$ from which they obtain $|V_{ub}| = 3.6 \pm 0.4 \pm 0.2^{+0.6}_{-0.4}$ (last error is from theory).

⁷ The signal events are tagged by a second B meson reconstructed in the semileptonic mode $B \rightarrow D^{(*)} \ell \nu_\ell$.

⁸ The analysis uses events in which the signal B decays are reconstructed with an innovative loose neutrino reconstruction technique.

⁹ The signals are tagged by a second B meson reconstructed in a semileptonic or hadronic decay. The B^0 and B^+ results are combined assuming the isospin symmetry.

¹⁰ B^+ and B^0 decays combined assuming isospin symmetry. Systematic errors include both experimental and form-factor uncertainties.

¹¹ ATHAR 03 reports systematic errors $0.11 \pm 0.01 \pm 0.07$, which are experimental systematic, systematic due to residual form-factor uncertainties in the signal, and systematic due to residual form-factor uncertainties in the cross-feed modes, respectively. We combine these in quadrature.

¹² ALEXANDER 96T gives systematic errors $\pm 0.3 \pm 0.2$ where the second error reflects the estimated model dependence. We combine these in quadrature. Assumes isospin symmetry: $\Gamma(B^0 \rightarrow \pi^- \ell^+ \nu) = 2 \times \Gamma(B^+ \rightarrow \pi^0 \ell^+ \nu)$.

$\Gamma(\pi^- \mu^+ \nu_\mu)/\Gamma_{\text{total}}$ Γ_{21}/Γ

| VALUE | DOCUMENT ID | TECN |
|-------|-------------|------|
|-------|-------------|------|

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

seen ¹ ALBRECHT 91C ARG

¹ In ALBRECHT 91C, one event is fully reconstructed providing evidence for the $b \rightarrow u$ transition.

 $\Gamma(\pi^- \tau^+ \nu_\tau)/\Gamma_{\text{total}}$ Γ_{22}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

$<2.5 \times 10^{-4}$ 90 ¹ HAMER 16 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K^\pm X)/\Gamma_{\text{total}}$ Γ_{23}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

0.78 ± 0.08 ¹ ALBRECHT 96D ARG $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Average multiplicity.

 $\Gamma(D^0 X)/\Gamma_{\text{total}}$ Γ_{24}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

$0.081 \pm 0.014 \pm 0.005$ ¹ AUBERT 07N BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

$0.063 \pm 0.019 \pm 0.005$ ¹ AUBERT, BE 04B BABR Repl. by AUBERT 07N

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

 $\Gamma(\overline{D}^0 X)/\Gamma_{\text{total}}$ Γ_{25}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

$0.474 \pm 0.020^{+0.020}_{-0.019}$ ¹ AUBERT 07N BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

$0.511 \pm 0.031 \pm 0.028$ ¹ AUBERT, BE 04B BABR Repl. by AUBERT 07N

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

 $\Gamma(D^0 X)/[\Gamma(D^0 X) + \Gamma(\overline{D}^0 X)]$ $\Gamma_{24}/(\Gamma_{24} + \Gamma_{25})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

$0.146 \pm 0.022 \pm 0.006$ AUBERT 07N BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

$0.110 \pm 0.031 \pm 0.008$ AUBERT, BE 04B BABR Repl. by AUBERT 07N

 $\Gamma(D^+ X)/\Gamma_{\text{total}}$ Γ_{26}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

<0.039 90 ¹ AUBERT 07N BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

<0.051 90 ¹ AUBERT, BE 04B BABR Repl. by AUBERT 07N

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

$\Gamma(D^- X)/\Gamma_{\text{total}}$ Γ_{27}/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-------------------------------------|---------------------|-------------|--------------------------------------|
| $0.369 \pm 0.016^{+0.030}_{-0.027}$ | ¹ AUBERT | 07N | BABR $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-------------------------------------|------------------------|-----|--------------------------|
| $0.397 \pm 0.030^{+0.040}_{-0.038}$ | ¹ AUBERT,BE | 04B | BABR Repl. by AUBERT 07N |
|-------------------------------------|------------------------|-----|--------------------------|

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

 $\Gamma(D^+ X)/[\Gamma(D^+ X) + \Gamma(D^- X)]$ $\Gamma_{26}/(\Gamma_{26} + \Gamma_{27})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------------------|--------------------|-------------|--------------------------------------|
| $0.058 \pm 0.028 \pm 0.006$ | AUBERT | 07N | BABR $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-----------------------------|-----------|-----|--------------------------|
| $0.055 \pm 0.040 \pm 0.006$ | AUBERT,BE | 04B | BABR Repl. by AUBERT 07N |
|-----------------------------|-----------|-----|--------------------------|

 $\Gamma(D_s^+ X)/\Gamma_{\text{total}}$ Γ_{28}/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-------------------------------------|---------------------|-------------|--------------------------------------|
| $0.103 \pm 0.012^{+0.017}_{-0.014}$ | ¹ AUBERT | 07N | BABR $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-------------------------------------|------------------------|-----|--------------------------|
| $0.109 \pm 0.021^{+0.039}_{-0.024}$ | ¹ AUBERT,BE | 04B | BABR Repl. by AUBERT 07N |
|-------------------------------------|------------------------|-----|--------------------------|

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

 $\Gamma(D_s^- X)/\Gamma_{\text{total}}$ Γ_{29}/Γ

| <u>VALUE</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|------------|---------------------|-------------|--------------------------------------|
| <0.026 | 90 | ¹ AUBERT | 07N | BABR $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|----------|----|------------------------|-----|--------------------------|
| <0.087 | 90 | ¹ AUBERT,BE | 04B | BABR Repl. by AUBERT 07N |
|----------|----|------------------------|-----|--------------------------|

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

 $\Gamma(D_s^+ X)/[\Gamma(D_s^+ X) + \Gamma(D_s^- X)]$ $\Gamma_{28}/(\Gamma_{28} + \Gamma_{29})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------------------|--------------------|-------------|--------------------------------------|
| $0.879 \pm 0.066 \pm 0.005$ | AUBERT | 07N | BABR $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-----------------------------|-----------|-----|--------------------------|
| $0.733 \pm 0.092 \pm 0.010$ | AUBERT,BE | 04B | BABR Repl. by AUBERT 07N |
|-----------------------------|-----------|-----|--------------------------|

 $\Gamma(\Lambda_c^+ X)/\Gamma_{\text{total}}$ Γ_{30}/Γ

| <u>VALUE</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|------------|---------------------|-------------|--------------------------------------|
| <0.031 | 90 | ¹ AUBERT | 07N | BABR $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|----------|----|------------------------|-----|--------------------------|
| <0.038 | 90 | ¹ AUBERT,BE | 04B | BABR Repl. by AUBERT 07N |
|----------|----|------------------------|-----|--------------------------|

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

| $\Gamma(\bar{\Lambda}_c^- X)/\Gamma_{\text{total}}$ | | | | | Γ_{31}/Γ |
|--|---------------------|-------------|----------------|----------------------------------|----------------------|
| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> | | |
| $0.05 \pm 0.010^{+0.019}_{-0.011}$ | ¹ AUBERT | 07N | BABR | $e^+ e^- \rightarrow \gamma(4S)$ | |

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

| | | | | | |
|-------------------------------------|-------------------------|-----|------|---------------------|--|
| $0.049 \pm 0.017^{+0.018}_{-0.011}$ | ¹ AUBERT, BE | 04B | BABR | Repl. by AUBERT 07N | |
|-------------------------------------|-------------------------|-----|------|---------------------|--|

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

| $\Gamma(\Lambda_c^+ X)/[\Gamma(\Lambda_c^+ X) + \Gamma(\bar{\Lambda}_c^- X)]$ | | | | | $\Gamma_{30}/(\Gamma_{30} + \Gamma_{31})$ |
|---|--------------------|-------------|----------------|----------------------------------|---|
| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> | | |
| $0.243 \pm 0.119^{+0.119}_{-0.121} \pm 0.003$ | AUBERT | 07N | BABR | $e^+ e^- \rightarrow \gamma(4S)$ | |

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

| | | | | | |
|-----------------------------|------------|-----|------|---------------------|--|
| $0.286 \pm 0.142 \pm 0.007$ | AUBERT, BE | 04B | BABR | Repl. by AUBERT 07N | |
|-----------------------------|------------|-----|------|---------------------|--|

| $\Gamma(\bar{c} X)/\Gamma_{\text{total}}$ | | | | | Γ_{32}/Γ |
|---|---------------------|-------------|----------------|----------------------------------|----------------------|
| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> | | |
| $0.947 \pm 0.030^{+0.045}_{-0.040}$ | ¹ AUBERT | 07N | BABR | $e^+ e^- \rightarrow \gamma(4S)$ | |

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

| | | | | | |
|-------------------------------------|-------------------------|-----|------|---------------------|--|
| $1.039 \pm 0.051^{+0.063}_{-0.058}$ | ¹ AUBERT, BE | 04B | BABR | Repl. by AUBERT 07N | |
|-------------------------------------|-------------------------|-----|------|---------------------|--|

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

| $\Gamma(c X)/\Gamma_{\text{total}}$ | | | | | Γ_{33}/Γ |
|---|---------------------|-------------|----------------|----------------------------------|----------------------|
| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> | | |
| $0.246 \pm 0.024^{+0.021}_{-0.017}$ | ¹ AUBERT | 07N | BABR | $e^+ e^- \rightarrow \gamma(4S)$ | |

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

| | | | | | |
|-------------------------------------|-------------------------|-----|------|---------------------|--|
| $0.237 \pm 0.036^{+0.041}_{-0.027}$ | ¹ AUBERT, BE | 04B | BABR | Repl. by AUBERT 07N | |
|-------------------------------------|-------------------------|-----|------|---------------------|--|

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

| $\Gamma(\bar{c}/c X)/\Gamma_{\text{total}}$ | | | | | Γ_{34}/Γ |
|---|---------------------|-------------|----------------|----------------------------------|----------------------|
| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> | | |
| $1.193 \pm 0.030^{+0.053}_{-0.049}$ | ¹ AUBERT | 07N | BABR | $e^+ e^- \rightarrow \gamma(4S)$ | |

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

| | | | | | |
|-------------------------------------|-------------------------|-----|------|---------------------|--|
| $1.276 \pm 0.062^{+0.088}_{-0.074}$ | ¹ AUBERT, BE | 04B | BABR | Repl. by AUBERT 07N | |
|-------------------------------------|-------------------------|-----|------|---------------------|--|

¹ Events are selected by completely reconstructing one B and searching for a reconstructed charmed particle in the rest of the event. The last error includes systematic and charm branching ratio uncertainties.

$\Gamma(D^- \pi^+)/\Gamma_{\text{total}}$ Γ_{35}/Γ

| VALUE (units 10^{-3}) | EVTS | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------|-------------|------|---------|
|--------------------------|------|-------------|------|---------|

2.51±0.08 OUR FIT**2.56±0.08 OUR AVERAGE**

| | | | | |
|--|----|---------------------------|------|--|
| 2.48±0.01±0.10 | | WAHEED | 22 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.55±0.05±0.16 | | ¹ AUBERT | 07H | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 3.03±0.23±0.23 | | ² AUBERT,BE | 06J | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.68±0.12±0.24 | | ^{1,3} AHMED | 02B | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.7 ±0.6 ±0.5 | | ⁴ BORTOLETTO92 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 4.8 ±1.1 ±1.1 | 22 | ⁵ ALBRECHT | 90J | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
| 5.1 ^{+2.8} ^{+1.3} _{-2.5} _{-1.2} | 4 | ⁶ BEBEK | 87 | CLEO $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|----------------|----|-------------------------|-----|---------------------------------------|
| 2.73±0.19±0.05 | | ^{1,7} AUBERT,B | 040 | BABR Repl. by AUBERT 07H |
| 2.83±0.42±0.05 | 81 | ⁸ ALAM | 94 | CLE2 Repl. by AHMED 02B |
| 3.1 ±1.3 ±1.0 | 7 | ⁵ ALBRECHT | 88K | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² Uses a missing-mass method. Does not depend on D branching fractions or B^+/B^0 production rates.³ AHMED 02B reports an additional uncertainty on the branching ratios to account for 4.5% uncertainty on relative production of B^0 and B^+ , which is not included here.⁴ BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .⁵ ALBRECHT 88K assumes $B^0\bar{B}^0:B^+B^-$ production ratio is 45:55. Superseded by ALBRECHT 90J which assumes 50:50.⁶ BEBEK 87 value has been updated in BERKELMAN 91 to use same assumptions as noted for BORTOLETTO 92.⁷ AUBERT,B 040 reports $[\Gamma(B^0 \rightarrow D^- \pi^+)/\Gamma_{\text{total}}] \times [B(D^+ \rightarrow K_S^0 \pi^+)] = (42.7 \pm 2.1 \pm 2.2) \times 10^{-6}$ which we divide by our best value $B(D^+ \rightarrow K_S^0 \pi^+) = (1.562 \pm 0.031) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.⁸ ALAM 94 reports $[\Gamma(B^0 \rightarrow D^- \pi^+)/\Gamma_{\text{total}}] \times [B(D^+ \rightarrow K^- 2\pi^+)] = (0.265 \pm 0.032 \pm 0.023) \times 10^{-3}$ which we divide by our best value $B(D^+ \rightarrow K^- 2\pi^+) = (9.38 \pm 0.16) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
 $\Gamma(D^- \ell^+ \nu_\ell)/\Gamma(D^- \pi^+)$ Γ_5/Γ_{35}

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

9.9±1.0±0.9AALTONEN 09E CDF $\rho\bar{p}$ at 1.96 TeV
 $\Gamma(D^- \rho^+)/\Gamma_{\text{total}}$ Γ_{36}/Γ

| VALUE | EVTS | DOCUMENT ID | TECN | COMMENT |
|-------|------|-------------|------|---------|
|-------|------|-------------|------|---------|

0.0076±0.0012 OUR AVERAGE

| | | | | |
|----------------------|----|-----------------------|-----|--|
| 0.0075±0.0013±0.0001 | 79 | ¹ ALAM | 94 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.009 ±0.005 ±0.003 | 9 | ² ALBRECHT | 90J | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |

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

- 0.022 ± 0.012 ± 0.009 6 2 ALBRECHT 88K ARG $e^+e^- \rightarrow \Upsilon(4S)$
¹ ALAM 94 reports $[\Gamma(B^0 \rightarrow D^- \rho^+)/\Gamma_{\text{total}}] \times [B(D^+ \rightarrow K^- 2\pi^+)] = 0.000704 \pm 0.000096 \pm 0.000070$ which we divide by our best value $B(D^+ \rightarrow K^- 2\pi^+) = (9.38 \pm 0.16) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
² ALBRECHT 88K assumes $B^0 \bar{B}^0 : B^+ B^-$ production ratio is 45:55. Superseded by ALBRECHT 90J which assumes 50:50.

$\Gamma(D^- K^0 \pi^+)/\Gamma_{\text{total}}$ Γ_{37}/Γ

| <u>VALUE (units 10^{-4})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------|-------------|--|
| 4.9 ± 0.7 ± 0.5 | ¹ AUBERT, BE | 05B | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D^- K^*(892)^+)/\Gamma_{\text{total}}$ Γ_{38}/Γ

| <u>VALUE (units 10^{-4})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------|-------------|--|
| 4.5 ± 0.7 OUR AVERAGE | | | |
| 4.6 ± 0.6 ± 0.5 | ¹ AUBERT, BE | 05B | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 3.7 ± 1.5 ± 1.0 | ¹ MAHAPATRA | 02 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D^- \omega \pi^+)/\Gamma_{\text{total}}$ Γ_{39}/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---------------------------------|------------------------|-------------|--|
| 0.0028 ± 0.0005 ± 0.0004 | ¹ ALEXANDER | 01B | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. The signal is consistent with all observed $\omega \pi^+$ having proceeded through the ρ'^+ resonance at mass $1349 \pm 25_{-5}^{+10}$ MeV and width $547 \pm 86_{-45}^{+46}$ MeV.

$\Gamma(D^- K^+)/\Gamma(D^- \pi^+)$ Γ_{40}/Γ_{35}

| <u>VALUE (units 10^{-2})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|--|
| 8.19 ± 0.20 OUR AVERAGE | | | |
| 8.19 ± 0.20 ± 0.23 | WAHEED | 22 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 8.22 ± 0.11 ± 0.25 | AAIJ | 13P | LHCB pp at 7 TeV |
| 6.8 ± 1.5 ± 0.7 | ABE | 01i | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

$\Gamma(D^- K^+ \pi^+ \pi^-)/\Gamma(D^- \pi^+ \pi^+ \pi^-)$ Γ_{41}/Γ_{47}

| <u>VALUE (units 10^{-2})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|--------------------|
| 5.9 ± 1.1 ± 0.5 | AAIJ | 12T | LHCB pp at 7 TeV |

$\Gamma(D^- K^+ \bar{K}^0)/\Gamma_{\text{total}}$ Γ_{42}/Γ

| <u>VALUE (units 10^{-4})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|-----------------------|-------------|--|
| < 3.1 | 90 | ¹ DRUTSKOY | 02 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D^- K^+ \bar{K}^*(892)^0)/\Gamma_{\text{total}}$ Γ_{43}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|---|--------------------------|------|------------------------------------|
| $8.8 \pm 1.1 \pm 1.5$ | ¹ DRUTSKOY 02 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\bar{D}^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{44}/Γ

| VALUE (units 10^{-4}) | CL% EVTS | DOCUMENT ID | TECN | COMMENT |
|---|----------|---------------------------|----------|------------------------------------|
| 8.8 ± 0.5 OUR AVERAGE | | | | |
| $8.95 \pm 0.15 \pm 0.52$ | | ¹ AAIJ | 15Y LHCb | pp at 7, 8 TeV |
| $8.4 \pm 0.4 \pm 0.8$ | | ² KUZMIN | 07 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| $8.0 \pm 0.6 \pm 1.5$ | | ^{2,3} SATPATHY | 03 BELL | Repl. by KUZMIN 07 |
| < 16 | 90 | ² ALAM | 94 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 70 | 90 | ⁴ BORTOLETTO92 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 340 | 90 | ⁵ BEBEK | 87 CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 700 ± 500 | 5 | ⁶ BEHREND | 83 CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ The second uncertainty combines in quadrature all systematic uncertainties quoted in the paper. AAIJ 15Y reports $B(B^0 \rightarrow \bar{D}^0 \pi^+ \pi^-) = (8.46 \pm 0.14 \pm 0.49) \times 10^{-4}$ in the kinematic region $m(\bar{D}^0 \pi^\pm) > 2.1$ GeV which we corrected to the full phase-space dividing by 0.945 from Belle.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ No assumption about the intermediate mechanism is made in the analysis.

⁴ BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D . The product branching fraction into $D_0^*(2340)\pi$ followed by $D_0^*(2340) \rightarrow D^0 \pi$ is < 0.0001 at 90% CL and into $D_2^*(2460)$ followed by $D_2^*(2460) \rightarrow D^0 \pi$ is < 0.0004 at 90% CL.

⁵ BEBEK 87 assume the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%. $B(D^0 \rightarrow K^- \pi^+) = (4.2 \pm 0.4 \pm 0.4)\%$ and $B(D^0 \rightarrow K^- \pi^+ \pi^+ \pi^-) = (9.1 \pm 0.8 \pm 0.8)\%$ were used.

⁶ Corrected by us using assumptions: $B(D^0 \rightarrow K^- \pi^+) = (0.042 \pm 0.006)$ and $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 50\%$. The product branching ratio is $B(B^0 \rightarrow \bar{D}^0 \pi^+ \pi^-)B(\bar{D}^0 \rightarrow K^+ \pi^-) = (0.39 \pm 0.26) \times 10^{-2}$.

$\Gamma(D^*(2010)^- \pi^+)/\Gamma_{\text{total}}$ Γ_{45}/Γ

| VALUE (units 10^{-3}) | EVTS | DOCUMENT ID | TECN | COMMENT |
|---|------|---------------------------|----------|------------------------------------|
| 2.74 ± 0.13 OUR AVERAGE | | | | |
| $2.79 \pm 0.08 \pm 0.17$ | | ¹ AUBERT | 07H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $2.48 \pm 0.34 \pm 0.08$ | | ^{2,3} AUBERT, BE | 06J BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $2.81 \pm 0.24 \pm 0.05$ | | ⁴ BRANDENB... | 98 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $2.6 \pm 0.3 \pm 0.4$ | 82 | ⁵ ALAM | 94 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $3.37 \pm 0.96 \pm 0.02$ | | ⁶ BORTOLETTO92 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $2.36 \pm 0.88 \pm 0.02$ | 12 | ⁷ ALBRECHT | 90J ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $2.36^{+1.50}_{-1.10} \pm 0.02$ | 5 | ⁸ BEBEK | 87 CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | | | |
|-----|-----------|-----------|----|------------------------|-----|------|-----------------------------------|
| 10 | ± 4 | ± 1 | 8 | ⁹ AKERS | 94J | OPAL | $e^+e^- \rightarrow Z$ |
| 2.7 | ± 1.4 | ± 1.0 | 5 | ¹⁰ ALBRECHT | 87C | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 3.5 | ± 2 | ± 2 | | ¹¹ ALBRECHT | 86F | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 17 | ± 5 | ± 5 | 41 | ¹² GILES | 84 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² AUBERT, BE 06J reports $[\Gamma(B^0 \rightarrow D^*(2010)^-\pi^+)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow D^-\pi^+)] = 0.99 \pm 0.11 \pm 0.08$ which we multiply by our best value $B(B^0 \rightarrow D^-\pi^+) = (2.51 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ Uses a missing-mass method. Does not depend on D branching fractions or B^+/B^0 production rates.

⁴ BRANDENBURG 98 assume equal production of B^+ and B^0 at $\Upsilon(4S)$ and use the D^* reconstruction technique. The first error is their experiment's error and the second error is the systematic error from the PDG 96 value of $B(D^* \rightarrow D\pi)$.

⁵ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2010)^+ \rightarrow D^0\pi^+)$ and absolute $B(D^0 \rightarrow K^-\pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^-\pi^+\pi^0)/B(D^0 \rightarrow K^-\pi^+)$ and $B(D^0 \rightarrow K^-2\pi^+\pi^-)/B(D^0 \rightarrow K^-\pi^+)$.

⁶ BORTOLETTO 92 reports $(4.0 \pm 1.0 \pm 0.7) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^-\pi^+)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0\pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0\pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0\pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

⁷ ALBRECHT 90J reports $(2.8 \pm 0.9 \pm 0.6) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^-\pi^+)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0\pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0\pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0\pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

⁸ BEBEK 87 reports $(2.8^{+1.5+1.0}_{-1.2-0.6}) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^-\pi^+)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0\pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0\pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0\pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Updated in BERKELMAN 91 to use same assumptions as noted for BORTOLETTO 92 and ALBRECHT 90J.

⁹ Assumes $B(Z \rightarrow b\bar{b}) = 0.217$ and 38% B_d production fraction.

¹⁰ ALBRECHT 87C use PDG 86 branching ratios for D and $D^*(2010)$ and assume $B(\Upsilon(4S) \rightarrow B^+B^-) = 55\%$ and $B(\Upsilon(4S) \rightarrow B^0\bar{B}^0) = 45\%$. Superseded by ALBRECHT 90J.

¹¹ ALBRECHT 86F uses pseudomass that is independent of D^0 and D^+ branching ratios.

¹² Assumes $B(D^*(2010)^+ \rightarrow D^0\pi^+) = 0.60^{+0.08}_{-0.15}$. Assumes $B(\Upsilon(4S) \rightarrow B^0\bar{B}^0) = 0.40 \pm 0.02$ Does not depend on D branching ratios.

| | | | | |
|--|--------------------|-------------|----------------|------------------------|
| $\Gamma(D^*(2010)^-\ell^+\nu_\ell)/\Gamma(D^*(2010)^-\pi^+)$ | | | | Γ_7/Γ_{45} |
| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> | |
| 16.5\pm2.3\pm1.1 | AALTONEN | 09E | CDF | $p\bar{p}$ at 1.96 TeV |

$\Gamma(\overline{D}^0 K^+ K^-)/\Gamma(\overline{D}^0 \pi^+ \pi^-)$ Γ_{46}/Γ_{44}

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-----------------------------------|
| 0.069 ± 0.004 ± 0.003 | AAIJ | 18AZ | LHCB pp at 7, 8 TeV |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 0.056 ± 0.011 ± 0.007 | AAIJ | 12AMLHCB | pp at 7 TeV, Repl. by AAIJ 18AZ |

 $\Gamma(D^- \pi^+ \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{47}/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|---------------------------|-------------|------------------------------------|
| 0.0060 ± 0.0006 OUR FIT | | | |
| 0.0080 ± 0.0021 ± 0.0014 | ¹ BORTOLETTO92 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D . | | | |

 $\Gamma(D^- \pi^+ \pi^+ \pi^-)/\Gamma(D^- \pi^+)$ Γ_{47}/Γ_{35}

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|----------------------------|--------------------|-------------|--------------------|
| 2.39 ± 0.23 OUR FIT | | | |
| 2.38 ± 0.11 ± 0.21 | AAIJ | 11E | LHCB pp at 7 TeV |

 $\Gamma((D^- \pi^+ \pi^+ \pi^-) \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{48}/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|---------------------------|-------------|------------------------------------|
| 0.0039 ± 0.0014 ± 0.0013 | ¹ BORTOLETTO92 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D . | | | |

 $\Gamma(D^- \pi^+ \rho^0)/\Gamma_{\text{total}}$ Γ_{49}/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|---------------------------|-------------|------------------------------------|
| 0.0011 ± 0.0009 ± 0.0004 | ¹ BORTOLETTO92 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D . | | | |

 $\Gamma(D^- a_1(1260)^+)/\Gamma_{\text{total}}$ Γ_{50}/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|---------------------------|-------------|------------------------------------|
| 0.0060 ± 0.0022 ± 0.0024 | ¹ BORTOLETTO92 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D . | | | |

 $\Gamma(D^*(2010)^- \pi^+ \pi^0)/\Gamma_{\text{total}}$ Γ_{51}/Γ

| <u>VALUE</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|-----------------------|-------------|--|
| 0.0152 ± 0.0052 ± 0.0001 | 51 | ¹ ALBRECHT | 90J | ARG $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.015 ± 0.008 ± 0.008 | 8 | ² ALBRECHT | 87C | ARG $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ ALBRECHT 90J reports $0.018 \pm 0.004 \pm 0.005$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- \pi^+ \pi^0)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0 \pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D . | | | | |
| ² ALBRECHT 87C use PDG 86 branching ratios for D and $D^*(2010)$ and assume $B(\Upsilon(4S) \rightarrow B^+ B^-) = 55\%$ and $B(\Upsilon(4S) \rightarrow B^0 \overline{B}^0) = 45\%$. Superseded by ALBRECHT 90J. | | | | |

| $\Gamma(D^*(2010)^-\rho^+)/\Gamma_{\text{total}}$ | | | | | Γ_{52}/Γ |
|---|------|-----------------------------|------|-----------------------------------|----------------------|
| VALUE (units 10^{-3}) | EVTS | DOCUMENT ID | TECN | COMMENT | |
| 6.8 ± 0.9 OUR AVERAGE | | | | | |
| 6.8 ± 0.3 ± 0.9 | | ^{1,2} CSORNA 03 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| 16.0 ± 11.3 ± 0.1 | | ³ BORTOLETTO92 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| 5.89 ± 3.52 ± 0.04 | 19 | ⁴ ALBRECHT 90J | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| | | ^{2,5} MATVIENKO 15 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| 7.4 ± 1.0 ± 1.4 | 76 | ^{6,7} ALAM 94 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| 81 ± 29 ⁺⁵⁹ / ₋₂₄ | 19 | ⁸ CHEN 85 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ | |

¹ The second error combines the systematic and theoretical uncertainties in quadrature. CSORNA 03 includes data used in ALAM 94. A full angular fit to three complex helicity amplitudes is performed.

² Assumes equal production of B^0 and B^+ at the $\Upsilon(4S)$ resonance.

³ BORTOLETTO 92 reports $0.019 \pm 0.008 \pm 0.011$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^-\rho^+)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0\pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0\pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0\pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

⁴ ALBRECHT 90J reports $0.007 \pm 0.003 \pm 0.003$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^-\rho^+)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0\pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0\pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0\pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

⁵ MATVIENKO 15 reports $B(B^0 \rightarrow D^*(2010)^-\rho^+, \rho^+ \rightarrow \omega\pi^+) = (1.48 \pm 0.27^{+0.15+0.21}_{-0.09-0.56}) \times 10^{-3}$. The last uncertainty is a model one.

⁶ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2010)^+ \rightarrow D^0\pi^+)$ and absolute $B(D^0 \rightarrow K^-\pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^-\pi^+\pi^0)/B(D^0 \rightarrow K^-\pi^+)$ and $B(D^0 \rightarrow K^-\pi^+\pi^-)/B(D^0 \rightarrow K^-\pi^+)$.

⁷ This decay is nearly completely longitudinally polarized, $\Gamma_L/\Gamma = (93 \pm 5 \pm 5)\%$, as expected from the factorization hypothesis (ROSNER 90). The nonresonant $\pi^+\pi^0$ contribution under the ρ^+ is less than 9% at 90% CL.

⁸ Uses $B(D^* \rightarrow D^0\pi^+) = 0.6 \pm 0.15$ and $B(\Upsilon(4S) \rightarrow B^0\bar{B}^0) = 0.4$. Does not depend on D branching ratios.

| $\Gamma(D^*(2010)^-K^+)/\Gamma_{\text{total}}$ | | | | | Γ_{53}/Γ |
|--|--|-------------------------|------|-----------------------------------|----------------------|
| VALUE (units 10^{-4}) | | DOCUMENT ID | TECN | COMMENT | |
| 2.12 ± 0.15 OUR AVERAGE | | | | | |
| 2.12 ± 0.12 ± 0.10 | | ¹ AUBERT 06A | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| 2.0 ± 0.4 ± 0.1 | | ² ABE 01i | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ | |

¹ AUBERT 06A reports $[\Gamma(B^0 \rightarrow D^*(2010)^-K^+)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow D^*(2010)^-\pi^+)] = 0.0776 \pm 0.0034 \pm 0.0029$ which we multiply by our best value $B(B^0 \rightarrow D^*(2010)^-\pi^+) = (2.74 \pm 0.13) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² ABE 01I reports $[\Gamma(B^0 \rightarrow D^*(2010)^- K^+)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow D^*(2010)^- \pi^+)] = 0.074 \pm 0.015 \pm 0.006$ which we multiply by our best value $B(B^0 \rightarrow D^*(2010)^- \pi^+) = (2.74 \pm 0.13) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D^*(2010)^- K^+)/\Gamma(D^*(2010)^- \pi^+)$ Γ_{53}/Γ_{45}

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|-----------|---------------|
| $(7.76 \pm 0.34 \pm 0.26) \times 10^{-2}$ | AAIJ | 13AO LHCB | pp at 7 TeV |

$\Gamma(D^*(2010)^- K^0 \pi^+)/\Gamma_{\text{total}}$ Γ_{54}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------------|----------|------------------------------------|
| $3.0 \pm 0.7 \pm 0.3$ | ¹ AUBERT, BE | 05B BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D^*(2010)^- K^*(892)^+)/\Gamma_{\text{total}}$ Γ_{55}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------|------|---------|
| 3.3 ± 0.6 OUR AVERAGE | | | |

3.2 ± 0.6 ± 0.3 ¹ AUBERT, BE 05B BABR $e^+ e^- \rightarrow \Upsilon(4S)$

3.8 ± 1.3 ± 0.8 ² MAHAPATRA 02 CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and an unpolarized final state.

$\Gamma(D^*(2010)^- K^+ \bar{K}^0)/\Gamma_{\text{total}}$ Γ_{56}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|--------------------------|------|------------------------------------|
| <4.7 | 90 | ¹ DRUTSKOY 02 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D^*(2010)^- K^+ \bar{K}^*(892)^0)/\Gamma_{\text{total}}$ Γ_{57}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|--------------------------|------|------------------------------------|
| 12.9 ± 2.2 ± 2.5 | ¹ DRUTSKOY 02 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D^*(2010)^- \pi^+ \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{58}/Γ

| VALUE (units 10^{-3}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-----|-------------|------|---------|
| 7.21 ± 0.29 OUR AVERAGE | | | | |

7.26 ± 0.11 ± 0.31 ¹ LEES 16H BABR $e^+ e^- \rightarrow \Upsilon(4S)$

6.81 ± 0.23 ± 0.72 ² MAJUMDER 04 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

6.3 ± 1.0 ± 1.1 ^{3,4} ALAM 94 CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$

13.4 ± 3.6 ± 0.1 ⁵ BORTOLETTO92 CLEO $e^+ e^- \rightarrow \Upsilon(4S)$

10.1 ± 4.1 ± 0.1 ⁶ ALBRECHT 90J ARG $e^+ e^- \rightarrow \Upsilon(4S)$

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

33 ± 9 ± 16 ⁷ ALBRECHT 87C ARG $e^+ e^- \rightarrow \Upsilon(4S)$

<42 90 ⁸ BEBEK 87 CLEO $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Assumes $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 0.486 \pm 0.006$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2010)^+ \rightarrow D^0 \pi^+)$ and absolute $B(D^0 \rightarrow K^- \pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^- \pi^+ \pi^0)/B(D^0 \rightarrow K^- \pi^+)$ and $B(D^0 \rightarrow K^- 2\pi^+ \pi^-)/B(D^0 \rightarrow K^- \pi^+)$.

⁴ The three pion mass is required to be between 1.0 and 1.6 GeV consistent with an a_1 meson. (If this channel is dominated by a_1^+ , the branching ratio for $\overline{D}^{*-} a_1^+$ is twice that for $\overline{D}^{*-} \pi^+ \pi^+ \pi^-$.)

⁵ BORTOLETTO 92 reports $0.0159 \pm 0.0028 \pm 0.0037$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- \pi^+ \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0 \pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

⁶ ALBRECHT 90J reports $0.012 \pm 0.003 \pm 0.004$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- \pi^+ \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0 \pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

⁷ ALBRECHT 87C use PDG 86 branching ratios for D and $D^*(2010)$ and assume $B(\Upsilon(4S) \rightarrow B^+ B^-) = 55\%$ and $B(\Upsilon(4S) \rightarrow B^0 \overline{B}^0) = 45\%$. Superseded by ALBRECHT 90J.

⁸ BEBEK 87 value has been updated in BERKELMAN 91 to use same assumptions as noted for BORTOLETTO 92.

$\Gamma((D^*(2010)^- \pi^+ \pi^+ \pi^-) \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{59}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|---------------------------|------|------------------------------------|
| 0.0000±0.0019±0.0016 | ¹ BORTOLETTO92 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D and $D^*(2010)$.

$\Gamma(D^*(2010)^- \pi^+ \rho^0)/\Gamma_{\text{total}}$ Γ_{60}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|---------------------------|------|------------------------------------|
| 0.00573±0.00317±0.00004 | ¹ BORTOLETTO92 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ BORTOLETTO 92 reports $0.0068 \pm 0.0032 \pm 0.0021$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- \pi^+ \rho^0)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0 \pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

$\Gamma(D^*(2010)^- a_1(1260)^+)/\Gamma_{\text{total}}$ Γ_{61}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|---------------------------|------|------------------------------------|
| 0.0130±0.0027 OUR AVERAGE | | | |
| 0.0126±0.0020±0.0022 | ^{1,2} ALAM 94 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.0152±0.0070±0.0001 | ³ BORTOLETTO92 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ ALAM 94 value is twice their $\Gamma(D^*(2010)^- \pi^+ \pi^+ \pi^-)/\Gamma_{\text{total}}$ value based on their observation that the three pions are dominantly in the $a_1(1260)$ mass range 1.0 to 1.6 GeV.

² ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2010)^+ \rightarrow D^0 \pi^+)$ and absolute $B(D^0 \rightarrow K^- \pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^- \pi^+ \pi^0)/B(D^0 \rightarrow K^- \pi^+)$ and $B(D^0 \rightarrow K^- 2\pi^+ \pi^-)/B(D^0 \rightarrow K^- \pi^+)$.

³ BORTOLETTO 92 reports $0.018 \pm 0.006 \pm 0.006$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- a_1(1260)^+)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0 \pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

| $\Gamma(\overline{D}_1(2420)^0 \pi^- \pi^+, \overline{D}_1^0 \rightarrow D^{*-} \pi^+)/\Gamma(D^*(2010)^- \pi^+ \pi^+ \pi^-)$ | Γ_{62}/Γ_{58} | | |
|---|---------------------------|------|--------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT |
| $(2.04 \pm 0.42 \pm 0.22) \times 10^{-2}$ | AAIJ | 13AO | LHCB pp at 7 TeV |

| $\Gamma(D^*(2010)^- K^+ \pi^- \pi^+)/\Gamma(D^*(2010)^- \pi^+ \pi^+ \pi^-)$ | Γ_{63}/Γ_{58} | | |
|---|---------------------------|------|--------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT |
| $(6.47 \pm 0.37 \pm 0.35) \times 10^{-2}$ | AAIJ | 13AO | LHCB pp at 7 TeV |

| $\Gamma(D^*(2010)^- \pi^+ \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ | Γ_{64}/Γ | | | |
|---|----------------------|----------------------------|------|------------------------------------|
| VALUE | EVTS | DOCUMENT ID | TECN | COMMENT |
| 0.0176 ± 0.0027 OUR AVERAGE | | | | |
| 0.0172 ± 0.0014 ± 0.0024 | | ¹ ALEXANDER 01B | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.0345 ± 0.0181 ± 0.0003 | 28 | ² ALBRECHT 90J | ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. The signal is consistent with all observed $\omega \pi^+$ having proceeded through the ρ'^+ resonance at mass $1349 \pm 25_{-5}^{+10}$ MeV and width $547 \pm 86_{-45}^{+46}$ MeV.

² ALBRECHT 90J reports $0.041 \pm 0.015 \pm 0.016$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- \pi^+ \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}] \times [B(D^*(2010)^+ \rightarrow D^0 \pi^+)]$ assuming $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 0.57 \pm 0.06$, which we rescale to our best value $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

| $\Gamma(D^{*-} 3\pi^+ 2\pi^-)/\Gamma_{\text{total}}$ | Γ_{65}/Γ | | |
|--|--------------------------|------|------------------------------------|
| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
| 4.72 ± 0.59 ± 0.71 | ¹ MAJUMDER 04 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

| $\Gamma(D^*(2010)^- \omega \pi^+)/\Gamma_{\text{total}}$ | Γ_{66}/Γ | | |
|--|-------------------------------------|------|------------------------------------|
| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
| 2.46 ± 0.18 OUR AVERAGE | Error includes scale factor of 1.2. | | |
| 2.31 ± 0.11 ± 0.14 | ¹ MATVIENKO 15 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 2.88 ± 0.21 ± 0.31 | ¹ AUBERT 06L | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 2.9 ± 0.3 ± 0.4 | ^{1,2} ALEXANDER 01B | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² The signal is consistent with all observed $\omega \pi^+$ having proceeded through the ρ'^+ resonance at mass $1349 \pm 25_{-5}^{+10}$ MeV and width $547 \pm 86_{-45}^{+46}$ MeV.

$\Gamma(\overline{D}_1(2430)^0 \omega, \overline{D}_1^0 \rightarrow D^{*-} \pi^+)/\Gamma_{\text{total}}$ Γ_{67}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

2.7^{+0.8}_{-0.4} OUR AVERAGE

| | | | |
|---|------------------|------|------------------------------------|
| 2.5 ± 0.4 ^{+0.8} _{-0.2} | 1,2 MATVIENKO 15 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---|------------------|------|------------------------------------|

| | | | |
|-----------------|-------------------------|------|------------------------------------|
| 4.1 ± 1.2 ± 1.1 | ³ AUBERT 06L | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------|-------------------------|------|------------------------------------|

¹ Assumes equal production of B^+ and B^0 .² The measurement is obtained by amplitude analysis of $B^0 \rightarrow D^{*-} \omega \pi^+$. The second uncertainty combines in quadrature experimental systematic and model uncertainties.³ Obtained by fitting the events with $\cos \theta_{D^*} < 0.5$ and scaling up the result by a factor of 4/3. No interference effects between $B^0 \rightarrow D_1' \omega$ and $D^* \omega \pi$ are assumed. $\Gamma(D^{*-} \rho(1450)^+, \rho^+ \rightarrow \omega \pi^+)/\Gamma_{\text{total}}$ Γ_{68}/Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

| | | | |
|---|------------------|------|------------------------------------|
| 1.07^{+0.15+0.40}_{-0.31-0.13} | 1,2 MATVIENKO 15 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---|------------------|------|------------------------------------|

¹ Obtained by amplitude analysis of $\overline{B}^0 \rightarrow D^{*-} \omega \pi^+$. The second uncertainty combines in quadrature experimental systematic and model uncertainties.² Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. $\Gamma(\overline{D}_1(2420)^0 \omega, \overline{D}_1^0 \rightarrow D^{*-} \pi^+)/\Gamma_{\text{total}}$ Γ_{69}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

| | | | |
|------------------------|------------------|------|------------------------------------|
| 0.7 ± 0.2 ± 0.1 | 1,2 MATVIENKO 15 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------------------------|------------------|------|------------------------------------|

¹ Obtained by amplitude analysis of $\overline{B}^0 \rightarrow D^{*-} \omega \pi^+$. The second uncertainty combines in quadrature experimental systematic and model uncertainties.² Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. $\Gamma(\overline{D}_2^*(2460)^0 \omega, \overline{D}_2^0 \rightarrow D^{*-} \pi^+)/\Gamma_{\text{total}}$ Γ_{70}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

| | | | |
|------------------------|------------------|------|------------------------------------|
| 0.4 ± 0.1 ± 0.1 | 1,2 MATVIENKO 15 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------------------------|------------------|------|------------------------------------|

¹ Obtained by amplitude analysis of $\overline{B}^0 \rightarrow D^{*-} \omega \pi^+$. The second uncertainty combines in quadrature experimental systematic and model uncertainties.² Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. $\Gamma(D^{*-} b_1(1235)^+, b_1^+ \rightarrow \omega \pi^+)/\Gamma_{\text{total}}$ Γ_{71}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

| | | | | |
|-----------------------------------|----|---------------------------|------|------------------------------------|
| < 0.7 × 10⁻⁴ | 90 | ¹ MATVIENKO 15 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------------------------|----|---------------------------|------|------------------------------------|

¹ Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. $\Gamma(\overline{D}^{*-} \pi^+)/\Gamma_{\text{total}}$ Γ_{72}/Γ D^{*-} represents an excited state with mass $2.2 < M < 2.8$ GeV/c².

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

| | | | |
|------------------------|--------------------|------|------------------------------------|
| 1.9 ± 0.9 ± 0.1 | 1,2 AUBERT, BE 06J | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------------------------|--------------------|------|------------------------------------|

¹ AUBERT, BE 06J reports $[\Gamma(B^0 \rightarrow \overline{D}^{*-} \pi^+)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow D^- \pi^+)] = 0.77 \pm 0.22 \pm 0.29$ which we multiply by our best value $B(B^0 \rightarrow D^- \pi^+) = (2.51 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.² Uses a missing-mass method. Does not depend on D branching fractions or B^+/B^0 production rates.

$$\Gamma(D_1(2420)^- \pi^+, D_1^- \rightarrow D^- \pi^+ \pi^-) / \Gamma_{\text{total}} \quad \Gamma_{73} / \Gamma$$

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------|------|---------|
| $0.99^{+0.20}_{-0.25}$ OUR FIT | | | |

$0.89 \pm 0.15^{+0.17}_{-0.32}$ ¹ ABE 05A BELL $e^+ e^- \rightarrow \gamma(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$$\Gamma(D_1(2420)^- \pi^+, D_1^- \rightarrow D^- \pi^+ \pi^-) / \Gamma(D^- \pi^+ \pi^+ \pi^-) \quad \Gamma_{73} / \Gamma_{47}$$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|---------|
| 1.7 ± 0.4 OUR FIT | | | |

$2.1 \pm 0.5^{+0.3}_{-0.5}$ AAIJ 11E LHCB pp at 7 TeV

$$\Gamma(D_1(2420)^- \pi^+, D_1^- \rightarrow D^{*-} \pi^+ \pi^-) / \Gamma_{\text{total}} \quad \Gamma_{74} / \Gamma$$

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|-----|------------------|----------|----------------------------------|
| < 0.33 | 90 | ¹ ABE | 05A BELL | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$$\Gamma(D^*(2010)^- \pi^+ \pi^+ \pi^-) / \Gamma(D^*(2010)^- \pi^+) \quad \Gamma_{58} / \Gamma_{45}$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------|------|---------------|
| $2.64 \pm 0.04 \pm 0.13$ | AAIJ 13AO | LHCB | pp at 7 TeV |

$$\Gamma(\overline{D}_2^*(2460)^- \pi^+, (D_2^*)^- \rightarrow D^0 \pi^-) / \Gamma_{\text{total}} \quad \Gamma_{75} / \Gamma$$

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------|------|---------|
| 2.38 ± 0.16 OUR AVERAGE | | | | |

$2.44 \pm 0.07 \pm 0.16$ ¹ AAIJ 15Y LHCB pp at 7, 8 TeV

$2.15 \pm 0.17 \pm 0.31$ ^{2,3} KUZMIN 07 BELL $e^+ e^- \rightarrow \gamma(4S)$

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

< 14.7 90 ² ALAM 94 CLE2 $e^+ e^- \rightarrow \gamma(4S)$

¹ Result obtained using the isobar formalism. The second uncertainty combines in quadrature all systematic uncertainties quoted in the paper.

² Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

³ Our second uncertainty combines systematics and model errors quoted in the paper.

$$\Gamma(\overline{D}_0^*(2400)^- \pi^+, (D_0^*)^- \rightarrow D^0 \pi^-) / \Gamma_{\text{total}} \quad \Gamma_{76} / \Gamma$$

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|---------|
| 0.76 ± 0.08 OUR AVERAGE | | | |

$0.77 \pm 0.05 \pm 0.06$ ¹ AAIJ 15Y LHCB pp at 7, 8 TeV

$0.60 \pm 0.13 \pm 0.27$ ^{2,3} KUZMIN 07 BELL $e^+ e^- \rightarrow \gamma(4S)$

¹ Result obtained using the isobar formalism. The second uncertainty combines in quadrature all systematic uncertainties quoted in the paper.

² Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

³ Our second uncertainty combines systematics and model errors quoted in the paper.

$$\Gamma(D_2^*(2460)^- \pi^+, (D_2^*)^- \rightarrow D^{*-} \pi^+ \pi^-) / \Gamma_{\text{total}} \quad \Gamma_{77} / \Gamma$$

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|-----|------------------|----------|----------------------------------|
| < 0.24 | 90 | ¹ ABE | 05A BELL | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(\overline{D}_2^*(2460)^-\rho^+)/\Gamma_{\text{total}}$ Γ_{78}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---------|-----|-------------------|---------|-----------------------------------|
| <0.0049 | 90 | ¹ ALAM | 94 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ ALAM 94 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II absolute $B(D^0 \rightarrow K^-\pi^+)$ and $B(D_2^*(2460)^+ \rightarrow D^0\pi^+) = 30\%$.

 $\Gamma(D^0\overline{D}^0)/\Gamma_{\text{total}}$ Γ_{79}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------|-----------|---------------|
| 0.14±0.06±0.03 | | ¹ AAIJ | 13AP LHCB | pp at 7 TeV |

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

| | | | | |
|-------|----|---------------------|---------|-----------------------------------|
| <0.43 | 90 | ² ADACHI | 08 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-------|----|---------------------|---------|-----------------------------------|

| | | | | |
|------|----|-----------------------|----------|-----------------------------------|
| <0.6 | 90 | ² AUBERT,B | 06A BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
|------|----|-----------------------|----------|-----------------------------------|

¹ Uses $B(B^0 \rightarrow D^-D^+) = (2.11 \pm 0.31) \times 10^{-4}$ and $B(B^+ \rightarrow \overline{D}^0D_s^+) = (10.1 \pm 1.7) \times 10^{-3}$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^{*0}\overline{D}^0)/\Gamma_{\text{total}}$ Γ_{80}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-----------------------|----------|-----------------------------------|
| <2.9 | 90 | ¹ AUBERT,B | 06A BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^-D^+)/\Gamma_{\text{total}}$ Γ_{81}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|-----------------------|----------|-----------------------------------|
| 2.11±0.18 OUR AVERAGE | | | | |
| 2.12±0.16±0.18 | | ¹ ROHRKEN | 12 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.97±0.20±0.20 | | ¹ FRATINA | 07 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.8 ±0.4 ±0.5 | | ¹ AUBERT,B | 06A BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|----------------|--|-----------------------|---------|---------------------|
| 1.91±0.51±0.30 | | ¹ MAJUMDER | 05 BELL | Repl. by FRATINA 07 |
|----------------|--|-----------------------|---------|---------------------|

| | | | | |
|-------|----|----------------------|---------|-----------------------------------|
| < 9.4 | 90 | ¹ LIPELES | 00 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-------|----|----------------------|---------|-----------------------------------|

| | | | | |
|-----|----|--------|----------|------------------------|
| <59 | 90 | BARATE | 98Q ALEP | $e^+e^- \rightarrow Z$ |
|-----|----|--------|----------|------------------------|

| | | | | |
|-----|----|-------|---------|-----------------------------------|
| <12 | 90 | ASNER | 97 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----|----|-------|---------|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^\pm D^{*\mp} (CP\text{-averaged}))/\Gamma_{\text{total}}$ Γ_{82}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|----------------------|---------|-----------------------------------|
| 6.14±0.29±0.50 | ¹ ROHRKEN | 12 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^-D_s^+)/\Gamma_{\text{total}}$ Γ_{83}/Γ

| VALUE | EVTS | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|------|---------------------------|----------|-----------------------------------|
| 0.0072±0.0008 OUR AVERAGE | | | | |
| 0.0073±0.0004±0.0007 | | ¹ ZUPANC | 07 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.0066±0.0014±0.0006 | | ² AUBERT | 06N BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.0068±0.0024±0.0006 | | ³ GIBAUT | 96 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.010 ±0.009 ±0.001 | | ⁴ ALBRECHT | 92G ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.0053±0.0030±0.0005 | | ⁵ BORTOLETTO92 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

- 0.012 ± 0.007 3 ⁶ BORTOLETTO90 CLEO $e^+e^- \rightarrow \Upsilon(4S)$
- ¹ ZUPANC 07 reports $(7.5 \pm 0.2 \pm 1.1) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = (4.4 \pm 0.6) \times 10^{-2}$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ² AUBERT 06N reports $(0.64 \pm 0.13 \pm 0.10) \times 10^{-2}$ from a measurement of $[\Gamma(B^0 \rightarrow D^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.0462 \pm 0.0062$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ³ GIBAUT 96 reports $0.0087 \pm 0.0024 \pm 0.0020$ from a measurement of $[\Gamma(B^0 \rightarrow D^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.035$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ⁴ ALBRECHT 92G reports $0.017 \pm 0.013 \pm 0.006$ from a measurement of $[\Gamma(B^0 \rightarrow D^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes PDG 1990 D^+ branching ratios, e.g., $B(D^+ \rightarrow K^- 2\pi^+) = 7.7 \pm 1.0\%$.
- ⁵ BORTOLETTO 92 reports $0.0080 \pm 0.0045 \pm 0.0030$ from a measurement of $[\Gamma(B^0 \rightarrow D^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.030 \pm 0.011$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .
- ⁶ BORTOLETTO 90 assume $B(D_s \rightarrow \phi\pi^+) = 2\%$. Superseded by BORTOLETTO 92.

$\Gamma(D^*(2010)^- D_s^+)/\Gamma_{\text{total}}$ Γ_{84}/Γ

| <u>VALUE</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|------------------------------------|-------------|---------------------------|-------------|-----------------------------------|
| 0.0080 ± 0.0011 OUR AVERAGE | | | | |
| 0.0073 ± 0.0013 ± 0.0007 | | ¹ AUBERT 06N | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.0083 ± 0.0015 ± 0.0007 | | ² AUBERT 03I | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.0088 ± 0.0017 ± 0.0008 | | ³ AHMED 00B | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.008 ± 0.006 ± 0.001 | | ⁴ ALBRECHT 92G | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.011 ± 0.006 ± 0.001 | | ⁵ BORTOLETTO92 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--------------------------|---|---------------------------|------|-----------------------------------|
| 0.0072 ± 0.0022 ± 0.0006 | | ⁶ GIBAUT 96 | CLE2 | Repl. by AHMED 00B |
| 0.024 ± 0.014 | 3 | ⁷ BORTOLETTO90 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AUBERT 06N reports $(0.71 \pm 0.13 \pm 0.09) \times 10^{-2}$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.0462 \pm 0.0062$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

- ² AUBERT 03I reports $0.0103 \pm 0.0014 \pm 0.0013$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ³ AHMED 00B reports $0.0110 \pm 0.0018 \pm 0.0011$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ⁴ ALBRECHT 92G reports $0.014 \pm 0.010 \pm 0.003$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes PDG 1990 D^+ and $D^*(2010)^+$ branching ratios, e.g., $B(D^0 \rightarrow K^- \pi^+) = 3.71 \pm 0.25\%$, $B(D^+ \rightarrow K^- 2\pi^+) = 7.1 \pm 1.0\%$, and $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 55 \pm 4\%$.
- ⁵ BORTOLETTO 92 reports $0.016 \pm 0.009 \pm 0.006$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.030 \pm 0.011$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D and $D^*(2010)$.
- ⁶ GIBAUT 96 reports $0.0093 \pm 0.0023 \pm 0.0016$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.035$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ⁷ BORTOLETTO 90 assume $B(D_s \rightarrow \phi\pi^+) = 2\%$. Superseded by BORTOLETTO 92.

| $\Gamma(D^- D_s^{*+})/\Gamma_{\text{total}}$ | | | | Γ_{85}/Γ |
|--|-------------|----------|------------------------------------|----------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT | |
| 0.0074 ± 0.0016 OUR AVERAGE | | | | |
| 0.0071 ± 0.0016 ± 0.0006 | 1 AUBERT | 06N BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ | |
| 0.0078 ± 0.0032 ± 0.0007 | 2 GIBAUT | 96 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ | |
| 0.016 ± 0.012 ± 0.001 | 3 ALBRECHT | 92G ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ | |

- ¹ AUBERT 06N reports $(0.69 \pm 0.16 \pm 0.09) \times 10^{-2}$ from a measurement of $[\Gamma(B^0 \rightarrow D^- D_s^{*+})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.0462 \pm 0.0062$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ² GIBAUT 96 reports $0.0100 \pm 0.0035 \pm 0.0022$ from a measurement of $[\Gamma(B^0 \rightarrow D^- D_s^{*+})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.035$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ ALBRECHT 92G reports $0.027 \pm 0.017 \pm 0.009$ from a measurement of $[\Gamma(B^0 \rightarrow D^- D_s^{*+})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes PDG 1990 D^+ branching ratios, e.g., $B(D^+ \rightarrow K^- 2\pi^+) = 7.7 \pm 1.0\%$.

| $\Gamma(D^*(2010)^- D_s^{*+})/\Gamma_{\text{total}}$ | Γ_{86}/Γ | | | |
|--|----------------------|------|---------|--|
| VALUE | DOCUMENT ID | TECN | COMMENT | |

0.0177 ± 0.0014 OUR AVERAGE

| | | | | |
|--------------------------|-----------------------|-----|------|-----------------------------------|
| 0.0173 ± 0.0018 ± 0.0015 | ¹ AUBERT | 06N | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.0188 ± 0.0009 ± 0.0017 | ² AUBERT | 05V | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.0158 ± 0.0027 ± 0.0014 | ³ AUBERT | 03I | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.015 ± 0.004 ± 0.001 | ⁴ AHMED | 00B | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.016 ± 0.009 ± 0.001 | ⁵ ALBRECHT | 92G | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-----------------------|---------------------|----|------|--------------------|
| 0.016 ± 0.005 ± 0.001 | ⁶ GIBAUT | 96 | CLE2 | Repl. by AHMED 00B |
|-----------------------|---------------------|----|------|--------------------|

¹ AUBERT 06N reports $(1.68 \pm 0.21 \pm 0.19) \times 10^{-2}$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^{*+})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.0462 \pm 0.0062$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² A partial reconstruction technique is used and the result is independent of the particle decay rate of D_s^+ meson. It also provides a model-independent determination of $B(D_s^+ \rightarrow \phi\pi^+) = (4.81 \pm 0.52 \pm 0.38)\%$.

³ AUBERT 03I reports $0.0197 \pm 0.0015 \pm 0.0030$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^{*+})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ AHMED 00B reports $0.0182 \pm 0.0037 \pm 0.0025$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^{*+})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁵ ALBRECHT 92G reports $0.026 \pm 0.014 \pm 0.006$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^{*+})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes PDG 1990 D^+ and $D^*(2010)^+$ branching ratios, e.g., $B(D^0 \rightarrow K^- \pi^+) = 3.71 \pm 0.25\%$, $B(D^+ \rightarrow K^- 2\pi^+) = 7.1 \pm 1.0\%$, and $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 55 \pm 4\%$.

⁶ GIBAUT 96 reports $0.0203 \pm 0.0050 \pm 0.0036$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^{*+})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.035$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D^*(2010)^- D_s^{*+})/\Gamma(D^*(2010)^- D_s^+)$ Γ_{86}/Γ_{84}

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------------|--------------------|-------------|----------------|
| 2.19±0.08±0.02 | ¹ AAIJ | 21S LHCb | pp at 13 TeV |

¹ AAIJ 21S reports $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^{*+})/\Gamma(B^0 \rightarrow D^*(2010)^- D_s^+)] \times [B(D_s^{*+} \rightarrow D_s^+ \gamma)] = 2.045 \pm 0.022 \pm 0.071$ which we divide by our best value $B(D_s^{*+} \rightarrow D_s^+ \gamma) = (93.5 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$[\Gamma(D^*(2010)^- D_s^+) + \Gamma(D^*(2010)^- D_s^{*+})]/\Gamma_{\text{total}}$ $(\Gamma_{84} + \Gamma_{86})/\Gamma$

| <u>VALUE (units 10^{-2})</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|--------------------|-------------|----------------|
| 2.5 ± 0.4 OUR AVERAGE | | | | |

2.40±0.35±0.22 ¹ AUBERT 03l BABR $e^+e^- \rightarrow \Upsilon(4S)$

3.3 ± 0.9 ± 0.3 22 ² BORTOLETTO90 CLEO $e^+e^- \rightarrow \Upsilon(4S)$

¹ AUBERT 03l reports $(3.00 \pm 0.19 \pm 0.39) \times 10^{-2}$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^+) + \Gamma(B^0 \rightarrow D^*(2010)^- D_s^{*+})]/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² BORTOLETTO 90 reports $(7.5 \pm 2.0) \times 10^{-2}$ from a measurement of $[\Gamma(B^0 \rightarrow D^*(2010)^- D_s^+) + \Gamma(B^0 \rightarrow D^*(2010)^- D_s^{*+})]/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.02$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_{s0}(2317)^- K^+, D_{s0}^- \rightarrow D_s^- \pi^0)/\Gamma_{\text{total}}$ Γ_{87}/Γ

| <u>VALUE (units 10^{-5})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------------|-------------|-----------------------------------|
| 4.2^{+1.4}_{-1.3}±0.4 | ¹ DRUTSKOY 05 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ DRUTSKOY 05 reports $(5.3^{+1.5}_{-1.3} \pm 1.6) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow D_{s0}(2317)^- K^+, D_{s0}^- \rightarrow D_s^- \pi^0)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.036 \pm 0.009$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_{s0}(2317)^- \pi^+, D_{s0}^- \rightarrow D_s^- \pi^0)/\Gamma_{\text{total}}$ Γ_{88}/Γ

| <u>VALUE (units 10^{-5})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|--------------------------|-------------|-----------------------------------|
| <2.5 | 90 | ¹ DRUTSKOY 05 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D_{sJ}(2457)^- K^+, D_{sJ}^- \rightarrow D_s^- \pi^0)/\Gamma_{\text{total}}$ Γ_{89}/Γ

| <u>VALUE (units 10^{-5})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|--------------------------|-------------|-----------------------------------|
| <0.94 | 90 | ¹ DRUTSKOY 05 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D_{sJ}(2457)^- \pi^+, D_{sJ}^- \rightarrow D_s^- \pi^0)/\Gamma_{\text{total}}$ Γ_{90}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|--------------------------|------|------------------------------------|
| <0.40 | 90 | ¹ DRUTSKOY 05 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D_s^- D_s^+)/\Gamma_{\text{total}}$ Γ_{91}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-----|------------------------|------|------------------------------------|
| < 3.6 × 10⁻⁵ | 90 | ¹ ZUPANC 07 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|------------------------|----|----------------------------|------|------------------------------------|
| <10 × 10 ⁻⁵ | 90 | ¹ AUBERT,BE 05F | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------------------------|----|----------------------------|------|------------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D_s^{*-} D_s^+)/\Gamma_{\text{total}}$ Γ_{92}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|----------------------------|------|------------------------------------|
| <1.3 × 10⁻⁴ | 90 | ¹ AUBERT,BE 05F | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D_s^{*-} D_s^{*+})/\Gamma_{\text{total}}$ Γ_{93}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|----------------------------|------|------------------------------------|
| <2.4 × 10⁻⁴ | 90 | ¹ AUBERT,BE 05F | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D_{s0}^*(2317)^+ D^-, D_{s0}^{*+} \rightarrow D_s^+ \pi^0)/\Gamma_{\text{total}}$ Γ_{94}/Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------------------------------|------|---------|
| 1.06 ± 0.16 OUR AVERAGE | Error includes scale factor of 1.1. | | |

| | | | |
|---|-------------------------|------|------------------------------------|
| 0.99 ^{+0.16} _{-0.15} ± 0.03 | ^{1,2} CHOI 15A | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---|-------------------------|------|------------------------------------|

| | | | |
|---|-----------------------------|------|------------------------------------|
| 1.4 ^{+0.5} _{-0.4} ± 0.1 | ^{2,3} AUBERT,B 04S | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---|-----------------------------|------|------------------------------------|

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

| | | | |
|---|-----------------------------|------|-------------------|
| 0.69 ^{+0.29} _{-0.24} ± 0.06 | ^{2,4} KROKOVNY 03B | BELL | Repl. by CHOI 15A |
|---|-----------------------------|------|-------------------|

¹ CHOI 15A reports $(10.2^{+1.3}_{-1.2} \pm 1.0 \pm 0.4) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow D_{s0}^*(2317)^+ D^-, D_{s0}^{*+} \rightarrow D_s^+ \pi^0)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow K^+ K^- \pi^+)] \times [B(D^+ \rightarrow K^- 2\pi^+)]$ assuming $B(D_s^+ \rightarrow K^+ K^- \pi^+) = (5.39 \pm 0.21) \times 10^{-2}$, $B(D^+ \rightarrow K^- 2\pi^+) = (9.13 \pm 0.19) \times 10^{-2}$, which we rescale to our best values $B(D_s^+ \rightarrow K^+ K^- \pi^+) = (5.38 \pm 0.10) \times 10^{-2}$, $B(D^+ \rightarrow K^- 2\pi^+) = (9.38 \pm 0.16) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ AUBERT,B 04S reports $(1.8 \pm 0.4^{+0.7}_{-0.5}) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_{s0}^*(2317)^+ D^-, D_{s0}^{*+} \rightarrow D_s^+ \pi^0)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.036 \pm 0.009$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ KROKOVNY 03B reports $(0.86_{-0.26}^{+0.33} \pm 0.26) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_{s0}^*(2317)^+ D^-, D_{s0}^{*+} \rightarrow D_s^+ \pi^0)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.036 \pm 0.009$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_{s0}(2317)^+ D^-, D_{s0}^+ \rightarrow D_s^{*+} \gamma)/\Gamma_{\text{total}}$ Γ_{95}/Γ

| VALUE (units 10^{-3}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------------|------|------------------------------------|
| <0.95 | 90 | ¹ KROKOVNY 03B | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D_{s0}(2317)^+ D^*(2010)^-, D_{s0}^+ \rightarrow D_s^+ \pi^0)/\Gamma_{\text{total}}$ Γ_{96}/Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------------|------|------------------------------------|
| $1.5 \pm 0.4_{-0.4}^{+0.5}$ | ¹ AUBERT,B 04s | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D_{sJ}(2457)^+ D^-)/\Gamma_{\text{total}}$ Γ_{97}/Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------------|------|------------------------------------|
| 3.5 ± 1.1 OUR AVERAGE | | | |
| $2.6 \pm 1.5 \pm 0.7$ | ¹ AUBERT 06N | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $4.8_{-1.6}^{+2.2} \pm 1.1$ | ^{2,3} AUBERT,B 04s | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $3.9_{-1.3}^{+1.5} \pm 0.9$ | ^{2,4} KROKOVNY 03B | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses a missing-mass method in the events that one of the B mesons is fully reconstructed.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ AUBERT,B 04s reports $[\Gamma(B^0 \rightarrow D_{sJ}(2457)^+ D^-)/\Gamma_{\text{total}}] \times [B(D_{s1}(2460)^+ \rightarrow D_s^{*+} \pi^0)] = (2.3_{-0.7}^{+1.0} \pm 0.3) \times 10^{-3}$ which we divide by our best value $B(D_{s1}(2460)^+ \rightarrow D_s^{*+} \pi^0) = (48 \pm 11) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ KROKOVNY 03B reports $[\Gamma(B^0 \rightarrow D_{sJ}(2457)^+ D^-)/\Gamma_{\text{total}}] \times [B(D_{s1}(2460)^+ \rightarrow D_s^{*+} \pi^0)] = (1.9_{-0.6}^{+0.7} \pm 0.2) \times 10^{-3}$ which we divide by our best value $B(D_{s1}(2460)^+ \rightarrow D_s^{*+} \pi^0) = (48 \pm 11) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^+ \gamma)/\Gamma_{\text{total}}$ Γ_{98}/Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--|-----------------------------|------|------------------------------------|
| $0.65_{-0.14}^{+0.17}$ OUR AVERAGE | | | |
| $0.64_{-0.16}^{+0.24} \pm 0.06$ | ^{1,2} AUBERT,B 04s | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.66_{-0.19}^{+0.21} \pm 0.06$ | ^{1,3} KROKOVNY 03B | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² AUBERT,B 04s reports $(0.8 \pm 0.2_{-0.2}^{+0.3}) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^+ \gamma)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) =$

$\phi\pi^+$) = 0.036 ± 0.009 , which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ KROKOVNY 03B reports $(0.82_{-0.19}^{+0.22} \pm 0.25) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^+ \gamma)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.036 \pm 0.009$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^{*+} \gamma)/\Gamma_{\text{total}}$ Γ_{99}/Γ

| <u>VALUE (units 10^{-3})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|---------------------------|-------------|----------------------------------|
| <0.60 | 90 | ¹ KROKOVNY 03B | BELL | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^+ \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{100}/Γ

| <u>VALUE (units 10^{-3})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|---------------------------|-------------|----------------------------------|
| <0.20 | 90 | ¹ KROKOVNY 03B | BELL | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(D_{sJ}(2457)^+ D^-, D_{sJ}^+ \rightarrow D_s^+ \pi^0)/\Gamma_{\text{total}}$ Γ_{101}/Γ

| <u>VALUE (units 10^{-3})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|---------------------------|-------------|----------------------------------|
| <0.36 | 90 | ¹ KROKOVNY 03B | BELL | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(D^*(2010)^- D_{sJ}(2457)^+)/\Gamma_{\text{total}}$ Γ_{102}/Γ

| <u>VALUE (units 10^{-3})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-----------------------------|-------------|----------------------------------|
| 9.3±2.2 OUR AVERAGE | | | |
| 8.8±2.0±1.4 | ¹ AUBERT 06N | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| 11 $^{+5}_{-4}$ ±3 | ^{2,3} AUBERT,B 04s | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Uses a missing-mass method in the events that one of the B mesons is fully reconstructed.

² AUBERT,B 04s reports $[\Gamma(B^0 \rightarrow D^*(2010)^- D_{sJ}(2457)^+)/\Gamma_{\text{total}}] \times [B(D_{s1}(2460)^+ \rightarrow D_s^{*+} \pi^0)] = (5.5 \pm 1.2_{-1.6}^{+2.2}) \times 10^{-3}$ which we divide by our best value $B(D_{s1}(2460)^+ \rightarrow D_s^{*+} \pi^0) = (48 \pm 11) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(D_{sJ}(2457)^+ D^*(2010), D_{sJ}^+ \rightarrow D_s^+ \gamma)/\Gamma_{\text{total}}$ Γ_{103}/Γ

| <u>VALUE (units 10^{-3})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------------|-------------|----------------------------------|
| 2.3±0.3$^{+0.9}_{-0.6}$ | ¹ AUBERT,B 04s | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$$\frac{[\Gamma(D^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*0} K^+) + \Gamma(D^{*+} K^0)]/\Gamma_{\text{total}}}{\Gamma_{104}/\Gamma = (\Gamma_{105} + \Gamma_{106})/\Gamma}$$

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------|------|----------------------------------|
| $2.75 \pm 0.62 \pm 0.36$ | 1,2 AUSHEV 11 | BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| ¹ Uses $\Gamma(D^*(2007)^0 \rightarrow D^0 \pi^0) / \Gamma(D^*(2007)^0 \rightarrow D^0 \gamma) = 1.74 \pm 0.13$ and $\Gamma(D_{s1}(2536)^+ \rightarrow D^*(2007)^0 K^+) / \Gamma(D_{s1}(2536)^+ \rightarrow D^*(2010)^+ K^0) = 1.36 \pm 0.2$. | | | |
| ² Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. | | | |

$$\Gamma(D^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*0} K^+)/\Gamma_{\text{total}} \quad \Gamma_{105}/\Gamma$$

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|--------------|------|----------------------------------|
| $1.71 \pm 0.48 \pm 0.32$ | | 1 AUBERT 08B | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| <5 | 90 | AUBERT 03X | BABR | Repl. by AUBERT 08B |
| ¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. | | | | |

$$\Gamma(D^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*+} K^0)/\Gamma_{\text{total}} \quad \Gamma_{106}/\Gamma$$

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--|--------------|------|----------------------------------|
| $2.61 \pm 1.03 \pm 0.31$ | 1 AUBERT 08B | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. | | | |

$$\frac{[\Gamma(D^*(2010)^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*0} K^+) + \Gamma(D^{*+} K^0)]/\Gamma_{\text{total}}}{\Gamma_{107}/\Gamma = (\Gamma_{108} + \Gamma_{109})/\Gamma}$$

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------|------|----------------------------------|
| $5.01 \pm 1.21 \pm 0.70$ | 1,2 AUSHEV 11 | BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| ¹ Uses $\Gamma(D^*(2007)^0 \rightarrow D^0 \pi^0) / \Gamma(D^*(2007)^0 \rightarrow D^0 \gamma) = 1.74 \pm 0.13$ and $\Gamma(D_{s1}(2536)^+ \rightarrow D^*(2007)^0 K^+) / \Gamma(D_{s1}(2536)^+ \rightarrow D^*(2010)^+ K^0) = 1.36 \pm 0.2$. | | | |
| ² Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. | | | |

$$\Gamma(D^*(2010)^- D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*0} K^+)/\Gamma_{\text{total}} \quad \Gamma_{108}/\Gamma$$

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|--------------|------|----------------------------------|
| $3.32 \pm 0.88 \pm 0.66$ | | 1 AUBERT 08B | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| <7 | 90 | AUBERT 03X | BABR | Repl. by AUBERT 08B |
| ¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. | | | | |

$$\Gamma(D^{*-} D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*+} K^0)/\Gamma_{\text{total}} \quad \Gamma_{109}/\Gamma$$

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--|--------------|------|----------------------------------|
| $5.00 \pm 1.51 \pm 0.67$ | 1 AUBERT 08B | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. | | | |

$$\Gamma(D^- D_{sJ}(2573)^+, D_{sJ}^+ \rightarrow D^0 K^+)/\Gamma_{\text{total}} \quad \Gamma_{110}/\Gamma$$

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------|------|----------------------------------|
| $3.4 \pm 1.7 \pm 0.5$ | | 1 LEES 15C | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| <10 | 90 | AUBERT 03X | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. | | | | |

$\Gamma(D^*(2010)^- D_{sJ}(2573)^+, D_{sJ}^+ \rightarrow D^0 K^+)/\Gamma_{\text{total}}$ Γ_{111}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---|
| <2 | 90 | AUBERT | 03X | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

$\Gamma(D^- D_{sJ}(2700)^+, D_{sJ}^+ \rightarrow D^0 K^+)/\Gamma_{\text{total}}$ Γ_{112}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|------|---|
| 7.14±0.96±0.69 | ¹ LEES | 15c | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{113}/Γ

| VALUE (units 10^{-7}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|--------------------|------|---|
| 7.3±1.2±0.2 | ^{1,2} DAS | 10 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ DAS 10 reports $[\Gamma(B^0 \rightarrow D^+ \pi^-)/\Gamma_{\text{total}}] / [\Gamma(B^0 \rightarrow D^- \pi^+)] = (2.92 \pm 0.38 \pm 0.31) \times 10^{-4}$ which we multiply by our best value $B(B^0 \rightarrow D^- \pi^+) = (2.51 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Derived using $\tan(\theta_C) f_D/f_{D_s} \sqrt{B(B^0 \rightarrow D_s^+ \pi^-)/B(B^0 \rightarrow D^- \pi^+)}$ by assuming the flavor SU(3) symmetry, where θ_C is the Cabibbo angle, f_D (f_{D_s}) is the D (D_s) meson decay constant.

$\Gamma(D_s^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{114}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|---------------------------|------|---|
| 20.3±1.8 OUR FIT | | | | |
| 21.6±2.6 OUR AVERAGE | | | | |
| 19.9±2.6±1.8 | | ¹ DAS | 10 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 25 ±4 ±2 | | ¹ AUBERT | 08AJ | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 14.0±3.5±1.3 | | ² AUBERT | 07K | BABR Repl. by AUBERT 08AJ |
| 25 ±9 ±2 | | ³ AUBERT | 03D | BABR Repl. by AUBERT 07K |
| 19 $\begin{smallmatrix} +9 \\ -7 \end{smallmatrix}$ ±2 | | ⁴ KROKOVNY | 02 | BELL Repl. by DAS 10 |
| < 220 | 90 | ⁵ ALEXANDER | 93B | CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <1300 | 90 | ⁶ BORTOLETTO90 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² AUBERT 07K reports $[\Gamma(B^0 \rightarrow D_s^+ \pi^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)] = (0.63 \pm 0.15 \pm 0.05) \times 10^{-6}$ which we divide by our best value $B(D_s^+ \rightarrow \phi \pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ AUBERT 03D reports $[\Gamma(B^0 \rightarrow D_s^+ \pi^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)] = (1.13 \pm 0.33 \pm 0.21) \times 10^{-6}$ which we divide by our best value $B(D_s^+ \rightarrow \phi \pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ KROKOVNY 02 reports $[\Gamma(B^0 \rightarrow D_s^+ \pi^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)] = (0.86_{-0.30}^{+0.37} \pm 0.11) \times 10^{-6}$ which we divide by our best value $B(D_s^+ \rightarrow \phi \pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁵ ALEXANDER 93B reports $< 270 \times 10^{-6}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^+ \pi^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.037$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$.

⁶ BORTOLETTO 90 assume $B(D_s \rightarrow \phi \pi^+) = 2\%$.

$$\frac{[\Gamma(D_s^+ \pi^-) + \Gamma(D_s^- K^+)]/\Gamma_{\text{total}}}{(\Gamma_{114} + \Gamma_{124})/\Gamma}$$

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|---------------------------|------|------------------------------------|
| $< 1.0 \times 10^{-3}$ | 90 | ¹ ALBRECHT 93E | ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 93E reports $< 1.7 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^+ \pi^-) + \Gamma(B^0 \rightarrow D_s^- K^+)]/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$.

$$\frac{\Gamma(D_s^+ \pi^-)/\Gamma(D^- \pi^+)}{\Gamma_{114}/\Gamma_{35}}$$

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|----------|----------------------|
| 8.1 ± 0.7 OUR FIT | | | |
| $7.7 \pm 0.7 \pm 0.6$ | AAIJ | 21W LHCb | pp at 7, 8, 13 TeV |

$$\frac{\Gamma(D_s^{*+} \pi^-)/\Gamma_{\text{total}}}{\Gamma_{115}/\Gamma}$$

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------------------------|------|------------------------------------|
| 2.1 ± 0.4 OUR AVERAGE | | Error includes scale factor of 1.4. | | |
| $1.75 \pm 0.34 \pm 0.20$ | | ¹ JOSHI 10 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $2.6^{+0.5}_{-0.4} \pm 0.2$ | | ¹ AUBERT 08AJ | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-----------------------|----|----------------------------|------|------------------------------------|
| $2.9 \pm 0.7 \pm 0.3$ | | ² AUBERT 07K | BABR | Repl. by AUBERT 08AJ |
| < 4.1 | 90 | AUBERT 03D | BABR | Repl. by AUBERT 07K |
| < 40 | 90 | ³ ALEXANDER 93B | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² AUBERT 07K reports $[\Gamma(B^0 \rightarrow D_s^{*+} \pi^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)] = (1.32 \pm 0.27 \pm 0.15) \times 10^{-6}$ which we divide by our best value $B(D_s^+ \rightarrow \phi \pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ ALEXANDER 93B reports $< 44 \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*+} \pi^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.037$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$.

$$\frac{[\Gamma(D_s^{*+} \pi^-) + \Gamma(D_s^{*-} K^+)]/\Gamma_{\text{total}}}{(\Gamma_{115} + \Gamma_{125})/\Gamma}$$

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|---------------------------|------|------------------------------------|
| $< 7 \times 10^{-4}$ | 90 | ¹ ALBRECHT 93E | ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 93E reports $< 1.2 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*+} \pi^-) + \Gamma(B^0 \rightarrow D_s^{*-} K^+)]/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$.

$\Gamma(D_s^+ \rho^-)/\Gamma_{\text{total}}$ Γ_{116}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|------------------------|-----------|------------------------------------|
| < 2.4 | 90 | ¹ AUBERT | 08AJ BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| <130 | 90 | ² ALBRECHT | 93E ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 50 | 90 | ³ ALEXANDER | 93B CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² ALBRECHT 93E reports $< 2.2 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^+ \rho^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$.³ ALEXANDER 93B reports $< 6.6 \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^+ \rho^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.037$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$. $\Gamma(D_s^{*+} \rho^-)/\Gamma_{\text{total}}$ Γ_{117}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|------------------------|-----------|------------------------------------|
| $4.1^{+1.3}_{-1.2} \pm 0.4$ | | ¹ AUBERT | 08AJ BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| <150 | 90 | ² ALBRECHT | 93E ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 60 | 90 | ³ ALEXANDER | 93B CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² ALBRECHT 93E reports $< 2.5 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*+} \rho^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$.³ ALEXANDER 93B reports $< 7.4 \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*+} \rho^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.037$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$. $\Gamma(D_s^+ a_0^-)/\Gamma_{\text{total}}$ Γ_{118}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|----------|------------------------------------|
| <1.9 | 90 | ¹ AUBERT | 06X BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(D_s^{*+} a_0^-)/\Gamma_{\text{total}}$ Γ_{119}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|----------|------------------------------------|
| <3.6 | 90 | ¹ AUBERT | 06X BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(D_s^+ a_1(1260)^-)/\Gamma_{\text{total}} \quad \Gamma_{120}/\Gamma$$

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|---------------------------|------|-----------------------------------|
| $<2.1 \times 10^{-3}$ | 90 | ¹ ALBRECHT 93E | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 93E reports $< 3.5 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^+ a_1(1260)^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

$$\Gamma(D_s^{*+} a_1(1260)^-)/\Gamma_{\text{total}} \quad \Gamma_{121}/\Gamma$$

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|---------------------------|------|-----------------------------------|
| $<1.7 \times 10^{-3}$ | 90 | ¹ ALBRECHT 93E | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 93E reports $< 2.9 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*+} a_1(1260)^-)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

$$\Gamma(D_s^+ a_2^-)/\Gamma_{\text{total}} \quad \Gamma_{122}/\Gamma$$

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------------|------|-----------------------------------|
| <19 | 90 | ¹ AUBERT 06X | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(D_s^{*+} a_2^-)/\Gamma_{\text{total}} \quad \Gamma_{123}/\Gamma$$

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------------|------|-----------------------------------|
| <20 | 90 | ¹ AUBERT 06X | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(D_s^- K^+)/\Gamma_{\text{total}} \quad \Gamma_{124}/\Gamma$$

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------------------------|------|-----------------------------------|
| 27 ± 5 OUR FIT | | Error includes scale factor of 2.7. | | |
| 22 ± 5 OUR AVERAGE | | Error includes scale factor of 1.8. | | |
| 19.1 ± 2.4 ± 1.7 | | ¹ DAS 10 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 29 ± 4 ± 2 | | ¹ AUBERT 08AJ | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 27 ± 5 ± 2 | | ² AUBERT 07K | BABR | Repl. by AUBERT 08AJ |
| 26 ± 10 ± 2 | | ³ AUBERT 03D | BABR | Repl. by AUBERT 07K |
| 36 $\begin{smallmatrix} +11 \\ -10 \end{smallmatrix}$ ± 3 | | ⁴ KROKOVNY 02 | BELL | Repl. by DAS 10 |
| < 190 | 90 | ⁵ ALEXANDER 93B | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <1300 | 90 | ⁶ BORTOLETTO90 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² AUBERT 07K reports $[\Gamma(B^0 \rightarrow D_s^- K^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)] = (1.21 \pm 0.17 \pm 0.11) \times 10^{-6}$ which we divide by our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ AUBERT 03D reports $[\Gamma(B^0 \rightarrow D_s^- K^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)] = (1.16 \pm 0.36 \pm 0.24) \times 10^{-6}$ which we divide by our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$.

Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ KROKOVNY 02 reports $[\Gamma(B^0 \rightarrow D_s^- K^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)] = (1.61^{+0.45}_{-0.38} \pm 0.21) \times 10^{-6}$ which we divide by our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁵ ALEXANDER 93B reports $< 230 \times 10^{-6}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^- K^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.037$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

⁶ BORTOLETTO 90 assume $B(D_s \rightarrow \phi\pi^+) = 2\%$.

$\Gamma(D_s^{*-} K^+)/\Gamma_{\text{total}}$ Γ_{125}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|------------------------|-----------|-----------------------------------|
| 2.19±0.30 OUR AVERAGE | | | | |
| 2.02±0.33±0.22 | | ¹ JOSHI | 10 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.4 ±0.4 ±0.2 | | ¹ AUBERT | 08AJ BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 2.2 ±0.6 ±0.2 | | ² AUBERT | 07K BABR | Repl. by AUBERT 08AJ |
| < 2.5 | 90 | AUBERT | 03D BABR | Repl. by AUBERT 07K |
| <14 | 90 | ³ ALEXANDER | 93B CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² AUBERT 07K reports $[\Gamma(B^0 \rightarrow D_s^{*-} K^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)] = (0.97 \pm 0.24 \pm 0.12) \times 10^{-6}$ which we divide by our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ ALEXANDER 93B reports $< 17 \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*-} K^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.037$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

$\Gamma(D_s^- K^+)/\Gamma(D^- \pi^+)$ Γ_{124}/Γ_{35}

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------|-----------|------------------|
| 1.09±0.19 OUR FIT Error includes scale factor of 2.7. | | | |
| 1.29±0.05±0.08 | AAIJ | 15AC LHCB | pp at 7, 8 TeV |

$\Gamma(D_s^- K^*(892)^+)/\Gamma_{\text{total}}$ Γ_{126}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|---------------------|-----------|-----------------------------------|
| 3.5^{+1.0}_{-0.9}±0.4 | | ¹ AUBERT | 08AJ BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|------|----|------------------------|----------|-----------------------------------|
| <280 | 90 | ² ALBRECHT | 93E ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 80 | 90 | ³ ALEXANDER | 93B CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ALBRECHT 93E reports $< 4.6 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^- K^*(892)^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

³ ALEXANDER 93B reports $< 9.7 \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^- K^*(892)^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.037$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

$\Gamma(D_s^{*-} K^*(892)^+)/\Gamma_{\text{total}}$ Γ_{127}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|---------------------|-----------|-----------------------------------|
| $3.2^{+1.4}_{-1.2} \pm 0.4$ | | ¹ AUBERT | 08AJ BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---------|----|------------------------|----------|-----------------------------------|
| < 350 | 90 | ² ALBRECHT | 93E ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 90 | 90 | ³ ALEXANDER | 93B CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ALBRECHT 93E reports $< 5.8 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*-} K^*(892)^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

³ ALEXANDER 93B reports $< 11.0 \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*-} K^*(892)^+)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.037$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

$\Gamma(D_s^- \pi^+ K^0)/\Gamma_{\text{total}}$ Γ_{128}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|----------------------------|----------|-----------------------------------|
| 0.97 ± 0.14 OUR AVERAGE | | | | |
| $0.94 \pm 0.12 \pm 0.10$ | | ¹ WIEHCZYN...15 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $1.10 \pm 0.26 \pm 0.20$ | | ¹ AUBERT | 08G BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--------|----|-----------------------|---------|-----------------------------------|
| < 40 | 90 | ² ALBRECHT | 93E ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------|----|-----------------------|---------|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ALBRECHT 93E reports $< 7.3 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^- \pi^+ K^0)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

$\Gamma(D_s^{*-} \pi^+ K^0)/\Gamma_{\text{total}}$ Γ_{129}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|-----|---------------------|----------|-----------------------------------|
| < 1.10 | 90 | ¹ AUBERT | 08G BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--------|----|-----------------------|---------|-----------------------------------|
| < 25 | 90 | ² ALBRECHT | 93E ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------|----|-----------------------|---------|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ALBRECHT 93E reports $< 4.2 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*-} \pi^+ K^0)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)]$ assuming $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 4.5 \times 10^{-2}$.

$\Gamma(D_s^- K^+ \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{130}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------------|-----------|---------------|
| $1.71 \pm 0.31 \pm 0.34$ | ¹ AAIJ | 12AX LHCb | pp at 7 TeV |

¹ AAIJ 12AX reports $[\Gamma(B^0 \rightarrow D_s^- K^+ \pi^+ \pi^-)/\Gamma_{\text{total}}] / [B(B_s^0 \rightarrow D_s^- K^+ \pi^+ \pi^-)] = 0.54 \pm 0.07 \pm 0.07$ which we multiply by our best value $B(B_s^0 \rightarrow D_s^- K^+ \pi^+ \pi^-) = (3.2 \pm 0.6) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(D_s^- \pi^+ K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{131}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|---------|----------------------------------|
| $< 3.0 \times 10^{-3}$ | 90 | ¹ ALBRECHT | 93E ARG | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ ALBRECHT 93E reports $< 5.0 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^- \pi^+ K^*(892)^0)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$.

 $\Gamma(D_s^{*-} \pi^+ K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{132}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|---------|----------------------------------|
| $< 1.6 \times 10^{-3}$ | 90 | ¹ ALBRECHT | 93E ARG | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ ALBRECHT 93E reports $< 2.7 \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^{*-} \pi^+ K^*(892)^0)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = 0.027$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = 4.5 \times 10^{-2}$.

 $\Gamma(\bar{D}^0 K^0)/\Gamma_{\text{total}}$ Γ_{133}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|---------|
| 5.2 ± 0.7 OUR AVERAGE | | | |

$5.3 \pm 0.7 \pm 0.3$ ¹ AUBERT,B 06L BABR $e^+ e^- \rightarrow \gamma(4S)$

$5.0^{+1.3}_{-1.2} \pm 0.6$ ¹ KROKOVNY 03 BELL $e^+ e^- \rightarrow \gamma(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

 $\Gamma(\bar{D}^0 K^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{134}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|-------------------------------------|---------------------|----------|----------------------------------|
| $88 \pm 15 \pm 9$ | ¹ AUBERT | 06A BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

 $\Gamma(\bar{D}^0 K^+ \pi^-)/\Gamma(\bar{D}^0 \pi^+ \pi^-)$ Γ_{134}/Γ_{44}

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|-----------|---------------|
| $0.106 \pm 0.007 \pm 0.008$ | AAIJ | 13AQ LHCb | pp at 7 TeV |

 $\Gamma(\bar{D}^0 K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{135}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|---------|
| 4.5 ± 0.6 OUR AVERAGE | | | |

$5.4 \pm 0.3 \pm 1.1$ ^{1,2} AAIJ 15X LHCb pp at 7, 8 TeV

$4.0 \pm 0.7 \pm 0.3$ ³ AUBERT,B 06L BABR $e^+ e^- \rightarrow \gamma(4S)$

$4.8^{+1.1}_{-1.0} \pm 0.5$ ³ KROKOVNY 03 BELL $e^+ e^- \rightarrow \gamma(4S)$

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

- 5.7 ± 0.9 ± 0.6 ³ AUBERT 06A BABR Repl. by AUBERT,B 06L
¹ AAIJ 15X reports $(5.13 \pm 0.20 \pm 0.15 \pm 0.24 \pm 0.60) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{D}^0 K^*(892)^0)/\Gamma_{\text{total}}] \times [B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-)]$ assuming $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (9.2 \pm 0.6 \pm 0.7 \pm 0.6) \times 10^{-5}$, which we rescale to our best value $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (8.8 \pm 1.7) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
² Measured via amplitude analysis of $B^0 \rightarrow \bar{D}^0 K^+ \pi^-$, which excludes contribution from decay via $D^*(2010)^-$ resonance.
³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\bar{D}^0 K^*(1410)^0)/\Gamma_{\text{total}}$ Γ_{136}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|-------------------|----------|------------------|
| <6.7 × 10⁻⁵ | 90 | ¹ AAIJ | 15X LHCB | pp at 7, 8 TeV |

¹ Measured via amplitude analysis of $B^0 \rightarrow \bar{D}^0 K^+ \pi^-$, which excludes contribution from decay via $D^*(2010)^-$ resonance.

$\Gamma(\bar{D}^0 K_0^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{137}/Γ

| VALUE (units 10 ⁻⁵) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|---------------------|----------|------------------|
| 0.7 ± 0.7 ± 0.1 | ^{1,2} AAIJ | 15X LHCB | pp at 7, 8 TeV |

¹ AAIJ 15X reports $(0.71 \pm 0.27 \pm 0.33 \pm 0.47 \pm 0.08) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{D}^0 K_0^*(1430)^0)/\Gamma_{\text{total}}] \times [B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-)]$ assuming $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (9.2 \pm 0.6 \pm 0.7 \pm 0.6) \times 10^{-5}$, which we rescale to our best value $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (8.8 \pm 1.7) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
² Measured via amplitude analysis of $B^0 \rightarrow \bar{D}^0 K^+ \pi^-$, which excludes contribution from decay via $D^*(2010)^-$ resonance.

$\Gamma(\bar{D}^0 K_2^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{138}/Γ

| VALUE (units 10 ⁻⁵) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|---------------------|----------|------------------|
| 2.1 ± 0.8 ± 0.4 | ^{1,2} AAIJ | 15X LHCB | pp at 7, 8 TeV |

¹ AAIJ 15X reports $(2.04 \pm 0.45 \pm 0.30 \pm 0.54 \pm 0.25) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{D}^0 K_2^*(1430)^0)/\Gamma_{\text{total}}] \times [B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-)]$ assuming $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (9.2 \pm 0.6 \pm 0.7 \pm 0.6) \times 10^{-5}$, which we rescale to our best value $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (8.8 \pm 1.7) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
² Measured via amplitude analysis of $B^0 \rightarrow \bar{D}^0 K^+ \pi^-$, which excludes contribution from decay via $D^*(2010)^-$ resonance.

$\Gamma(D_0^*(2300)^- K^+, D_0^{*-} \rightarrow \bar{D}^0 \pi^-)/\Gamma_{\text{total}}$ Γ_{139}/Γ

| VALUE (units 10 ⁻⁵) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|---------------------|----------|------------------|
| 1.9 ± 0.8 ± 0.4 | ^{1,2} AAIJ | 15X LHCB | pp at 7, 8 TeV |

¹ AAIJ 15X reports $(1.77 \pm 0.26 \pm 0.19 \pm 0.67 \pm 0.20) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow D_0^*(2300)^- K^+, D_0^{*-} \rightarrow \bar{D}^0 \pi^-)/\Gamma_{\text{total}}] \times [B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-)]$ assuming $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (9.2 \pm 0.6 \pm 0.7 \pm 0.6) \times 10^{-5}$, which we rescale to our best value $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (8.8 \pm 1.7) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
² Measured via amplitude analysis of $B^0 \rightarrow \bar{D}^0 K^+ \pi^-$, which excludes contribution from decay via $D^*(2010)^-$ resonance.

$\Gamma(D_2^*(2460)^- K^+, D_2^{*-} \rightarrow \bar{D}^0 \pi^-) / \Gamma_{\text{total}}$ Γ_{140} / Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|---------------------|------|---|
| 20.3 ± 3.5 OUR AVERAGE | | | |
| 22 ± 2 ± 4 | ^{1,2} AAIJ | 15X | LHCB pp at 7, 8 TeV |
| 18.3 ± 4.0 ± 3.1 | ³ AUBERT | 06A | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ AAIJ 15X reports $(2.12 \pm 0.10 \pm 0.11 \pm 0.11 \pm 0.25) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow D_2^*(2460)^- K^+, D_2^{*-} \rightarrow \bar{D}^0 \pi^-) / \Gamma_{\text{total}}] \times [B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-)]$ assuming $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (9.2 \pm 0.6 \pm 0.7 \pm 0.6) \times 10^{-5}$, which we rescale to our best value $B(B^0 \rightarrow \bar{D}^0 K^+ \pi^-) = (8.8 \pm 1.7) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Measured via amplitude analysis of $B^0 \rightarrow \bar{D}^0 K^+ \pi^-$, which excludes contribution from decay via $D^*(2010)^-$ resonance.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D_3^*(2760)^- K^+, D_3^{*-} \rightarrow \bar{D}^0 \pi^-) / \Gamma_{\text{total}}$ Γ_{141} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------------|-----|-------------------|------|-----------------------|
| < 0.10 × 10⁻⁵ | 90 | ¹ AAIJ | 15X | LHCB pp at 7, 8 TeV |

¹ Measured via amplitude analysis of $B^0 \rightarrow \bar{D}^0 K^+ \pi^-$, which excludes contribution from decay via $D^*(2010)^-$ resonance.

 $\Gamma(\bar{D}^0 K^+ \pi^- \text{ nonresonant}) / \Gamma_{\text{total}}$ Γ_{142} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|------|---|
| < 37 | 90 | ¹ AUBERT | 06A | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma([K^+ K^-]_D K^*(892)^0) / \Gamma(\bar{D}^0 K^*(892)^0)$ $\Gamma_{143} / \Gamma_{135}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|------|---------------------------|
| 0.92 ± 0.10 ± 0.02 | AAIJ | 19N | LHCB pp at 7, 8, 13 TeV |

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

1.05^{+0.17}_{-0.15} ± 0.04 AAIJ 14BN LHCB Repl. by AAIJ 16S

1.36^{+0.37}_{-0.32} ± 0.07 AAIJ 13L LHCB Repl. by AAIJ 14BN

 $\Gamma([\pi^+ \pi^-]_D K^*(892)^0) / \Gamma(\bar{D}^0 K^*(892)^0)$ $\Gamma_{144} / \Gamma_{135}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|------|---------------------------|
| 1.32 ± 0.19 ± 0.03 | AAIJ | 19N | LHCB pp at 7, 8, 13 TeV |

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

1.21^{+0.28}_{-0.25} ± 0.05 AAIJ 14BN LHCB Repl. by AAIJ 16S

 $\Gamma([\pi^+ K^-]_D K^*(892)^0) / \Gamma([K^+ \pi^-]_D K^*(892)^0)$ $\Gamma_{145} / \Gamma_{146}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------|------|---------------------------|
| 0.080 ± 0.015 ± 0.002 | AAIJ | 19N | LHCB pp at 7, 8, 13 TeV |

 $\Gamma([\pi^+ \pi^- \pi^+ \pi^-]_D K^*(892)^0) / \Gamma(\bar{D}^0 K^*(892)^0)$ $\Gamma_{147} / \Gamma_{135}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|------|---------------------------|
| 1.01 ± 0.16 ± 0.04 | AAIJ | 19N | LHCB pp at 7, 8, 13 TeV |

$$\Gamma([\pi^+ K^- \pi^+ \pi^-]_D K^{*0})/\Gamma([K^+ \pi^- \pi^+ \pi^-]_D K^{*0}) \quad \Gamma_{148}/\Gamma_{149}$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------------------------|
| 0.073±0.018±0.002 | AAIJ | 19N | LHCB pp at 7, 8, 13 TeV |

$$\Gamma(\overline{D}^0 \pi^0)/\Gamma_{\text{total}} \quad \Gamma_{150}/\Gamma$$

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|-------------|------|---------|
| 2.63±0.14 OUR AVERAGE | | | | |

| | | | | |
|---|----|---------------------|-----|--|
| 2.69±0.09±0.13 | | ¹ LEES | 11M | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.25±0.14±0.35 | | ¹ BLYTH | 06 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.74 ^{+0.36} _{-0.32} ±0.55 | | ¹ COAN | 02 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 2.9 ±0.2 ±0.3 | | ¹ AUBERT | 04B | BABR Repl. by LEES 11M |
| 3.1 ±0.4 ±0.5 | | ¹ ABE | 02J | BELL Repl. by BLYTH 06 |
| <1.2 | 90 | ² NEMAT1 | 98 | CLE2 Repl. by COAN 02 |
| <4.8 | 90 | ³ ALAM | 94 | CLE2 Repl. by NEMAT1 98 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² NEMAT1 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

³ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II absolute $B(D^0 \rightarrow K^- \pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^- \pi^+ \pi^0)/B(D^0 \rightarrow K^- \pi^+)$ and $B(D^0 \rightarrow K^- 2\pi^+ \pi^-)/B(D^0 \rightarrow K^- \pi^+)$.

$$\Gamma(\overline{D}^0 \rho^0)/\Gamma_{\text{total}} \quad \Gamma_{151}/\Gamma$$

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|-------------|------|---------|
| 3.21±0.21 OUR AVERAGE | | | | |

| | | | | |
|---|----|---------------------------|------|--|
| 3.21±0.10±0.21 | | ¹ AAIJ | 15Y | LHCB pp at 7, 8 TeV |
| 3.19±0.20±0.45 | | ^{2,3} KUZMIN | 07 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 2.9 ±1.0 ±0.4 | | ² SATPATHY | 03 | BELL Repl. by KUZMIN 07 |
| < 3.9 | 90 | ⁴ NEMAT1 | 98 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 5.5 | 90 | ⁵ ALAM | 94 | CLE2 Repl. by NEMAT1 98 |
| < 6.0 | 90 | ⁶ BORTOLETTO92 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <27.0 | 90 | ⁷ ALBRECHT | 88K | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Measured using isobar formalism in the decay chain $B^0 \rightarrow \overline{D}^0 \rho(770)$, $\rho \rightarrow \pi^+ \pi^-$ assuming $B(\rho(770) \rightarrow \pi^+ \pi^-) = 1$. The second uncertainty combines in quadrature all systematic uncertainties quoted in the paper.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ Our second uncertainty combines systematics and model errors quoted in the paper.

⁴ NEMAT1 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

⁵ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II absolute $B(D^0 \rightarrow K^- \pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^- \pi^+ \pi^0)/B(D^0 \rightarrow K^- \pi^+)$ and $B(D^0 \rightarrow K^- 2\pi^+ \pi^-)/B(D^0 \rightarrow K^- \pi^+)$.

⁶ BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D .

⁷ ALBRECHT 88K reports < 0.003 assuming $B^0 \overline{B}^0 : B^+ B^-$ production ratio is 45:55. We rescale to 50%.

$\Gamma(\overline{D}^0 f_2)/\Gamma_{\text{total}}$ Γ_{152}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-----------------------|------|--|
| 1.56 ± 0.21 OUR AVERAGE | | | |
| 1.68 ± 0.11 ± 0.21 | ¹ AAIJ | 15Y | LHCB pp at 7, 8 TeV |
| 1.20 ± 0.18 ± 0.38 | ^{2,3} KUZMIN | 07 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Result obtained using the isobar formalism. The second uncertainty combines in quadrature all systematic uncertainties quoted in the paper. Measured in the decay chain $B^0 \rightarrow \overline{D}^0 f_2(1270)$, $f_2 \rightarrow \pi^+\pi^-$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ Our second uncertainty combines systematics and model errors quoted in the paper.

 $\Gamma(\overline{D}^0 \eta)/\Gamma_{\text{total}}$ Γ_{153}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------------------------|------|--|
| 2.36 ± 0.32 OUR AVERAGE | | Error includes scale factor of 2.5. | | |
| 2.53 ± 0.09 ± 0.11 | | ¹ LEES | 11M | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.77 ± 0.16 ± 0.21 | | ¹ BLYTH | 06 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 2.5 ± 0.2 ± 0.3 | | ¹ AUBERT | 04B | BABR Repl. by LEES 11M |
| 1.4 ^{+0.5} ± 0.3 -0.4 | | ¹ ABE | 02J | BELL Repl. by BLYTH 06 |
| <1.3 | 90 | ² NEMAT1 | 98 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| <6.8 | 90 | ³ ALAM | 94 | CLE2 Repl. by NEMAT1 98 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² NEMAT1 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

³ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II absolute $B(D^0 \rightarrow K^- \pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^- \pi^+ \pi^0)/B(D^0 \rightarrow K^- \pi^+)$ and $B(D^0 \rightarrow K^- 2\pi^+ \pi^-)/B(D^0 \rightarrow K^- \pi^+)$.

 $\Gamma(\overline{D}^0 \eta')/\Gamma_{\text{total}}$ Γ_{154}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------------------------|------|--|
| 1.38 ± 0.16 OUR AVERAGE | | Error includes scale factor of 1.3. | | |
| 1.48 ± 0.13 ± 0.07 | | ¹ LEES | 11M | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.14 ± 0.20 ^{+0.10} -0.13 | | ¹ SCHUMANN | 05 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 1.7 ± 0.4 ± 0.2 | | ¹ AUBERT | 04B | BABR Repl. by LEES 11M |
| <9.4 | 90 | ² NEMAT1 | 98 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| <8.6 | 90 | ³ ALAM | 94 | CLE2 Repl. by NEMAT1 98 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² NEMAT1 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

³ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II absolute $B(D^0 \rightarrow K^- \pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^- \pi^+ \pi^0)/B(D^0 \rightarrow K^- \pi^+)$ and $B(D^0 \rightarrow K^- 2\pi^+ \pi^-)/B(D^0 \rightarrow K^- \pi^+)$.

$\Gamma(\overline{D}^0 \eta')/\Gamma(\overline{D}^0 \eta)$ $\Gamma_{154}/\Gamma_{153}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-----------------------------------|
| 0.54±0.07±0.01 | LEES | 11M BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 0.7 ±0.2 ±0.1 | AUBERT | 04B BABR | Repl. by LEES 11M |

 $\Gamma(\overline{D}^0 \omega)/\Gamma_{\text{total}}$ Γ_{155}/Γ

| <u>VALUE (units 10⁻⁴)</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|---------------------|-------------|-----------------------------------|
| 2.54±0.16 OUR AVERAGE | | | | |
| 2.75±0.72±0.35 | | ¹ AAIJ | 15Y LHCB | pp at 7, 8 TeV |
| 2.57±0.11±0.14 | | ² LEES | 11M BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.37±0.23±0.28 | | ² BLYTH | 06 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 3.0 ±0.3 ±0.4 | | ² AUBERT | 04B BABR | Repl. by LEES 11M |
| 1.8 ±0.5 ^{+0.4} _{-0.3} | | ² ABE | 02J BELL | Repl. by BLYTH 06 |
| <5.1 | 90 | ³ NEMAT1 | 98 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <6.3 | 90 | ⁴ ALAM | 94 CLE2 | Repl. by NEMAT1 98 |

¹ Result obtained using the isobar model. The second uncertainty combines in quadrature all systematic uncertainties quoted in the paper.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ NEMAT1 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

⁴ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II absolute $B(D^0 \rightarrow K^- \pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^- \pi^+ \pi^0)/B(D^0 \rightarrow K^- \pi^+)$ and $B(D^0 \rightarrow K^- 2\pi^+ \pi^-)/B(D^0 \rightarrow K^- \pi^+)$.

 $\Gamma(D^0 \phi)/\Gamma_{\text{total}}$ Γ_{156}/Γ

| <u>VALUE</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|------------|---------------------|-------------|-----------------------------------|
| < 2.3 × 10⁻⁶ | 95 | AAIJ | 18AY LHCB | pp at 7 and 8 TeV |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| <11.6 × 10 ⁻⁶ | 90 | ¹ AUBERT | 07A0 BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | | |

 $\Gamma(D^0 K^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{157}/Γ

| <u>VALUE (units 10⁻⁶)</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|------------|---------------------|-------------|----------------------|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| <19 | 90 | ¹ AUBERT | 06A BABR | Repl. by AUBERT 09AE |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | | |

 $\Gamma(D^0 K^+ \pi^-)/\Gamma(\overline{D}^0 K^+ \pi^-)$ $\Gamma_{157}/\Gamma_{134}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------------------|-------------|-----------------------------------|
| 0.060±0.034 OUR AVERAGE | | | |
| 0.045 ^{+0.056 +0.028} _{-0.050 -0.018} | ^{1,2} NEGISHI | 12 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.068±0.042 | ³ AUBERT | 09AE BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$.

² Uses $D^0 \rightarrow K^- \pi^+$ mode. Restricts $K^+ \pi^-$ mass within ± 50 MeV of the nominal K^{*0} mass. Corresponds to the upper limit, < 0.16 at 95% CL.

³ Reports a signal at the level of 2.5 standard deviations after combining results from $D^0 \rightarrow K^+ \pi^-$, $K^+ \pi^- \pi^0$, and $K^+ \pi^- \pi^+ \pi^-$.

$\Gamma(D^0 K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{158}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

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

| | | | | |
|------|----|-----------------------|-----|--|
| <1.1 | 90 | ¹ AUBERT,B | 06L | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|------|----|-----------------------|-----|--|

| | | | | |
|------|----|-----------------------|----|--|
| <1.8 | 90 | ¹ KROKOVNY | 03 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
|------|----|-----------------------|----|--|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^0 K^*(892)^0)/\Gamma(\overline{D}^0 K^*(892)^0)$ $\Gamma_{158}/\Gamma_{135}$

"OUR EVALUATION" is derived from $r_{B^0}(B^0 \rightarrow DK^{*0})$ data block listed in "CP violation parameters" section.

| VALUE (units 10^{-2}) | DOCUMENT ID |
|--------------------------|-------------|
|--------------------------|-------------|

$6.6^{+1.1}_{-1.2}$ OUR EVALUATION

 $\Gamma(\overline{D}^{*0}\gamma)/\Gamma_{\text{total}}$ Γ_{159}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

| | | | | |
|------------------------|----|-----------------------|-----|--|
| < 2.5×10^{-5} | 90 | ¹ AUBERT,B | 05Q | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|------------------------|----|-----------------------|-----|--|

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

| | | | | |
|------------------------|----|---------------------|----|--|
| < 5.0×10^{-5} | 90 | ¹ ARTUSO | 00 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
|------------------------|----|---------------------|----|--|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\overline{D}^*(2007)^0\pi^0)/\Gamma_{\text{total}}$ Γ_{160}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

2.2 ± 0.6 OUR AVERAGE Error includes scale factor of 2.6. See the ideogram below.

| | | | | |
|--------------------------|--|-------------------|-----|--|
| $3.05 \pm 0.14 \pm 0.28$ | | ¹ LEES | 11M | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|--|-------------------|-----|--|

| | | | | |
|--------------------------|--|--------------------|----|--|
| $1.39 \pm 0.18 \pm 0.26$ | | ¹ BLYTH | 06 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|--|--------------------|----|--|

| | | | | |
|---------------------------------|--|-------------------|----|--|
| $2.20^{+0.59}_{-0.52} \pm 0.79$ | | ¹ COAN | 02 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
|---------------------------------|--|-------------------|----|--|

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

| | | | | |
|-----------------------|--|---------------------|-----|------------------------|
| $2.9 \pm 0.4 \pm 0.5$ | | ¹ AUBERT | 04B | BABR Repl. by LEES 11M |
|-----------------------|--|---------------------|-----|------------------------|

| | | | | |
|-----------------------------|--|------------------|-----|------------------------|
| $2.7^{+0.8}_{-0.7} \pm 0.5$ | | ¹ ABE | 02J | BELL Repl. by BLYTH 06 |
|-----------------------------|--|------------------|-----|------------------------|

| | | | | |
|------|----|---------------------|----|-----------------------|
| <4.4 | 90 | ² NEMAT1 | 98 | CLE2 Repl. by COAN 02 |
|------|----|---------------------|----|-----------------------|

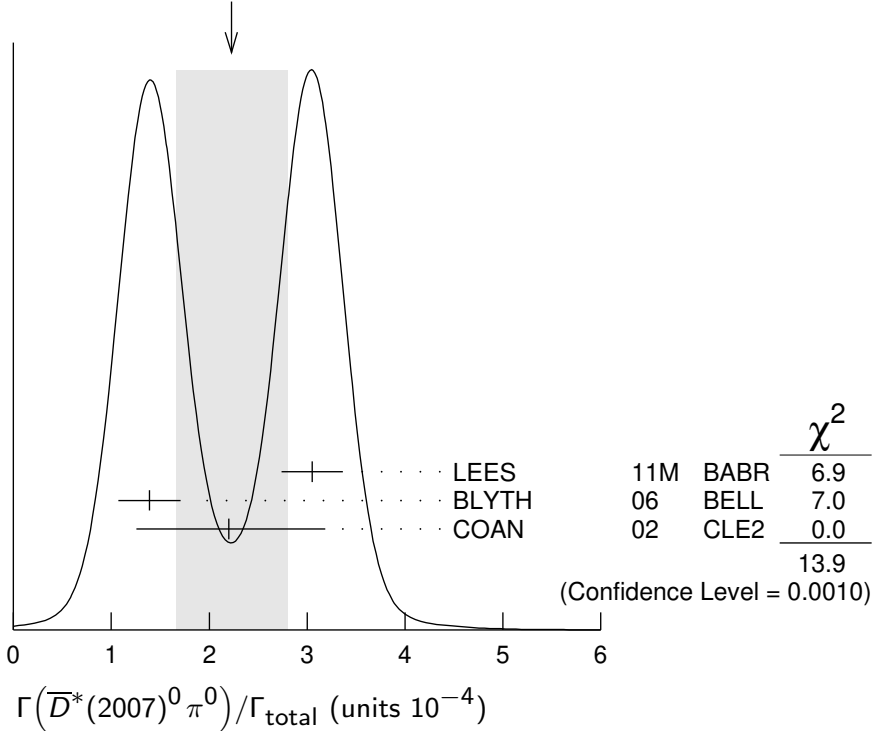
| | | | | |
|------|----|-------------------|----|-------------------------|
| <9.7 | 90 | ³ ALAM | 94 | CLE2 Repl. by NEMAT1 98 |
|------|----|-------------------|----|-------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² NEMAT1 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

³ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2007)^0 \rightarrow D^0\pi^0)$ and absolute $B(D^0 \rightarrow K^-\pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^-\pi^+\pi^0)/B(D^0 \rightarrow K^-\pi^+)$ and $B(D^0 \rightarrow K^-\pi^+\pi^-)/B(D^0 \rightarrow K^-\pi^+)$.

WEIGHTED AVERAGE
2.2±0.6 (Error scaled by 2.6)



$\Gamma(\overline{D}^0 \pi^0) / \Gamma(\overline{D}^*(2007)^0 \pi^0)$

$\Gamma_{150} / \Gamma_{160}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|----------|-----------------------------------|
| 0.90±0.08 OUR AVERAGE | | | |
| 0.88±0.05±0.06 | LEES | 11M BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.62±0.23±0.35 | BLYTH | 06 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ••• We do not use the following data for averages, fits, limits, etc. ••• | | | |
| 1.0 ±0.1 ±0.2 | AUBERT | 04B BABR | Repl. by LEES 11M |

$\Gamma(\overline{D}^*(2007)^0 \rho^0) / \Gamma_{total}$

Γ_{161} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|---------|-----------------------------------|
| <5.1 × 10⁻⁴ | 90 | ¹ SATPATHY | 03 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ••• We do not use the following data for averages, fits, limits, etc. ••• | | | | |
| <0.00056 | 90 | ² NEMAT1 | 98 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <0.00117 | 90 | ³ ALAM | 94 CLE2 | Repl. by NEMAT1 98 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² NEMAT1 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

³ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2007)^0 \rightarrow D^0 \pi^0)$ and absolute $B(D^0 \rightarrow K^- \pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^- \pi^+ \pi^0) / B(D^0 \rightarrow K^- \pi^+)$ and $B(D^0 \rightarrow K^- 2\pi^+ \pi^-) / B(D^0 \rightarrow K^- \pi^+)$.

$\Gamma(\overline{D}^*(2007)^0 \eta) / \Gamma_{total}$

Γ_{162} / Γ

| VALUE (units 10 ⁻⁴) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|-------------------------------------|----------|-----------------------------------|
| 2.3 ±0.6 OUR AVERAGE | | Error includes scale factor of 2.8. | | |
| 2.69±0.14±0.23 | | ¹ LEES | 11M BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.40±0.28±0.26 | | ¹ BLYTH | 06 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-----------------------|----|---------------------|-----|------|-----------------------------------|
| $2.6 \pm 0.4 \pm 0.4$ | | ¹ AUBERT | 04B | BABR | Repl. by LEES 11M |
| <4.6 | 90 | ¹ ABE | 02J | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <2.6 | 90 | ² NEMAT1 | 98 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <6.9 | 90 | ³ ALAM | 94 | CLE2 | Repl. by NEMAT1 98 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² NEMAT1 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

³ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2007)^0 \rightarrow D^0\pi^0)$ and absolute $B(D^0 \rightarrow K^-\pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^-\pi^+\pi^0)/B(D^0 \rightarrow K^-\pi^+)$ and $B(D^0 \rightarrow K^-2\pi^+\pi^-)/B(D^0 \rightarrow K^-\pi^+)$.

$\Gamma(\overline{D^0}\eta)/\Gamma(\overline{D^*}(2007)^0\eta)$ $\Gamma_{153}/\Gamma_{162}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
| 0.99 ± 0.10 OUR AVERAGE | | | |

| | | | | |
|--------------------------|------|-----|------|-----------------------------------|
| $0.97 \pm 0.07 \pm 0.07$ | LEES | 11M | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|------|-----|------|-----------------------------------|

| | | | | |
|--------------------------|-------|----|------|-----------------------------------|
| $1.27 \pm 0.29 \pm 0.25$ | BLYTH | 06 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|-------|----|------|-----------------------------------|

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

| | | | | |
|-----------------------|--------|-----|------|-------------------|
| $0.9 \pm 0.2 \pm 0.1$ | AUBERT | 04B | BABR | Repl. by LEES 11M |
|-----------------------|--------|-----|------|-------------------|

$\Gamma(\overline{D^*}(2007)^0\eta')/\Gamma(\overline{D^*}(2007)^0\eta)$ $\Gamma_{163}/\Gamma_{162}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|--|
| $0.61 \pm 0.14 \pm 0.02$ | LEES | 11M | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-----------------------|--------|-----|------|-------------------|
| $0.5 \pm 0.3 \pm 0.1$ | AUBERT | 04B | BABR | Repl. by LEES 11M |
|-----------------------|--------|-----|------|-------------------|

$\Gamma(\overline{D^*}(2007)^0\eta')/\Gamma_{\text{total}}$ Γ_{163}/Γ

| <u>VALUE (units 10^{-4})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|--------------------|-------------|----------------|
| 1.40 ± 0.22 OUR AVERAGE | | | | |

| | | | | |
|--------------------------|-------------------|-----|------|-----------------------------------|
| $1.48 \pm 0.22 \pm 0.13$ | ¹ LEES | 11M | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|-------------------|-----|------|-----------------------------------|

| | | | | |
|--------------------------|-----------------------|----|------|-----------------------------------|
| $1.21 \pm 0.34 \pm 0.22$ | ¹ SCHUMANN | 05 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|-----------------------|----|------|-----------------------------------|

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

| | | | | |
|-----------------------|-----------------------|-----|------|-------------------|
| $1.3 \pm 0.7 \pm 0.2$ | ^{1,2} AUBERT | 04B | BABR | Repl. by LEES 11M |
|-----------------------|-----------------------|-----|------|-------------------|

| | | | | | |
|-------|----|-------------|----|------|-----------------------------------|
| <14 | 90 | BRANDENB... | 98 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-------|----|-------------|----|------|-----------------------------------|

| | | | | | |
|-------|----|---------------------|----|------|-----------------------------------|
| <19 | 90 | ³ NEMAT1 | 98 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-------|----|---------------------|----|------|-----------------------------------|

| | | | | | |
|-------|----|-------------------|----|------|--------------------|
| <27 | 90 | ⁴ ALAM | 94 | CLE2 | Repl. by NEMAT1 98 |
|-------|----|-------------------|----|------|--------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Reports an upper limit $< 2.6 \times 10^{-4}$ at 90% CL.

³ NEMAT1 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

⁴ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2007)^0 \rightarrow D^0\pi^0)$ and absolute $B(D^0 \rightarrow K^-\pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^-\pi^+\pi^0)/B(D^0 \rightarrow K^-\pi^+)$ and $B(D^0 \rightarrow K^-2\pi^+\pi^-)/B(D^0 \rightarrow K^-\pi^+)$.

$\Gamma(\overline{D^0}\eta')/\Gamma(\overline{D^*}(2007)^0\eta')$ $\Gamma_{154}/\Gamma_{163}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|--|
| $0.96 \pm 0.18 \pm 0.06$ | LEES | 11M | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-----------------------|--------|-----|------|-------------------|
| $1.3 \pm 0.8 \pm 0.2$ | AUBERT | 04B | BABR | Repl. by LEES 11M |
|-----------------------|--------|-----|------|-------------------|

$\Gamma(\bar{D}^*(2007)^0 \pi^+ \pi^-) / \Gamma_{\text{total}}$ Γ_{164} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-----------------|------|------------------------------------|
| $(6.2 \pm 1.2 \pm 1.8) \times 10^{-4}$ | | 1,2 SATPATHY 03 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² No assumption about the intermediate mechanism is made in the analysis.

 $\Gamma(\bar{D}^*(2007)^0 K^0) / \Gamma_{\text{total}}$ Γ_{165} / Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------------|------|------------------------------------|
| $3.6 \pm 1.2 \pm 0.3$ | | ¹ AUBERT,B 06L | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

<6.6 90 ¹ KROKOVNY 03 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\bar{D}^*(2007)^0 K^*(892)^0) / \Gamma_{\text{total}}$ Γ_{166} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------|-----|--------------------------|------|------------------------------------|
| < 6.9×10^{-5} | 90 | ¹ KROKOVNY 03 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^*(2007)^0 K^*(892)^0) / \Gamma_{\text{total}}$ Γ_{167} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------|-----|--------------------------|------|------------------------------------|
| < 4.0×10^{-5} | 90 | ¹ KROKOVNY 03 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^*(2007)^0 \pi^+ \pi^+ \pi^- \pi^-) / \Gamma_{\text{total}}$ Γ_{168} / Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|--------------------------|------|------------------------------------|
| 2.7 ± 0.5 OUR AVERAGE | | | |
| 2.60 ± 0.47 ± 0.37 | ¹ MAJUMDER 04 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 3.0 ± 0.7 ± 0.6 | ¹ EDWARDS 02 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^*(2007)^0 \pi^+ \pi^+ \pi^- \pi^-) / \Gamma(D^*(2010)^- \pi^+ \pi^+ \pi^- \pi^0)$ $\Gamma_{168} / \Gamma_{64}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------------------|------|------------------------------------|
| 0.17 ± 0.04 ± 0.02 | ¹ EDWARDS 02 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^*(2010)^+ D^*(2010)^-) / \Gamma_{\text{total}}$ Γ_{169} / Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-----------------------------|------|------------------------------------|
| 8.0 ± 0.6 OUR AVERAGE | | | | |
| 7.82 ± 0.38 ± 0.63 | | ¹ KRONENBIT...12 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 8.1 ± 0.6 ± 1.0 | | ¹ AUBERT,B 06A | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 9.9 $\begin{smallmatrix} +4.2 \\ -3.3 \end{smallmatrix}$ ± 1.2 | | ¹ LIPELES 00 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|--|----|-----------------------|-----|------|--------------------------|
| 8.1 ±0.8 ±1.1 | | ¹ MIYAKE | 05 | BELL | Repl. by KRONENBITTER 12 |
| 8.3 ±1.6 ±1.2 | | ^{1,2} AUBERT | 02M | BABR | Repl. by AUBERT,B 06B |
| 6.2 ^{+4.0} _{-2.9} ±1.0 | | ³ ARTUSO | 99 | CLE2 | Repl. by LIPELES 00 |
| <61 | 90 | ⁴ BARATE | 98Q | ALEP | $e^+e^- \rightarrow Z$ |
| <22 | 90 | ⁵ ASNER | 97 | CLE2 | Repl. by ARTUSO 99 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² AUBERT 02M also assumes the measured CP -odd fraction of the final states is $0.22 \pm 0.18 \pm 0.03$.

³ ARTUSO 99 uses $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = (48 \pm 4)\%$.

⁴ BARATE 98Q (ALEPH) observes 2 events with an expected background of 0.10 ± 0.03 which corresponds to a branching ratio of $(2.3^{+1.9}_{-1.2} \pm 0.4) \times 10^{-3}$.

⁵ ASNER 97 at CLEO observes 1 event with an expected background of 0.022 ± 0.011 . This corresponds to a branching ratio of $(5.3^{+7.1}_{-3.7} \pm 1.0) \times 10^{-4}$.

$\Gamma(\bar{D}^*(2007)^0 \omega) / \Gamma_{\text{total}}$ Γ_{170} / Γ

| <u>VALUE (units 10^{-4})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|-------------------------------------|-------------|--|
| 3.6 ±1.1 OUR AVERAGE | | Error includes scale factor of 3.1. | | |
| 4.55 ±0.24 ±0.39 | | ¹ LEES | 11M | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.29 ±0.39 ±0.40 | | ¹ BLYTH | 06 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|---------------|----|---------------------|-----|------|-----------------------------------|
| 4.2 ±0.7 ±0.9 | 90 | ¹ AUBERT | 04B | BABR | Repl. by LEES 11M |
| < 7.9 | 90 | ¹ ABE | 02J | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 7.4 | 90 | ² NEMATI | 98 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <21 | 90 | ³ ALAM | 94 | CLE2 | Repl. by NEMATI 98 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² NEMATI 98 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the PDG 96 values for D^0 , D^{*0} , η , η' , and ω branching fractions.

³ ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2007)^0 \rightarrow D^0 \pi^0)$ and absolute $B(D^0 \rightarrow K^- \pi^+)$ and the PDG 1992 $B(D^0 \rightarrow K^- \pi^+ \pi^0) / B(D^0 \rightarrow K^- \pi^+)$ and $B(D^0 \rightarrow K^- 2\pi^+ \pi^-) / B(D^0 \rightarrow K^- \pi^+)$.

$\Gamma(\bar{D}^0 \omega) / \Gamma(\bar{D}^*(2007)^0 \omega)$ $\Gamma_{155} / \Gamma_{170}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-------------------------------|--------------------|-------------|--|
| 0.58 ±0.06 OUR AVERAGE | | | |
| 0.56 ±0.04 ±0.04 | LEES | 11M | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.04 ±0.20 ±0.17 | BLYTH | 06 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---------------|--------|-----|------|-------------------|
| 0.7 ±0.1 ±0.1 | AUBERT | 04B | BABR | Repl. by LEES 11M |
|---------------|--------|-----|------|-------------------|

$\Gamma(D^*(2010)^+ D^-) / \Gamma_{\text{total}}$ Γ_{171} / Γ

| <u>VALUE (units 10^{-4})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|-------------------------------------|-------------|--|
| 6.1 ±1.5 OUR AVERAGE | | Error includes scale factor of 1.6. | | |
| 5.7 ±0.7 ±0.7 | | ¹ AUBERT,B | 06A | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 11.7 ±2.6 ^{+2.2} _{-2.5} | | ^{1,2} ABE | 02Q | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|------------------------------|----|----------------------|-----|------|---------------------------------|
| $8.8 \pm 1.0 \pm 1.3$ | | ¹ AUBERT | 03J | BABR | Repl. by AUBERT,B 06B |
| $14.8 \pm 3.8^{+2.8}_{-3.1}$ | | ^{1,3} ABE | 02Q | BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| < 6.3 | 90 | ¹ LIPELES | 00 | CLE2 | $e^+e^- \rightarrow \gamma(4S)$ |
| <56 | 90 | BARATE | 98Q | ALEP | $e^+e^- \rightarrow Z$ |
| <18 | 90 | ASNER | 97 | CLE2 | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² The measurement is performed using fully reconstructed D^* and D^+ decays.

³ The measurement is performed using a partial reconstruction technique for the D^* and fully reconstructed D^+ decays as a cross check.

$\Gamma(D^*(2007)^0 \bar{D}^*(2007)^0) / \Gamma_{\text{total}}$ Γ_{172} / Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-----------------------|------|--------------------------------------|
| < 0.9 | 90 | ¹ AUBERT,B | 06A | BABR $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|------|----|--------|-----|-----------------------------|
| <270 | 90 | BARATE | 98Q | ALEP $e^+e^- \rightarrow Z$ |
|------|----|--------|-----|-----------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(D^- D^0 K^+) / \Gamma_{\text{total}}$ Γ_{173} / Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------------------------------|------|---------------------------------|
| $1.07 \pm 0.07 \pm 0.09$ | ¹ DEL-AMO-SA..11B | BABR | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-----------------------|---------------------|-----|-----------------------------------|
| $1.7 \pm 0.3 \pm 0.3$ | ¹ AUBERT | 03X | BABR Repl. by DEL-AMO-SANCHEZ 11B |
|-----------------------|---------------------|-----|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(D^- D^*(2007)^0 K^+) / \Gamma_{\text{total}}$ Γ_{174} / Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------------------------------|------|---------------------------------|
| $3.46 \pm 0.18 \pm 0.37$ | ¹ DEL-AMO-SA..11B | BABR | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-----------------------|---------------------|-----|-----------------------------------|
| $4.6 \pm 0.7 \pm 0.7$ | ¹ AUBERT | 03X | BABR Repl. by DEL-AMO-SANCHEZ 11B |
|-----------------------|---------------------|-----|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(D^*(2010)^- D^0 K^+) / \Gamma_{\text{total}}$ Γ_{175} / Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------------------------------|------|---------------------------------|
| $2.47 \pm 0.10 \pm 0.18$ | ¹ DEL-AMO-SA..11B | BABR | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-----------------------------|---------------------|-----|-----------------------------------|
| $3.1^{+0.4}_{-0.3} \pm 0.4$ | ¹ AUBERT | 03X | BABR Repl. by DEL-AMO-SANCHEZ 11B |
|-----------------------------|---------------------|-----|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(D^*(2010)^- D^0 K^+) / \Gamma(D^- D^0 K^+)$ $\Gamma_{175} / \Gamma_{173}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-------------------|------|---------------------------|
| $1.754 \pm 0.028 \pm 0.038$ | ¹ AAIJ | 20AN | LHCB pp at 7, 8, 13 TeV |

¹ Uses $D^+ \rightarrow K^- \pi^+ \pi^+$, $D^0 \rightarrow K^- \pi^+$ and $D^0 \rightarrow K^- \pi^+ \pi^+ \pi^-$ decays.

$\Gamma(D^*(2010)^- D^*(2007)^0 K^+)/\Gamma_{\text{total}}$ Γ_{176}/Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

| | | | |
|---------------------------|------------------------------|------|------------------------------------|
| 10.6 ± 0.33 ± 0.86 | ¹ DEL-AMO-SA..11B | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---------------------------|------------------------------|------|------------------------------------|

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

| | | | |
|------------------|---------------------|-----|-----------------------------------|
| 11.8 ± 1.0 ± 1.7 | ¹ AUBERT | 03X | BABR Repl. by DEL-AMO-SANCHEZ 11B |
|------------------|---------------------|-----|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^- D^+ K^0)/\Gamma_{\text{total}}$ Γ_{177}/Γ

| VALUE (units 10^{-3}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

| | | | | |
|---------------------------|--|------------------------------|------|------------------------------------|
| 0.75 ± 0.12 ± 0.12 | | ¹ DEL-AMO-SA..11B | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---------------------------|--|------------------------------|------|------------------------------------|

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

| | | | | |
|------|----|---------------------|-----|-----------------------------------|
| <1.7 | 90 | ¹ AUBERT | 03X | BABR Repl. by DEL-AMO-SANCHEZ 11B |
|------|----|---------------------|-----|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $[\Gamma(D^*(2010)^- D^+ K^0) + \Gamma(D^- D^*(2010)^+ K^0)]/\Gamma_{\text{total}}$ Γ_{178}/Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

| | | | |
|---------------------------|------------------------------|------|------------------------------------|
| 6.41 ± 0.36 ± 0.39 | ¹ DEL-AMO-SA..11B | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---------------------------|------------------------------|------|------------------------------------|

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

| | | | |
|-----------------|---------------------|-----|-----------------------------------|
| 6.5 ± 1.2 ± 1.0 | ¹ AUBERT | 03X | BABR Repl. by DEL-AMO-SANCHEZ 11B |
|-----------------|---------------------|-----|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^*(2010)^- D^*(2010)^+ K^0)/\Gamma_{\text{total}}$ Γ_{179}/Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

8.1 ± 0.7 OUR AVERAGE

| | | | |
|--------------------|------------------------------|------|------------------------------------|
| 8.26 ± 0.43 ± 0.67 | ¹ DEL-AMO-SA..11B | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--------------------|------------------------------|------|------------------------------------|

| | | | |
|-----------------|------------------------|----|---|
| 6.8 ± 0.8 ± 1.4 | ^{1,2} DALSENO | 07 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------|------------------------|----|---|

| | | | |
|-----------------|-------------------------|-----|---|
| 8.8 ± 0.8 ± 1.4 | ^{1,2} AUBERT,B | 06Q | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------|-------------------------|-----|---|

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

| | | | |
|---|---------------------|-----|----------------------------|
| 8.8 ^{+1.5} _{-1.4} ± 1.3 | ¹ AUBERT | 03X | BABR Repl. by AUBERT,B 06Q |
|---|---------------------|-----|----------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² The result is rescaled by a factor of 2 to convert from K_S^0 to K^0 .

 $\Gamma(D^* D_{s1}(2536)^+, D_{s1}^+ \rightarrow D^{*+} K^0)/\Gamma_{\text{total}}$ Γ_{180}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

8.0 ± 2.4 OUR AVERAGE

| | | | |
|---|------------------------|----|---|
| 7.6 ^{+4.8+1.6} _{-4.2-1.4} | ^{1,2} DALSENO | 07 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---|------------------------|----|---|

| | | | |
|-----------------|-------------------------|-----|---|
| 8.2 ± 2.6 ± 1.2 | ^{1,2} AUBERT,B | 06Q | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------|-------------------------|-----|---|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² The result is rescaled by a factor of 2 to convert from K_S^0 to K^0 .

 $\Gamma(\bar{D}^0 D^0 K^0)/\Gamma_{\text{total}}$ Γ_{181}/Γ

| VALUE (units 10^{-3}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

| | | | | |
|---------------------------|--|------------------------------|------|------------------------------------|
| 0.27 ± 0.10 ± 0.05 | | ¹ DEL-AMO-SA..11B | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---------------------------|--|------------------------------|------|------------------------------------|

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

<1.4 90 ¹ AUBERT 03X BABR Repl. by DEL-AMO-SANCHEZ 11B

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(D^0 \bar{D}^0 K^+ \pi^-) / \Gamma(D^{*-}(2010)^- D^0 K^+) \quad \Gamma_{182} / \Gamma_{175}$$

| VALUE (%) | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|-----------|--------------------------|
| 14.2 ± 1.1 ± 1.0 | ¹ AAIJ | 20AG LHCb | pp at 7, 8, and 13 TeV |
| ¹ AAIJ 20AG excluded contributions from $B^0 \rightarrow D^{*-} D^0 K^+$ transitions with $D^{*-} \rightarrow \bar{D}^0 \pi^-$. | | | |

$$[\Gamma(\bar{D}^0 D^{*}(2007)^0 K^0) + \Gamma(\bar{D}^{*}(2007)^0 D^0 K^0)] / \Gamma_{\text{total}} \quad \Gamma_{183} / \Gamma$$

| VALUE (units 10^{-3}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-----|------------------------------|------|------------------------------------|
| 1.08 ± 0.32 ± 0.36 | | ¹ DEL-AMO-SA..11B | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

<3.7 90 ¹ AUBERT 03X BABR Repl. by DEL-AMO-SANCHEZ 11B

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(\bar{D}^{*}(2007)^0 D^{*}(2007)^0 K^0) / \Gamma_{\text{total}} \quad \Gamma_{184} / \Gamma$$

| VALUE (units 10^{-3}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-----|------------------------------|------|------------------------------------|
| 2.40 ± 0.55 ± 0.67 | | ¹ DEL-AMO-SA..11B | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

<6.6 90 ¹ AUBERT 03X BABR Repl. by DEL-AMO-SANCHEZ 11B

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma((\bar{D} + \bar{D}^*)(D + D^*)K) / \Gamma_{\text{total}} \quad \Gamma_{185} / \Gamma$$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|---------------------------|------------------------------|------|------------------------------------|
| 3.68 ± 0.10 ± 0.24 | ¹ DEL-AMO-SA..11B | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

4.3 ± 0.3 ± 0.6 ¹ AUBERT 03X BABR Repl. by DEL-AMO-SANCHEZ 11B

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(\eta_c K^0) / \Gamma_{\text{total}} \quad \Gamma_{186} / \Gamma$$

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------------------|-----------|------------------------------------|
| 0.80 ± 0.11 OUR AVERAGE | | | |
| 0.71 ^{+0.12} _{-0.10} ± 0.28 | ¹ CHILIKIN | 19 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.58 ^{+0.20} _{-0.18} ± 0.06 ^{+0.06} _{-0.05} | ^{2,3} AUBERT | 07AV BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.89 ± 0.15 ± 0.05 | ^{2,4} AUBERT,B | 04B BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 1.23 ± 0.23 ^{+0.40} _{-0.41} | ² FANG | 03 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 1.09 ^{+0.55} _{-0.42} ± 0.33 | ⁵ EDWARDS | 01 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ CHILIKIN 19 reports $[\Gamma(B^0 \rightarrow \eta_c K^0) / \Gamma_{\text{total}}] \times [B(\eta_c(1S) \rightarrow \pi^+ \pi^- \rho \bar{p})] = (38.0^{+6.4+1.3}_{-2.9-4.7}) \times 10^{-7}$ which we divide by our best value $B(\eta_c(1S) \rightarrow \pi^+ \pi^- \rho \bar{p})$

= $(5.3 \pm 2.1) \times 10^{-3}$. 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 AUBERT 07AV reports $[\Gamma(B^0 \rightarrow \eta_c K^0)/\Gamma_{\text{total}}] \times [B(\eta_c(1S) \rightarrow p\bar{p})] = (0.83_{-0.26}^{+0.28} \pm 0.05) \times 10^{-6}$ which we divide by our best value $B(\eta_c(1S) \rightarrow p\bar{p}) = (1.44 \pm 0.14) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ AUBERT,B 04B reports $[\Gamma(B^0 \rightarrow \eta_c K^0)/\Gamma_{\text{total}}] \times [B(\eta_c(1S) \rightarrow K\bar{K}\pi)] = (0.0648 \pm 0.0085 \pm 0.0071) \times 10^{-3}$ which we divide by our best value $B(\eta_c(1S) \rightarrow K\bar{K}\pi) = (7.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁵ EDWARDS 01 assumes equal production of B^0 and B^+ at the $\Upsilon(4S)$. The correlated uncertainties (28.3)% from $B(J/\psi(1S) \rightarrow \gamma\eta_c)$ in those modes have been accounted for.

$\Gamma(\eta_c K^0)/\Gamma(J/\psi(1S)K^0)$ $\Gamma_{186}/\Gamma_{200}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|---------------------------|------|-----------------------------------|
| 1.39±0.20±0.45 | ¹ AUBERT,B 04B | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Uses BABAR measurement of $B(B^0 \rightarrow J/\psi K^0) = (8.5 \pm 0.5 \pm 0.6) \times 10^{-4}$.

$\Gamma(\eta_c(1S)K^+\pi^-)/\Gamma(J/\psi(1S)K^+\pi^-)$ $\Gamma_{187}/\Gamma_{201}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|------------------------|------|----------------------|
| 0.53±0.03±0.05 | ¹ AAIJ 18AN | LHCB | pp at 7, 8, 13 TeV |

¹ AAIJ 18AN reports $[\Gamma(B^0 \rightarrow \eta_c(1S)K^+\pi^-)/\Gamma(B^0 \rightarrow J/\psi(1S)K^+\pi^-)] \times [B(\eta_c(1S) \rightarrow p\bar{p})] / [B(J/\psi(1S) \rightarrow p\bar{p})] = 0.357 \pm 0.015 \pm 0.008$ which we multiply or divide by our best values $B(\eta_c(1S) \rightarrow p\bar{p}) = (1.44 \pm 0.14) \times 10^{-3}$, $B(J/\psi(1S) \rightarrow p\bar{p}) = (2.120 \pm 0.029) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(\eta_c(1S)K^*(1410)^0)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\Gamma_{190}/\Gamma_{187}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------------------------|------|----------------------|
| 32±24±6 | ¹ AAIJ 18AN | LHCB | pp at 7, 8, 13 TeV |

¹ AAIJ 18AN reports $[\Gamma(B^0 \rightarrow \eta_c(1S)K^*(1410)^0)/\Gamma(B^0 \rightarrow \eta_c(1S)K^+\pi^-)] \times [B(K^*(1410) \rightarrow K\pi)] = 0.021 \pm 0.011 \pm 0.011$ which we divide by our best value $B(K^*(1410) \rightarrow K\pi) = (6.6 \pm 1.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\eta_c(1S)K^+\pi^-(NR))/\Gamma(\eta_c(1S)K^+\pi^-)$ $\Gamma_{188}/\Gamma_{187}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|----------------------|
| 10.3±1.4^{+1.0}_{-1.2} | AAIJ 18AN | LHCB | pp at 7, 8, 13 TeV |

$\Gamma(\eta_c(1S)K_0^*(1430)^0)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\Gamma_{191}/\Gamma_{187}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------------------------|------|----------------------|
| 27±5±3 | ¹ AAIJ 18AN | LHCB | pp at 7, 8, 13 TeV |

¹ AAIJ 18AN reports $[\Gamma(B^0 \rightarrow \eta_c(1S)K_0^*(1430)^0)/\Gamma(B^0 \rightarrow \eta_c(1S)K^+\pi^-)] \times [B(K_0^*(1430) \rightarrow K\pi)] = 0.253 \pm 0.035_{-0.028}^{+0.035}$ which we divide by our best value $B(K_0^*(1430) \rightarrow K\pi) = (93 \pm 10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\eta_c(1S)K_2^*(1430)^0)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\Gamma_{192}/\Gamma_{187}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-------------------|-----------|----------------------|
| $8.2^{+3.6}_{-4.4} \pm 0.2$ | ¹ AAIJ | 18AN LHCB | pp at 7, 8, 13 TeV |

¹ AAIJ 18AN reports $[\Gamma(B^0 \rightarrow \eta_c(1S)K_2^*(1430)^0)/\Gamma(B^0 \rightarrow \eta_c(1S)K^+\pi^-)] \times [B(K_2^*(1430) \rightarrow K\pi)] = 0.041 \pm 0.015^{+0.010}_{-0.016}$ which we divide by our best value $B(K_2^*(1430) \rightarrow K\pi) = (49.9 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\eta_c(1S)K^*(1680)^0)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\Gamma_{193}/\Gamma_{187}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-------------------|-----------|----------------------|
| $5.7^{+6.5}_{-6.8} \pm 0.4$ | ¹ AAIJ | 18AN LHCB | pp at 7, 8, 13 TeV |

¹ AAIJ 18AN reports $[\Gamma(B^0 \rightarrow \eta_c(1S)K^*(1680)^0)/\Gamma(B^0 \rightarrow \eta_c(1S)K^+\pi^-)] \times [B(K^*(1680) \rightarrow K\pi)] = 0.022 \pm 0.020^{+0.015}_{-0.017}$ which we divide by our best value $B(K^*(1680) \rightarrow K\pi) = (38.7 \pm 2.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\eta_c(1S)K_0^*(1950)^0)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\Gamma_{194}/\Gamma_{187}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|-----------|----------------------|
| $7^{+4}_{-6} \pm 2$ | ¹ AAIJ | 18AN LHCB | pp at 7, 8, 13 TeV |

¹ AAIJ 18AN reports $[\Gamma(B^0 \rightarrow \eta_c(1S)K_0^*(1950)^0)/\Gamma(B^0 \rightarrow \eta_c(1S)K^+\pi^-)] \times [B(K_0^*(1950) \rightarrow K^-\pi^+)] = 0.038 \pm 0.018^{+0.014}_{-0.025}$ which we divide by our best value $B(K_0^*(1950) \rightarrow K^-\pi^+) = (52 \pm 14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(X(4100)^-K^+, X^- \rightarrow \eta_c\pi^-)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\Gamma_{189}/\Gamma_{187}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-------------|-----------|----------------------|
| $3.3 \pm 1.1^{+1.2}_{-1.1}$ | AAIJ | 18AN LHCB | pp at 7, 8, 13 TeV |

$\Gamma(\eta_c K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{195}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--|---|------|---------|
| 5.2 $^{+0.8}_{-0.9}$ OUR AVERAGE | Error includes scale factor of 1.6. See the ideogram below. | | |

| | | | |
|---------------------------------|-----------------------|-----------|---------------------------------|
| $4.42 \pm 0.24^{+0.54}_{-0.66}$ | ¹ AAIJ | 18AN LHCB | pp at 7, 8, 13 TeV |
| $6.7 \pm 0.8 \pm 0.5$ | ^{2,3} AUBERT | 08AB BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| $7.2^{+2.2}_{-2.0} \pm 0.7$ | ^{4,5} AUBERT | 07AV BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| $16.2 \pm 3.2^{+5.5}_{-6.0}$ | ⁵ FANG | 03 BELL | $e^+e^- \rightarrow \gamma(4S)$ |

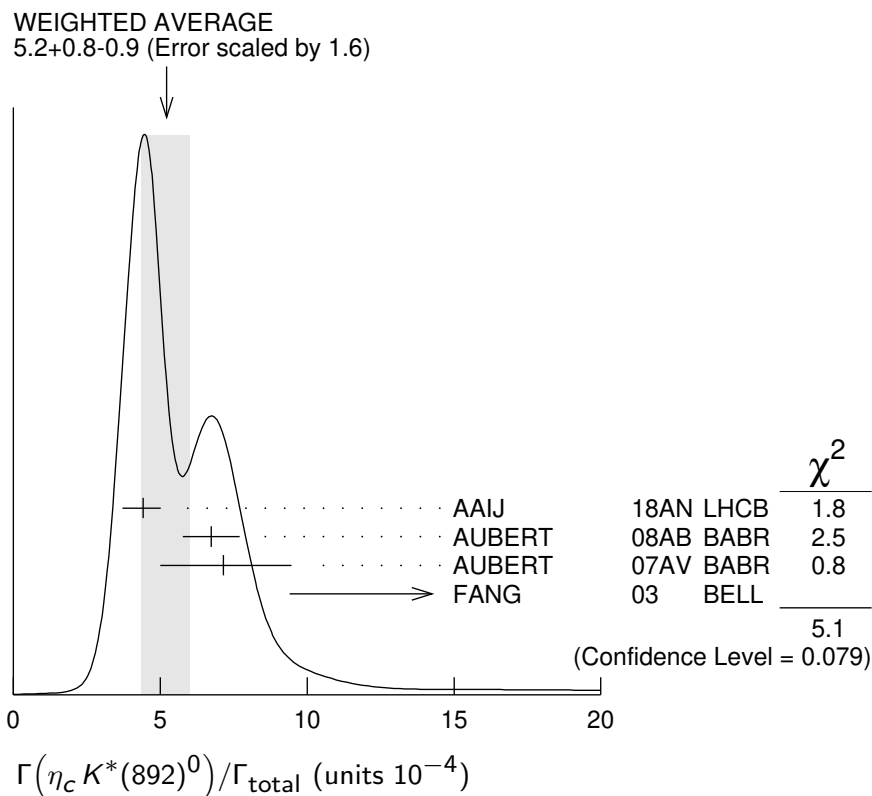
¹ AAIJ 18AN reports $B(B^0 \rightarrow \eta_c K^*(892)^0, K^*(892)^0 \rightarrow K^+\pi^-) = (2.95 \pm 0.16^{+0.36}_{-0.44}) \times 10^{-4}$ using the fitted fraction of $0.514 \pm 0.019^{+0.017}_{-0.048}$ from Dalitz decay of $B(B^0 \rightarrow \eta_c K^+\pi^-) = (5.73 \pm 0.24 \pm 0.67) \times 10^{-4}$ and corrected for $B(K^*(892)^0 \rightarrow K^+\pi^-) = 2/3$.

² AUBERT 08AB reports $[\Gamma(B^0 \rightarrow \eta_c K^*(892)^0)/\Gamma_{\text{total}}] / [B(B^+ \rightarrow \eta_c K^+)] = 0.62 \pm 0.06 \pm 0.05$ which we multiply by our best value $B(B^+ \rightarrow \eta_c K^+) = (1.09 \pm 0.08) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ Uses the production ratio of $(B^+ B^-)/(B^0 \bar{B}^0) = 1.026 \pm 0.032$ at $\Upsilon(4S)$.

⁴ AUBERT 07AV reports $[\Gamma(B^0 \rightarrow \eta_c K^*(892)^0)/\Gamma_{\text{total}}] \times [B(\eta_c(1S) \rightarrow \rho \bar{\rho})] = (1.03^{+0.27}_{-0.24} \pm 0.17) \times 10^{-6}$ which we divide by our best value $B(\eta_c(1S) \rightarrow \rho \bar{\rho}) = (1.44 \pm 0.14) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁵ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.



$\Gamma(\eta_c(2S) K_S^0, \eta_c \rightarrow \rho \bar{\rho} \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{196}/Γ

| VALUE (units 10^{-7}) | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-------------|------|------------------------------------|
| $4.2^{+1.4+0.3}_{-1.2-0.3}$ | CHILIKIN 19 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

$\Gamma(\eta_c(2S) K^{*0})/\Gamma_{\text{total}}$ Γ_{197}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------------------|------|------------------------------------|
| <3.9 | 90 | ¹ AUBERT 08AB BABR | | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses the production ratio of $(B^+ B^-)/(B^0 \bar{B}^0) = 1.026 \pm 0.032$ at $\Upsilon(4S)$.

$\Gamma(h_c(1P) K_S^0)/\Gamma_{\text{total}}$ Γ_{198}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------|-------------|------|------------------------------------|
| < 1.4×10^{-5} | CHILIKIN 19 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

$$\Gamma(B^0 \rightarrow h_c(1P)K^{*0})/\Gamma_{\text{total}} \times \Gamma(h_c(1P) \rightarrow \gamma\eta_c(1S))/\Gamma_{\text{total}} \quad \Gamma_{199}/\Gamma \times \Gamma_{22}^{h_c(1P)}/\Gamma_{h_c(1P)}$$

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|-----------------------------------|
| <2.2 | 90 | ¹ AUBERT | 08AB BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Uses the production ratio of $(B^+B^-)/(B^0\bar{B}^0) = 1.026 \pm 0.032$ at $\Upsilon(4S)$.

$$\Gamma(\eta_c K^*(892)^0)/\Gamma(\eta_c K^0) \quad \Gamma_{195}/\Gamma_{186}$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|---------|-----------------------------------|
| $1.33 \pm 0.36^{+0.24}_{-0.33}$ | FANG | 03 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

$$\Gamma(J/\psi(1S)K^0)/\Gamma_{\text{total}} \quad \Gamma_{200}/\Gamma$$

| VALUE (units 10^{-4}) | CL% | EVTS | DOCUMENT ID | TECN | COMMENT |
|---|-----|------|-------------|------|---------|
| 8.91 ± 0.21 OUR FIT | | | | | |
| 8.91 ± 0.21 OUR AVERAGE | | | | | |

| | | | | | |
|-----------------------------|--|--------------|-------------------------|-----------|-----------------------------------|
| $9.02 \pm 0.10 \pm 0.26$ | | | ¹ CHOUDHURY | 21 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $8.1 \pm 0.9 \pm 0.6$ | | | ² CHILIKIN | 19 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $8.8^{+1.4}_{-1.3} \pm 0.1$ | | | ^{3,4} AUBERT | 07AV BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $8.69 \pm 0.22 \pm 0.30$ | | | ⁴ AUBERT | 05J BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $9.5 \pm 0.8 \pm 0.6$ | | | ⁴ AVERY | 00 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $11.5 \pm 2.3 \pm 1.7$ | | | ⁵ ABE | 96H CDF | $\rho\bar{\rho}$ at 1.8 TeV |
| $6.93 \pm 4.07 \pm 0.04$ | | | ⁶ BORTOLETTO | 92 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $9.24 \pm 7.21 \pm 0.05$ | | ² | ⁷ ALBRECHT | 90J ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-----------------------------|----|---------------|---------------------|----------|-----------------------------------|
| $7.9 \pm 0.4 \pm 0.9$ | | | ⁴ ABE | 03B BELL | Repl. by CHOUDHURY 21 |
| $8.3 \pm 0.4 \pm 0.5$ | | | ⁴ AUBERT | 02 BABR | Repl. by AUBERT 05J |
| $8.5^{+1.4}_{-1.2} \pm 0.6$ | | | ⁴ JESSOP | 97 CLE2 | Repl. by AVERY 00 |
| $7.5 \pm 2.4 \pm 0.8$ | | ¹⁰ | ⁶ ALAM | 94 CLE2 | Sup. by JESSOP 97 |
| <50 | 90 | | ALAM | 86 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ CHOUDHURY 21 uses the relative production fraction of charged (f^{+-}) to neutral (f^{00}) B mesons at $\Upsilon(4S)$ value of $f^{+-}/f^{00} = 1.058 \pm 0.024$.

² CHILIKIN 19 reports $[\Gamma(B^0 \rightarrow J/\psi(1S)K^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \rho\bar{\rho}\pi^+\pi^-)] = (48.6^{+4.6+2.4}_{-4.4-2.6}) \times 10^{-7}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \rho\bar{\rho}\pi^+\pi^-) = (6.0 \pm 0.5) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ AUBERT 07AV reports $[\Gamma(B^0 \rightarrow J/\psi(1S)K^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \rho\bar{\rho})] = (1.87^{+0.28}_{-0.26} \pm 0.07) \times 10^{-6}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \rho\bar{\rho}) = (2.120 \pm 0.029) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁵ ABE 96H assumes that $B(B^+ \rightarrow J/\psi K^+) = (1.02 \pm 0.14) \times 10^{-3}$.

⁶ BORTOLETTO 92 reports $(6 \pm 3 \pm 2) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)K^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow e^+e^-)]$ assuming $B(J/\psi(1S) \rightarrow e^+e^-) = 0.069 \pm 0.009$, which we rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.971 \pm 0.032) \times 10^{-2}$. Our first error is their experiment's error and our second error is the

systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁷ ALBRECHT 90J reports $(8 \pm 6 \pm 2) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)K^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow e^+e^-)]$ assuming $B(J/\psi(1S) \rightarrow e^+e^-) = 0.069 \pm 0.009$, which we rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.971 \pm 0.032) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)K^+\pi^-)/\Gamma_{\text{total}}$ Γ_{201}/Γ

| VALUE (units 10^{-3}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|---------------------------|------|---|
| 1.15 ± 0.05 OUR AVERAGE | | | | |
| 1.15 ± 0.01 ± 0.05 | | CHILIKIN | 14 | BELL $\bar{B}^0 \rightarrow J/\psi K^- \pi^+$ |
| 1.16 ± 0.56 ± 0.01 | | ¹ BORTOLETTO92 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 1.079 ± 0.011 | | ² AUBERT | 09AA | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| <1.3 | 90 | ³ ALBRECHT | 87D | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
| <6.3 | 90 | GILES | 84 | CLEO $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ BORTOLETTO 92 reports $(1.0 \pm 0.4 \pm 0.3) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)K^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow e^+e^-)]$ assuming $B(J/\psi(1S) \rightarrow e^+e^-) = 0.069 \pm 0.009$, which we rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.971 \pm 0.032) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Does not report systematic uncertainties.

³ ALBRECHT 87D assume $B^+B^-/B^0\bar{B}^0$ ratio is 55/45. $K\pi$ system is specifically selected as nonresonant.

$\Gamma(J/\psi(1S)K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{202}/Γ

| VALUE (units 10^{-3}) | EVTS | DOCUMENT ID | TECN | COMMENT |
|---|------|---------------------------|------|---|
| 1.27 ± 0.05 OUR FIT | | | | |
| 1.28 ± 0.05 OUR AVERAGE | | | | |
| 1.19 ± 0.01 ± 0.08 | | CHILIKIN | 14 | BELL $\bar{B}^0 \rightarrow J/\psi K^- \pi^+$ |
| 1.33 $^{+0.22}_{-0.21}$ ± 0.02 | | ^{1,2} AUBERT | 07AV | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.309 ± 0.026 ± 0.077 | | ² AUBERT | 05J | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.29 ± 0.05 ± 0.13 | | ² ABE | 02N | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.74 ± 0.20 ± 0.18 | | ³ ABE | 98O | CDF $p\bar{p}$ 1.8 TeV |
| 1.32 ± 0.17 ± 0.17 | | ⁴ JESSOP | 97 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.27 ± 0.65 ± 0.01 | | ⁵ BORTOLETTO92 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.27 ± 0.60 ± 0.01 | 6 | ⁶ ALBRECHT | 90J | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
| 4.04 ± 1.81 ± 0.02 | 5 | ⁷ BEBEK | 87 | CLEO $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 1.24 ± 0.05 ± 0.09 | | ² AUBERT | 02 | BABR Repl. by AUBERT 05J |
| 1.36 ± 0.27 ± 0.22 | | ⁸ ABE | 96H | CDF Sup. by ABE 98O |
| 1.69 ± 0.31 ± 0.18 | 29 | ⁹ ALAM | 94 | CLE2 Sup. by JESSOP 97 |
| | | ¹⁰ ALBRECHT | 94G | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
| 4.0 ± 0.30 | | ¹¹ ALBAJAR | 91E | UA1 $E_{\text{cm}}^{p\bar{p}} = 630$ GeV |

3.3 ± 0.18 5 12 ALBRECHT 87D ARG $e^+e^- \rightarrow \Upsilon(4S)$
 4.1 ± 0.18 5 13 ALAM 86 CLEO Repl. by BEBEK 87

¹ AUBERT 07AV reports $[\Gamma(B^0 \rightarrow J/\psi(1S)K^*(892)^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow p\bar{p})] = (2.82^{+0.30+0.36}_{-0.28-0.35}) \times 10^{-6}$ which we divide by our best value $B(J/\psi(1S) \rightarrow p\bar{p}) = (2.120 \pm 0.029) \times 10^{-3}$. 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 ABE 98O reports $[B(B^0 \rightarrow J/\psi(1S)K^*(892)^0)]/[B(B^+ \rightarrow J/\psi(1S)K^+)] = 1.76 \pm 0.14 \pm 0.15$. We multiply by our best value $B(B^+ \rightarrow J/\psi(1S)K^+) = (9.9 \pm 1.0) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁵ BORTOLETTO 92 reports $(1.1 \pm 0.5 \pm 0.3) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)K^*(892)^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow e^+e^-)]$ assuming $B(J/\psi(1S) \rightarrow e^+e^-) = 0.069 \pm 0.009$, which we rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.971 \pm 0.032) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁶ ALBRECHT 90J reports $(1.1 \pm 0.5 \pm 0.2) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)K^*(892)^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow e^+e^-)]$ assuming $B(J/\psi(1S) \rightarrow e^+e^-) = 0.069 \pm 0.009$, which we rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.971 \pm 0.032) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁷ BEBEK 87 reports $(3.5 \pm 1.6 \pm 0.3) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)K^*(892)^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow e^+e^-)]$ assuming $B(J/\psi(1S) \rightarrow e^+e^-) = 0.069 \pm 0.009$, which we rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.971 \pm 0.032) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Updated in BORTOLETTO 92 to use the same assumptions.

⁸ ABE 96H assumes that $B(B^+ \rightarrow J/\psi K^+) = (1.02 \pm 0.14) \times 10^{-3}$.

⁹ The neutral and charged B events together are predominantly longitudinally polarized, $\Gamma_L/\Gamma = 0.080 \pm 0.08 \pm 0.05$. This can be compared with a prediction using HQET, 0.73 (KRAMER 92). This polarization indicates that the $B \rightarrow \psi K^*$ decay is dominated by the $CP = -1$ CP eigenstate. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

¹⁰ ALBRECHT 94G measures the polarization in the vector-vector decay to be predominantly longitudinal, $\Gamma_T/\Gamma = 0.03 \pm 0.16 \pm 0.15$ making the neutral decay a CP eigenstate when the K^{*0} decays through $K_S^0 \pi^0$.

¹¹ ALBAJAR 91E assumes B_d^0 production fraction of 36%.

¹² ALBRECHT 87D assume $B^+ B^- / B^0 \bar{B}^0$ ratio is 55/45. Superseded by ALBRECHT 90J.

¹³ ALAM 86 assumes B^\pm / B^0 ratio is 60/40. The observation of the decay $B^+ \rightarrow J/\psi K^*(892)^+$ (HAAS 85) has been retracted in this paper.

$\Gamma(J/\psi(1S)K^*(892)^0)/\Gamma(J/\psi(1S)K^0)$

$\Gamma_{202}/\Gamma_{200}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|--|
| 1.50\pm0.09 OUR AVERAGE | | | |
| 1.51 \pm 0.05 \pm 0.08 | AUBERT | 05J | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.39 \pm 0.36 \pm 0.10 | ABE | 96Q | CDF $p\bar{p}$ |

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

1.49 ± 0.10 ± 0.08 ¹ AUBERT 02 BABR Repl. by AUBERT 05J

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\eta K_S^0)/\Gamma_{\text{total}}$ Γ_{203}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

5.4 ± 0.9 OUR AVERAGE

5.22 ± 0.78 ± 0.49 ¹ IWASHITA 14 BELL $e^+e^- \rightarrow \Upsilon(4S)$

8.4 ± 2.6 ± 2.7 ¹ AUBERT 04Y BABR $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\eta' K_S^0)/\Gamma_{\text{total}}$ Γ_{204}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

<2.5 90 ¹ XIE 07 BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\omega K^0)/\Gamma_{\text{total}}$ Γ_{206}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

2.3 ± 0.3 ± 0.3 ¹ DEL-AMO-SA..10B BABR $e^+e^- \rightarrow \Upsilon(4S)$

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

3.1 ± 0.6 ± 0.3 ¹ AUBERT 08W BABR Repl. by DEL-AMO-SANCHEZ 10B

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c0}(3915), \chi_{c0} \rightarrow J/\psi\omega)/\Gamma_{\text{total}}$ Γ_{207}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

2.1 ± 0.9 ± 0.3 ¹ DEL-AMO-SA..10B BABR $e^+e^- \rightarrow \Upsilon(4S)$

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

1.3 ^{+1.3}_{-1.1} ± 0.2 ^{1,2} AUBERT 08W BABR Repl. by DEL-AMO-SANCHEZ 10B

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Corresponds to upper limit of 3.9×10^{-5} at 90% CL.

$\Gamma(J/\psi(1S)\phi K^0)/\Gamma_{\text{total}}$ Γ_{205}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

4.9 ± 1.0 OUR AVERAGE Error includes scale factor of 1.3.

4.43 ± 0.76 ± 0.19 LEES 15 BABR $e^+e^- \rightarrow \Upsilon(4S)$

10.2 ± 3.8 ± 1.0 ¹ AUBERT 030 BABR $e^+e^- \rightarrow \Upsilon(4S)$

8.8 ^{+3.5}_{-3.0} ± 1.3 ² ANASTASSOV 00 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ANASTASSOV 00 finds 10 events on a background of 0.5 ± 0.2 . Assumes equal production of B^0 and B^+ at the $\Upsilon(4S)$, a uniform Dalitz plot distribution, isotropic $J/\psi(1S)$ and ϕ decays, and $B(B^+ \rightarrow J/\psi(1S)\phi K^+) = B(B^0 \rightarrow J/\psi(1S)\phi K^0)$.

$\Gamma(J/\psi(1S)K(1270)^0)/\Gamma_{\text{total}}$ Γ_{208}/Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------------------|----------|-----------------------------------|
| 1.30±0.34±0.32 | ¹ ABE | 01L BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses the PDG value of $B(B^+ \rightarrow J/\psi(1S)K^+) = (1.00 \pm 0.10) \times 10^{-3}$.

 $\Gamma(J/\psi(1S)\pi^0)/\Gamma_{\text{total}}$ Γ_{209}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|---------------------|-----------|-----------------------------------|
| 1.66±0.10 OUR AVERAGE | | | | |
| 1.62±0.11±0.06 | | ¹ PAL | 18 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.69±0.14±0.07 | | ¹ AUBERT | 08AU BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.5 $^{+1.1}_{-0.9}$ ±0.2 | | ¹ AVERY | 00 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|----------------|----|------------------------|----------|-----------------------|
| 1.94±0.22±0.17 | | ¹ AUBERT,B | 06B BABR | Repl. by AUBERT 08AU |
| 2.3 ±0.5 ±0.2 | | ¹ ABE | 03B BELL | Repl. by PAL 18 |
| 2.0 ±0.6 ±0.2 | | ¹ AUBERT | 02 BABR | Repl. by AUBERT,B 06B |
| < 32 | 90 | ² ACCIARRI | 97C L3 | |
| < 5.8 | 90 | BISHAI | 96 CLE2 | Sup. by AVERY 00 |
| <690 | 90 | ¹ ALEXANDER | 95 CLE2 | Sup. by BISHAI 96 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ACCIARRI 97C assumes B^0 production fraction $(39.5 \pm 4.0)\%$ and B_S $(12.0 \pm 3.0)\%$.

 $\Gamma(J/\psi(1S)\eta)/\Gamma_{\text{total}}$ Γ_{210}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-----|----------------------|----------|-------------------------------------|
| 10.8±2.3 OUR AVERAGE | | | | Error includes scale factor of 1.5. |
| 7.3±2.5±1.3 | | ¹ AAIJ | 15D LHCB | pp at 7, 8 TeV |
| 12.3 $^{+1.8}_{-1.7}$ ±0.7 | | ^{2,3} CHANG | 12 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-------------|----|-----------------------|----------|-----------------------------------|
| 9.5±1.7±0.8 | | ³ CHANG | 07A BELL | Repl. by CHANG 12 |
| < 27 | 90 | ³ AUBERT | 03O BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <1200 | 90 | ⁴ ACCIARRI | 97C L3 | |

¹ AAIJ 15D reports $[\Gamma(B^0 \rightarrow J/\psi(1S)\eta)/\Gamma_{\text{total}}] / [B(B_S^0 \rightarrow J/\psi(1S)\eta)] = (1.85 \pm 0.61 \pm 0.14) \times 10^{-2}$ which we multiply by our best value $B(B_S^0 \rightarrow J/\psi(1S)\eta) = (4.0 \pm 0.7) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Reconstructs η in $\gamma\gamma$ and $\pi^+\pi^-\pi^0$ decays.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ ACCIARRI 97C assumes B^0 production fraction $(39.5 \pm 4.0\%)$ and B_S $(12.0 \pm 3.0\%)$.

 $\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{211}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|---------------------|----------|-----------------------------------|
| 4.00±0.15 OUR AVERAGE | | | |
| 3.98±0.14±0.07 | ^{1,2} AAIJ | 13M LHCB | pp at 7 TeV |
| 4.6 ±0.7 ±0.6 | ³ AUBERT | 03B BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AAIJ 13M reports $(3.97 \pm 0.09 \pm 0.11 \pm 0.16) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}] / [B(B^+ \rightarrow J/\psi(1S)K^+)]$ assuming $B(B^+ \rightarrow J/\psi(1S)K^+)$

$= (1.018 \pm 0.042) \times 10^{-3}$, which we rescale to our best value $B(B^+ \rightarrow J/\psi(1S)K^+)$
 $= (1.020 \pm 0.019) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² AAIJ 13M does not report correlations between various measurements of the $J/\psi\pi\pi$ final state.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\pi^+\pi^- \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{212}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|-----------------------------------|
| <1.2 | 90 | ¹ AUBERT | 07AC BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)f_0(500), f_0 \rightarrow \pi\pi)/\Gamma_{\text{total}}$ Γ_{213}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|----------|------------------|
| $8.8 \pm 0.5^{+1.1}_{-1.5}$ | ¹ AAIJ | 14X LHCb | pp at 7, 8 TeV |

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

| | | | |
|-----------------------------|---------------------|----------|-------------------|
| $6.4^{+2.5}_{-1.1} \pm 0.2$ | ^{2,3} AAIJ | 13M LHCb | Repl. by AAIJ 14X |
|-----------------------------|---------------------|----------|-------------------|

¹ AAIJ 14X uses Dalitz plot analysis of $B^0 \rightarrow J/\psi\pi^+\pi^-$.

² AAIJ 13M reports $(6.4 \pm 0.8^{+2.4}_{-0.8}) \times 10^{-6}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)f_0(500), f_0 \rightarrow \pi\pi)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-)]$ assuming $B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-) = (3.97 \pm 0.09 \pm 0.11 \pm 0.16) \times 10^{-5}$, which we rescale to our best value $B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-) = (4.00 \pm 0.15) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ AAIJ 13M does not report correlations between various measurements of the $J/\psi\pi\pi$ final state. Measured in Dalitz plot like analysis of $B^0 \rightarrow J/\psi\pi^+\pi^-$.

$\Gamma(J/\psi(1S)f_2)/\Gamma_{\text{total}}$ Γ_{214}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------|------|-------------------------------------|
| $0.33^{+0.05}_{-0.06}$ OUR AVERAGE | | | | Error includes scale factor of 1.5. |

| | | | |
|---------------------------------|-------------------|----------|------------------|
| $0.30 \pm 0.03^{+0.02}_{-0.03}$ | ¹ AAIJ | 14X LHCb | pp at 7, 8 TeV |
|---------------------------------|-------------------|----------|------------------|

| | | | |
|--------------------------|---------------------|----------|---------------|
| $0.42 \pm 0.06 \pm 0.02$ | ^{2,3} AAIJ | 13M LHCb | pp at 7 TeV |
|--------------------------|---------------------|----------|---------------|

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

| | | | | |
|------|----|-----------------------|-----------|-----------------------------------|
| <0.5 | 90 | ^{4,5} AUBERT | 07AC BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
|------|----|-----------------------|-----------|-----------------------------------|

¹ AAIJ 14X uses Dalitz plot analysis of $B^0 \rightarrow J/\psi\pi^+\pi^-$.

² AAIJ 13M reports $[\Gamma(B^0 \rightarrow J/\psi(1S)f_2)/\Gamma_{\text{total}}] \times [B(f_2(1270) \rightarrow \pi\pi)] = (3.5 \pm 0.4 \pm 0.4) \times 10^{-6}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)f_2)/\Gamma_{\text{total}}] \times [B(f_2(1270) \rightarrow \pi\pi)] / [B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-)]$ assuming $B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-) = (3.97 \pm 0.09 \pm 0.11 \pm 0.16) \times 10^{-5}$, which we rescale to our best values $B(f_2(1270) \rightarrow \pi\pi) = (84.2^{+2.9}_{-0.9}) \times 10^{-2}$, $B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-) = (4.00 \pm 0.15) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

³ AAIJ 13M does not report correlations between various measurements of the $J/\psi\pi\pi$ final state. Measured in Dalitz plot like analysis of $B^0 \rightarrow J/\psi\pi^+\pi^-$.

⁴ AUBERT 07AC reports $[\Gamma(B^0 \rightarrow J/\psi(1S)f_2)/\Gamma_{\text{total}}] \times [B(f_2(1270) \rightarrow \pi\pi)] < 0.46 \times 10^{-5}$ which we divide by our best value $B(f_2(1270) \rightarrow \pi\pi) = 84.2 \times 10^{-2}$.

⁵ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\rho^0)/\Gamma_{\text{total}}$ Γ_{215}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

2.55^{+0.18}_{-0.16} OUR AVERAGE

2.50 ± 0.10^{+0.18}_{-0.15} 1 AAIJ 14X LHCb pp at 7, 8 TeV

2.7 ± 0.3 ± 0.2 2 AUBERT 07AC BABR e⁺e⁻ → $\Upsilon(4S)$

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

2.51^{+0.22}_{-0.23} ± 0.10 3,4 AAIJ 13M LHCb Repl. by AAIJ 14X

1.6 ± 0.6 ± 0.4 2 AUBERT 03B BABR Repl. by AUBERT 07AC

<25 90 BISHAI 96 CLE2 e⁺e⁻ → $\Upsilon(4S)$

¹ AAIJ 14X uses Dalitz plot analysis of $B^0 \rightarrow J/\psi \pi^+ \pi^-$. We assume $B(\rho(770)^0 \rightarrow \pi^+ \pi^-) = 100\%$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ AAIJ 13M reports (2.49^{+0.20+0.16}_{-0.13-0.23}) × 10⁻⁵

from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)\rho^0)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-)]$ assuming $B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-) = (3.97 \pm 0.09 \pm 0.11 \pm 0.16) \times 10^{-5}$, which we rescale to our best value $B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-) = (4.00 \pm 0.15) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ AAIJ 13M does not report correlations between various measurements of the $J/\psi \pi \pi$ final state. Measured in Dalitz plot like analysis of $B^0 \rightarrow J/\psi \pi^+ \pi^-$. Assumes $B(\rho(770)^0 \rightarrow \pi \pi) = 100\%$.

$\Gamma(J/\psi(1S)f_0(980), f_0 \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{216}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

<1.1 × 10⁻⁶ 90 1 AAIJ 13M LHCb pp at 7 TeV

¹ AAIJ 13M does not provide correlations between various measurements of the $J/\psi \pi^+ \pi^-$ final state. The measurements were obtained from a Dalitz plot like analysis of $B^0 \rightarrow J/\psi \pi^+ \pi^-$. Also reports $\Gamma(J/\psi(1S)f_0(980), f_0 \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}} = (6.1^{+3.1+1.7}_{-2.0-1.4}) \times 10^{-6}$.

$\Gamma(J/\psi(1S)\rho(1450)^0, \rho^0 \rightarrow \pi \pi)/\Gamma_{\text{total}}$ Γ_{217}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

2.9^{+1.6}_{-0.7} OUR AVERAGE

4.6 ± 1.1 ± 1.9 1 AAIJ 14X LHCb pp at 7, 8 TeV

2.1^{+2.4}_{-0.7} ± 0.1 2,3 AAIJ 13M LHCb pp at 7 TeV

¹ AAIJ 14X uses Dalitz plot analysis of $B^0 \rightarrow J/\psi \pi^+ \pi^-$.

² AAIJ 13M reports (2.1^{+1.0+2.2}_{-0.6-0.4}) × 10⁻⁶ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)\rho(1450)^0, \rho^0 \rightarrow \pi \pi)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-)]$ assuming $B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-) = (3.97 \pm 0.09 \pm 0.11 \pm 0.16) \times 10^{-5}$, which we rescale to our best value $B(B^0 \rightarrow J/\psi(1S)\pi^+\pi^-) = (4.00 \pm 0.15) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ AAIJ 13M does not report correlations between various measurements of the $J/\psi \pi \pi$ final state. Measured in Dalitz plot like analysis of $B^0 \rightarrow J/\psi \pi^+ \pi^-$.

$\Gamma(J/\psi \rho(1700)^0, \rho^0 \rightarrow \pi^+ \pi^-) / \Gamma_{\text{total}}$ Γ_{218} / Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|------|-----------------------|
| $2.0 \pm 0.5 \pm 1.2$ | ¹ AAIJ | 14X | LHCB pp at 7, 8 TeV |

¹ AAIJ 14X uses Dalitz plot analysis of $B^0 \rightarrow J/\psi \pi^+ \pi^-$.

 $\Gamma(J/\psi(1S)\omega) / \Gamma_{\text{total}}$ Γ_{219} / Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-----|-------------------|------|-----------------------|
| $1.8^{+0.7}_{-0.5} \pm 0.1$ | | ¹ AAIJ | 14X | LHCB pp at 7, 8 TeV |

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

<27 90 BISHAI 96 CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$

¹ AAIJ 14X reports $[\Gamma(B^0 \rightarrow J/\psi(1S)\omega) / \Gamma_{\text{total}}] \times [B(\omega(782) \rightarrow \pi^+ \pi^-)] = (2.7^{+0.8+0.7}_{-0.6-0.5}) \times 10^{-7}$ which we divide by our best value $B(\omega(782) \rightarrow \pi^+ \pi^-) = (1.53^{+0.11}_{-0.13}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(J/\psi(1S)\omega) / \Gamma(J/\psi(1S)\rho^0)$ $\Gamma_{219} / \Gamma_{215}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|---------------------|------|--------------------|
| $0.61^{+0.24+0.31}_{-0.14-0.16}$ | ^{1,2} AAIJ | 13M | LHCB pp at 7 TeV |

¹ AAIJ 13M reports $0.61^{+0.24+0.31}_{-0.14-0.16}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)\omega) / \Gamma(B^0 \rightarrow J/\psi(1S)\rho^0)] \times [B(\omega(782) \rightarrow \pi^+ \pi^-)]$ assuming $B(\omega(782) \rightarrow \pi^+ \pi^-) = (1.53^{+0.11}_{-0.13}) \times 10^{-2}$.

² AAIJ 13M does not report correlations between various measurements of the $J/\psi \pi \pi$ final state. Measured in Dalitz plot like analysis of $B^0 \rightarrow J/\psi \pi^+ \pi^-$. Assumes $B(\rho(770)^0 \rightarrow \pi \pi) = 100\%$.

 $\Gamma(J/\psi(1S)\omega) / \Gamma(J/\psi(1S)\rho^0)$ $\Gamma_{219} / \Gamma_{215}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-------------|------|--------------------|
| $0.89 \pm 0.19^{+0.07}_{-0.13}$ | AAIJ | 13A | LHCB pp at 7 TeV |

 $\Gamma(J/\psi(1S)K^+ K^-) / \Gamma_{\text{total}}$ Γ_{220} / Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|------|--------------------|
| $2.54 \pm 0.35 \pm 0.05$ | ¹ AAIJ | 13BT | LHCB pp at 7 TeV |

¹ AAIJ 13BT reports $(2.53 \pm 0.31 \pm 0.19) \times 10^{-6}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)K^+ K^-) / \Gamma_{\text{total}}] / [B(B^+ \rightarrow J/\psi(1S)K^+)]$ assuming $B(B^+ \rightarrow J/\psi(1S)K^+) = (1.018 \pm 0.042) \times 10^{-3}$, which we rescale to our best value $B(B^+ \rightarrow J/\psi(1S)K^+) = (1.020 \pm 0.019) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(J/\psi(1S)a_0(980), a_0 \rightarrow K^+ K^-) / \Gamma_{\text{total}}$ Γ_{221} / Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-------------------|------|--------------------|
| $0.470 \pm 0.331 \pm 0.072$ | ¹ AAIJ | 13BT | LHCB pp at 7 TeV |

¹ AAIJ 13BT uses $B(\bar{B}^0 \rightarrow J/\psi K^+ K^-) = (2.53 \pm 0.31 \pm 0.19) \times 10^{-6}$ to derive this result. It also reports the equivalent upper limit of $< 9.0 \times 10^{-7}$ at 90% CL.

$\Gamma(J/\psi(1S)\phi)/\Gamma_{\text{total}}$ Γ_{222}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-----|---------------------|------|--|
| < 1.1 × 10⁻⁷ | 90 | AAIJ | 21K | LHCB pp at 7, 8, 13 TeV |
| <10.1 × 10 ⁻⁷ | 90 | LEES | 15 | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1.9 × 10 ⁻⁷ | 90 | ¹ AAIJ | 13BT | LHCB pp at 7 TeV |
| < 9.4 × 10 ⁻⁷ | 90 | ² LIU | 08I | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 9.2 × 10 ⁻⁶ | 90 | ² AUBERT | 03O | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

• • • We do not use the following data for averages, fits, limits, etc. • • •
¹AAIJ 13BT uses $B(B^0 \rightarrow J/\psi(1S)K^+K^-) = (2.53 \pm 0.31 \pm 0.19) \times 10^{-6}$ and $B(\phi \rightarrow K^+K^-) = (48.9 \pm 0.5)\%$ to obtain this result.
²Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\eta'(958))/\Gamma_{\text{total}}$ Γ_{223}/Γ

| VALUE (units 10 ⁻⁶) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|----------------------|------|--|
| 7.6 ± 2.2 ± 1.0 | | ¹ AAIJ | 15D | LHCB pp at 7, 8 TeV |
| < 7.4 | 90 | ^{2,3} CHANG | 12 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 63 | 90 | ³ AUBERT | 03O | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

• • • We do not use the following data for averages, fits, limits, etc. • • •
¹AAIJ 15D reports $[\Gamma(B^0 \rightarrow J/\psi(1S)\eta'(958))/\Gamma_{\text{total}}] / [B(B_S^0 \rightarrow J/\psi(1S)\eta')]$ = $(2.28 \pm 0.65 \pm 0.16) \times 10^{-2}$ which we multiply by our best value $B(B_S^0 \rightarrow J/\psi(1S)\eta')$ = $(3.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
²Reconstructs $\eta'(985)$ in $(\eta\pi^+ + \pi^-)$ and $\rho(770)$ decays.
³Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\eta'(958))$ $\Gamma_{210}/\Gamma_{223}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------------|------|-----------------------|
| 1.111 ± 0.475 ± 0.062 | ¹ AAIJ | 15D | LHCB pp at 7, 8 TeV |

¹Uses $J/\psi \rightarrow \mu^+\mu^-$, $\eta' \rightarrow \rho^0\gamma$, and $\eta' \rightarrow \eta\pi^+\pi^-$ decays.

$\Gamma(J/\psi(1S)K^0\pi^+\pi^-)/\Gamma(J/\psi(1S)K^0)$ $\Gamma_{224}/\Gamma_{200}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|------|------------------------|
| 0.50 ± 0.04 OUR AVERAGE | | | |
| 0.493 ± 0.034 ± 0.027 | AAIJ | 14L | LHCB pp at 7 TeV |
| 1.24 ± 0.40 ± 0.15 | AFFOLDER | 02B | CDF $p\bar{p}$ 1.8 TeV |

$\Gamma(J/\psi(1S)K^0K^+K^-)/\Gamma_{\text{total}}$ Γ_{226}/Γ

| VALUE (units 10 ⁻⁶) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-------------------------------------|------|--|
| 25 ± 7 OUR AVERAGE | Error includes scale factor of 1.8. | | |
| 34.9 ± 6.7 ± 1.5 | LEES | 15 | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 20.2 ± 4.3 ± 1.9 | ¹ AAIJ | 14L | LHCB pp at 7 TeV |

¹Measured with $B(B^0 \rightarrow J/\psi K_S^0 K^+K^-) / B(B^0 \rightarrow J/\psi K_S^0)$ using PDG 12 for the involved branching fractions.

$\Gamma(J/\psi(1S)K^0K^-\pi^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{225}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|-------------------|------|--------------------|
| < 21 × 10⁻⁶ | 90 | ¹ AAIJ | 14L | LHCB pp at 7 TeV |

¹Measured with $B(B^0 \rightarrow J/\psi K_S^0 K^\pm\pi^\mp) / B(B^0 \rightarrow J/\psi K_S^0 \pi^+\pi^-)$ using PDG 12 values for the involved branching fractions.

$\Gamma(J/\psi(1S)K^0\rho^0)/\Gamma_{\text{total}}$ Γ_{228}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|------|------------------------|
| $5.4 \pm 2.9 \pm 0.9$ | ¹ AFFOLDER | 02B | CDF $p\bar{p}$ 1.8 TeV |

¹ Uses $B^0 \rightarrow J/\psi(1S)K_S^0$ decay as a reference and $B(B^0 \rightarrow J/\psi(1S)K^0) = 8.3 \times 10^{-4}$.

 $\Gamma(J/\psi(1S)K^*(892)^+\pi^-)/\Gamma_{\text{total}}$ Γ_{229}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|------|------------------------|
| $7.7 \pm 4.1 \pm 1.3$ | ¹ AFFOLDER | 02B | CDF $p\bar{p}$ 1.8 TeV |

¹ Uses $B^0 \rightarrow J/\psi(1S)K_S^0$ decay as a reference and $B(B^0 \rightarrow J/\psi(1S)K^0) = 8.3 \times 10^{-4}$.

 $\Gamma(J/\psi(1S)\pi^+\pi^-\pi^+\pi^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ $\Gamma_{230}/\Gamma_{211}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|------|-----------------------|
| $0.361 \pm 0.017 \pm 0.021$ | ¹ AAIJ | 14Y | LHCB pp at 7, 8 TeV |

¹ Excludes contributions from $\psi(2S)$ and $\chi_{c1}(3872)$ decaying to $J/\psi(1S)\pi^+\pi^-$.

 $\Gamma(J/\psi(1S)f_1(1285))/\Gamma_{\text{total}}$ Γ_{231}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|------|-----------------------|
| $8.4^{+2.1}_{-2.0} \pm 0.5$ | ¹ AAIJ | 14Y | LHCB pp at 7, 8 TeV |

¹ AAIJ 14Y reports $(8.37 \pm 1.95^{+0.71}_{-0.66} \pm 0.35) \times 10^{-6}$ from a measurement of $[\Gamma(B^0 \rightarrow J/\psi(1S)f_1(1285))/\Gamma_{\text{total}}] \times [B(f_1(1285) \rightarrow 2\pi^+2\pi^-)]$ assuming $B(f_1(1285) \rightarrow 2\pi^+2\pi^-) = 0.11^{+0.007}_{-0.006}$, which we rescale to our best value $B(f_1(1285) \rightarrow 2\pi^+2\pi^-) = (10.9 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(J/\psi(1S)K^*(892)^0\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{232}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|------|------------------------|
| $6.6 \pm 1.9 \pm 1.1$ | ¹ AFFOLDER | 02B | CDF $p\bar{p}$ 1.8 TeV |

¹ Uses $B^0 \rightarrow J/\psi(1S)K^*(892)^0$ decay as a reference and $B(B^0 \rightarrow J/\psi(1S)K^0) = 12.4 \times 10^{-4}$.

 $\Gamma(\eta_{c2}(1D)K_S^0, \eta_{c2} \rightarrow h_c\gamma)/\Gamma_{\text{total}}$ Γ_{233}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------|------|--------------------------------------|
| $< 3.5 \times 10^{-5}$ | 90 | CHILIKIN | 20 | BELL $e^+e^- \rightarrow \gamma(4S)$ |

 $\Gamma(\eta_{c2}(1D)\pi^-K^+, \eta_{c2} \rightarrow h_c\gamma)/\Gamma_{\text{total}}$ Γ_{234}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------|------|--------------------------------------|
| $< 1.0 \times 10^{-4}$ | 90 | CHILIKIN | 20 | BELL $e^+e^- \rightarrow \gamma(4S)$ |

 $\Gamma(\chi_{c1}(3872)K^0)/\Gamma_{\text{total}}$ Γ_{237}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|------------------------------|------|--------------------------------------|
| 1.1 ± 0.4 OUR AVERAGE | | | | |
| $1.05 \pm 0.31 \pm 0.34$ | | ¹ CHOI | 11 | BELL $e^+e^- \rightarrow \gamma(4S)$ |
| $1.4 \pm 0.7 \pm 0.7$ | | ² DEL-AMO-SA..10B | BABR | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | | |
|---|----|---------------|-----|------|-----------------------------------|
| <2.8 | 90 | 3,4 BHARDWAJ | 11 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.6 ± 1.3 ± 0.6 | | 4,5 AUSHEV | 10 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <6 | 90 | 6,7 AUBERT | 09B | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 6.1 ± 3.1 ± 1.5 | | 4,6,8 AUBERT | 08B | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <1.6 | 90 | 9 AUBERT | 08Y | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <2.7 | 90 | 10 AUBERT | 06 | BABR | Repl. by AUBERT 08Y |
| 3.4 ± 1.6 ^{+1.4} _{-1.3} | | 11,12 GOKHROO | 06 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ CHOI 11 reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^0)/\Gamma_{\text{total}}] / [B(B^+ \rightarrow \chi_{c1}(3872)K^+)] = 0.50 \pm 0.14 \pm 0.04$ which we multiply by our best value $B(B^+ \rightarrow \chi_{c1}(3872)K^+) = (2.1 \pm 0.7) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² DEL-AMO-SANCHEZ 10B reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \omega J/\psi(1S))] = (6 \pm 3 \pm 1) \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \omega J/\psi(1S)) = (4.3 \pm 2.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ BHARDWAJ 11 reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \gamma J/\psi)] < 2.4 \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \gamma J/\psi) = 8 \times 10^{-3}$.

⁴ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁵ AUSHEV 10 reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \bar{D}^{*0}D^0)] = (0.97 \pm 0.46 \pm 0.13) \times 10^{-4}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \bar{D}^{*0}D^0) = (37 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁶ Uses $B(\Upsilon(4S) \rightarrow B^+B^-) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0\bar{B}^0) = (48.4 \pm 0.6)\%$.

⁷ AUBERT 09B reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \gamma J/\psi)] < 4.9 \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \gamma J/\psi) = 8 \times 10^{-3}$.

⁸ AUBERT 08B reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \bar{D}^{*0}D^0)] = (2.22 \pm 1.05 \pm 0.42) \times 10^{-4}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \bar{D}^{*0}D^0) = (37 \pm 9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁹ AUBERT 08Y reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))] < 6.0 \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S)) = 3.8 \times 10^{-2}$.

¹⁰ AUBERT 06 reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S))] < 10.3 \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^- J/\psi(1S)) = 3.8 \times 10^{-2}$.

¹¹ GOKHROO 06 reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow D^0\bar{D}^0\pi^0)] = (1.66 \pm 0.70^{+0.32}_{-0.37}) \times 10^{-4}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow D^0\bar{D}^0\pi^0) = (49^{+18}_{-20}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

¹² Measure the near-threshold enhancements in the $(D^0\bar{D}^0\pi^0)$ system at a mass $3875.2 \pm 0.7^{+0.3}_{-1.6} \pm 0.8$ MeV/c².

| $\Gamma(\chi_{c1}(3872)^- K^+)/\Gamma_{\text{total}}$ | | Γ_{235}/Γ | | | |
|---|-----|-----------------------|------|---------|-----------------------------------|
| VALUE | CL% | DOCUMENT ID | TECN | COMMENT | |
| <5 × 10 ⁻⁴ | 90 | ¹ AUBERT | 06E | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Perform measurements of absolute branching fractions using a missing mass technique.

$\Gamma(\chi_{c1}(3872)^- K^+, \chi_{c1}(3872)^- \rightarrow J/\psi(1S)\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_{236}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---|
| <4.2 | 90 | 1,2 CHOI | 11 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| ••• | | | | We do not use the following data for averages, fits, limits, etc. ••• |
| <5.4 | 90 | 2,3 AUBERT | 05B | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes $\pi^+\pi^0$ originates from ρ^+ .

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ The isovector- X hypothesis is excluded with a likelihood test at 1×10^{-4} level.

$\Gamma(\chi_{c1}(3872)K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{238}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------|------|---|
| 1.0±0.4±0.3 | | ¹ BALA | 15 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| ••• | | | | We do not use the following data for averages, fits, limits, etc. ••• |
| <3.3 | 90 | 2,3 AUBERT | 09B | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| <1.0 | 90 | 3,4 AUBERT | 09B | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ BALA 15 reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^*(892)^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \pi^+\pi^-J/\psi(1S))]$ = $(4.0 \pm 1.5 \pm 0.3) \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^-J/\psi(1S)) = (3.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² AUBERT 09B reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^*(892)^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \gamma J/\psi)] < 2.8 \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \gamma J/\psi) = 8 \times 10^{-3}$.

³ Uses $B(\Upsilon(4S) \rightarrow B^+B^-) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0\bar{B}^0) = (48.4 \pm 0.6)\%$.

⁴ AUBERT 09B reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^*(892)^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \gamma\psi(2S))] < 4.4 \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \gamma\psi(2S)) = 4.5 \times 10^{-2}$.

$\Gamma(\chi_{c1}(3872)K^+\pi^-)/\Gamma_{\text{total}}$ Γ_{239}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|--|
| 2.1±0.4±0.7 | 1,2 BALA | 15 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ BALA 15 reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)K^+\pi^-)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \pi^+\pi^-J/\psi(1S))] = (7.9 \pm 1.3 \pm 0.4) \times 10^{-6}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^-J/\psi(1S)) = (3.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c1}(3872)\gamma)/\Gamma_{\text{total}}$ Γ_{240}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|-------------|------|--|
| <1.3 × 10⁻⁵ | 90 | 1,2 CHOU | 19 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at $\Upsilon(4S)$.

² CHOU 19 reports $[\Gamma(B^0 \rightarrow \chi_{c1}(3872)\gamma)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(3872) \rightarrow \pi^+\pi^-J/\psi(1S))] < 5.1 \times 10^{-7}$ which we divide by our best value $B(\chi_{c1}(3872) \rightarrow \pi^+\pi^-J/\psi(1S)) = 3.8 \times 10^{-2}$.

$\Gamma(Z_c(4430)^\pm K^\mp, Z_c^\pm \rightarrow \psi(2S)\pi^\pm)/\Gamma_{\text{total}}$ Γ_{241}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------|------|--|
| 6.0^{+1.7+2.5}_{-2.0-1.4} | | CHILIKIN | 13 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-----------------------------|----|---------------------|-----------|-----------------------------------|
| <3.1 | 95 | ¹ AUBERT | 09AA BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $3.2^{+1.8+5.3}_{-0.9-1.6}$ | | ¹ MIZUK | 09 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $4.1 \pm 1.0 \pm 1.4$ | | ^{1,2} CHOI | 08 BELL | Repl. by MIZUK 09 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Establishes the $(Z_c4430)^+$ with a significance of 6.5 sigma. Needs confirmation.

$\Gamma(Z_c(4430)^\pm K^\mp, Z_c^\pm \rightarrow J/\psi \pi^\pm)/\Gamma_{\text{total}}$ Γ_{242}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|--------------------|-------------|--|
| $5.4^{+4.0+1.1}_{-1.0-0.6}$ | | CHILIKIN | 14 BELL | $\bar{B}^0 \rightarrow J/\psi K^- \pi^+$ |

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

| | | | | |
|----|----|---------------------|-----------|-----------------------------------|
| <4 | 95 | ¹ AUBERT | 09AA BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
|----|----|---------------------|-----------|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(Z_c(3900)^\pm K^\mp, Z_c^\pm \rightarrow J/\psi \pi^\pm)/\Gamma_{\text{total}}$ Γ_{243}/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|----------------------|--------------------|-------------|--|
| < 9×10^{-7} | CHILIKIN 14 BELL | | $\bar{B}^0 \rightarrow J/\psi K^- \pi^+$ |

$\Gamma(Z_c(4200)^\pm K^\mp, X^\pm \rightarrow J/\psi \pi^\pm)/\Gamma_{\text{total}}$ Γ_{244}/Γ

| <u>VALUE (units 10^{-5})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|--|
| $2.2^{+0.7+1.1}_{-0.5-0.6}$ | CHILIKIN 14 BELL | | $\bar{B}^0 \rightarrow J/\psi K^- \pi^+$ |

$\Gamma(Z_c(3900)^\pm K^\mp, Z_c^\pm \rightarrow J/\psi \pi^\pm)/\Gamma(J/\psi(1S)K^*(892)^0)$ $\Gamma_{243}/\Gamma_{202}$

| <u>VALUE</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|------------------------|------------|--------------------|-------------|------------------------|
| < 1.5×10^{-2} | 90 | ABAZOV 18B | D0 | $p\bar{p}$ at 1.96 TeV |

$\Gamma(J/\psi(1S)p\bar{p})/\Gamma_{\text{total}}$ Γ_{245}/Γ

| <u>VALUE (units 10^{-7})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|--------------------|-------------|----------------------|
| $4.51 \pm 0.40 \pm 0.44$ | | ¹ AAIJ | 19U LHCB | pp at 7, 8, 13 TeV |

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

| | | | | |
|-------|----|---------------------|----------|-----------------------------------|
| < 5.2 | 90 | ² AAIJ | 13Z LHCB | Repl. by AAIJ 19U |
| < 8.3 | 90 | ³ XIE | 05 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <19 | 90 | ³ AUBERT | 03K BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Measured relative to $B_S^0 \rightarrow J/\psi \phi$ assuming $B(B_S^0 \rightarrow J/\psi \phi) = (10.5 \pm 0.13 \pm 0.64) \times 10^{-4}$ and taking into account small $K^+ K^- S$ -wave contribution. Measurement assumes $f_s/f_d = 0.259 \pm 0.015$ for 7, 8 TeV data and f_s/f_d multiplied by 1.068 ± 0.046 for 13 TeV data.

² Uses $B(B_S^0 \rightarrow J/\psi(1S)\pi^+\pi^-) = (1.98 \pm 0.20) \times 10^{-4}$.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\gamma)/\Gamma_{\text{total}}$ Γ_{246}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|--------------------|-------------|------------------|
| <1.5 | 90 | ¹ AAIJ | 15BB LHCB | pp at 7, 8 TeV |

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

<1.6 90 ² AUBERT,B 04T BABR $e^+e^- \rightarrow \Upsilon(4S)$

¹ Branching fractions of normalization modes $B^0 \rightarrow J/\psi \gamma X$ taken from PDG 14. Uses $f_s/f_d = 0.259 \pm 0.015$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\bar{D}^0)/\Gamma_{\text{total}}$ Γ_{247}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|------|--|
| <1.3 | 90 | ¹ AUBERT | 05U | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

<2.0 90 ¹ ZHANG 05B BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\psi(2S)\pi^0)/\Gamma_{\text{total}}$ Γ_{248}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|---------------------------|------|-----------------------------------|
| 1.17±0.17±0.08 | ¹ CHOBANOVA 16 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\psi(2S)K^0)/\Gamma_{\text{total}}$ Γ_{249}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-----|-----------------------|------|--|
| 5.8 ±0.5 OUR FIT | | | | |
| 5.8 ±0.5 OUR AVERAGE | | | | |
| 4.7 ±0.7 ±0.7 | | ¹ AAIJ | 14L | LHCB pp at 7 TeV |
| 6.46±0.65±0.51 | | ² AUBERT | 05J | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 6.7 ±1.1 | | ² ABE | 03B | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 5.0 ±1.1 ±0.6 | | ² RICHICHI | 01 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |

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

6.9 ±1.1 ±1.1 ² AUBERT 02 BABR Repl. by AUBERT 05J

< 8 90 ² ALAM 94 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$

<15 90 ² BORTOLETTO92 CLEO $e^+e^- \rightarrow \Upsilon(4S)$

<28 90 ² ALBRECHT 90J ARG $e^+e^- \rightarrow \Upsilon(4S)$

¹ Measured with $B(B^0 \rightarrow \psi(2S)K_S^0) \times B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) / B(B^0 \rightarrow J/\psi K_S^0)$ using PDG 12 values for the involved branching fractions.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\psi(2S)K^0)/\Gamma(J/\psi(1S)K^0)$ $\Gamma_{249}/\Gamma_{200}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|---------------------|------|--|
| 0.82±0.13±0.12 | ¹ AUBERT | 02 | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\psi(3770)K^0, \psi \rightarrow \bar{D}^0 D^0)/\Gamma_{\text{total}}$ Γ_{250}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|------|--|
| <1.23 | 90 | ¹ AUBERT | 08B | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\psi(3770)K^0, \psi \rightarrow D^- D^+)/\Gamma_{\text{total}}$ Γ_{251}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|----------|------------------------------------|
| <1.88 | 90 | ¹ AUBERT | 08B BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\psi(2S)\pi^+\pi^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ $\Gamma_{252}/\Gamma_{211}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------------|-----------|---------------|
| $0.56 \pm 0.07 \pm 0.05$ | ¹ AAIJ | 13AA LHCB | pp at 7 TeV |

¹ Assuming lepton universality for dimuon decay modes of J/ψ and $\psi(2S)$ mesons, the ratio $B(J/\psi \rightarrow \mu^+ \mu^-)/B(\psi(2S) \rightarrow \mu^+ \mu^-) = B(J/\psi \rightarrow e^+ e^-)/B(\psi(2S) \rightarrow e^+ e^-) = 7.69 \pm 0.19$ was used.

 $\Gamma(\psi(2S)K^+\pi^-)/\Gamma_{\text{total}}$ Γ_{253}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-----|-------------------------|---------|------------------------------------|
| 5.80 ± 0.39 | | ^{1,2} CHILIKIN | 13 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--------------------------|----|-----------------------|-----------|------------------------------------|
| 5.57 ± 0.16 | | ³ AUBERT | 09AA BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $5.68 \pm 0.13 \pm 0.42$ | | ² MIZUK | 09 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <10 | 90 | ² ALBRECHT | 90J ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Combines measurements with $\psi(2S) \rightarrow \ell^+ \ell^-$ with measurement from MIZUK 09 which uses $\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ Does not report systematic uncertainties.

 $\Gamma(\psi(2S)K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{254}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------|------|---------|
| 5.9 ± 0.4 OUR FIT | | | | |

$6.0^{+0.5}_{-0.7}$ OUR AVERAGE Error includes scale factor of 1.1.

| | | | | |
|----------------------------------|--|-----------------------|----------|------------------------------------|
| $5.55^{+0.22+0.41}_{-0.23-0.84}$ | | ¹ CHILIKIN | 13 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $6.49 \pm 0.59 \pm 0.97$ | | ¹ AUBERT | 05J BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $7.6 \pm 1.1 \pm 1.0$ | | ¹ RICHICHI | 01 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $9.0 \pm 2.2 \pm 0.9$ | | ² ABE | 980 CDF | $p\bar{p}$ 1.8 TeV |

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

| | | | | |
|----------------------------------|----|-------------------------|----------|------------------------------------|
| $5.52^{+0.35+0.53}_{-0.32-0.58}$ | | ¹ MIZUK | 09 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <19 | 90 | ¹ ALAM | 94 CLE2 | Repl. by RICHICHI 01 |
| 14 ± 8 ± 4 | | ¹ BORTOLETTO | 092 CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <23 | 90 | ¹ ALBRECHT | 90J ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ABE 980 reports $[B(B^0 \rightarrow \psi(2S)K^*(892)^0)]/[B(B^+ \rightarrow J/\psi(1S)K^+)] = 0.908 \pm 0.194 \pm 0.10$. We multiply by our best value $B(B^+ \rightarrow J/\psi(1S)K^+) = (9.9 \pm 1.0) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\psi(2S)K^*(892)^0)/\Gamma(J/\psi(1S)K^*(892)^0)$ $\Gamma_{254}/\Gamma_{202}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|---------------------|------|--------------------|
| 0.487±0.018±0.011 | ^{1,2} AAIJ | 12L | LHCB pp at 7 TeV |

¹ AAIJ 12L reports $0.476 \pm 0.014 \pm 0.010 \pm 0.012$ from a measurement of $[\Gamma(B^0 \rightarrow \psi(2S)K^*(892)^0)/\Gamma(B^0 \rightarrow J/\psi(1S)K^*(892)^0)] \times [B(J/\psi(1S) \rightarrow e^+e^-)] / [B(\psi(2S) \rightarrow e^+e^-)]$ assuming $B(J/\psi(1S) \rightarrow e^+e^-) = (5.94 \pm 0.06) \times 10^{-2}$, $B(\psi(2S) \rightarrow e^+e^-) = (7.72 \pm 0.17) \times 10^{-3}$, which we rescale to our best values $B(J/\psi(1S) \rightarrow e^+e^-) = (5.971 \pm 0.032) \times 10^{-2}$, $B(\psi(2S) \rightarrow e^+e^-) = (7.93 \pm 0.17) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

² Assumes $B(J/\psi \rightarrow \mu^+\mu^-) / B(\psi(2S) \rightarrow \mu^+\mu^-) = B(J/\psi \rightarrow e^+e^-) / B(\psi(2S) \rightarrow e^+e^-) = 7.69 \pm 0.19$.

$\Gamma(\psi(2S)K^*(892)^0)/\Gamma(\psi(2S)K^0)$ $\Gamma_{254}/\Gamma_{249}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|--|
| 1.02±0.10 OUR FIT | | | |
| 1.00±0.14±0.09 | AUBERT | 05J | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

$\Gamma(\chi_{c0}K^0)/\Gamma_{total}$ Γ_{255}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------|------|-----------------------|
| 195⁺₋ 42⁺₃₆ ± 11 | | ¹ AAIJ | 18F | LHCB pp at 7, 8 TeV |

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

| | | | | |
|--------------------------|----|-----------------------|------|--|
| $145^{+103}_{-85} \pm 8$ | | ^{2,3} LEES | 12I | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| $148 \pm 30 \pm 13$ | | ^{2,4} LEES | 12O | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| $142^{+55}_{-44} \pm 22$ | | ^{2,5} AUBERT | 09AU | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 113 | 90 | ⁵ GARMASH | 07 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1240 | 90 | ² AUBERT | 05K | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 500 | 90 | ⁶ EDWARDS | 01 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AAIJ 18F uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0 \pi^+ \pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used. We compute $B(B^0 \rightarrow \chi_{c0}K^0)$ using the PDG value $B(\chi_{c0} \rightarrow \pi\pi) = (8.51 \pm 0.33) \times 10^{-3}$ and 2/3 for the $\pi^+ \pi^-$ fraction. Our first error is their experiment's error and the second error is systematic error from using our best value.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ LEES 12I reports $[\Gamma(B^0 \rightarrow \chi_{c0}K^0)/\Gamma_{total}] \times [B(\chi_{c0}(1P) \rightarrow K_S^0 K_S^0)] = (0.46^{+0.25}_{-0.17} \pm 0.21) \times 10^{-6}$ which we divide by our best value $B(\chi_{c0}(1P) \rightarrow K_S^0 K_S^0) = (3.16 \pm 0.17) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ Measured in the $B^0 \rightarrow K_S^0 K^+ K^-$ decay.

⁵ Uses Dalitz plot analysis of the $B^0 \rightarrow K^0 \pi^+ \pi^-$ final state decays.

⁶ EDWARDS 01 assumes equal production of B^0 and B^+ at the $\Upsilon(4S)$. The correlated uncertainties (28.3)% from $B(J/\psi(1S) \rightarrow \gamma\eta_c)$ in those modes have been accounted for.

$\Gamma(\chi_{c0} K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{256}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

| | | | | |
|--|----|---------------------|-----------|-----------------------------------|
| 1.7±0.3±0.2 | | ¹ AUBERT | 08BD BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| <7.7 | 90 | ¹ AUBERT | 05K BABR | Repl. by AUBERT 08BD |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | | |

$\Gamma(\chi_{c1} \pi^0)/\Gamma_{\text{total}}$ Γ_{257}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

| | | | |
|--|--------------------|---------|-----------------------------------|
| 1.12±0.25±0.12 | ¹ KUMAR | 08 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | |

$\Gamma(\chi_{c1} K^0)/\Gamma_{\text{total}}$ Γ_{258}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

| | | | | |
|--|--|-----------------------|----------|-----------------------------------|
| 3.95±0.27 OUR AVERAGE | | | | |
| 15 $\begin{matrix} +5 \\ -4 \end{matrix} \pm 6$ | | ¹ CHILIKIN | 19 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 3.78 $\begin{matrix} +0.17 \\ -0.16 \end{matrix} \pm 0.33$ | | ² BHARDWAJ | 11 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 4.2 ±0.3 ±0.3 | | ³ AUBERT | 09B BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 3.1 $\begin{matrix} +1.5 \\ -1.1 \end{matrix} \pm 0.1$ | | ⁴ AVERY | 00 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

- ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●
- 3.51±0.33±0.45 ² SONI 06 BELL Repl. by BHARDWAJ 11
- 4.53±0.41±0.51 ² AUBERT 05J BABR Repl. by AUBERT 09B
- 4.3 ±1.4 ±0.1 ⁵ AUBERT 02 BABR Repl. by AUBERT 05J
- <27 90 ² ALAM 94 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$
- ¹ CHILIKIN 19 reports $[\Gamma(B^0 \rightarrow \chi_{c1} K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(1P) \rightarrow p\bar{p}\pi^+\pi^-)] = (7.4 \begin{matrix} +2.4+0.6 \\ -2.0-0.4 \end{matrix}) \times 10^{-7}$ which we divide by our best value $B(\chi_{c1}(1P) \rightarrow p\bar{p}\pi^+\pi^-) = (5.0 \pm 1.9) \times 10^{-4}$. 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 Uses $\chi_{c1,2} \rightarrow J/\psi\gamma$. Assumes $B(\Upsilon(4S) \rightarrow B^+B^-) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0\bar{B}^0) = (48.4 \pm 0.6)\%$.
- ⁴ AVERY 00 reports $(3.9 \begin{matrix} +1.9 \\ -1.3 \end{matrix} \pm 0.4) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \chi_{c1} K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))]$ assuming $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = 0.273 \pm 0.016$, which we rescale to our best value $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = (34.3 \pm 1.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
- ⁵ AUBERT 02 reports $(5.4 \pm 1.4 \pm 1.1) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \chi_{c1} K^0)/\Gamma_{\text{total}}] \times [B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))]$ assuming $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = 0.273 \pm 0.016$, which we rescale to our best value $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = (34.3 \pm 1.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c1} K^0)/\Gamma(J/\psi(1S) K^0)$ $\Gamma_{258}/\Gamma_{200}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|---------------------|------|--|
| 0.53±0.16±0.01 | ¹ AUBERT | 02 | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AUBERT 02 reports $0.66 \pm 0.11 \pm 0.17$ from a measurement of $[\Gamma(B^0 \rightarrow \chi_{c1} K^0)/\Gamma(B^0 \rightarrow J/\psi(1S) K^0)] \times [B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))]$ assuming $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = 0.273 \pm 0.016$, which we rescale to our best value $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = (34.3 \pm 1.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c1} \pi^- K^+)/\Gamma_{total}$ Γ_{259}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----------------------|------|--|
| 4.97±0.12±0.28 | ¹ BHARDWAJ | 16 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|----------------|--------------------|----|---------------------------|
| 3.83±0.10±0.39 | ¹ MIZUK | 08 | BELL Repl. by BHARDWAJ 16 |
|----------------|--------------------|----|---------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c1} \pi^- K^+)/\Gamma(J/\psi(1S) K^+ \pi^-)$ $\Gamma_{259}/\Gamma_{201}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|------|---------|
| 0.476±0.021±0.013 | ¹ LEES | 12B | BABR |

¹ LEES 12B reports $0.474 \pm 0.013 \pm 0.026$ from a measurement of $[\Gamma(B^0 \rightarrow \chi_{c1} \pi^- K^+)/\Gamma(B^0 \rightarrow J/\psi(1S) K^+ \pi^-)] \times [B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))]$ assuming $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = (34.4 \pm 1.5) \times 10^{-2}$, which we rescale to our best value $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = (34.3 \pm 1.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\chi_{c1} K^*(892)^0)/\Gamma_{total}$ Γ_{260}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|-------------------------------------|
| 2.38±0.19 OUR FIT | | | | Error includes scale factor of 1.2. |

2.22^{+0.40}_{-0.31} OUR AVERAGE Error includes scale factor of 1.6.

| | | | |
|-----------------|---------------------|-----|--|
| 2.5 ± 0.2 ± 0.2 | ¹ AUBERT | 09B | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----------------|---------------------|-----|--|

| | | | |
|--|--------------------|----|--|
| 1.73 ^{+0.15+0.34} _{-0.12-0.22} | ² MIZUK | 08 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
|--|--------------------|----|--|

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

| | | | |
|----------------|-------------------|----|------------------------|
| 3.14±0.34±0.72 | ² SONI | 06 | BELL Repl. by MIZUK 08 |
|----------------|-------------------|----|------------------------|

| | | | |
|----------------|---------------------|-----|--------------------------|
| 3.27±0.42±0.64 | ² AUBERT | 05J | BABR Repl. by AUBERT 09B |
|----------------|---------------------|-----|--------------------------|

| | | | |
|-----------------|---------------------|----|--------------------------|
| 3.8 ± 1.3 ± 0.1 | ³ AUBERT | 02 | BABR Repl. by AUBERT 05J |
|-----------------|---------------------|----|--------------------------|

| | | | | |
|-----|----|-------------------|----|--|
| <21 | 90 | ⁴ ALAM | 94 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----|----|-------------------|----|--|

¹ Uses $\chi_{c1,2} \rightarrow J/\psi\gamma$. Assumes $B(\Upsilon(4S) \rightarrow B^+ B^-) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = (48.4 \pm 0.6)\%$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ AUBERT 02 reports $(4.8 \pm 1.4 \pm 0.9) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \chi_{c1} K^*(892)^0)/\Gamma_{total}] \times [B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))]$ assuming $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = 0.273 \pm 0.016$, which we rescale to our best value $B(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) = (34.3 \pm 1.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c1} K^*(892)^0)/\Gamma(J/\psi(1S) K^*(892)^0)$ $\Gamma_{260}/\Gamma_{202}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------------|------|-------------------------------------|
| 18.8 ± 1.5 OUR FIT | | | Error includes scale factor of 1.1. |
| $19.8 \pm 1.1 \pm 1.5$ | ¹ AAIJ | 13AC | LHCB pp at 7 TeV |

¹ Uses $B(\chi_{c1} \rightarrow J/\psi\gamma) = (34.4 \pm 1.5)\%$. $\Gamma(\chi_{c1} K^*(892)^0)/\Gamma(\chi_{c1} K^0)$ $\Gamma_{260}/\Gamma_{258}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------|------|--|
| $0.72 \pm 0.11 \pm 0.12$ | AUBERT | 05J | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

0.89 ± 0.34 ± 0.17 ¹ AUBERT 02 BABR Repl. by AUBERT 05J¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(X(4051)^- K^+, X^- \rightarrow \chi_{c1} \pi^-)/\Gamma_{\text{total}}$ Γ_{261}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|--------------------|------|--|
| $3.0^{+1.5+3.7}_{-0.8-1.6}$ | | ¹ MIZUK | 08 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

<1.8 90 ^{1,2} LEES 12B BABR¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² Uses $\chi_{c1} \rightarrow J/\psi\gamma$ mode. Uses $\chi_{c1} \rightarrow J/\psi\gamma$ mode. Finds a good description of the data without this $B^0 \rightarrow X(4051)^+ K^-$ decay mode in a fit. $\Gamma(X(4248)^- K^+, X^- \rightarrow \chi_{c1} \pi^-)/\Gamma_{\text{total}}$ Γ_{262}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|--------------------|------|--|
| $4.0^{+2.3+19.7}_{-0.9-0.5}$ | | ¹ MIZUK | 08 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

<4.0 90 ^{1,2} LEES 12B BABR¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² Uses $\chi_{c1} \rightarrow J/\psi\gamma$ mode. Finds a good description of the data without this $B^0 \rightarrow X(4248)^+ K^-$ decay mode in a fit. $\Gamma(\chi_{c1} \pi^+ \pi^- K^0)/\Gamma_{\text{total}}$ Γ_{263}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--|-----------------------|------|--|
| $3.16 \pm 0.35 \pm 0.32$ | ¹ BHARDWAJ | 16 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\chi_{c1} \pi^- \pi^0 K^+)/\Gamma_{\text{total}}$ Γ_{264}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--|-----------------------|------|--|
| $3.52 \pm 0.52 \pm 0.24$ | ¹ BHARDWAJ | 16 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\chi_{c2} K^0)/\Gamma_{\text{total}}$ Γ_{265}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-----------------------|------|--|
| $<1.5 \times 10^{-5}$ | 90 | ¹ BHARDWAJ | 11 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-----------------------|----|---------------------|-----|------|-----------------------------------|
| $<2.8 \times 10^{-5}$ | 90 | ² AUBERT | 09B | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $<2.6 \times 10^{-5}$ | 90 | ¹ SONI | 06 | BELL | Repl. by BHARDWAJ 11 |
| $<4.1 \times 10^{-5}$ | 90 | ¹ AUBERT | 05K | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Uses $\chi_{c1,2} \rightarrow J/\psi\gamma$. Assumes $B(\Upsilon(4S) \rightarrow B^+ B^-) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = (48.4 \pm 0.6)\%$.

$\Gamma(\chi_{c2} K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{266}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

4.9 ± 1.2 OUR FIT Error includes scale factor of 1.1.

$6.6 \pm 1.8 \pm 0.5$ ¹ AUBERT 09B BABR $e^+e^- \rightarrow \Upsilon(4S)$

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

| | | | | | |
|--------|----|---------------------|-----|------|-----------------------------------|
| <7.1 | 90 | ² SONI | 06 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <3.6 | 90 | ² AUBERT | 05K | BABR | Repl. by AUBERT 09B |

¹ Uses $\chi_{c1,2} \rightarrow J/\psi\gamma$. Assumes $B(\Upsilon(4S) \rightarrow B^+ B^-) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = (48.4 \pm 0.6)\%$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c2} K^*(892)^0)/\Gamma(\chi_{c1} K^*(892)^0)$ $\Gamma_{266}/\Gamma_{260}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

20 ± 5 OUR FIT Error includes scale factor of 1.1.

$17.1 \pm 5.0 \pm 2.0$ ¹ AAIJ 13AC LHCB pp at 7 TeV

¹ Uses $B(\chi_{c1} \rightarrow J/\psi\gamma)/B(\chi_{c2} \rightarrow J/\psi\gamma) = 1.76 \pm 0.11$.

$\Gamma(\chi_{c2} \pi^- K^+)/\Gamma_{\text{total}}$ Γ_{267}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

$0.72 \pm 0.09 \pm 0.05$ ¹ BHARDWAJ 16 BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c2} \pi^+ \pi^- K^0)/\Gamma_{\text{total}}$ Γ_{268}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

$<1.70 \times 10^{-4}$ 90 ¹ BHARDWAJ 16 BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c2} \pi^- \pi^0 K^+)/\Gamma_{\text{total}}$ Γ_{269}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

$<0.74 \times 10^{-4}$ 90 ¹ BHARDWAJ 16 BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\psi(4660) K^0, \psi \rightarrow \Lambda_c^+ \Lambda_c^-)/\Gamma_{\text{total}}$ Γ_{270}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

$<2.3 \times 10^{-4}$ 90 ¹ LI 18D BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 48.6 \pm 0.6\%$ and $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 6.23 \pm 0.33\%$.

$$\Gamma(\psi(4230)^0 K^0, \psi^0 \rightarrow J/\psi \pi^+ \pi^-) / \Gamma_{\text{total}} \quad \Gamma_{271} / \Gamma$$

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------|-----|-------------------|---------|------------------------------------|
| $<17 \times 10^{-6}$ | 90 | ¹ GARG | 19 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^0 and B^+ at the $\Upsilon(4S)$.

$$\Gamma(K^+ \pi^-) / \Gamma_{\text{total}} \quad \Gamma_{272} / \Gamma$$

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|-----------------------|----------|------------------------------------|
| 19.6 ± 0.5 OUR FIT | | | | |
| 19.6 ± 0.5 OUR AVERAGE | | | | |
| 20.00 ± 0.34 ± 0.60 | | ¹ DUH | 13 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 19.1 ± 0.6 ± 0.6 | | ¹ AUBERT | 07B BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 18.0 + 2.3 + 1.2 - 2.1 - 0.9 | | ¹ BORNHEIM | 03 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---------------------------------|----|-----------------------------|----------|------------------------------------|
| 19.9 ± 0.4 ± 0.8 | | ¹ LIN | 07A BELL | Repl. by DUH 13 |
| 18.5 ± 1.0 ± 0.7 | | ¹ CHAO | 04 BELL | Repl. by LIN 07A |
| 17.9 ± 0.9 ± 0.7 | | ¹ AUBERT | 02Q BABR | Repl. by AUBERT 07B |
| 22.5 ± 1.9 ± 1.8 | | ¹ CASEY | 02 BELL | Repl. by CHAO 04 |
| 19.3 + 3.4 + 1.5 - 3.2 - 0.6 | | ¹ ABE | 01H BELL | Repl. by CASEY 02 |
| 16.7 ± 1.6 ± 1.3 | | ¹ AUBERT | 01E BABR | Repl. by AUBERT 02Q |
| < 66 | 90 | ² ABE | 00C SLD | $e^+ e^- \rightarrow Z$ |
| 17.2 + 2.5 ± 1.2 - 2.4 | | ¹ CRONIN-HEN..00 | CLE2 | Repl. by BORNHEIM 03 |
| 15 + 5. ± 1.4 - 4 | | GODANG | 98 CLE2 | Repl. by CRONIN-HENNESSY 00 |
| 24 + 17 ± 2 - 11 | | ³ ADAM | 96D DLPH | $e^+ e^- \rightarrow Z$ |
| < 17 | 90 | ASNER | 96 CLE2 | Sup. by ADAM 96D |
| < 30 | 90 | ⁴ BUSKULIC | 96V ALEP | $e^+ e^- \rightarrow Z$ |
| < 90 | 90 | ⁵ ABREU | 95N DLPH | Sup. by ADAM 96D |
| < 81 | 90 | ⁶ AKERS | 94L OPAL | $e^+ e^- \rightarrow Z$ |
| < 26 | 90 | ⁷ BATTLE | 93 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 180 | 90 | ALBRECHT | 91B ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 90 | 90 | ⁸ AVERY | 89B CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 320 | 90 | AVERY | 87 CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the B fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$.

³ ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$. Contributions from B^0 and B_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

⁴ BUSKULIC 96V assumes PDG 96 production fractions for B^0 , B^+ , B_s , b baryons.

⁵ Assumes a B^0 , B^- production fraction of 0.39 and a B_s production fraction of 0.12. Contributions from B^0 and B_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

⁶ Assumes $B(Z \rightarrow b\bar{b}) = 0.217$ and B_d^0 (B_s^0) fraction 39.5% (12%).

⁷ BATTLE 93 assumes equal production of $B^0 \bar{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

⁸ Assumes the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$.

$$\Gamma(K^+\pi^-)/\Gamma(K^0\pi^0) \qquad \Gamma_{272}/\Gamma_{273}$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|------------------|------|--|
| 2.16±0.16±0.16 | LIN | 07A | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.20 ^{+0.50+0.22} _{-0.58-0.32} | ¹ ABE | 01H | BELL Repl. by LIN 07A |

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

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$[\Gamma(K^+\pi^-) + \Gamma(\pi^+\pi^-)]/\Gamma_{\text{total}} \qquad (\Gamma_{272} + \Gamma_{405})/\Gamma$$

| VALUE (units 10^{-6}) | EVTS | DOCUMENT ID | TECN | COMMENT |
|--|------|-------------------|------|--|
| 19± 6 OUR AVERAGE | | | | |
| 28 ⁺¹⁵ ₋₁₀ ± 20 | | ¹ ADAM | 96D | DLPH $e^+e^- \rightarrow Z$ |
| 18 ^{+ 6+ 3} _{- 5- 4} | 17.2 | ASNER | 96 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--------------------------------------|--|---------------------|----|--|
| 24 ^{+ 8} _{- 7} ± 2 | | ² BATTLE | 93 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------------------------------------|--|---------------------|----|--|

¹ ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$. Contributions from B^0 and B_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

² BATTLE 93 assumes equal production of $B^0\bar{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$$\Gamma(K^0\pi^0)/\Gamma_{\text{total}} \qquad \Gamma_{273}/\Gamma$$

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-----------------------|------|--|
| 9.9 ± 0.5 OUR AVERAGE | | | | |
| 9.68±0.46±0.50 | | ¹ DUH | 13 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 10.1 ± 0.6 ± 0.4 | | ¹ LEES | 13D | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 12.8 ^{+4.0 +1.7} _{-3.3 -1.4} | | ¹ BORNHEIM | 03 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--|----|-----------------------------|------|----------------------------------|
| 8.7 ± 0.5 ± 0.6 | | ¹ FUJIKAWA | 10A | BELL Repl. by DUH 13 |
| 10.3 ± 0.7 ± 0.6 | | ¹ AUBERT | 08E | BABR Repl. by LEES 13D |
| 9.2 ± 0.7 ± 0.6 | | ¹ LIN | 07A | BELL Repl. by FUJIKAWA 10A |
| 11.4 ± 0.9 ± 0.6 | | ¹ AUBERT | 05Y | BABR Repl. by AUBERT 08E |
| 11.4 ± 1.7 ± 0.8 | | ¹ AUBERT | 04M | BABR Repl. by AUBERT 05Y |
| 11.7 ± 2.3 ^{+1.2} _{-1.3} | | ¹ CHAO | 04 | BELL Repl. by LIN 07A |
| 8.0 ^{+3.3} _{-3.1} ± 1.6 | | ¹ CASEY | 02 | BELL Repl. by CHAO 04 |
| 16.0 ^{+7.2 +2.5} _{-5.9 -2.7} | | ¹ ABE | 01H | BELL Repl. by CASEY 02 |
| 8.2 ^{+3.1} _{-2.7} ± 1.2 | | ¹ AUBERT | 01E | BABR Repl. by AUBERT 04M |
| 14.6 ^{+5.9 +2.4} _{-5.1 -3.3} | | ¹ CRONIN-HEN..00 | CLE2 | Repl. by BORNHEIM 03 |
| <41 | 90 | GODANG | 98 | CLE2 Repl. by CRONIN-HENNESSY 00 |
| <40 | 90 | ASNER | 96 | CLE2 Rep. by GODANG 98 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta' K^0)/\Gamma_{\text{total}}$ Γ_{274}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|------------------------------------|
| 66 ± 4 OUR AVERAGE | Error includes scale factor of 1.4. | | |
| 68.5 ± 2.2 ± 3.1 | ¹ AUBERT | 09AV BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 58.9 ⁺ ₋ $\frac{3.6}{3.5} \pm 4.3$ | ¹ SCHUEMANN | 06 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 89 $\frac{+18}{-16} \pm 9$ | ¹ RICHICHI | 00 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 66.6 ± 2.6 ± 2.8 | ¹ AUBERT | 07AE BABR | Repl. by AUBERT 09AV |
| 67.4 ± 3.3 ± 3.2 | ¹ AUBERT | 05M BABR | AUBERT 07AE |
| 60.6 ± 5.6 ± 4.6 | ¹ AUBERT | 03W BABR | Repl. by AUBERT 05M |
| 55 $\frac{+19}{-16} \pm 8$ | ¹ ABE | 01M BELL | Repl. by SCHUEMANN 06 |
| 42 $\frac{+13}{-11} \pm 4$ | ¹ AUBERT | 01G BABR | Repl. by AUBERT 03W |
| 47 $\frac{+27}{-20} \pm 9$ | BEHRENS | 98 CLE2 | Repl. by RICHICHI 00 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\eta' K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{275}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|------------------------------|-------------|------------------------------------|
| 2.8 ± 0.6 OUR AVERAGE | | | | |
| 2.6 ± 0.7 ± 0.2 | | ¹ SATO | 14 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 3.1 ⁺ ₋ $\frac{0.9}{0.8} \pm 0.3$ | | ¹ DEL-AMO-SA..10A | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 3.8 ± 1.1 ± 0.5 | | ¹ AUBERT | 07E BABR | Repl. by DEL-AMO-SANCHEZ 10A |
| < 2.6 | 90 | ¹ SCHUEMANN | 07 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 7.6 | 90 | ¹ AUBERT,B | 04D BABR | Repl. by AUBERT 07E |
| < 24 | 90 | ¹ RICHICHI | 00 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 39 | 90 | BEHRENS | 98 CLE2 | Repl. by RICHICHI 00 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\eta' K_0^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{276}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------------------------|-------------|------------------------------------|
| 6.3 ± 1.3 ± 0.9 | ¹ DEL-AMO-SA..10A | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\eta' K_2^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{277}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|------------------------------|-------------|------------------------------------|
| 13.7⁺₋ $\frac{3.0}{2.9} \pm 1.2$ | ¹ DEL-AMO-SA..10A | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\eta K^0)/\Gamma_{\text{total}}$ Γ_{278}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|------------|--------------------|-------------|------------------------------------|
| 1.23⁺₋ $\frac{0.27}{0.24} \text{ OUR AVERAGE}$ | | | | |
| 1.27 ⁺ ₋ $\frac{0.33}{0.29} \pm 0.08$ | | ¹ HOI | 12 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

$1.15^{+0.43}_{-0.38} \pm 0.09$ ¹ AUBERT 09AV BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

| | | | | | |
|-------|----|-----------------------|-----|------|------------------------------------|
| < 1.9 | 90 | ¹ CHANG | 07B | BELL | Repl. by HOI 12 |
| < 2.9 | 90 | ¹ AUBERT,B | 06V | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 2.5 | 90 | ¹ AUBERT,B | 05K | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 2.0 | 90 | ¹ CHANG | 05A | BELL | Repl. by CHANG 07B |
| < 5.2 | 90 | ¹ AUBERT | 04H | BABR | Repl. by AUBERT,B 05K |
| < 9.3 | 90 | ¹ RICHICHI | 00 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <33 | 90 | BEHRENS | 98 | CLE2 | Repl. by RICHICHI 00 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{279}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|-----------------------|-------------|---|
| 15.9±1.0 OUR AVERAGE | | | | |
| 15.2±1.2±1.0 | | ¹ WANG | 07B | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 16.5±1.1±0.8 | | ¹ AUBERT,B | 06H | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 13.8 ^{+5.5} _{-4.6} ±1.6 | | ¹ RICHICHI | 00 | CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|--------------|----|-----------------------|-----|------|-----------------------|
| 18.6±2.3±1.2 | | ¹ AUBERT,B | 04D | BABR | Repl. by AUBERT,B 06H |
| <30 | 90 | BEHRENS | 98 | CLE2 | Repl. by RICHICHI 00 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta K_0^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{280}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-----------------------|-------------|---|
| 11.0±1.6±1.5 | | | |
| | ¹ AUBERT,B | 06H | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta K_2^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{281}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-----------------------|-------------|---|
| 9.6±1.8±1.1 | | | |
| | ¹ AUBERT,B | 06H | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\omega K^0)/\Gamma_{\text{total}}$ Γ_{282}/Γ

| <u>VALUE (units 10^{-6})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|------------------------|-------------|---|
| 4.8±0.4 OUR AVERAGE | | | | |
| 4.5±0.4±0.3 | | ¹ CHOBANOVA | 14 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 5.4±0.8±0.3 | | ¹ AUBERT | 07AE | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 10.0 ^{+5.4} _{-4.2} ±1.4 | | ¹ JESSOP | 00 | CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|--|----|-----------------------|-----|------|-----------------------|
| 6.2±1.0±0.4 | | ¹ AUBERT,B | 06E | BABR | Repl. by AUBERT 07AE |
| 4.4 ^{+0.8} _{-0.7} ±0.4 | | ¹ JEN | 06 | BELL | Repl. by CHOBANOVA 14 |
| 5.9 ^{+1.6} _{-1.3} ±0.5 | | ¹ AUBERT | 04H | BABR | Repl. by AUBERT,B 06E |
| 4.0 ^{+1.9} _{-1.6} ±0.5 | | ¹ WANG | 04A | BELL | Repl. by JEN 06 |
| <13 | 90 | ¹ AUBERT | 01G | BABR | Repl. by AUBERT 04H |
| <57 | 90 | ¹ BERGFELD | 98 | CLE2 | Repl. by JESSOP 00 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(a_0(980)^0 K^0, a_0^0 \rightarrow \eta\pi^0)/\Gamma_{\text{total}} \quad \Gamma_{283}/\Gamma$$

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------------|------|-----------------------------------|
| <7.8 | 90 | ¹ AUBERT,BE 04 | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of charged and neutral B mesons at $\Upsilon(4S)$.

$$\Gamma(b_1^0 K^0, b_1^0 \rightarrow \omega\pi^0)/\Gamma_{\text{total}} \quad \Gamma_{284}/\Gamma$$

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|--------------------------|------|-----------------------------------|
| <7.8 | 90 | ¹ AUBERT 08AG | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(a_0(980)^\pm K^\mp, a_0^\pm \rightarrow \eta\pi^\pm)/\Gamma_{\text{total}} \quad \Gamma_{285}/\Gamma$$

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------------|------|-----------------------------------|
| <1.9 | 90 | ¹ AUBERT 07Y | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|------|----|---------------------------|------|---------------------|
| <2.1 | 90 | ¹ AUBERT,BE 04 | BABR | Repl. by AUBERT 07Y |
|------|----|---------------------------|------|---------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(b_1^- K^+, b_1^- \rightarrow \omega\pi^-)/\Gamma_{\text{total}} \quad \Gamma_{286}/\Gamma$$

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|--------------------------|------|-----------------------------------|
| $7.4 \pm 1.0 \pm 1.0$ | ¹ AUBERT 07BI | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(b_1^0 K^{*0}, b_1^0 \rightarrow \omega\pi^0)/\Gamma_{\text{total}} \quad \Gamma_{287}/\Gamma$$

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------|-----|--------------------------|------|-----------------------------------|
| < 8.0×10^{-6} | 90 | ¹ AUBERT 09AF | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(b_1^- K^{*+}, b_1^- \rightarrow \omega\pi^-)/\Gamma_{\text{total}} \quad \Gamma_{288}/\Gamma$$

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------|-----|--------------------------|------|-----------------------------------|
| < 5.0×10^{-6} | 90 | ¹ AUBERT 09AF | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(a_0(1450)^\pm K^\mp, a_0^\pm \rightarrow \eta\pi^\pm)/\Gamma_{\text{total}} \quad \Gamma_{289}/\Gamma$$

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------------|------|-----------------------------------|
| <3.1 | 90 | ¹ AUBERT 07Y | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$$\Gamma(K_S^0 X^0 (\text{Familon}))/\Gamma_{\text{total}} \quad \Gamma_{290}/\Gamma$$

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|------------------------|------|-----------------------------------|
| <53 | 90 | ¹ AMMAR 01B | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AMMAR 01B searched for the two-body decay of the B meson to a massless neutral feebly-interacting particle X^0 such as the familon, the Nambu-Goldstone boson associated with a spontaneously broken global family symmetry.

$\Gamma(\omega K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{291}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|----------------------------|----------|-----------------------------------|
| 2.0±0.5 OUR AVERAGE | | | | |
| 2.2±0.6±0.2 | | ¹ AUBERT | 09H BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.8±0.7±0.3 | | ¹ GOLDENZWE..08 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| < 4.2 | 90 | ¹ AUBERT,B | 06T BABR | Repl. by AUBERT 09H |
| < 6.0 | 90 | ¹ AUBERT | 05O BABR | Repl. by AUBERT,B 06T |
| <23 | 90 | ¹ BERGFELD | 98 CLE2 | |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | | |

 $\Gamma(\omega(K\pi)_0^{*0})/\Gamma_{\text{total}}$ Γ_{292}/Γ

$(K\pi)_0^{*0}$ is the total S-wave composed of $K_0^*(1430)$ and nonresonant that are described using LASS shape.

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--|---------------------|----------|-----------------------------------|
| 18.4±1.8±1.7 | | | |
| | ¹ AUBERT | 09H BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | |

 $\Gamma(\omega K_0^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{293}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--|---------------------|----------|-----------------------------------|
| 16.0±1.6±3.0 | | | |
| | ¹ AUBERT | 09H BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | |

 $\Gamma(\omega K_2^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{294}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--|---------------------|----------|-----------------------------------|
| 10.1±2.0±1.1 | | | |
| | ¹ AUBERT | 09H BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | |

 $\Gamma(\omega K^+ \pi^- \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{295}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--|------------------------------|------|-----------------------------------|
| 5.1±0.7±0.7 | | | |
| | ^{1,2} GOLDENZWE..08 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | |
| ² For the $K\pi$ mass range 0.755–1.250 GeV/ c^2 , excluding $K^*(892)$. | | | |

 $\Gamma(K^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ Γ_{296}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|----------------------|-----------|-----------------------------------|
| 37.8±3.2 OUR AVERAGE | | | | |
| 38.5±1.0±3.9 | | ^{1,2} LEES | 11 BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 36.6 ^{+4.2} _{-4.3} ±3.0 | | ¹ CHANG | 04 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 35.7 ^{+2.6} _{-1.5} ±2.2 | | ¹ AUBERT | 08AQ BABR | Repl. by LEES 11 |
| <40 | 90 | ¹ ECKHART | 02 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | | |
| ² Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays. | | | | |

$\Gamma(K^+\rho^-)/\Gamma_{\text{total}}$ Γ_{297}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

7.0±0.9 OUR AVERAGE6.6±0.5±0.8 1,2 LEES 11 BABR $e^+e^- \rightarrow \Upsilon(4S)$ 15.1^{+3.4+2.4}_{-3.3-2.6} 1 CHANG 04 BELL $e^+e^- \rightarrow \Upsilon(4S)$

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

8.0^{+0.8}_{-1.3}±0.6 1 AUBERT 08AQ BABR Repl. by LEES 117.3^{+1.3}_{-1.2}±1.3 1 AUBERT 03T BABR Repl. by AUBERT 08AQ<32 90 1 JESSOP 00 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$

<35 90 ASNER 96 CLE2 Repl. by JESSOP 00

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² Uses Dalitz plot analysis of $B^0 \rightarrow K^+\pi^-\pi^0$ decays. $\Gamma(K^+\rho(1450)^-)/\Gamma_{\text{total}}$ Γ_{298}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

2.4±1.0±0.6 1,2 LEES 11 BABR $e^+e^- \rightarrow \Upsilon(4S)$

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

<2.1 90 1 AUBERT 08AQ BABR Repl. by LEES 11

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² Uses Dalitz plot analysis of $B^0 \rightarrow K^+\pi^-\pi^0$ decays. $\Gamma(K^+\rho(1700)^-)/\Gamma_{\text{total}}$ Γ_{299}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

0.6±0.6±0.4 1,2 LEES 11 BABR $e^+e^- \rightarrow \Upsilon(4S)$

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

<1.1 90 1 AUBERT 08AQ BABR Repl. by LEES 11

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² Uses Dalitz plot analysis of $B^0 \rightarrow K^+\pi^-\pi^0$ decays. $\Gamma((K^+\pi^-\pi^0)_{\text{nonresonant}})/\Gamma_{\text{total}}$ Γ_{300}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

2.8±0.5±0.4 1,2 LEES 11 BABR $e^+e^- \rightarrow \Upsilon(4S)$

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

4.4±0.9±0.5 1 AUBERT 08AQ BABR Repl. by LEES 11

<9.4 90 1 CHANG 04 BELL $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² Uses Dalitz plot analysis of $B^0 \rightarrow K^+\pi^-\pi^0$ decays. The quoted value is only for the flat part of the non-resonant component. $\Gamma((K\pi)_0^{*+}\pi^-, (K\pi)_0^{*+} \rightarrow K^+\pi^0)/\Gamma_{\text{total}}$ Γ_{301}/Γ $(K\pi)_0^{*+}$ is the total S-wave composed of $K_0^*(1430)$ and nonresonant that are described using LASS shape.

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

34.2±2.4±4.1 1,2 LEES 11 BABR $e^+e^- \rightarrow \Upsilon(4S)$

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

$9.4^{+1.1+2.3}_{-1.3-2.1}$ ¹ AUBERT 08AQ BABR Repl. by LEES 11

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

$\Gamma((K\pi)_0^{*0} \pi^0, (K\pi)_0^{*0} \rightarrow K^+ \pi^-) / \Gamma_{\text{total}}$ Γ_{302} / Γ

$(K\pi)_0^{*0}$ is the total S-wave composed of $K_0^*(1430)$ and nonresonant that are described using LASS shape.

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------|------|---|
| $8.6 \pm 1.1 \pm 1.3$ | | 1,2 LEES | 11 | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

$8.7^{+1.1+2.8}_{-0.9-2.6}$ ¹ AUBERT 08AQ BABR Repl. by LEES 11

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

$\Gamma(K_2^*(1430)^0 \pi^0) / \Gamma_{\text{total}}$ Γ_{303} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|-------------|-----------|------------------------------------|
| < 4.0 | 90 | 1 AUBERT | 08AQ BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K^*(1680)^0 \pi^0) / \Gamma_{\text{total}}$ Γ_{304} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|-------------|-----------|------------------------------------|
| < 7.5 | 90 | 1 AUBERT | 08AQ BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K_x^{*0} \pi^0) / \Gamma_{\text{total}}$ Γ_{305} / Γ

K_x^{*0} stands for the possible candidates of $K^*(1410)$, $K_0^*(1430)$ and $K_2^*(1430)$.

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------|---------|------------------------------------|
| $6.1^{+1.6+0.5}_{-1.5-0.6}$ | | 1 CHANG | 04 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K^0 \pi^+ \pi^-) / \Gamma_{\text{total}}$ Γ_{306} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|----------------------|-----------|------------------------------------|
| 49.7 ± 1.8 OUR FIT | | | | |
| 49.6 ± 2.0 OUR AVERAGE | | | | |
| $50.2 \pm 1.5 \pm 1.8$ | | ¹ AUBERT | 09AU BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $47.5 \pm 2.4 \pm 3.7$ | | ² GARMASH | 07 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $50^{+10}_{-9} \pm 7$ | | ¹ ECKHART | 02 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

$43.0 \pm 2.3 \pm 2.3$ ¹ AUBERT 06I BABR Repl. by AUBERT 09AU

$43.7 \pm 3.8 \pm 3.4$ ¹ AUBERT,B 04O BABR Repl. by AUBERT 06I

$45.4 \pm 5.2 \pm 5.9$ ¹ GARMASH 04 BELL Repl. by GARMASH 07

< 440 90 ALBRECHT 91E ARG $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Uses Dalitz plot analysis of the $B^0 \rightarrow K^0 \pi^+ \pi^-$ final state decays.

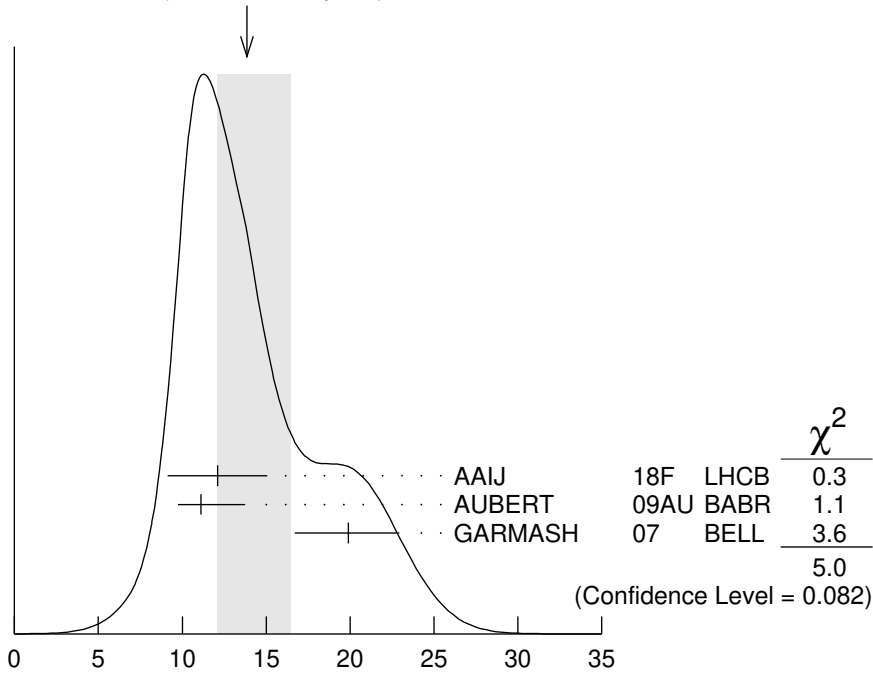
$\Gamma(K^0 \pi^+ \pi^- \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{307}/Γ

VALUE (units 10^{-6}) DOCUMENT ID TECN COMMENT

13.9^{+2.6}_{-1.8} OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.

| | | | | | |
|--|---|---------|------|------|---------------------------------|
| 12.1 \pm 0.6 \pm 2.9 | 1 | AAIJ | 18F | LHCB | pp at 7, 8 TeV |
| 11.1 ^{+2.5} _{-1.0} \pm 0.9 | 2 | AUBERT | 09AU | BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| 19.9 \pm 2.5 ^{+1.7} _{-2.0} | 3 | GARMASH | 07 | BELL | $e^+e^- \rightarrow \gamma(4S)$ |

WEIGHTED AVERAGE
13.9^{+2.6}_{-1.8} (Error scaled by 1.6)



¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0 \pi^+ \pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

² Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

³ Uses Dalitz plot analysis of the $B^0 \rightarrow K^0 \pi^+ \pi^-$ final state decays.

$\Gamma(K^0 \pi^+ \pi^- \text{ nonresonant})/\Gamma_{\text{total}}$ (units 10^{-6})

$\Gamma(K^0 \rho^0)/\Gamma_{\text{total}}$ Γ_{308}/Γ

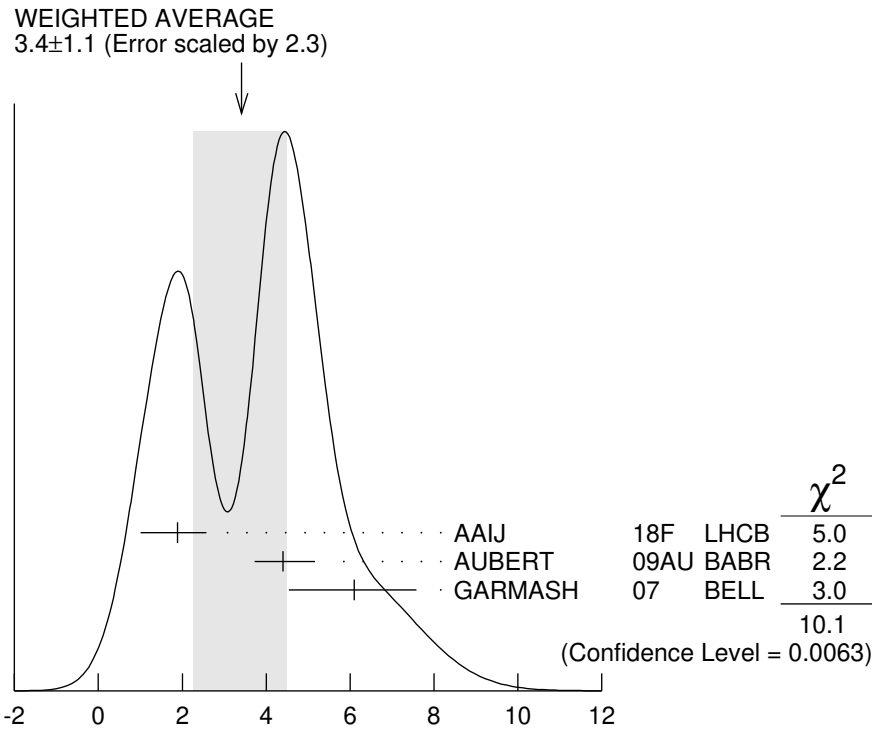
VALUE (units 10^{-6}) CL% DOCUMENT ID TECN COMMENT

3.4 \pm 1.1 OUR AVERAGE Error includes scale factor of 2.3. See the ideogram below.

| | | | | | |
|---|---|---------|------|------|---------------------------------|
| 1.89 ^{+0.55} _{-0.79} \pm 0.40 | 1 | AAIJ | 18F | LHCB | pp at 7, 8 TeV |
| 4.4 ^{+0.7} _{-0.6} \pm 0.3 | 2 | AUBERT | 09AU | BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| 6.1 \pm 1.0 ^{+1.1} _{-1.2} | 3 | GARMASH | 07 | BELL | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|-----------------------|---------------------|--------------------|------|--|
| $4.9 \pm 0.8 \pm 0.9$ | ² AUBERT | 07F | BABR | Repl. by AUBERT 09AU |
| < 39 | 90 | ASNER | 96 | CLEO $e^+e^- \rightarrow \Upsilon(4S)$ |
| <320 | 90 | ALBRECHT | 91B | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
| <500 | 90 | ⁴ AVERY | 89B | CLEO $e^+e^- \rightarrow \Upsilon(4S)$ |



¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0 \pi^+ \pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ Uses Dalitz plot analysis of the $B^0 \rightarrow K^0 \pi^+ \pi^-$ final state decays.

⁴ AVERY 89B reports $< 5.8 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.

$\Gamma(K^0 \rho^0) / \Gamma_{\text{total}}$ (units 10^{-6})

| $\Gamma(K^*(892)^+ \pi^-) / \Gamma_{\text{total}}$ | Γ_{309} / Γ |
|--|---|
| <u>VALUE (units 10^{-6})</u> | <u>CL%</u> |
| <u>DOCUMENT ID</u> | <u>TECN</u> |
| <u>COMMENT</u> | |
| 7.5 ± 0.4 OUR AVERAGE | |
| 7.02 ± 0.30 ± 0.45 | ¹ AAIJ 18F LHCB pp at 7, 8 TeV |
| 8.0 ± 1.1 ± 0.8 | ^{2,3} LEES 11 BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 8.3 $^{+0.9}_{-0.8}$ ± 0.8 | ^{3,4} AUBERT 09AU BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 8.4 ± 1.1 $^{+1.0}_{-0.9}$ | ⁴ GARMASH 07 BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 16 $^{+6}_{-5}$ ± 2 | ³ ECKHART 02 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|---|-----|----------|------|------|-----------------------------------|
| 12.6 $\begin{smallmatrix} +2.7 \\ -1.6 \end{smallmatrix}$ ± 0.9 | 2,3 | AUBERT | 08AQ | BABR | Repl. by LEES 11 |
| 11.0 ± 1.5 ± 0.71 | 3 | AUBERT | 06I | BABR | Repl. by AUBERT 09AU |
| 12.9 ± 2.4 ± 1.4 | 3 | AUBERT,B | 04O | BABR | Repl. by AUBERT 06I |
| 14.8 $\begin{smallmatrix} +4.6 & +2.8 \\ -4.4 & -1.3 \end{smallmatrix}$ | 3 | CHANG | 04 | BELL | Repl. by GARMASH 07 |
| < 72 | 90 | ASNER | 96 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <620 | 90 | ALBRECHT | 91B | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <380 | 90 | 5 AVERY | 89B | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <560 | 90 | 6 AVERY | 87 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0 \pi^+ \pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

² Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ Uses Dalitz plot analysis of the $B^0 \rightarrow K^0 \pi^+ \pi^-$ final state decays.

⁵ AVERY 89B reports $< 4.4 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.

⁶ AVERY 87 reports $< 7 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0 \bar{B}^0$. We rescale to 50%.

$\Gamma(K_0^{*+}(1430) \pi^-) / \Gamma_{\text{total}}$ Γ_{310} / Γ

| <u>VALUE (units 10^{-6})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|---|
| 33 ± 7 OUR AVERAGE | Error includes scale factor of 2.0. | | |
| 29.9 $\begin{smallmatrix} +2.3 \\ -1.7 \end{smallmatrix}$ ± 3.6 | 1,2 | AUBERT | 09AU BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 49.7 ± 3.8 $\begin{smallmatrix} +6.8 \\ -8.2 \end{smallmatrix}$ | 2 | GARMASH | 07 BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Uses Dalitz plot analysis of the $B^0 \rightarrow K^0 \pi^+ \pi^-$ final state decays.

$\Gamma(K_x^{*+} \pi^-) / \Gamma_{\text{total}}$ Γ_{311} / Γ

K_x^{*+} stands for the possible candidates of $K^*(1410)$, $K_0^*(1430)$ and $K_2^*(1430)$.

| <u>VALUE (units 10^{-6})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---|
| 5.1 ± 1.5 $\begin{smallmatrix} +0.6 \\ -0.7 \end{smallmatrix}$ | 1 | CHANG | 04 BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K^*(1410) \pi^-, K^{*+} \rightarrow K^0 \pi^+) / \Gamma_{\text{total}}$ Γ_{312} / Γ

| <u>VALUE (units 10^{-6})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|--------------------|-------------|---|
| <3.8 | 90 | 1 | GARMASH | 07 BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K^0 \pi^+ \pi^-$ final state decays.

$\Gamma((K\pi)_0^{*+} \pi^-, (K\pi)_0^{*+} \rightarrow K^0 \pi^+) / \Gamma_{\text{total}}$ Γ_{313} / Γ

| <u>VALUE (units 10^{-6})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---------------------------|
| 16.2 ± 0.69 ± 1.15 | 1 | AAIJ | 18F LHCB pp at 7, 8 TeV |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays. $(K\pi)_0^{*+}$ is the S-wave component of $K^0 \pi^+$. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0 \pi^+ \pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

$\Gamma(f_0(980)K^0, f_0 \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{314}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

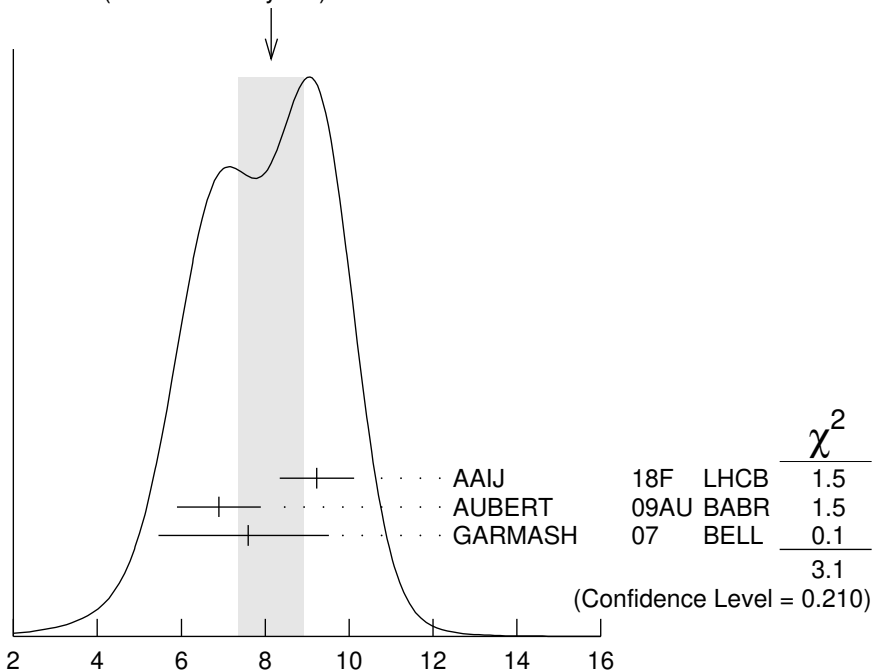
8.1 ± 0.8 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.

| | | | | |
|---|--|----------------------|-----------|-----------------------------------|
| 9.23 ± 0.40 ± 0.79 | | ¹ AAIJ | 18F LHCb | pp at 7, 8 TeV |
| 6.9 ± 0.8 ± 0.6 | | ² AUBERT | 09AU BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 7.6 ± 1.7 ^{+0.9} _{-1.3} | | ³ GARMASH | 07 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-----------------|----|---------------------|----------|-----------------------------------|
| 5.5 ± 0.7 ± 0.6 | | ² AUBERT | 06I BABR | Repl. by AUBERT 09AU |
| <360 | 90 | ⁴ AVERY | 89B CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

WEIGHTED AVERAGE
8.1 ± 0.8 (Error scaled by 1.3)



¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0 \pi^+ \pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ Uses Dalitz plot analysis of the $B^0 \rightarrow K^0 \pi^+ \pi^-$ final state decays.

⁴ AVERY 89B reports $< 4.2 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.

$\Gamma(f_0(980)K^0, f_0 \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}$ (units 10^{-6})

$\Gamma(K^0 f_0(500))/\Gamma_{\text{total}}$ Γ_{315}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

0.16 ^{+0.20}_{-0.04} ± 0.15 ¹ AAIJ 18F LHCb pp at 7, 8 TeV

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0 \pi^+ \pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

$\Gamma(K^0 f_0(1500))/\Gamma_{\text{total}}$ Γ_{316}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------|----------|------------------|
| $1.29 \pm 0.27 \pm 0.70$ | | ¹ AAIJ | 18F LHCB | pp at 7, 8 TeV |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0 \pi^+ \pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

 $\Gamma(f_2(1270)K^0)/\Gamma_{\text{total}}$ Γ_{317}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-----|---------------------|-----------|------------------------------------|
| $2.7^{+1.0}_{-0.8} \pm 0.9$ | | ¹ AUBERT | 09AU BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

<2.5 90 ² GARMASH 07 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² GARMASH 07 reports $B(B^0 \rightarrow f_2(1270)K^0) \times B(f_2(1270) \rightarrow \pi^+ \pi^-) < 1.4 \times 10^{-6}$ using Dalitz plot analysis. We compute $B(B^0 \rightarrow f_2(1270)K^0)$ using the PDG value $B(f_2(1270) \rightarrow \pi\pi) = 84.2 \times 10^{-2}$ and 2/3 for the $\pi^+ \pi^-$ fraction.

 $\Gamma(f_x(1300)K^0, f_x \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{318}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|---------------------|-----------|------------------------------------|
| $1.81^{+0.55}_{-0.45} \pm 0.48$ | | ¹ AUBERT | 09AU BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K^*(892)^0 \pi^0)/\Gamma_{\text{total}}$ Γ_{319}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|---------|------------------------------------|
| $3.3 \pm 0.5 \pm 0.4$ | | ^{1,2} LEES | 11 BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

$3.6 \pm 0.7 \pm 0.4$ ^{1,2} AUBERT 08AQ BABR Repl. by LEES 11
 < 3.5 90 ² CHANG 04 BELL $e^+ e^- \rightarrow \Upsilon(4S)$
 < 3.6 90 JESSOP 00 CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$
 <28 90 ASNER 96 CLE2 Repl. by JESSOP 00

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K_2^*(1430)^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{320}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|-------------------|----------|------------------|
| $3.65^{+0.15}_{-0.12} \pm 0.31$ | | ¹ AAIJ | 18F LHCB | pp at 7, 8 TeV |

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

< 16.2 90 ^{2,3} AUBERT 08AQ BABR $e^+ e^- \rightarrow \Upsilon(4S)$
 < 6 90 ⁴ GARMASH 07 BELL $e^+ e^- \rightarrow \Upsilon(4S)$
 < 18 90 ³ GARMASH 04 BELL Repl. by GARMASH 07
 <2600 90 ALBRECHT 91B ARG $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays. We compute $B(B^0 \rightarrow K_2^*(1430)^+ \pi^-)$ using the PDG 18 value $B(K_2^*(1430) \rightarrow K\pi) = 49.9 \times 10^{-2}$

and 2/3 for the $K^0\pi^+$ fraction. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0\pi^+\pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

² Uses Dalitz plot analysis of $B^0 \rightarrow K^+\pi^-\pi^0$ decays.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ GARMASH 07 reports $B(B^0 \rightarrow K_2^*(1430)^+\pi^-) \times B(K_2^{*+} \rightarrow K^0\pi^+) < 2.1 \times 10^{-6}$ using Dalitz plot analysis. We compute $B(B^0 \rightarrow K_2^*(1430)^+\pi^-)$ using the PDG value $B(K_2^*(1430) \rightarrow K\pi) = 49.9 \times 10^{-2}$ and 2/3 for the $K^0\pi^+$ fraction.

$\Gamma(K^*(1680)^+\pi^-)/\Gamma_{\text{total}}$ Γ_{321}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|-----------|-----------------------------------|
| $14.1 \pm 0.58 \pm 0.84$ | | ¹ AAIJ | 18F LHCB | pp at 7, 8 TeV |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| <25 | 90 | ^{2,3} AUBERT | 08AQ BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <10 | 90 | ⁴ GARMASH | 07 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0\pi^+\pi^-$ final state decays. We compute $B(B^0 \rightarrow K_2^*(1430)^+\pi^-)$ using the PDG 18 value $B(K_2^*(1430) \rightarrow K\pi) = (49.9 \pm 1.2) \times 10^{-2}$ and 2/3 for the $K^0\pi^+$ fraction. For the branching fraction of the reference mode, the PDG 18 average $B(B^0 \rightarrow K_S^0\pi^+\pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

² Uses Dalitz plot analysis of $B^0 \rightarrow K^+\pi^-\pi^0$ decays.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ GARMASH 07 reports $B(B^0 \rightarrow K^*(1680)^+\pi^-) \times B(K^{*+} \rightarrow K^0\pi^+) < 2.6 \times 10^{-6}$ using Dalitz plot analysis. We compute $B(B^0 \rightarrow K^*(1680)^+\pi^-)$ using the PDG value $B(K^*(1680) \rightarrow K\pi) = 38.7 \times 10^{-2}$ and 2/3 for the $K^0\pi^+$ fraction.

$\Gamma(K^+\pi^-\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{322}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|--------------------|----------|------------------------|
| $<2.3 \times 10^{-4}$ | 90 | ¹ ADAM | 96D DLPH | $e^+e^- \rightarrow Z$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| < 2.1×10^{-4} | 90 | ² ABREU | 95N DLPH | Sup. by ADAM 96D |

¹ ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$. Contributions from B^0 and B_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

² Assumes a B^0, B^- production fraction of 0.39 and a B_s production fraction of 0.12. Contributions from B^0 and B_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

$\Gamma(\rho^0 K^+\pi^-)/\Gamma_{\text{total}}$ Γ_{323}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|---------|-----------------------------------|
| $2.8 \pm 0.5 \pm 0.5$ | ^{1,2} KYEONG | 09 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Required $0.75 < m_{K^+\pi^-} < 1.20 \text{ GeV}/c^2$.

$\Gamma(f_0(980)K^+\pi^-, f_0 \rightarrow \pi\pi)/\Gamma_{\text{total}}$ Γ_{324}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|---------|-----------------------------------|
| $1.4 \pm 0.4^{+0.3}_{-0.4}$ | ^{1,2} KYEONG | 09 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Required $0.75 < m_{K^+K^-} < 1.2 \text{ GeV}/c^2$.

$\Gamma(K^+ \pi^- \pi^+ \pi^- \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{325}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|---------------|------|------------------------------------|
| $<2.1 \times 10^{-6}$ | 90 | 1,2 KYEONG 09 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Required $0.55 < m_{\pi^+ \pi^-} < 1.42$ and $0.75 < m_{K^+ \pi^-} < 1.20$ GeV/c².

 $\Gamma(K^*(892)^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{326}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|--------------------------|------|------------------------------------|
| $54.5 \pm 2.9 \pm 4.3$ | | ¹ AUBERT 07AS | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-----------------------------|----|--------------------------|------|------------------------------------|
| $4.5^{+1.1+0.9}_{-1.0-1.6}$ | | ^{1,2} KYEONG 09 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <1400 | 90 | ALBRECHT 91E | ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Required $0.55 < m_{\pi^+ \pi^-} < 1.42$ GeV/c².

 $\Gamma(K^*(892)^0 \rho^0)/\Gamma_{\text{total}}$ Γ_{327}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-----|-------------------------------------|------|---------|
| 3.9 ± 1.3 OUR AVERAGE | | Error includes scale factor of 1.9. | | |

| | | | | |
|-----------------------------|--|------------------------|------|------------------------------------|
| $5.1 \pm 0.6^{+0.6}_{-0.8}$ | | ¹ LEES 12K | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $2.1^{+0.8+0.9}_{-0.7-0.5}$ | | ¹ KYEONG 09 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-----------------------|----|---------------------------|------|------------------------------------|
| $5.6 \pm 0.9 \pm 1.3$ | | ¹ AUBERT,B 06G | BABR | Repl. by LEES 12K |
| < 34 | 90 | ² GODANG 02 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 286 | 90 | ³ ABE 00C | SLD | $e^+ e^- \rightarrow Z$ |
| < 460 | 90 | ALBRECHT 91B | ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 580 | 90 | ⁴ AVERY 89B | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 960 | 90 | ⁵ AVERY 87 | CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 2.4×10^{-5} .

³ ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the B fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$.

⁴ AVERY 89B reports $< 6.7 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.

⁵ AVERY 87 reports $< 1.2 \times 10^{-3}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0 \bar{B}^0$. We rescale to 50%.

 $\Gamma(K^*(892)^0 f_0(980), f_0 \rightarrow \pi\pi)/\Gamma_{\text{total}}$ Γ_{328}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|-------------------------------------|------|---------|
| $3.9^{+2.1}_{-1.8}$ OUR AVERAGE | | Error includes scale factor of 3.9. | | |

| | | | | |
|-----------------------------|--|--------------------------|------|------------------------------------|
| $5.7 \pm 0.6 \pm 0.4$ | | ¹ LEES 12K | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $1.4^{+0.6+0.6}_{-0.5-0.4}$ | | ^{1,2} KYEONG 09 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------|----|-----------------------|-----|------|-----------------------------------|
| < 4.3 | 90 | ¹ AUBERT,B | 06G | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <170 | 90 | ³ AVERY | 89B | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² The upper limit is 2.2×10^{-6} at 90% CL.

³ AVERY 89B reports $< 2.0 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\bar{B}^0$. We rescale to 50%.

$\Gamma(K_1(1270)^+\pi^-)/\Gamma_{\text{total}}$ Γ_{329}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|---------------------|------|--|
| <3.0 × 10⁻⁵ | 90 | ¹ AUBERT | 10D | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K_1(1400)^+\pi^-)/\Gamma_{\text{total}}$ Γ_{330}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|---------------------|------|--|
| <2.7 × 10⁻⁵ | 90 | ¹ AUBERT | 10D | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------------------------|----|----------|-----|-----|-----------------------------------|
| <1.1 × 10 ⁻³ | 90 | ALBRECHT | 91B | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-------------------------|----|----------|-----|-----|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(a_1(1260)^-K^+)/\Gamma_{\text{total}}$ Γ_{331}/Γ

| VALUE (units 10 ⁻⁶) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|-----------------------|------|--|
| 16.3 ± 2.9 ± 2.3 | | ^{1,2} AUBERT | 08F | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|------|----|--------------------|-----|------|------------------------|
| <230 | 90 | ³ ADAM | 96D | DLPH | $e^+e^- \rightarrow Z$ |
| <390 | 90 | ⁴ ABREU | 95N | DLPH | Sup. by ADAM 96D |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Assumes a_1^\pm decays only to 3π and $B(a_1^\pm \rightarrow \pi^\pm\pi^\mp\pi^\pm) = 0.5$.

³ ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$. Contributions from B^0 and B_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

⁴ Assumes a B^0 , B^- production fraction of 0.39 and a B_s production fraction of 0.12. Contributions from B^0 and B_s^0 decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

$\Gamma(K^*(892)^+\rho^-)/\Gamma_{\text{total}}$ Γ_{332}/Γ

| VALUE (units 10 ⁻⁶) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|-------------------|------|--|
| 10.3 ± 2.3 ± 1.3 | | ¹ LEES | 12K | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------|----|-----------------------|-----|------|-------------------|
| <12.0 | 90 | ¹ AUBERT,B | 06G | BABR | Repl. by LEES 12K |
|-------|----|-----------------------|-----|------|-------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K_0^*(1430)^+\rho^-)/\Gamma_{\text{total}}$ Γ_{333}/Γ

| VALUE (units 10 ⁻⁶) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|-------------------|------|--|
| 28 ± 10 ± 6 | | ¹ LEES | 12K | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K_1(1400)^0 \rho^0)/\Gamma_{\text{total}}$ Γ_{334}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------|-----|-------------|---------|---------------------------------|
| $< 3.0 \times 10^{-3}$ | 90 | ALBRECHT | 91B ARG | $e^+e^- \rightarrow \gamma(4S)$ |

 $\Gamma(K_0^*(1430)^0 \rho^0)/\Gamma_{\text{total}}$ Γ_{335}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|----------|---------------------------------|
| $27 \pm 4 \pm 4$ | ¹ LEES | 12K BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. $\Gamma(K_0^*(1430)^0 f_0(980), f_0 \rightarrow \pi\pi)/\Gamma_{\text{total}}$ Γ_{336}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|----------|---------------------------------|
| $2.7 \pm 0.7 \pm 0.6$ | ¹ LEES | 12K BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. $\Gamma(K_2^*(1430)^0 f_0(980), f_0 \rightarrow \pi\pi)/\Gamma_{\text{total}}$ Γ_{337}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|----------|---------------------------------|
| $8.6 \pm 1.7 \pm 1.0$ | ¹ LEES | 12K BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$. $\Gamma(K^+ K^-)/\Gamma_{\text{total}}$ Γ_{338}/Γ

| VALUE (units 10^{-8}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------|----------|---------------------|
| $7.80 \pm 1.27 \pm 0.84$ | | ¹ AAIJ | 17G LHCB | pp at 7 and 8 TeV |

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

| | | | | |
|---|----|--------------------------|-----------|---------------------------------|
| 10 $\pm 8 \pm 4$ | | ^{2,3} DUH | 13 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| 12 $\begin{matrix} + 8 \\ - 7 \end{matrix} \pm 1$ | | ⁴ AAIJ | 12AR LHCB | Repl. by AAIJ 17G |
| 23 $\pm 10 \pm 10$ | | ⁵ AALTONEN | 12L CDF | $p\bar{p}$ at 1.96 TeV |
| < 70 | 90 | ⁶ AALTONEN | 09C CDF | Repl. by AALTONEN 12L |
| < 50 | 90 | ³ AUBERT | 07B BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| < 41 | 90 | ³ LIN | 07 BELL | Repl. by DUH 13 |
| < 180 | 90 | ⁷ ABULENCIA,A | 06D CDF | Repl. by AALTONEN 09C |
| < 37 | 90 | ABE | 05G BELL | Repl. by LIN 07 |
| < 70 | 90 | CHAO | 04 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| < 80 | 90 | ³ BORNHEIM | 03 CLE2 | $e^+e^- \rightarrow \gamma(4S)$ |
| < 60 | 90 | ³ AUBERT | 02Q BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| < 90 | 90 | ³ CASEY | 02 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| < 270 | 90 | ³ ABE | 01H BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| < 250 | 90 | ³ AUBERT | 01E BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| < 6600 | 90 | ⁸ ABE | 00C SLD | $e^+e^- \rightarrow Z$ |
| < 190 | 90 | ³ CRONIN-HEN. | 00 CLE2 | $e^+e^- \rightarrow \gamma(4S)$ |
| < 430 | 90 | GODANG | 98 CLE2 | Repl. by CRONIN-HENNESSY 00 |
| < 4600 | | ⁹ ADAM | 96D DLPH | $e^+e^- \rightarrow Z$ |
| < 400 | 90 | ASNER | 96 CLE2 | Repl. by GODANG 98 |
| < 1800 | 90 | ¹⁰ BUSKULIC | 96V ALEP | $e^+e^- \rightarrow Z$ |

| | | | | | |
|--------|----|---------------------|-----|------|-----------------------------------|
| <12000 | 90 | ¹¹ ABREU | 95N | DLPH | Sup. by ADAM 96D |
| < 700 | 90 | ³ BATTLE | 93 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Supercedes results of AAIJ 12AR.

² DUH 13 reports also for the same data $B(B^0 \rightarrow K^+K^-) < 0.20 \times 10^{-6}$ at 90% CL.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ AAIJ 12AR reports $[\Gamma(B^0 \rightarrow K^+K^-)/\Gamma_{\text{total}}] / [B(B_s^0 \rightarrow K^+K^-)] / [\Gamma(\bar{b} \rightarrow B_s^0)/\Gamma(\bar{b} \rightarrow B^0)] = 0.018_{-0.007}^{+0.008} \pm 0.009$ which we multiply by our best values $B(B_s^0 \rightarrow K^+K^-) = (2.66 \pm 0.22) \times 10^{-5}$, $\Gamma(\bar{b} \rightarrow B_s^0)/\Gamma(\bar{b} \rightarrow B^0) = 0.246 \pm 0.023$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

⁵ Reported a central value of $(0.23 \pm 0.10 \pm 0.10) \times 10^{-6}$ using $B(B^0 \rightarrow K^+\pi^-) = (19.4 \pm 0.6) \times 10^{-6}$.

⁶ Obtains this result from $B(K^+K^-)/B(K^+\pi^-) = 0.020 \pm 0.008 \pm 0.006$, assuming $B(B^0 \rightarrow K^+\pi^-) = (19.4 \pm 0.6) \times 10^{-6}$.

⁷ ABULENCIA,A 06D obtains this from $\Gamma(K^+K^-)/\Gamma(K^+\pi^-) < 0.10$ at 90% CL, assuming $B(B^0 \rightarrow K^+\pi^-) = (18.9 \pm 0.7) \times 10^{-6}$.

⁸ ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the B fractions $f_{B^0} = f_{B^+} = (39.7_{-2.2}^{+1.8})\%$ and $f_{B_s} = (10.5_{-2.2}^{+1.8})\%$.

⁹ ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$. Contributions from B^0 and B_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

¹⁰ BUSKULIC 96V assumes PDG 96 production fractions for B^0 , B^+ , B_s , b baryons.

¹¹ Assumes a B^0 , B^- production fraction of 0.39 and a B_s production fraction of 0.12. Contributions from B^0 and B_s^0 decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

$\Gamma(K^0\bar{K}^0)/\Gamma_{\text{total}}$ Γ_{339}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|----------------------------|------|-----------------------------------|
| 1.21±0.16 OUR AVERAGE | | | | |
| 1.26±0.19±0.05 | | ¹ DUH 13 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.08±0.28±0.11 | | ¹ AUBERT,BE 06c | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 0.87 ^{+0.25} _{-0.20} ±0.09 | | ¹ LIN 07 | BELL | Repl. by DUH 13 |
| 0.8 ± 0.3 ± 0.9 | | ¹ ABE 05G | BELL | Repl. by LIN 07 |
| 1.19 ^{+0.40} _{-0.35} ±0.13 | | ¹ AUBERT,BE 05E | BABR | Repl. by AUBERT,BE 06c |
| < 1.8 | 90 | ¹ AUBERT 04M | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1.5 | 90 | ¹ CHAO 04 | BELL | Repl. by ABE 05G |
| < 3.3 | 90 | ¹ BORNHEIM 03 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 4.1 | 90 | ¹ CASEY 02 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <17 | 90 | GODANG 98 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K^0\bar{K}^0)/\Gamma(K^0\phi)$ $\Gamma_{339}/\Gamma_{348}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----------------------|------|----------------------|
| 0.17±0.08±0.02 | ¹ AAIJ 20F | LHCB | pp at 7, 8, 13 TeV |

¹ Observed signal with a significance of 3.5 σ .

$\Gamma(K^0 K^- \pi^+)/\Gamma_{\text{total}}$ Γ_{340}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

6.7 ± 0.5 OUR FIT**7.0 ± 0.6 OUR AVERAGE**

7.2 ± 0.7 ± 0.3

¹ LAI 19 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

6.4 ± 1.0 ± 0.6

¹ DEL-AMO-SA...10E BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

<18 90 ¹ GARMASH 04 BELL $e^+ e^- \rightarrow \Upsilon(4S)$ <21 90 ¹ ECKHART 02 CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(K^*(892)^\pm K^\mp)/\Gamma_{\text{total}}$ Γ_{341}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

<0.4 × 10⁻⁶

90

AAIJ

14BMLHCB

 pp at 7 TeV $\Gamma(K^0 K^- \pi^+)/\Gamma(K^0 \pi^+ \pi^-)$ $\Gamma_{340}/\Gamma_{306}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

0.134 ± 0.011 OUR FIT**0.123 ± 0.009 ± 0.015**

AAIJ

17BP LHCb

 pp at 7, 8 TeV

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

0.128 ± 0.017 ± 0.009

AAIJ

13BP LHCb

Repl. by AAIJ 17BP

 $[\Gamma(\bar{K}^{*0} K^0) + \Gamma(K^{*0} \bar{K}^0)]/\Gamma_{\text{total}}$ Γ_{342}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

<0.96

90

¹ AAIJ

16

LHCb

 pp at 7 TeV

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

<1.9 90 ² AUBERT, BE 06N BABR $e^+ e^- \rightarrow \Upsilon(4S)$ ¹ Assumes $B(B^0 \rightarrow K^0 \pi^+ \pi^-) = (4.96 \pm 0.20) \times 10^{-5}$.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(K^+ K^- \pi^0)/\Gamma_{\text{total}}$ Γ_{343}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

2.17 ± 0.60 ± 0.24¹ GAUR

13

BELL

 $e^+ e^- \rightarrow \Upsilon(4S)$

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

<19 90 ¹ ECKHART 02 CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(K_S^0 K_S^0 \pi^0)/\Gamma_{\text{total}}$ Γ_{344}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

<0.9 × 10⁻⁶

90

¹ AUBERT

09AD BABR

 $e^+ e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(K_S^0 K_S^0 \eta)/\Gamma_{\text{total}}$ Γ_{345}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

<1.0 × 10⁻⁶

90

¹ AUBERT

09AD BABR

 $e^+ e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

| $\Gamma(K_S^0 K_S^0 \eta')/\Gamma_{\text{total}}$ | | | | | Γ_{346}/Γ |
|---|-----|---------------------|-----------|-----------------------------------|-----------------------|
| VALUE | CL% | DOCUMENT ID | TECN | COMMENT | |
| $<2.0 \times 10^{-6}$ | 90 | ¹ AUBERT | 09AD BABR | $e^+e^- \rightarrow \Upsilon(4S)$ | |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

| $\Gamma(K^0 K^+ K^-)/\Gamma_{\text{total}}$ | | | | | Γ_{347}/Γ |
|---|-----|-----------------------|----------|-----------------------------------|-----------------------|
| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT | |
| 26.8±1.1 OUR FIT | | | | | |
| 26.6±1.2 OUR AVERAGE | | | | | |
| 26.5±0.9±0.8 | | ^{1,2} LEES | 120 BABR | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| 28.3±3.3±4.0 | | ¹ GARMASH | 04 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | | |
| 23.8±2.0±1.6 | | ¹ AUBERT,B | 04V BABR | Repl. by LEES 120 | |
| <1300 | 90 | ALBRECHT | 91E ARG | $e^+e^- \rightarrow \Upsilon(4S)$ | |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
² All intermediate charmonium and charm resonances are removed, except of χ_{c0} .

| $\Gamma(K^0 K^+ K^-)/\Gamma(K^0 \pi^+ \pi^-)$ | | | | $\Gamma_{347}/\Gamma_{306}$ |
|---|-------------|-----------|--------------------|-----------------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT | |
| 0.539±0.025 OUR FIT | | | | |
| 0.549±0.018±0.033 | AAIJ | 17BP LHCb | pp at 7, 8 TeV | |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 0.385±0.031±0.023 | AAIJ | 13BP LHCb | Repl. by AAIJ 17BP | |

| $\Gamma(K^0 \phi)/\Gamma_{\text{total}}$ | | | | | Γ_{348}/Γ |
|---|-----|-----------------------|----------|-----------------------------------|-----------------------|
| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT | |
| 7.3±0.7 OUR AVERAGE | | | | | |
| 7.1±0.6 ^{+0.4} _{-0.3} | | ¹ LEES | 120 BABR | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| 9.0 ^{+2.2} _{-1.8} ±0.7 | | ¹ CHEN | 03B BELL | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | | |
| 8.4 ^{+1.5} _{-1.3} ±0.5 | | ¹ AUBERT | 04A BABR | Repl. by LEES 120 | |
| 8.1 ^{+3.1} _{-2.5} ±0.8 | | ¹ AUBERT | 01D BABR | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| < 12.3 | 90 | ¹ BRIERE | 01 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| < 31 | 90 | ¹ BERGFELD | 98 CLE2 | | |
| < 88 | 90 | ASNER | 96 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| < 720 | 90 | ALBRECHT | 91B ARG | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| < 420 | 90 | ² AVERY | 89B CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ | |
| <1000 | 90 | ³ AVERY | 87 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ | |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
² AVERY 89B reports $< 4.9 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.
³ AVERY 87 reports $< 1.3 \times 10^{-3}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0 \bar{B}^0$. We rescale to 50%.

$\Gamma(f_0(980)K^0, f_0 \rightarrow K^+K^-)/\Gamma_{\text{total}}$ Γ_{349}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-------------------|----------|---------------------------------|
| $7.0^{+2.6}_{-1.8} \pm 2.4$ | ¹ LEES | 120 BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(f_0(1500)K^0)/\Gamma_{\text{total}}$ Γ_{350}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------------|----------|---------------------------------|
| $13.3^{+5.8}_{-4.4} \pm 3.2$ | ¹ LEES | 120 BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(f'_2(1525)^0K^0)/\Gamma_{\text{total}}$ Γ_{351}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-------------------|----------|---------------------------------|
| $0.29^{+0.27}_{-0.18} \pm 0.36$ | ¹ LEES | 120 BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(f_0(1710)K^0, f_0 \rightarrow K^+K^-)/\Gamma_{\text{total}}$ Γ_{352}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|----------|---------------------------------|
| $4.4 \pm 0.7 \pm 0.5$ | ¹ LEES | 120 BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(K^0K^+K^- \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{353}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|----------|---------------------------------|
| $33 \pm 5 \pm 9$ | ¹ LEES | 120 BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(K_S^0K_S^0K_S^0)/\Gamma_{\text{total}}$ Γ_{354}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------------------------------|----------|---------------------------------|
| 6.0 \pm 0.5 OUR AVERAGE | Error includes scale factor of 1.1. | | |
| $6.19 \pm 0.48 \pm 0.19$ | ¹ LEES | 121 BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| $4.2^{+1.6}_{-1.3} \pm 0.8$ | ¹ GARMASH | 04 BELL | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|-----------------------------|-----------------------|---------|-------------------|
| $6.9^{+0.9}_{-0.8} \pm 0.6$ | ¹ AUBERT,B | 05 BABR | Repl. by LEES 121 |
|-----------------------------|-----------------------|---------|-------------------|

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(f_0(980)K^0, f_0 \rightarrow K_S^0K_S^0)/\Gamma_{\text{total}}$ Γ_{355}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|---------------------|----------|---------------------------------|
| $2.7^{+1.3}_{-1.2} \pm 1.3$ | ^{1,2} LEES | 121 BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0K_S^0K_S^0$ decay.

$\Gamma(f_0(1710)K^0, f_0 \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{356}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-------------|----------|----------------------------------|
| $0.50^{+0.46}_{-0.24} \pm 0.11$ | 1,2 LEES | 12I BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 K_S^0 K_S^0$ decay.

 $\Gamma(f_2(2010)K^0, f_2 \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{357}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-------------|----------|----------------------------------|
| $0.54^{+0.21}_{-0.20} \pm 0.52$ | 1,2 LEES | 12I BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 K_S^0 K_S^0$ decay.

 $\Gamma(K_S^0 K_S^0 K_S^0 \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{358}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------|----------|----------------------------------|
| $13.3^{+2.2}_{-2.3} \pm 2.2$ | 1,2 LEES | 12I BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 K_S^0 K_S^0$ decay.

 $\Gamma(K_S^0 K_S^0 K_L^0)/\Gamma_{\text{total}}$ Γ_{359}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|----------|----------------------------------|
| <16 | 90 | 1 AUBERT,B | 06R BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

 $\Gamma(K^*(892)^0 K^+ K^-)/\Gamma_{\text{total}}$ Γ_{360}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|-----------|----------------------------------|
| $27.5 \pm 1.3 \pm 2.2$ | | 1 AUBERT | 07AS BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|--------|----|----------|---------|----------------------------------|
| <610 | 90 | ALBRECHT | 91E ARG | $e^+ e^- \rightarrow \gamma(4S)$ |
|--------|----|----------|---------|----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

 $\Gamma(K^*(892)^0 \phi)/\Gamma_{\text{total}}$ Γ_{361}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|---------------------|-----------|----------------------------------|
| 10.0 \pm 0.5 OUR FIT | | | | |
| 10.0 \pm 0.5 OUR AVERAGE | | | | |
| $10.4 \pm 0.5 \pm 0.6$ | | ¹ PRIM | 13 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| $9.7 \pm 0.5 \pm 0.5$ | | ¹ AUBERT | 08BG BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| $11.5^{+4.5+1.8}_{-3.7-1.7}$ | | ¹ BRIERE | 01 CLE2 | $e^+ e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|------------------------|--|-----------------------|----------|-----------------------|
| $9.2 \pm 0.7 \pm 0.6$ | | ¹ AUBERT | 07D BABR | Repl. by AUBERT 08BG |
| $9.2 \pm 0.9 \pm 0.5$ | | ¹ AUBERT,B | 04W BABR | Repl. by AUBERT 07D |
| $11.2 \pm 1.3 \pm 0.8$ | | ¹ AUBERT | 03V BABR | Repl. by AUBERT,B 04W |

| | | | | | |
|------------------------------|----|-----------------------|-----|------|-----------------------------------|
| $10.0^{+1.6+0.7}_{-1.5-0.8}$ | | ¹ CHEN | 03B | BELL | Repl. by PRIM 13 |
| $8.7^{+2.5}_{-2.1} \pm 1.1$ | | ¹ AUBERT | 01D | BABR | Repl. by AUBERT 03v |
| <384 | 90 | ² ABE | 00C | SLD | $e^+e^- \rightarrow Z$ |
| < 21 | 90 | ¹ BERGFELD | 98 | CLE2 | |
| < 43 | 90 | ASNER | 96 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <320 | 90 | ALBRECHT | 91B | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <380 | 90 | ³ AVERY | 89B | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <380 | 90 | ⁴ AVERY | 87 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the B fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$.

³ AVERY 89B reports $< 4.4 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\bar{B}^0$. We rescale to 50%.

⁴ AVERY 87 reports $< 4.7 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0\bar{B}^0$. We rescale to 50%.

$\Gamma(K^+K^-\pi^+\pi^- \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{362}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-----------------------|------|--|
| <71.7 | 90 | ^{1,2} CHIANG | 10 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Measured in the range $0.7 < m_{K\pi} < 1.7$ and corrected using PS assumption for the full $K\pi$ mass range.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K^*(892)^0K^-\pi^+)/\Gamma_{\text{total}}$ Γ_{363}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|------|--|
| 4.5 ± 1.3 OUR AVERAGE | | | |
| $2.11^{+5.63+4.85}_{-5.26-4.75}$ | ^{1,2} CHIANG | 10 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| $4.6 \pm 1.1 \pm 0.8$ | ² AUBERT | 07AS | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Measured in the range $0.7 < m_{K\pi} < 1.7$ and corrected using PS assumption for the full $K\pi$ mass range. The quoted result is equivalent to the upper limit of $< 13.9 \times 10^{-6}$ at 90% CL.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

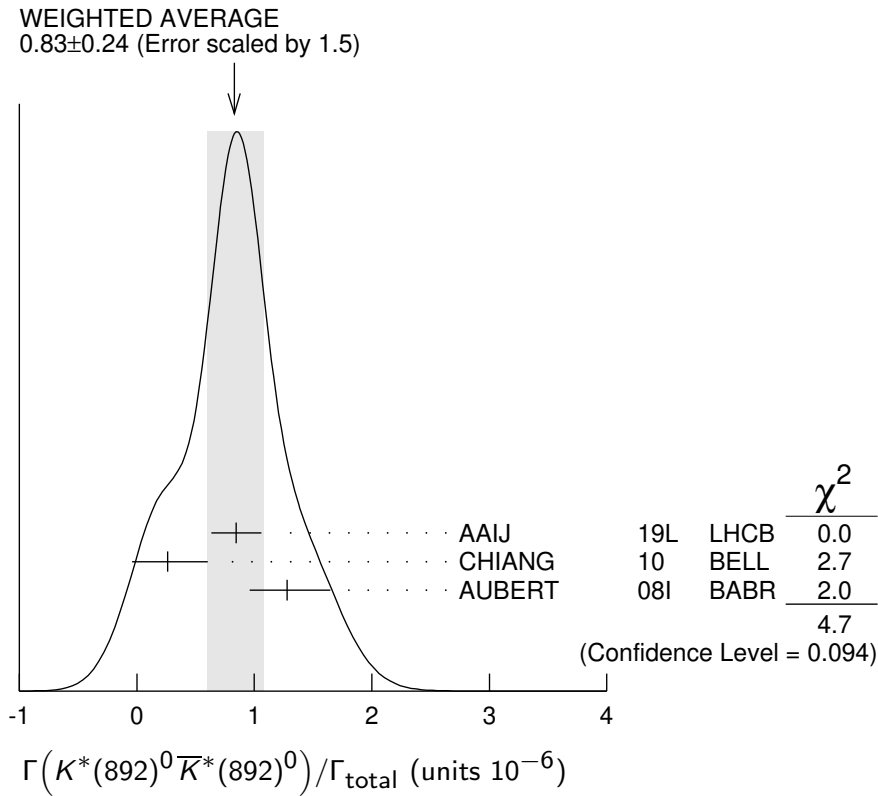
$\Gamma(K^*(892)^0\bar{K}^*(892)^0)/\Gamma_{\text{total}}$ Γ_{364}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|------|---|
| 0.83 ± 0.24 OUR AVERAGE | | | | Error includes scale factor of 1.5. See the ideogram below. |
| $0.85 \pm 0.07 \pm 0.20$ | | ¹ AAIJ | 19L | LHCB pp at 7 and 8 TeV |
| $0.26^{+0.33+0.10}_{-0.29-0.08}$ | | ^{2,3} CHIANG | 10 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| $1.28^{+0.35}_{-0.30} \pm 0.11$ | | ³ AUBERT | 08i | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|------|----|---------------------|-----|------|-----------------------------------|
| < 22 | 90 | ⁴ GODANG | 02 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <469 | 90 | ⁵ ABE | 00C | SLD | $e^+e^- \rightarrow Z$ |

- ¹ AAIJ 19L reports $[\Gamma(B^0 \rightarrow K^*(892)^0 \bar{K}^*(892)^0) / \Gamma_{\text{total}}] / [B(B_S^0 \rightarrow \bar{K}^*(892)^0 K^*(892)^0)] = 0.0758 \pm 0.0057 \pm 0.0030$ which we multiply by our best value $B(B_S^0 \rightarrow \bar{K}^*(892)^0 K^*(892)^0) = (1.11 \pm 0.27) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ² Measured in the range $0.7 < m_{K\pi} < 1.7$ and corrected using PS assumption for the full $K\pi$ mass range. The quoted result is equivalent to the upper limit of $< 0.8 \times 10^{-6}$ at 90% CL.
- ³ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.
- ⁴ Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 1.9×10^{-5} .
- ⁵ ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the B fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$.



$\Gamma(K^+ K^+ \pi^- \pi^- \text{nonresonant}) / \Gamma_{\text{total}}$ Γ_{365} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-----------------------------|------|----------------------------------|
| <6.0 | 90 | ¹ CHIANG 10 BELL | | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(K^*(892)^0 K^+ \pi^-) / \Gamma_{\text{total}}$ Γ_{366} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------------------|------|----------------------------------|
| <2.2 | 90 | ¹ AUBERT 07AS BABR | | $e^+ e^- \rightarrow \gamma(4S)$ |

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

<7.6 90 ¹ CHIANG 10 BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K^*(892)^0 K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{367}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

| | | | | |
|-------|----|---------------------|----|--|
| < 0.2 | 90 | ¹ CHIANG | 10 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
|-------|----|---------------------|----|--|

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

| | | | | |
|--------|----|---------------------|-----|--|
| < 0.41 | 90 | ¹ AUBERT | 08I | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------|----|---------------------|-----|--|

| | | | | |
|-----|----|---------------------|----|--|
| <37 | 90 | ² GODANG | 02 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----|----|---------------------|----|--|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 2.9×10^{-5} .

$\Gamma(K^*(892)^+ K^*(892)^-)/\Gamma_{\text{total}}$ Γ_{368}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

| | | | | |
|-------|----|---------------------|------|--|
| < 2.0 | 90 | ¹ AUBERT | 08AP | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|-------|----|---------------------|------|--|

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

| | | | | |
|------|----|---------------------|----|--|
| <141 | 90 | ² GODANG | 02 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
|------|----|---------------------|----|--|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 8.9×10^{-5} .

$\Gamma(K_1(1400)^0 \phi)/\Gamma_{\text{total}}$ Γ_{369}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

| | | | | |
|------------------------|----|----------|-----|---------------------------------------|
| < 5.0×10^{-3} | 90 | ALBRECHT | 91B | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
|------------------------|----|----------|-----|---------------------------------------|

$\Gamma(\phi(K\pi)_0^{*0})/\Gamma_{\text{total}}$ Γ_{370}/Γ

This decay refers to the coherent sum of resonant and nonresonant $J^P = 0^+ K\pi$ components with $1.13 < m_{K\pi} < 1.53 \text{ GeV}/c^2$.

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

4.3±0.4 OUR AVERAGE

| | | | |
|-------------|-------------------|----|--|
| 4.3±0.4±0.4 | ¹ PRIM | 13 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
|-------------|-------------------|----|--|

| | | | |
|-------------|---------------------|------|--|
| 4.3±0.6±0.4 | ¹ AUBERT | 08BG | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|-------------|---------------------|------|--|

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

| | | | |
|-------------|---------------------|-----|---------------------------|
| 5.0±0.8±0.3 | ¹ AUBERT | 07D | BABR Repl. by AUBERT 08BG |
|-------------|---------------------|-----|---------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\phi(K\pi)_0^{*0} (1.60 < m_{K\pi} < 2.15))/\Gamma_{\text{total}}$ Γ_{371}/Γ

This decay refers to the coherent sum of resonant and nonresonant $J^P = 0^+ K\pi$ components with $1.60 < m_{K\pi} < 2.15 \text{ GeV}/c^2$.

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

| | | | | |
|------|----|---------------------|------|--|
| <1.7 | 90 | ¹ AUBERT | 07AO | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|------|----|---------------------|------|--|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K_0^*(1430)^0 K^- \pi^+)/\Gamma_{\text{total}}$ Γ_{372}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|---------|------------------------------------|
| <31.8 | 90 | 1,2 CHIANG | 10 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Measured in the range $0.7 < m_{K\pi} < 1.7$ and corrected using PS assumption for the full $K\pi$ mass range.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K_0^*(1430)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}$ Γ_{373}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|---------|------------------------------------|
| <3.3 | 90 | 1,2 CHIANG | 10 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Measured in the range $0.7 < m_{K\pi} < 1.7$ and corrected using PS assumption for the full $K\pi$ mass range.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K_0^*(1430)^0 \bar{K}_0^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{374}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|---------|------------------------------------|
| <8.4 | 90 | 1,2 CHIANG | 10 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Measured in the range $0.7 < m_{K\pi} < 1.7$ and corrected using PS assumption for the full $K\pi$ mass range.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K_0^*(1430)^0 \phi)/\Gamma_{\text{total}}$ Γ_{375}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|-----------|------------------------------------|
| $3.9 \pm 0.5 \pm 0.6$ | ¹ AUBERT | 08BG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|-------------------------------|-----------------------|----------|----------------------|
| $4.6 \pm 0.7 \pm 0.6$ seen | ¹ AUBERT | 07D BABR | Repl. by AUBERT 08BG |
| | ² AUBERT,B | 04W BABR | Repl. by AUBERT 07D |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Observed 181 ± 17 events with statistical significance greater than 10σ .

 $\Gamma(K_0^*(1430)^0 K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{376}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|---------|------------------------------------|
| <1.7 | 90 | ¹ CHIANG | 10 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K_0^*(1430)^0 K_0^*(1430)^0)/\Gamma_{\text{total}}$ Γ_{377}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|---------|------------------------------------|
| <4.7 | 90 | ¹ CHIANG | 10 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K^*(1680)^0 \phi)/\Gamma_{\text{total}}$ Γ_{378}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|------------------------------------|
| <3.5 | 90 | ¹ AUBERT | 07AO BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K^*(1780)^0 \phi) / \Gamma_{\text{total}}$ Γ_{379} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|------------------------------------|
| <2.7 | 90 | ¹ AUBERT | 07AO BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K^*(2045)^0 \phi) / \Gamma_{\text{total}}$ Γ_{380} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|------------------------------------|
| <15.3 | 90 | ¹ AUBERT | 07AO BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(K_2^*(1430)^0 \rho^0) / \Gamma_{\text{total}}$ Γ_{381} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|---------|------------------------------------|
| <1.1 $\times 10^3$ | 90 | ALBRECHT | 91B ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $\Gamma(K_2^*(1430)^0 \phi) / \Gamma_{\text{total}}$ Γ_{382} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------------------------|------|---------|
| 6.8 \pm 0.9 OUR AVERAGE | | Error includes scale factor of 1.2. | | |

5.5^{+0.9}_{-0.7} \pm 1.0 ¹ PRIM 13 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

7.5 \pm 0.9 \pm 0.5 ¹ AUBERT 08BG BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

7.8 \pm 1.1 \pm 0.6 ¹ AUBERT 07D BABR Repl. by AUBERT 08BG

seen ² AUBERT,B 04W BABR Repl. by AUBERT 07D

<1400 90 ALBRECHT 91B ARG $e^+ e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² The angular distribution of $B \rightarrow \phi K^*(1430)$ provides evidence with statistical significance of 3.2 σ .

 $\Gamma(K^0 \phi \phi) / \Gamma_{\text{total}}$ Γ_{383} / Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------------------------------|------|---------|
| 3.7 \pm 0.7 OUR AVERAGE | Error includes scale factor of 1.3. | | |

3.02^{+0.75}_{-0.66} \pm 0.20 ¹ MOHANTY 21 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

4.5 \pm 0.8 \pm 0.3 ¹ LEES 11A BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

4.1^{+1.7}_{-1.4} \pm 0.4 ¹ AUBERT,BE 06H BABR Repl. by LEES 11A

¹ Assumes equal production of B^0 and B^+ at the $\Upsilon(4S)$ and the $\phi\phi$ invariant mass below 2.85 GeV/ c^2 .

 $\Gamma(\eta' \eta' K^0) / \Gamma_{\text{total}}$ Γ_{384} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-----------------------|----------|------------------------------------|
| <31 | 90 | ¹ AUBERT,B | 06P BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta K^0 \gamma)/\Gamma_{\text{total}}$ Γ_{385}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

7.6 ± 1.8 OUR AVERAGE

| | | | | |
|-----------------------------|--|------------|---------|------------------------------------|
| $7.1^{+2.1}_{-2.0} \pm 0.4$ | | 1,2 AUBERT | 09 BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------------------|--|------------|---------|------------------------------------|

| | | | | |
|-----------------------------|--|-------------|---------|------------------------------------|
| $8.7^{+3.1+1.9}_{-2.7-1.6}$ | | 2,3 NISHIDA | 05 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------------------|--|-------------|---------|------------------------------------|

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

| | | | | |
|------------------------------|--|--------------|----------|--------------------|
| $11.3^{+2.8}_{-1.6} \pm 0.6$ | | 1,2 AUBERT,B | 06M BABR | Repl. by AUBERT 09 |
|------------------------------|--|--------------|----------|--------------------|

¹ $m_{\eta K} < 3.25 \text{ GeV}/c^2$.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.³ $m_{\eta K} < 2.4 \text{ GeV}/c^2$ $\Gamma(\eta' K^0 \gamma)/\Gamma_{\text{total}}$ Γ_{386}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

| | | | | |
|----------------|----|----------|---------|------------------------------------|
| <6.4 | 90 | 1,2 WEDD | 10 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|----------------|----|----------|---------|------------------------------------|

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

| | | | | |
|------|----|--------------|----------|------------------------------------|
| <6.6 | 90 | 1,3 AUBERT,B | 06M BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------|----|--------------|----------|------------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² $m_{\eta' K} < 3.4 \text{ GeV}/c^2$.³ $m_{\eta' K} < 3.25 \text{ GeV}/c^2$. $\Gamma(K^0 \phi \gamma)/\Gamma_{\text{total}}$ Γ_{387}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

| | | | | |
|---------------------------|--|---------|----------|------------------------------------|
| 2.74 ± 0.60 ± 0.32 | | 1 SAHOO | 11A BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---------------------------|--|---------|----------|------------------------------------|

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

| | | | | |
|------|----|----------|----------|------------------------------------|
| <2.7 | 90 | 1 AUBERT | 07Q BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------|----|----------|----------|------------------------------------|

| | | | | |
|------|----|------------|---------|------------------------------------|
| <8.3 | 90 | 1 DRUTSKOY | 04 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------|----|------------|---------|------------------------------------|

¹ Assumes equal production of B^+ and B^0 at $\Upsilon(4S)$. $\Gamma(K^+ \pi^- \gamma)/\Gamma_{\text{total}}$ Γ_{388}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

| | | | |
|--|-------------|---------|------------------------------------|
| $(4.6^{+1.3+0.5}_{-1.2-0.7}) \times 10^{-6}$ | 1,2 NISHIDA | 02 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--|-------------|---------|------------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² $1.25 \text{ GeV}/c^2 < M_{K\pi} < 1.6 \text{ GeV}/c^2$ $\Gamma(K^*(892)^0 \gamma)/\Gamma_{\text{total}}$ Γ_{389}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

41.8 ± 2.5 OUR AVERAGE Error includes scale factor of 2.1.

| | | | |
|------------------------|-------------|---------|------------------------------------|
| $39.6 \pm 0.7 \pm 1.4$ | 1 Horiguchi | 17 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------------------------|-------------|---------|------------------------------------|

| | | | |
|------------------------|----------|-----------|------------------------------------|
| $44.7 \pm 1.0 \pm 1.6$ | 2 AUBERT | 09A0 BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------------------------|----------|-----------|------------------------------------|

| | | | |
|------------------------------|--------|---------|------------------------------------|
| $45.5^{+7.2}_{-6.8} \pm 3.4$ | 3 COAN | 00 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------------------------------|--------|---------|------------------------------------|

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

| | | | | | |
|------------------------|----|-------------------------|-----|------|-----------------------------------|
| $39.2 \pm 2.0 \pm 2.4$ | | ⁴ AUBERT, BE | 04A | BABR | Repl. by AUBERT 09AO |
| $40.1 \pm 2.1 \pm 1.7$ | | ⁵ NAKAO | 04 | BELL | Repl. by HORIGUCHI 17 |
| < 110 | 90 | ACOSTA | 02G | CDF | $\rho\bar{p}$ at 1.8 TeV |
| $42.3 \pm 4.0 \pm 2.2$ | | ⁵ AUBERT | 02C | BABR | Repl. by AUBERT, BE 04A |
| < 210 | 90 | ⁶ ADAM | 96D | DLPH | $e^+e^- \rightarrow Z$ |
| $40 \pm 17 \pm 8$ | | ⁷ AMMAR | 93 | CLE2 | Repl. by COAN 00 |
| < 420 | 90 | ALBRECHT | 89G | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 240 | 90 | ⁸ AVERY | 89B | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 2100 | 90 | AVERY | 87 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Uses $B(\Upsilon(4S) \rightarrow B^+B^-) = (51.4 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0\bar{B}^0) = (48.6 \pm 0.6)\%$.

² Uses $B(\Upsilon(4S) \rightarrow B^+B^-) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0\bar{B}^0) = (48.4 \pm 0.6)\%$.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. No evidence for a nonresonant $K\pi\gamma$ contamination was seen; the central value assumes no contamination.

⁴ Uses the production ratio of charged and neutral B from $\Upsilon(4S)$ decays $R^{+/0} = 1.006 \pm 0.048$.

⁵ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁶ ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.

⁷ AMMAR 93 observed 6.6 ± 2.8 events above background.

⁸ AVERY 89B reports $< 2.8 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\bar{B}^0$. We rescale to 50%.

$\Gamma(K^*(1410)\gamma)/\Gamma_{\text{total}}$ Γ_{390}/Γ

| <u>VALUE</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------------------------|------------|----------------------|-------------|--|
| < 1.3 × 10⁻⁴ | 90 | ¹ NISHIDA | 02 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K^+\pi^-\gamma \text{ nonresonant})/\Gamma_{\text{total}}$ Γ_{391}/Γ

| <u>VALUE</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------------------------|------------|------------------------|-------------|--|
| < 2.6 × 10⁻⁶ | 90 | ^{1,2} NISHIDA | 02 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² $1.25 \text{ GeV}/c^2 < M_{K\pi} < 1.6 \text{ GeV}/c^2$

$\Gamma(K^*(892)^0 X(214), X \rightarrow \mu^+\mu^-)/\Gamma_{\text{total}}$ Γ_{392}/Γ

$X(214)$ is a hypothetical particle of mass 214 MeV/ c^2 reported by the HyperCP experiment (PARK 05)

| <u>VALUE (units 10⁻⁸)</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------------------------------|------------|---------------------|-------------|--|
| < 2.26 | 90 | ^{1,2} HYUN | 10 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Based on scalar nature of X particle. With a vector X assumption, the upper limit is 2.27×10^{-8} .

$\Gamma(K^0\pi^+\pi^-\gamma)/\Gamma_{\text{total}}$ Γ_{393}/Γ

| <u>VALUE (units 10⁻⁵)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------------------------------|-------------------------------|-------------|--|
| 1.99 ± 0.18 OUR AVERAGE | | | |
| $2.05 \pm 0.20^{+0.26}_{-0.22}$ | ^{1,2} DEL-AMO-SA..16 | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $1.85 \pm 0.21 \pm 0.12$ | ^{1,3} AUBERT | 07R | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

2.40±0.4 ±0.3 3,4 YANG 05 BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ $M_{K\pi\pi} < 1.8 \text{ GeV}/c^2$.

² Uses $B(\Upsilon(4S) \rightarrow B^+B^-) = 0.513 \pm 0.006$.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ $M_{K\pi\pi} < 2.0 \text{ GeV}/c^2$.

 $\Gamma(K^+\pi^-\pi^0\gamma)/\Gamma_{\text{total}}$ Γ_{394}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|----------|-----------------------------------|
| 4.07±0.22±0.31 | | 1,2 AUBERT | 07R BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ $M_{K\pi\pi} < 1.8 \text{ GeV}/c^2$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(K_1(1270)^0\gamma)/\Gamma_{\text{total}}$ Γ_{395}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------|---------|-----------------------------------|
| < 5.8 | 90 | ¹ YANG | 05 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|------|----|-----------------------|---------|-----------------------------------|
| <700 | 90 | ² ALBRECHT | 89G ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
|------|----|-----------------------|---------|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² ALBRECHT 89G reports < 0.0078 assuming the $\Upsilon(4S)$ decays 45% to $B^0\bar{B}^0$. We rescale to 50%. $\Gamma(K_1(1400)^0\gamma)/\Gamma_{\text{total}}$ Γ_{396}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------|---------|-----------------------------------|
| < 1.2 | 90 | ¹ YANG | 05 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|------|----|-----------------------|---------|-----------------------------------|
| <430 | 90 | ² ALBRECHT | 89G ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
|------|----|-----------------------|---------|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² ALBRECHT 89G reports < 0.0048 assuming the $\Upsilon(4S)$ decays 45% to $B^0\bar{B}^0$. We rescale to 50%. $\Gamma(K_2^*(1430)^0\gamma)/\Gamma_{\text{total}}$ Γ_{397}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|-------------|------|---------|
| 1.24±0.24 OUR AVERAGE | | | | |

1.22±0.25±0.10 ¹ AUBERT,B 04U BABR $e^+e^- \rightarrow \Upsilon(4S)$

1.3 ±0.5 ±0.1 ¹ NISHIDA 02 BELL $e^+e^- \rightarrow \Upsilon(4S)$

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

| | | | | |
|-----|----|-----------------------|---------|-----------------------------------|
| <40 | 90 | ² ALBRECHT | 89G ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----|----|-----------------------|---------|-----------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² ALBRECHT 89G reports $< 4.4 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0\bar{B}^0$. We rescale to 50%. $\Gamma(K^*(1680)^0\gamma)/\Gamma_{\text{total}}$ Γ_{398}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------------------|-----|-----------------------|---------|-----------------------------------|
| <0.0020 | 90 | ¹ ALBRECHT | 89G ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 89G reports < 0.0022 assuming the $\Upsilon(4S)$ decays 45% to $B^0\bar{B}^0$. We rescale to 50%.

$\Gamma(K_3^*(1780)^0 \gamma) / \Gamma_{\text{total}}$ Γ_{399} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|---------|------------------------------------|
| < 83 | 90 | 1,2 NISHIDA | 05 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--------|----|------------|---------|------------------------------------|
| <10000 | 90 | 3 ALBRECHT | 89G ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--------|----|------------|---------|------------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Uses $B(K_3^*(1780) \rightarrow \eta K) = 0.11^{+0.05}_{-0.04}$.

³ ALBRECHT 89G reports < 0.011 assuming the $\Upsilon(4S)$ decays 45% to $B^0 \bar{B}^0$. We rescale to 50%.

 $\Gamma(K_4^*(2045)^0 \gamma) / \Gamma_{\text{total}}$ Γ_{400} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---------|-----|-------------|---------|------------------------------------|
| <0.0043 | 90 | 1 ALBRECHT | 89G ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 89G reports < 0.0048 assuming the $\Upsilon(4S)$ decays 45% to $B^0 \bar{B}^0$. We rescale to 50%.

 $\Gamma(\rho^0 \gamma) / \Gamma_{\text{total}}$ Γ_{401} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-----|-------------|------|---------|
| 0.86 ± 0.15 OUR AVERAGE | | | | |

| | | | |
|---|----------|-----------|------------------------------------|
| 0.97 ^{+0.24} _{-0.22} ± 0.06 | 1 AUBERT | 08BH BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---|----------|-----------|------------------------------------|

| | | | |
|--|-------------|---------|------------------------------------|
| 0.78 ^{+0.17} _{-0.16} ^{+0.09} _{-0.10} | 1 TANIGUCHI | 08 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--|-------------|---------|------------------------------------|

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

| | | | |
|---|----------|----------|----------------------|
| 0.79 ^{+0.22} _{-0.20} ± 0.06 | 1 AUBERT | 07L BABR | Repl. by AUBERT 08BH |
|---|----------|----------|----------------------|

| | | | |
|--|-------------|---------|-----------------------|
| 1.25 ^{+0.37} _{-0.33} ^{+0.07} _{-0.06} | 1 MOHAPATRA | 06 BELL | Repl. by TANIGUCHI 08 |
|--|-------------|---------|-----------------------|

| | | | | |
|-----------------|----|----------|---------|---------------------|
| 0.0 ± 0.2 ± 0.1 | 90 | 1 AUBERT | 05 BABR | Repl. by AUBERT 07L |
|-----------------|----|----------|---------|---------------------|

| | | | | |
|-------|----|-------------|---------|------------------------------------|
| < 0.8 | 90 | 1 MOHAPATRA | 05 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-------|----|-------------|---------|------------------------------------|

| | | | | |
|-------|----|----------|----------|------------------------------------|
| < 1.2 | 90 | 1 AUBERT | 04C BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-------|----|----------|----------|------------------------------------|

| | | | | |
|-----|----|--------|---------|------------------------------------|
| <17 | 90 | 1 COAN | 00 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----|----|--------|---------|------------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\rho^0 X(214), X \rightarrow \mu^+ \mu^-) / \Gamma_{\text{total}}$ Γ_{402} / Γ

$X(214)$ is a hypothetical particle of mass 214 MeV/ c^2 reported by the HyperCP experiment (PARK 05)

| VALUE (units 10^{-8}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|---------|------------------------------------|
| <1.73 | 90 | 1,2 HYUN | 10 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² The result is the same for a scalar or vector X particle.

 $\Gamma(\rho^0 \gamma) / \Gamma(K^*(892)^0 \gamma)$ $\Gamma_{401} / \Gamma_{389}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------|---------|------------------------------------|
| 2.06^{+0.45}_{-0.43} ^{+0.14}_{-0.16} | TANIGUCHI | 08 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

$\Gamma(\omega\gamma)/\Gamma_{\text{total}}$ Γ_{403}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

0.44^{+0.18}_{-0.16} OUR AVERAGE0.50^{+0.27}_{-0.23} ± 0.09 ¹ AUBERT 08BH BABR $e^+e^- \rightarrow \Upsilon(4S)$ 0.40^{+0.19}_{-0.17} ± 0.13 ¹ TANIGUCHI 08 BELL $e^+e^- \rightarrow \Upsilon(4S)$

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

0.40^{+0.24}_{-0.20} ± 0.05 ¹ AUBERT 07L BABR Repl. by AUBERT 08BH0.56^{+0.34+0.05}_{-0.27-0.10} ¹ MOHAPATRA 06 BELL Repl. by TANIGUCHI 08<1.0 90 ¹ AUBERT 05 BABR Repl. by AUBERT 07L<0.8 90 ¹ MOHAPATRA 05 BELL Repl. by MOHAPATRA 06<1.0 90 ¹ AUBERT 04c BABR $e^+e^- \rightarrow \Upsilon(4S)$ <9.2 90 ¹ COAN 00 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\phi\gamma)/\Gamma_{\text{total}}$ Γ_{404}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

<1.0 × 10⁻⁷ 90 ¹ KING 16 BELL $e^+e^- \rightarrow \Upsilon(4S)$

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

<8.5 × 10⁻⁷ 90 ¹ AUBERT, BE 05c BABR $e^+e^- \rightarrow \Upsilon(4S)$ <3.3 × 10⁻⁶ 90 ¹ COAN 00 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{405}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

5.12 ± 0.19 OUR FIT**5.13 ± 0.24 OUR AVERAGE**5.04 ± 0.21 ± 0.18 ¹ DUH 13 BELL $e^+e^- \rightarrow \Upsilon(4S)$ 5.5 ± 0.4 ± 0.3 ¹ AUBERT 07B BABR $e^+e^- \rightarrow \Upsilon(4S)$ 4.5 ^{+1.4}_{-1.2} ^{+0.5}_{-0.4} ¹ BORNHEIM 03 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$

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

5.1 ± 0.2 ± 0.2 ¹ LIN 07A BELL Repl. by DUH 134.4 ± 0.6 ± 0.3 ¹ CHAO 04 BELL Repl. by LIN 07A4.7 ± 0.6 ± 0.2 ¹ AUBERT 02Q BABR Repl. by AUBERT 07B5.4 ± 1.2 ± 0.5 ¹ CASEY 02 BELL Repl. by CHAO 045.6 ^{+2.3}_{-2.0} ^{+0.4}_{-0.5} ¹ ABE 01H BELL Repl. by CASEY 024.1 ± 1.0 ± 0.7 ¹ AUBERT 01E BABR Repl. by AUBERT 02Q< 67 90 ² ABE 00C SLD $e^+e^- \rightarrow Z$ 4.3 ^{+1.6}_{-1.4} ± 0.5 ¹ CRONIN-HEN..00 CLE2 Repl. by BORNHEIM 03

< 15 90 GODANG 98 CLE2 Repl. by CRONIN-HENNESSY 00

< 45 90 ³ ADAM 96D DLPH $e^+e^- \rightarrow Z$

| | | | | | |
|------|----|-------------------------|-----|------|-----------------------------------|
| < 20 | 90 | ASNER | 96 | CLE2 | Repl. by GODANG 98 |
| < 41 | 90 | ⁴ BUSKULIC | 96V | ALEP | $e^+e^- \rightarrow Z$ |
| < 55 | 90 | ⁵ ABREU | 95N | DLPH | Sup. by ADAM 96D |
| < 47 | 90 | ⁶ AKERS | 94L | OPAL | $e^+e^- \rightarrow Z$ |
| < 29 | 90 | ¹ BATTLE | 93 | CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <130 | 90 | ¹ ALBRECHT | 90B | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 77 | 90 | ⁷ BORTOLETTO | 89 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <260 | 90 | ⁷ BEBEK | 87 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <500 | 90 | GILES | 84 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the B fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$.

³ ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.

⁴ BUSKULIC 96V assumes PDG 96 production fractions for B^0 , B^+ , B_s , b baryons.

⁵ Assumes a B^0 , B^- production fraction of 0.39 and a B_s production fraction of 0.12.

⁶ Assumes $B(Z \rightarrow b\bar{b}) = 0.217$ and B_d^0 (B_s^0) fraction 39.5% (12%).

⁷ Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0\bar{B}^0$. We rescale to 50%.

$\Gamma(\pi^+\pi^-)/\Gamma(K^+\pi^-)$

$\Gamma_{405}/\Gamma_{272}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------------------|
| 0.261 ± 0.010 OUR FIT | | | |
| 0.261 ± 0.015 OUR AVERAGE | | | |
| 0.262 ± 0.009 ± 0.017 | AAIJ | 12AR | LHCB $p\bar{p}$ at 7 TeV |
| 0.259 ± 0.017 ± 0.016 | AALTONEN | 11N | CDF $p\bar{p}$ at 1.96 TeV |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 0.21 ± 0.05 ± 0.03 | ABULENCIA,A | 06D | CDF Repl. by AALTONEN 11N |

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

Γ_{406}/Γ

| <u>VALUE (units 10⁻⁶)</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|-----------------------|-------------|--|
| 1.59 ± 0.26 OUR AVERAGE | | | | Error includes scale factor of 1.4. |
| 1.31 ± 0.19 ± 0.19 | | ¹ JULIUS | 17 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.83 ± 0.21 ± 0.13 | | ¹ LEES | 13D | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 1.47 ± 0.25 ± 0.12 | | ¹ AUBERT | 07BC | BABR Repl. by LEES 13D |
| 1.17 ± 0.32 ± 0.10 | | ¹ AUBERT | 05L | BABR Repl. by AUBERT 07BC |
| 2.3 ^{+0.4} _{-0.5} ^{+0.2} _{-0.3} | | ¹ CHAO | 05 | BELL Repl. by JULIUS 17 |
| < 3.6 | 90 | ¹ AUBERT | 03L | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.1 ± 0.6 ± 0.3 | | ¹ AUBERT | 03S | BABR Repl. by AUBERT 05L |
| < 4.4 | 90 | ¹ BORNHEIM | 03 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.7 ± 0.6 ± 0.2 | | ¹ LEE | 03 | BELL Repl. by CHAO 05 |
| < 5.7 | 90 | ¹ ASNER | 02 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 6.4 | 90 | ¹ CASEY | 02 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 9.3 | 90 | GODANG | 98 | CLE2 Repl. by ASNER 02 |
| < 9.1 | 90 | ASNER | 96 | CLE2 Repl. by GODANG 98 |
| < 60 | 90 | ² ACCIARRI | 95H | L3 $e^+e^- \rightarrow Z$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ACCIARRI 95H assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.

$\Gamma(\eta\pi^0)/\Gamma_{\text{total}}$ Γ_{407}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------|---------|---------------------------------|
| $0.41^{+0.17+0.05}_{-0.15-0.07}$ | | 1,2 PAL | 15 BELL | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|-------|----|-----------------------|-----------|---------------------------------|
| < 1.5 | 90 | ² AUBERT | 08AH BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| < 1.3 | 90 | ² AUBERT | 06W BABR | Repl. by AUBERT 08AH |
| < 2.5 | 90 | ² CHANG | 05A BELL | Repl. by PAL 15 |
| < 2.5 | 90 | ² AUBERT,B | 04D BABR | Repl. by AUBERT 06W |
| < 2.9 | 90 | ² RICHICHI | 00 CLE2 | $e^+e^- \rightarrow \gamma(4S)$ |
| < 8 | 90 | BEHRENS | 98 CLE2 | Repl. by RICHICHI 00 |
| < 250 | 90 | ³ ACCIARRI | 95H L3 | $e^+e^- \rightarrow Z$ |
| <1800 | 90 | ² ALBRECHT | 90B ARG | $e^+e^- \rightarrow \gamma(4S)$ |

¹ PAL 15 signal significance is 3.0 standard deviations. The measurement corresponds to 90% CL upper limit of $< 6.5 \times 10^{-7}$.

² Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

³ ACCIARRI 95H assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.

 $\Gamma(\eta\eta)/\Gamma_{\text{total}}$ Γ_{408}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|---------------------------------|
| < 1.0 | 90 | ¹ AUBERT | 09AV BABR | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|-------|----|-----------------------|----------|---------------------------------|
| < 1.8 | 90 | ¹ AUBERT,B | 06V BABR | Repl. by AUBERT 09AV |
| < 2.0 | 90 | ¹ CHANG | 05A BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| < 2.8 | 90 | ¹ AUBERT,B | 04X BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| < 18 | 90 | BEHRENS | 98 CLE2 | $e^+e^- \rightarrow \gamma(4S)$ |
| <410 | 90 | ² ACCIARRI | 95H L3 | $e^+e^- \rightarrow Z$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² ACCIARRI 95H assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.

 $\Gamma(\eta'\pi^0)/\Gamma_{\text{total}}$ Γ_{409}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------------------------|------|---------|
| 1.2 ± 0.6 OUR AVERAGE | | Error includes scale factor of 1.7. | | |

$0.9 \pm 0.4 \pm 0.1$ ¹ AUBERT 08AH BABR $e^+e^- \rightarrow \gamma(4S)$

$2.8 \pm 1.0 \pm 0.3$ ¹ SCHUEMANN 06 BELL $e^+e^- \rightarrow \gamma(4S)$

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

$0.8^{+0.8}_{-0.6} \pm 0.1$ ¹ AUBERT 06W BABR Repl. by AUBERT 08AH

$1.0^{+1.4}_{-1.0} \pm 0.8$ 90 ¹ AUBERT,B 04D BABR Repl. by AUBERT 06W

< 5.7 90 ¹ RICHICHI 00 CLE2 $e^+e^- \rightarrow \gamma(4S)$

<11 90 BEHRENS 98 CLE2 Repl. by RICHICHI 00

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

 $\Gamma(\eta'\eta')/\Gamma_{\text{total}}$ Γ_{410}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|---------------------------------|
| < 1.7 | 90 | ¹ AUBERT | 09AV BABR | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|-------|----|---------------------------|----------|-----------------------------------|
| < 6.5 | 90 | ¹ SCHUEMANN 07 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 2.4 | 90 | ¹ AUBERT,B | 06V BABR | Repl. by AUBERT 09AV |
| <10 | 90 | ¹ AUBERT,B | 04X BABR | Repl. by AUBERT,B 06V |
| <47 | 90 | BEHRENS | 98 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta'\eta)/\Gamma_{\text{total}}$ Γ_{411}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|-----------------------------------|
| < 1.2 | 90 | ¹ AUBERT | 08AH BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-------|----|---------------------------|----------|-----------------------------------|
| < 4.5 | 90 | ¹ SCHUEMANN 07 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1.7 | 90 | ¹ AUBERT | 06W BABR | Repl. by AUBERT 08AH |
| < 4.6 | 90 | ¹ AUBERT,B | 04X BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <27 | 90 | BEHRENS | 98 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta'\rho^0)/\Gamma_{\text{total}}$ Γ_{412}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------------|------|-----------------------------------|
| < 1.3 | 90 | ¹ SCHUEMANN 07 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-------|----|------------------------------|----------|-----------------------------------|
| < 2.8 | 90 | ¹ DEL-AMO-SA..10A | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 3.7 | 90 | AUBERT | 07E BABR | Repl. by DEL-AMO-SANCHEZ 10A |
| < 4.3 | 90 | ¹ AUBERT,B | 04D BABR | Repl. by AUBERT 07E |
| <12 | 90 | ¹ RICHICHI | 00 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <23 | 90 | BEHRENS | 98 CLE2 | Repl. by RICHICHI 00 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta' f_0(980), f_0 \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{413}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|------------------------------|------|-----------------------------------|
| < 0.9 | 90 | ¹ DEL-AMO-SA..10A | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|------|----|--------|----------|------------------------------|
| <1.5 | 90 | AUBERT | 07E BABR | Repl. by DEL-AMO-SANCHEZ 10A |
|------|----|--------|----------|------------------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta\rho^0)/\Gamma_{\text{total}}$ Γ_{414}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|----------|-----------------------------------|
| < 1.5 | 90 | ¹ AUBERT | 07Y BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-------|----|-----------------------|----------|-----------------------------------|
| < 1.9 | 90 | ¹ WANG | 07B BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1.5 | 90 | ¹ AUBERT,B | 04D BABR | Repl. by AUBERT 07Y |
| <10 | 90 | ¹ RICHICHI | 00 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <13 | 90 | BEHRENS | 98 CLE2 | Repl. by RICHICHI 00 |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\eta f_0(980), f_0 \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{415}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|----------|------------------------------------|
| <0.4 | 90 | ¹ AUBERT | 07Y BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\omega \eta)/\Gamma_{\text{total}}$ Γ_{416}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|---------------------|-----------|------------------------------------|
| $0.94^{+0.35}_{-0.30} \pm 0.09$ | | ¹ AUBERT | 09AV BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

< 1.9 90 ¹ AUBERT,B 05K BABR Repl. by AUBERT 09AV

4.0 $^{+1.3}_{-1.2} \pm 0.4$ ¹ AUBERT,B 04X BABR Repl. by AUBERT,B 05K

<12 90 ¹ BERGFELD 98 CLE2

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\omega \eta')/\Gamma_{\text{total}}$ Γ_{417}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|---------------------|-----------|------------------------------------|
| $1.01^{+0.46}_{-0.38} \pm 0.09$ | | ¹ AUBERT | 09AV BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

< 2.2 90 ¹ SCHUEMANN 07 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

< 2.8 90 ¹ AUBERT,B 04X BABR $e^+ e^- \rightarrow \Upsilon(4S)$

<60 90 ¹ BERGFELD 98 CLE2

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\omega \rho^0)/\Gamma_{\text{total}}$ Γ_{418}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|----------|------------------------------------|
| < 1.6 | 90 | ¹ AUBERT | 09H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

< 1.5 90 ¹ AUBERT,B 06T BABR Repl. by AUBERT 09H

< 3.3 90 ¹ AUBERT 05O BABR Repl. by AUBERT,B 06T

<11 90 ¹ BERGFELD 98 CLE2

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\omega f_0(980), f_0 \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{419}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|----------|------------------------------------|
| <1.5 | 90 | ¹ AUBERT | 09H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

<1.5 90 ¹ AUBERT,B 06T BABR Repl. by AUBERT 09H

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\omega \omega)/\Gamma_{\text{total}}$ Γ_{420}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------|---------|------------------------------------|
| $1.2 \pm 0.3^{+0.3}_{-0.2}$ | | ¹ LEES | 14 BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------|----|-----------------------|-----|------|------------------|
| < 4.0 | 90 | ¹ AUBERT,B | 06T | BABR | Repl. by LEES 14 |
| <19 | 90 | ¹ BERGFELD | 98 | CLE2 | |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\phi\pi^0)/\Gamma_{\text{total}}$ Γ_{421}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|------------------|------|--|
| <0.15 | 90 | ¹ KIM | 12A | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------|----|-----------------------|-----|------|-----------------------------------|
| <0.28 | 90 | ¹ AUBERT,B | 06C | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <1.0 | 90 | ¹ AUBERT,B | 04D | BABR | Repl. by AUBERT,B 06C |
| <5 | 90 | ¹ BERGFELD | 98 | CLE2 | |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\phi\eta)/\Gamma_{\text{total}}$ Γ_{422}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|------|--|
| <0.5 | 90 | ¹ AUBERT | 09AV | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|------|----|-----------------------|-----|------|-----------------------|
| <0.6 | 90 | ¹ AUBERT,B | 06V | BABR | Repl. by AUBERT 09AV |
| <1.0 | 90 | ¹ AUBERT,B | 04X | BABR | Repl. by AUBERT,B 06V |
| <9 | 90 | ¹ BERGFELD | 98 | CLE2 | |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\phi\eta')/\Gamma_{\text{total}}$ Γ_{423}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|------------------------|------|--|
| < 0.5 | 90 | ¹ SCHUEMANN | 07 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------|----|-----------------------|------|------|-----------------------------------|
| < 1.1 | 90 | ¹ AUBERT | 09AV | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1.0 | 90 | ¹ AUBERT,B | 06V | BABR | Repl. by AUBERT 09AV |
| < 4.5 | 90 | ¹ AUBERT,B | 04X | BABR | Repl. by AUBERT,B 06V |
| <31 | 90 | ¹ BERGFELD | 98 | CLE2 | |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\phi\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{424}/Γ

| VALUE (units 10^{-7}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------------|------|-----------------------|
| $1.82 \pm 0.25 \pm 0.43$ | ¹ AAIJ | 17A | LHCB pp at 7, 8 TeV |

¹ Signal evidence is 4.5 standard deviations.

$\Gamma(\phi\rho^0)/\Gamma_{\text{total}}$ Γ_{425}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|------|--|
| < 0.33 | 90 | ¹ AUBERT | 08BK | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|------|----|-----------------------|-----|------|------------------------|
| <156 | 90 | ² ABE | 00C | SLD | $e^+e^- \rightarrow Z$ |
| < 13 | 90 | ¹ BERGFELD | 98 | CLE2 | |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the B fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$.

$\Gamma(\phi f_0(980), f_0 \rightarrow \pi^+ \pi^-) / \Gamma_{\text{total}}$ Γ_{426} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|------------------------------------|
| <0.38 | 90 | ¹ AUBERT | 08BK BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\phi\omega) / \Gamma_{\text{total}}$ Γ_{427} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------|---------|------------------------------------|
| < 0.7 | 90 | ¹ LEES | 14 BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-------|----|-----------------------|----------|------------------|
| < 1.2 | 90 | ¹ AUBERT,B | 06T BABR | Repl. by LEES 14 |
| <21 | 90 | ¹ BERGFELD | 98 CLE2 | |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\phi\phi) / \Gamma_{\text{total}}$ Γ_{428} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------|-----------|-------------------------|
| <2.7 $\times 10^{-8}$ | 90 | AAIJ | 19AP LHCB | pp at 7, 8 and 13 TeV |

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

| | | | | |
|------------------------|----|-----------------------|-----------|------------------------------------|
| <2.8 $\times 10^{-8}$ | 90 | AAIJ | 15AS LHCB | Repl. by AAIJ 19AP |
| <2 $\times 10^{-7}$ | 90 | ¹ AUBERT | 08BK BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <1.5 $\times 10^{-6}$ | 90 | ¹ AUBERT,B | 04X BABR | Repl. by AUBERT 08BK |
| <3.21 $\times 10^{-4}$ | 90 | ² ABE | 00C SLD | $e^+ e^- \rightarrow Z$ |
| <1.2 $\times 10^{-5}$ | 90 | ¹ BERGFELD | 98 CLE2 | |
| <3.9 $\times 10^{-5}$ | 90 | ASNER | 96 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the B fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$.

 $\Gamma(a_0(980)^\pm \pi^\mp, a_0^\pm \rightarrow \eta \pi^\pm) / \Gamma_{\text{total}}$ Γ_{429} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|----------|------------------------------------|
| <3.1 | 90 | ¹ AUBERT | 07Y BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|------|----|------------------------|---------|---------------------|
| <5.1 | 90 | ¹ AUBERT,BE | 04 BABR | Repl. by AUBERT 07Y |
|------|----|------------------------|---------|---------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(a_0(1450)^\pm \pi^\mp, a_0^\pm \rightarrow \eta \pi^\pm) / \Gamma_{\text{total}}$ Γ_{430} / Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|----------|------------------------------------|
| <2.3 | 90 | ¹ AUBERT | 07Y BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\pi^+ \pi^- \pi^0) / \Gamma_{\text{total}}$ Γ_{431} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-----------------------|---------|------------------------------------|
| <7.2 $\times 10^{-4}$ | 90 | ¹ ALBRECHT | 90B ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 90B limit assumes equal production of $B^0 \bar{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

$\Gamma(\rho^0\pi^0)/\Gamma_{\text{total}}$ Γ_{432}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|-----------------------|----------|-----------------------------------|
| 2.0 ± 0.5 OUR AVERAGE | | | | |
| 3.0 ± 0.5 ± 0.7 | | ^{1,2} KUSAKA | 08 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.4 ± 0.6 ± 0.3 | | ¹ AUBERT | 04Z BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.6 $^{+2.0}_{-1.4}$ ± 0.8 | | ¹ JESSOP | 00 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-----------------------------------|----|-----------------------|---------|-----------------------------------|
| 3.12 $^{+0.88+0.60}_{-0.82-0.76}$ | | ¹ DRAGIC | 06 BELL | Repl. by KUSAKA 08 |
| 5.1 ± 1.6 ± 0.9 | | DRAGIC | 04 BELL | Repl. by DRAGIC 06 |
| < 5.3 | 90 | ¹ GORDON | 02 BELL | Repl. by DRAGIC 04 |
| < 24 | 90 | ASNER | 96 CLEO | Repl. by JESSOP 00 |
| < 400 | 90 | ¹ ALBRECHT | 90B ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² This is the first measurement that excludes contributions from $\rho(1450)$ and $\rho(1570)$ resonances.

 $\Gamma(\rho^\mp\pi^\pm)/\Gamma_{\text{total}}$ Γ_{433}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|-----|-----------------------|----------|-----------------------------------|
| 23.0 ± 2.3 OUR AVERAGE | | | | |
| 22.6 ± 1.1 ± 4.4 | | ^{1,2} KUSAKA | 08 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 22.6 ± 1.8 ± 2.2 | | ¹ AUBERT | 03T BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 27.6 $^{+8.4}_{-7.4}$ ± 4.2 | | ¹ JESSOP | 00 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-------------------------------|----|-----------------------|---------|-----------------------------------|
| 20.8 $^{+6.0+2.8}_{-6.3-3.1}$ | | ¹ GORDON | 02 BELL | Repl. by KUSAKA 08 |
| < 88 | 90 | ASNER | 96 CLE2 | Repl. by JESSOP 00 |
| < 520 | 90 | ¹ ALBRECHT | 90B ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 5200 | 90 | ³ BEBEK | 87 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² This is the first measurement that excludes contributions from $\rho(1450)$ and $\rho(1570)$ resonances.

³ BEBEK 87 reports $< 6.1 \times 10^{-3}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\bar{B}^0$. We rescale to 50%.

 $\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{434}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------------|-----|------------------------|---------|-----------------------------------|
| < 11.2 × 10⁻⁶ | 90 | ¹ VANHOEFER | 14 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---------------------------|----|-----------------------|-----------|-----------------------------------|
| < 23.1 × 10 ⁻⁶ | 90 | ¹ AUBERT | 08BB BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 19.3 × 10 ⁻⁶ | 90 | ¹ CHIANG | 08 BELL | Repl. by VANHOEFER 14 |
| < 2.3 × 10 ⁻⁴ | 90 | ² ADAM | 96D DLPH | $e^+e^- \rightarrow Z$ |
| < 2.8 × 10 ⁻⁴ | 90 | ³ ABREU | 95N DLPH | Sup. by ADAM 96D |
| < 6.7 × 10 ⁻⁴ | 90 | ¹ ALBRECHT | 90B ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.

³ Assumes a B^0, B^- production fraction of 0.39 and a B_s production fraction of 0.12.

$\Gamma(\rho^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{435}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|------------------------|-----------|------------------------------------|
| < 8.8 | 90 | ¹ AUBERT | 08BB BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| <12.0 | 90 | ¹ VANHOEFER | 14 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <12.0 | 90 | ¹ CHIANG | 08 BELL | Repl. by VANHOEFER 14 |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | | |

 $\Gamma(\rho^0 \rho^0)/\Gamma_{\text{total}}$ Γ_{436}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|--------------------------|-----------|------------------------------------|
| 0.96 ± 0.15 OUR FIT | | | | |
| 0.97 ± 0.24 OUR AVERAGE | | | | |
| 1.02 ± 0.30 ± 0.15 | | ^{1,2} VANHOEFER | 14 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.92 ± 0.32 ± 0.14 | | ² AUBERT | 08BB BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.4 ± 0.4 ^{+0.2} / _{-0.3} | | ² CHIANG | 08 BELL | Repl. by VANHOEFER 14 |
| 1.07 ± 0.33 ± 0.19 | | ² AUBERT | 07G BABR | Repl. by AUBERT 08BB |
| < 1.1 | 90 | ² AUBERT | 05I BABR | Repl. by AUBERT 07G |
| < 2.1 | 90 | ² AUBERT | 03V BABR | Repl. by AUBERT 05I |
| < 18 | 90 | ³ GODANG | 02 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <136 | 90 | ⁴ ABE | 00C SLD | $e^+ e^- \rightarrow Z$ |
| <280 | 90 | ² ALBRECHT | 90B ARG | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <290 | 90 | ⁵ BORTOLETTO | 089 CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| <430 | 90 | ⁵ BEBEK | 87 CLEO | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Signal significance 3.4 standard deviations.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.³ Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 1.4×10^{-5} .⁴ ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the B fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$.⁵ Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%. $\Gamma(\rho^0 \rho^0)/\Gamma(K^*(892)^0 \phi)$ $\Gamma_{436}/\Gamma_{361}$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|----------|------------------|
| 9.5 ± 1.5 OUR FIT | | | |
| 9.4 ± 1.7 ± 0.9 | AAIJ | 15T LHCB | pp at 7, 8 TeV |

 $\Gamma(f_0(980) \pi^+ \pi^-, f_0 \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{437}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|------------------------|---------|------------------------------------|
| < 3.0 × 10⁻⁶ | 90 | ¹ VANHOEFER | 14 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| < 3.8 × 10 ⁻⁶ | 90 | ¹ CHIANG | 08 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | | |

 $\Gamma(\rho^0 f_0(980), f_0 \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{438}/Γ

| VALUE (units 10^{-7}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|--------------------------|---------|------------------------------------|
| 7.8 ± 2.2 ± 1.1 | | ^{1,2} VANHOEFER | 14 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|------|----|---------------------|------|------|-----------------------------------|
| <8.1 | 90 | AAIJ | 15T | LHCB | pp at 7, 8 TeV |
| <4.0 | 90 | ² AUBERT | 08BB | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <3 | 90 | ² CHIANG | 08 | BELL | Repl. by VANHOEFER 14 |
| <5.3 | 90 | ² AUBERT | 07G | BABR | Repl. by AUBERT 08BB |

¹ Signal significance of 3.1 standard deviations.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(f_0(980)f_0(980), f_0 \rightarrow \pi^+\pi^-, f_0 \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{439}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|-----------------------------------|
| <0.19 | 90 | ¹ AUBERT | 08BB BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------|----|------------------------|-----|------|-----------------------------------|
| <0.2 | 90 | ¹ VANHOEFER | 14 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <0.1 | 90 | ¹ CHIANG | 08 | BELL | Repl. by VANHOEFER 14 |
| <0.16 | 90 | ¹ AUBERT | 07G | BABR | Repl. by AUBERT 08BB |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(f_0(980)f_0(980), f_0 \rightarrow \pi^+\pi^-, f_0 \rightarrow K^+K^-)/\Gamma_{\text{total}}$ Γ_{440}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|-----------------------------------|
| <0.23 | 90 | ¹ AUBERT | 08BK BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(a_1(1260)^\mp \pi^\pm)/\Gamma_{\text{total}}$ Γ_{441}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-----|-------------------------------------|------|--|
| 26 ± 5 OUR AVERAGE | | Error includes scale factor of 1.9. | | |
| 22.2 ± 2.0 ± 2.8 | | ^{1,2} DALSENO | 12 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| 33.2 ± 3.8 ± 3.0 | | ^{2,3} AUBERT | 06V | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------|----|-------------------------|-----|------|-----------------------------------|
| < 630 | 90 | ² ALBRECHT | 90B | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 490 | 90 | ⁴ BORTOLETTO | 089 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <1000 | 90 | ⁴ BEBEK | 87 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ DALSENO 12 reports $B(B^0 \rightarrow a_1^\pm \pi^\mp) B(a_1^\pm \rightarrow \pi^\pm \pi^+ \pi^-) = (11.1 \pm 1.0 \pm 1.4) \times 10^{-6}$ which we rescaled assuming $a_1(1260)$ decays only to 3π and $B(a_1^\pm \rightarrow \pi^\pm \pi^+ \pi^-) = 0.5$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ Assumes $a_1(1260)$ decays only to 3π and $B(a_1^\pm \rightarrow \pi^\pm \pi^\mp \pi^\pm) = 0.5$.

⁴ Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.

$\Gamma(a_2(1320)^\mp \pi^\pm)/\Gamma_{\text{total}}$ Γ_{442}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|----------------------|------|--|
| <6.3 × 10⁻⁶ | 90 | ¹ DALSENO | 12 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------------------------|----|-------------------------|-----|------|-----------------------------------|
| <3.0 × 10 ⁻⁴ | 90 | ² BORTOLETTO | 089 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <1.4 × 10 ⁻³ | 90 | ² BEBEK | 87 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ DALSENO 12 reports $B(B^0 \rightarrow a_2^\pm \pi^\mp) B(a_2^\pm \rightarrow \pi^\pm \pi^+ \pi^-) < 2.2 \times 10^{-6}$ which we rescaled using $B(a_2^\pm \rightarrow \pi^\pm \pi^+ \pi^-) = 1/2 B(a_2^\pm \rightarrow 3\pi) = 0.35 \pm 0.013$.

² Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}$ Γ_{443}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|-------------------------------|------|-----------------------------------|
| $<3.1 \times 10^{-3}$ | 90 | ¹ ALBRECHT 90B ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 90B limit assumes equal production of $B^0\bar{B}^0$ and B^+B^- at $\Upsilon(4S)$.

 $\Gamma(\rho^+\rho^-)/\Gamma_{\text{total}}$ Γ_{444}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|--------------------------------|------|-----------------------------------|
| 27.7 ± 1.9 OUR AVERAGE | | | | |
| 28.3 ± 1.5 ± 1.5 | | ¹ VANHOEFER 16 BELL | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 25.5 ± 2.1 ^{+3.6} _{-3.9} | | ¹ AUBERT 07BF BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--|----|----------------------------------|--|-----------------------------------|
| 22.8 ± 3.8 ^{+2.3} _{-2.6} | | ¹ SOMOV 06 BELL | | Repl. by VANHOEFER 16 |
| 25 ⁺⁷ ₋₆ ⁺⁵ ₋₆ | | ¹ AUBERT 04G BABR | | Repl. by AUBERT,B 04R |
| 30 ± 4 ± 5 | | ^{1,2} AUBERT,B 04R BABR | | Repl. by AUBERT 07BF |
| <2200 | 90 | ¹ ALBRECHT 90B ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² The quoted result is obtained after combining with AUBERT 04G result by AUBERT 04R alone gives $(33 \pm 4 \pm 5) \times 10^{-6}$.

 $\Gamma(a_1(1260)^0\pi^0)/\Gamma_{\text{total}}$ Γ_{445}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|-------------------------------|------|-----------------------------------|
| $<1.1 \times 10^{-3}$ | 90 | ¹ ALBRECHT 90B ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 90B limit assumes equal production of $B^0\bar{B}^0$ and B^+B^- at $\Upsilon(4S)$.

 $\Gamma(\omega\pi^0)/\Gamma_{\text{total}}$ Γ_{446}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------------------|------|-----------------------------------|
| < 0.5 | 90 | ¹ AUBERT 08AH BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-------|----|--------------------------------|--|-----------------------------------|
| < 2.0 | 90 | ¹ JEN 06 BELL | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1.2 | 90 | ¹ AUBERT,B 04D BABR | | Repl. by AUBERT 08AH |
| < 1.9 | 90 | ¹ WANG 04A BELL | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 3 | 90 | ¹ AUBERT 01G BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 5.5 | 90 | ¹ JESSOP 00 CLE2 | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 14 | 90 | ¹ BERGFELD 98 CLE2 | | Repl. by JESSOP 00 |
| <460 | 90 | ² ALBRECHT 90B ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² ALBRECHT 90B limit assumes equal production of $B^0\bar{B}^0$ and B^+B^- at $\Upsilon(4S)$.

 $\Gamma(\pi^+\pi^+\pi^-\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_{447}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|-------------------------------|------|-----------------------------------|
| $<9.0 \times 10^{-3}$ | 90 | ¹ ALBRECHT 90B ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 90B limit assumes equal production of $B^0\bar{B}^0$ and B^+B^- at $\Upsilon(4S)$.

 $\Gamma(a_1(1260)^+\rho^-)/\Gamma_{\text{total}}$ Γ_{448}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|----------------------------------|------|-----------------------------------|
| < 61 | 90 | ^{1,2} AUBERT,B 06O BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

<3400 90 ¹ ALBRECHT 90B ARG $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Assumes $a_1(1260)$ decays only to 3π and $B(a_1^\pm \rightarrow \pi^\pm \pi^\mp \pi^\pm) = 0.5$.

$\Gamma(a_1(1260)^0 \rho^0)/\Gamma_{\text{total}}$ Γ_{449}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------------------------|-----|-------------------------------------|------|-----------------------------------|
| <2.4 × 10 ⁻³ | 90 | ¹ ALBRECHT 90B ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |

<2.4 × 10⁻³ 90 ¹ ALBRECHT 90B ARG $e^+e^- \rightarrow \Upsilon(4S)$

¹ ALBRECHT 90B limit assumes equal production of $B^0 \bar{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

$\Gamma(b_1^\mp \pi^\pm, b_1^\mp \rightarrow \omega \pi^\mp)/\Gamma_{\text{total}}$ Γ_{450}/Γ

| VALUE (units 10 ⁻⁶) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|---|------|-----------------------------------|
| 10.9 ± 1.2 ± 0.9 | ¹ AUBERT 07BI BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |

10.9 ± 1.2 ± 0.9 ¹ AUBERT 07BI BABR $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(b_1^0 \pi^0, b_1^0 \rightarrow \omega \pi^0)/\Gamma_{\text{total}}$ Γ_{451}/Γ

| VALUE (units 10 ⁻⁶) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|---|------|-----------------------------------|
| <1.9 | ¹ AUBERT 08AG BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |

<1.9 90 ¹ AUBERT 08AG BABR $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(b_1^- \rho^+, b_1^- \rightarrow \omega \pi^-)/\Gamma_{\text{total}}$ Γ_{452}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------------------------|---|------|-----------------------------------|
| <1.4 × 10 ⁻⁶ | ¹ AUBERT 09AF BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |

<1.4 × 10⁻⁶ 90 ¹ AUBERT 09AF BABR $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(b_1^0 \rho^0, b_1^0 \rightarrow \omega \pi^0)/\Gamma_{\text{total}}$ Γ_{453}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------------------------|---|------|-----------------------------------|
| <3.4 × 10 ⁻⁶ | ¹ AUBERT 09AF BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |

<3.4 × 10⁻⁶ 90 ¹ AUBERT 09AF BABR $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^-)/\Gamma_{\text{total}}$ Γ_{454}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------------------------|-------------------------------------|------|-----------------------------------|
| <3.0 × 10 ⁻³ | ¹ ALBRECHT 90B ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |

<3.0 × 10⁻³ 90 ¹ ALBRECHT 90B ARG $e^+e^- \rightarrow \Upsilon(4S)$

¹ ALBRECHT 90B limit assumes equal production of $B^0 \bar{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

$\Gamma(a_1(1260)^+ a_1(1260)^-, a_1^+ \rightarrow 2\pi^+ \pi^-, a_1^- \rightarrow 2\pi^- \pi^+)/\Gamma_{\text{total}}$ Γ_{455}/Γ

| VALUE (units 10 ⁻⁶) | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|---|------|-----------------------------------|
| 11.8 ± 2.6 ± 1.6 | ¹ AUBERT 09AL BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |

11.8 ± 2.6 ± 1.6 ¹ AUBERT 09AL BABR $e^+e^- \rightarrow \Upsilon(4S)$

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

<6000 90 ¹ ALBRECHT 90B ARG $e^+e^- \rightarrow \Upsilon(4S)$

<2800 90 ² BORTOLETTO89 CLEO $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of $B^0 \bar{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

² BORTOLETTO 89 reports $< 3.2 \times 10^{-3}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.

$\Gamma(\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_{456}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|-------------------------------|------|-----------------------------------|
| $<1.1 \times 10^{-2}$ | 90 | ¹ ALBRECHT 90B ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ ALBRECHT 90B limit assumes equal production of $B^0\bar{B}^0$ and B^+B^- at $\Upsilon(4S)$.

 $\Gamma(p\bar{p})/\Gamma_{\text{total}}$ Γ_{457}/Γ

| VALUE (units 10^{-8}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-----------------------------|------|---------------------|
| $1.25 \pm 0.27 \pm 0.18$ | | ¹ AAIJ 17BJ LHCB | | pp at 7 and 8 TeV |

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

| | | | | |
|----------------------------------|----|--------------------------------|--|-----------------------------------|
| $1.47^{+0.62+0.35}_{-0.51-0.14}$ | | ² AAIJ 13BQ LHCB | | Repl. by AAIJ 17BJ |
| < 11 | 90 | ³ TSAI 07 BELL | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 41 | 90 | ³ CHANG 05 BELL | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 27 | 90 | ³ AUBERT 04U BABR | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 140 | 90 | ³ BORNHEIM 03 CLE2 | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 120 | 90 | ³ ABE 02O BELL | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 700 | 90 | ³ COAN 99 CLE2 | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1800 | 90 | ⁴ BUSKULIC 96V ALEP | | $e^+e^- \rightarrow Z$ |
| < 35000 | 90 | ⁵ ABREU 95N DLPH | | Sup. by ADAM 96D |
| < 3400 | 90 | ⁶ BORTOLETTO89 CLEO | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 12000 | 90 | ⁷ ALBRECHT 88F ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 17000 | 90 | ⁶ BEBEK 87 CLEO | | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Uses normalization mode $B(B^0 \rightarrow K^+\pi^-) = (19.6 \pm 0.5) \times 10^{-6}$.

² Uses normalization mode $B(B^0 \rightarrow K^+\pi^-) = (19.55 \pm 0.54) \times 10^{-6}$.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ BUSKULIC 96V assumes PDG 96 production fractions for B^0 , B^+ , B_s , b baryons.

⁵ Assumes a B^0 , B^- production fraction of 0.39 and a B_s production fraction of 0.12.

⁶ Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0\bar{B}^0$. We rescale to 50%.

⁷ ALBRECHT 88F reports $< 1.3 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0\bar{B}^0$. We rescale to 50%.

 $\Gamma(p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{458}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------------------|------|------------------|
| $2.87 \pm 0.15 \pm 0.11$ | | ^{1,2} AAIJ 17BD LHCB | | pp at 7, 8 TeV |

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

| | | | | |
|--------------------------|----|-------------------------------|--|-----------------------------------|
| $0.83 \pm 0.17 \pm 0.17$ | | ³ CHU 20 BELL | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 950 | 90 | ⁴ ABREU 95N DLPH | | Sup. by ADAM 96D |
| < 250 | 90 | ⁵ BEBEK 89 CLEO | | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $540 \pm 180 \pm 200$ | | ⁶ ALBRECHT 88F ARG | | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AAIJ 17BD reports $[\Gamma(B^0 \rightarrow p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow J/\psi(1S)K^*(892)^0)] / [B(J/\psi(1S) \rightarrow p\bar{p})] / [B(K^*(892) \rightarrow (K\pi)^\pm)] = 1.07 \pm 0.04 \pm 0.04$ which we multiply by our best values $B(B^0 \rightarrow J/\psi(1S)K^*(892)^0) = (1.27 \pm 0.05) \times 10^{-3}$, $B(J/\psi(1S) \rightarrow p\bar{p}) = (2.120 \pm 0.029) \times 10^{-3}$, $B(K^*(892) \rightarrow (K\pi)^\pm) = (99.902 \pm 0.009) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

² The branching ratio is given for $m_{p\bar{p}} < 2.85$ GeV.

³ Assumes equal production of B^0 and B^+ from $\Upsilon(4S)$ decays. This measurement is quoted for $M(\pi^+\pi^-) < 1.22$ GeV excluding the $0.46 < M(\pi^+\pi^-) < 0.53$ GeV region.

⁴ Assumes a B^0 , B^- production fraction of 0.39 and a B_s production fraction of 0.12.

⁵ BEBEK 89 reports $< 2.9 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.

⁶ ALBRECHT 88F reports $6.0 \pm 2.0 \pm 2.2$ assuming the $\Upsilon(4S)$ decays 45% to $B^0 \bar{B}^0$. We rescale to 50%.

$\Gamma(p\bar{p}\pi^+\pi^-)/\Gamma(p\bar{p}K^+\pi^-)$ $\Gamma_{458}/\Gamma_{459}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|-----------|------------------|
| $0.46 \pm 0.02 \pm 0.02$ | ¹ AAIJ | 17BD LHCB | pp at 7, 8 TeV |

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

¹ The ratio is given for $m_{p\bar{p}} < 2.85$ GeV.

$\Gamma(p\bar{p}K^0)/\Gamma_{\text{total}}$ Γ_{460}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|--------------------|-------------|------|---------|
| 2.66 ± 0.32 | OUR AVERAGE | | | |

$2.51^{+0.35}_{-0.29} \pm 0.21$ ^{1,2} CHEN 08C BELL $e^+e^- \rightarrow \Upsilon(4S)$

$3.0 \pm 0.5 \pm 0.3$ ² AUBERT 07AV BABR $e^+e^- \rightarrow \Upsilon(4S)$

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

$2.40^{+0.64}_{-0.44} \pm 0.28$ ^{2,3,4} WANG 05A BELL Repl. by CHEN 08C

$1.88^{+0.77}_{-0.60} \pm 0.23$ ^{2,3,5} WANG 04 BELL Repl. by WANG 05A

< 7.2 ⁹⁰ ^{2,3} ABE 02K BELL Repl. by WANG 04

¹ Explicitly vetoes resonant production of $p\bar{p}$ from charmonium states.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ Explicitly vetoes resonant production of $p\bar{p}$ from charmonium states and pK^0 production from Λ_c .

⁴ Provides also results with $M_{p\bar{p}} < 2.85$ GeV/ c^2 and angular asymmetry of $p\bar{p}$ system.

⁵ The branching fraction for $M_{p\bar{p}} < 2.85$ is also reported.

$\Gamma(\Theta(1540)^+\bar{p}, \Theta^+ \rightarrow pK_S^0)/\Gamma_{\text{total}}$ Γ_{461}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|-----|---------------------|-----------|-----------------------------------|
| < 0.05 | 90 | ¹ AUBERT | 07AV BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

< 0.23 ⁹⁰ ¹ WANG 05A BELL $e^+e^- \rightarrow \Upsilon(4S)$

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(f_J(2220)K^0, f_J \rightarrow p\bar{p})/\Gamma_{\text{total}}$ Γ_{462}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|-----|---------------------|-----------|-----------------------------------|
| < 0.45 | 90 | ¹ AUBERT | 07AV BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(p\bar{p}K^+\pi^-)/\Gamma_{\text{total}}$ Γ_{459}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|-----------|------------------|
| $6.3 \pm 0.5 \pm 0.2$ | ^{1,2} AAIJ | 17BD LHCB | pp at 7, 8 TeV |

¹ AAIJ 17BD reports $[\Gamma(B^0 \rightarrow p\bar{p}K^+\pi^-)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow J/\psi(1S)K^*(892)^0)] / [B(J/\psi(1S) \rightarrow p\bar{p})] / [B(K^*(892) \rightarrow (K\pi)^\pm)] = 2.34 \pm 0.12 \pm 0.12$ which we multiply

by our best values $B(B^0 \rightarrow J/\psi(1S) K^*(892)^0) = (1.27 \pm 0.05) \times 10^{-3}$, $B(J/\psi(1S) \rightarrow p\bar{p}) = (2.120 \pm 0.029) \times 10^{-3}$, $B(K^*(892) \rightarrow (K\pi)^\pm) = (99.902 \pm 0.009) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

² The branching ratio is given for $m_{p\bar{p}} < 2.85$ GeV.

$\Gamma(p\bar{p}K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{463}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|---------------------|-----------|---|
| $1.24^{+0.28}_{-0.25}$ | | | | OUR AVERAGE |
| $1.18^{+0.29}_{-0.25} \pm 0.11$ | | 1,2 CHEN | 08C BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $1.47 \pm 0.45 \pm 0.40$ | | ² AUBERT | 07AV BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| • • • | | | | We do not use the following data for averages, fits, limits, etc. • • • |
| <7.6 | 90 | ² WANG | 04 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Explicitly vetoes resonant production of $p\bar{p}$ from charmonium states.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$ Γ_{466}/Γ

| VALUE (units 10^{-7}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|---------|-----------------------------------|
| $5.0 \pm 1.8 \pm 0.6$ | PAL | 19 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

$\Gamma(f_J(2220)K_0^*, f_J \rightarrow p\bar{p})/\Gamma_{\text{total}}$ Γ_{464}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------|-----------|-----------------------------------|
| <0.15 | 90 | ¹ AUBERT | 07AV BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(p\bar{p}K^+K^-)/\Gamma_{\text{total}}$ Γ_{465}/Γ

| VALUE (units 10^{-8}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------|-----------|------------------|
| $12.1 \pm 3.1 \pm 0.5$ | 1,2 AAIJ | 17BD LHCB | pp at 7, 8 TeV |

¹ AAIJ 17BD reports $[\Gamma(B^0 \rightarrow p\bar{p}K^+K^-)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow J/\psi(1S)K^*(892)^0)] / [B(J/\psi(1S) \rightarrow p\bar{p})] / [B(K^*(892) \rightarrow (K\pi)^\pm)] = 0.045 \pm 0.011 \pm 0.004$ which we multiply by our best values $B(B^0 \rightarrow J/\psi(1S)K^*(892)^0) = (1.27 \pm 0.05) \times 10^{-3}$, $B(J/\psi(1S) \rightarrow p\bar{p}) = (2.120 \pm 0.029) \times 10^{-3}$, $B(K^*(892) \rightarrow (K\pi)^\pm) = (99.902 \pm 0.009) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

² The branching ratio is given for $m_{p\bar{p}} < 2.85$ GeV.

$\Gamma(p\bar{p}K^+K^-)/\Gamma(p\bar{p}K^+\pi^-)$ $\Gamma_{465}/\Gamma_{459}$

| VALUE (%) | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-------------------|-----------|---|
| • • • | | | We do not use the following data for averages, fits, limits, etc. • • • |
| $1.9 \pm 0.5 \pm 0.2$ | ¹ AAIJ | 17BD LHCB | pp at 7, 8 TeV |

¹ The ratio is given for $m_{p\bar{p}} < 2.85$ GeV.

$\Gamma(p\rho\bar{p}\bar{p})/\Gamma_{\text{total}}$ Γ_{467}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------------|----------|-----------------------------------|
| $<2.0 \times 10^{-7}$ | 90 | ¹ LEES | 18C BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\rho\bar{\Lambda}\pi^-)/\Gamma_{\text{total}}$ Γ_{468}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

3.14 ± 0.29 OUR AVERAGE3.07 ± 0.31 ± 0.23 1 AUBERT 09AC BABR $e^+e^- \rightarrow \Upsilon(4S)$ 3.23 $^{+0.33}_{-0.29}$ ± 0.29 1 WANG 07C BELL $e^+e^- \rightarrow \Upsilon(4S)$

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

2.62 $^{+0.44}_{-0.40}$ ± 0.31 1,2 WANG 05A BELL Repl. by WANG 07C3.97 $^{+1.00}_{-0.80}$ ± 0.56 1 WANG 03 BELL Repl. by WANG 05A< 13 90 1 COAN 99 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ < 180 90 3 ALBRECHT 88F ARG $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² Provides also results with $M_{p\bar{p}} < 2.85 \text{ GeV}/c^2$ and angular asymmetry of $p\bar{\Lambda}$ system.³ ALBRECHT 88F reports $< 2.0 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0\bar{B}^0$. We rescale to 50%. $\Gamma(\rho\bar{\Lambda}\pi^-\gamma)/\Gamma_{\text{total}}$ Γ_{469}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

< 6.5 × 10⁻⁷ 90 1 LAI 14 BELL $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\rho\bar{\Sigma}(1385)^-)/\Gamma_{\text{total}}$ Γ_{470}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

< 0.26 90 1 WANG 07C BELL $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $[\Gamma(\Delta(1232)^+\bar{p}) + \Gamma(\Delta(1232)^-\rho)]/\Gamma_{\text{total}}$ Γ_{471}/Γ

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

< 1.6 × 10⁻⁶ PAL 19 BELL $e^+e^- \rightarrow \Upsilon(4S)$ $\Gamma(\Delta^0\bar{\Lambda})/\Gamma_{\text{total}}$ Γ_{472}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

< 0.93 90 1 WANG 07C BELL $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\rho\bar{\Lambda}K^-)/\Gamma_{\text{total}}$ Γ_{473}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

< 0.82 90 1 WANG 03 BELL $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\rho\bar{\Lambda}D^-)/\Gamma_{\text{total}}$ Γ_{474}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|---------|
|--------------------------|-------------|------|---------|

25.1 ± 2.6 ± 3.5 1 CHANG 15 BELL $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\rho\bar{\Lambda}D^{*-})/\Gamma_{\text{total}}$ Γ_{475}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|--------------------|------|--|
| $33.6 \pm 6.3 \pm 4.4$ | | ¹ CHANG | 15 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\rho\bar{\Sigma}^0\pi^-)/\Gamma_{\text{total}}$ Γ_{476}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------|------|--|
| $< 3.8 \times 10^{-6}$ | 90 | ¹ WANG | 03 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\bar{\Lambda}\Lambda)/\Gamma_{\text{total}}$ Γ_{477}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|-----|-------------------|------|--|
| < 0.32 | 90 | ¹ TSAI | 07 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|----------|----|-----------------------|-----|--|
| < 0.69 | 90 | ¹ CHANG | 05 | BELL Repl. by TSAI 07 |
| < 1.2 | 90 | ¹ BORNHEIM | 03 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1.0 | 90 | ¹ ABE | 020 | BELL Repl. by CHANG 05 |
| < 3.9 | 90 | ¹ COAN | 99 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\bar{\Lambda}\Lambda K^0)/\Gamma_{\text{total}}$ Γ_{478}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|----------------------|------|--|
| $4.76^{+0.84}_{-0.68} \pm 0.61$ | ^{1,2} CHANG | 09 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Excluding charmonium events in $2.85 < m_{\Lambda\bar{\Lambda}} < 3.128 \text{ GeV}/c^2$ and $3.315 < m_{\Lambda\bar{\Lambda}} < 3.735 \text{ GeV}/c^2$. Measurements in various $m_{\Lambda\bar{\Lambda}}$ bins are also reported.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\bar{\Lambda}\Lambda K^{*0})/\Gamma_{\text{total}}$ Γ_{479}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|---|----------------------|------|--|
| $2.46^{+0.87}_{-0.72} \pm 0.34$ | ^{1,2} CHANG | 09 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Excluding charmonium events in $2.85 < m_{\Lambda\bar{\Lambda}} < 3.128 \text{ GeV}/c^2$ and $3.315 < m_{\Lambda\bar{\Lambda}} < 3.735 \text{ GeV}/c^2$. Measurements in various $m_{\Lambda\bar{\Lambda}}$ bins are also reported.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\bar{\Lambda}\Lambda D^0)/\Gamma_{\text{total}}$ Γ_{480}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------|------|---------|
| $1.00^{+0.30}_{-0.26}$ OUR AVERAGE | | | |

0.98^{+0.29}_{-0.26} ± 0.19 ^{1,2} LEES 14B BABR $e^+e^- \rightarrow \Upsilon(4S)$ 1.05^{+0.57}_{-0.44} ± 0.14 ² CHANG 09 BELL $e^+e^- \rightarrow \Upsilon(4S)$ ¹ Evidence for 3.4 st. dev. signal significance.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D^0 \Sigma^0 \bar{\Lambda} + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{481}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|-------------|------|--|
| $<3.1 \times 10^{-5}$ | 90 | 1,2 LEES | 14B | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Here $\Sigma^0 \rightarrow \Lambda\gamma$.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\Delta^0 \bar{\Delta}^0)/\Gamma_{\text{total}}$ Γ_{482}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------|-----|---------------------------|------|-----------------------------------|
| <0.0015 | 90 | ¹ BORTOLETTO89 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ BORTOLETTO 89 reports < 0.0018 assuming $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%. $\Gamma(\Delta^{++} \bar{\Delta}^{--})/\Gamma_{\text{total}}$ Γ_{483}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|---------------------------|------|-----------------------------------|
| $<1.1 \times 10^{-4}$ | 90 | ¹ BORTOLETTO89 | CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ BORTOLETTO 89 reports $< 1.3 \times 10^{-4}$ assuming $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%. $\Gamma(\bar{D}^0 \rho \bar{\rho})/\Gamma_{\text{total}}$ Γ_{484}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|------|---------|
| 1.04 ± 0.07 OUR AVERAGE | | | |

1.02 ± 0.04 ± 0.06 ^{1,2} DEL-AMO-SA..12 BABR $e^+e^- \rightarrow \Upsilon(4S)$ 1.18 ± 0.15 ± 0.16 ² ABE 02W BELL $e^+e^- \rightarrow \Upsilon(4S)$

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

1.13 ± 0.06 ± 0.08 ² AUBERT,B 06S BABR Repl. by DEL-AMO-SANCHEZ 12¹ Uses the values of D and D^* branching fractions from PDG 08.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(D_s^- \bar{\Lambda} \rho)/\Gamma_{\text{total}}$ Γ_{485}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------------------|------|-----------------------------------|
| 2.8 ± 0.8 ± 0.3 | 1,2 MEDVEDEVA 07 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.² MEDVEDEVA 07 reports $(2.9 \pm 0.7 \pm 0.5 \pm 0.4) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow D_s^- \bar{\Lambda} \rho)/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi \pi^+)]$ assuming $B(D_s^+ \rightarrow \phi \pi^+) = (4.4 \pm 0.6) \times 10^{-2}$, which we rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. $\Gamma(\bar{D}^*(2007)^0 \rho \bar{\rho})/\Gamma_{\text{total}}$ Γ_{486}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|------|---------|
| 0.99 ± 0.11 OUR AVERAGE | | | |

0.97 ± 0.07 ± 0.09 ^{1,2} DEL-AMO-SA..12 BABR $e^+e^- \rightarrow \Upsilon(4S)$ 1.20 $^{+0.33}_{-0.29}$ ± 0.21 ² ABE 02W BELL $e^+e^- \rightarrow \Upsilon(4S)$

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

1.01 ± 0.10 ± 0.09 ² AUBERT,B 06S BABR Repl. by DEL-AMO-SANCHEZ 12¹ Uses the values of D and D^* branching fractions from PDG 08.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(D^*(2010)^- p \bar{n})/\Gamma_{\text{total}}$ Γ_{487}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|--------------------------|------|------------------------------------|
| $14.5^{+3.4}_{-3.0} \pm 2.7$ | ¹ ANDERSON 01 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^- p \bar{p} \pi^+)/\Gamma_{\text{total}}$ Γ_{488}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------------------|------|------------------------------------|
| $3.32 \pm 0.10 \pm 0.29$ | ^{1,2} DEL-AMO-SA..12 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|--------------------------|---------------------------|------|-----------------------------|
| $3.38 \pm 0.14 \pm 0.29$ | ² AUBERT,B 06s | BABR | Repl. by DEL-AMO-SANCHEZ 12 |
|--------------------------|---------------------------|------|-----------------------------|

¹ Uses the values of D and D^* branching fractions from PDG 08.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(D^*(2010)^- p \bar{p} \pi^+)/\Gamma_{\text{total}}$ Γ_{489}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------------------------------|------|---------|
| 4.7 ± 0.5 OUR AVERAGE | Error includes scale factor of 1.2. | | |

| | | | |
|--------------------------|-------------------------------|------|------------------------------------|
| $4.55 \pm 0.16 \pm 0.39$ | ^{1,2} DEL-AMO-SA..12 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|-------------------------------|------|------------------------------------|

| | | | |
|-----------------------------|--------------------------|------|------------------------------------|
| $6.5^{+1.3}_{-1.2} \pm 1.0$ | ² ANDERSON 01 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------------------|--------------------------|------|------------------------------------|

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

| | | | |
|--------------------------|---------------------------|------|-----------------------------|
| $4.81 \pm 0.22 \pm 0.44$ | ² AUBERT,B 06s | BABR | Repl. by DEL-AMO-SANCHEZ 12 |
|--------------------------|---------------------------|------|-----------------------------|

¹ Uses the values of D and D^* branching fractions from PDG 08.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\bar{D}^0 p \bar{p} \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{490}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------------------------|------|------------------------------------|
| $2.99 \pm 0.21 \pm 0.45$ | ^{1,2} DEL-AMO-SA..12 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses the values of D and D^* branching fractions from PDG 08.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\bar{D}^{*0} p \bar{p} \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{491}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------------------------|------|------------------------------------|
| $1.91 \pm 0.36 \pm 0.29$ | ^{1,2} DEL-AMO-SA..12 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses the values of D and D^* branching fractions from PDG 08.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\Theta_c \bar{p} \pi^+, \Theta_c \rightarrow D^- p)/\Gamma_{\text{total}}$ Γ_{492}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------------|------|------------------------------------|
| < 9 | 90 | ¹ AUBERT,B 06s | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

 $\Gamma(\Theta_c \bar{p} \pi^+, \Theta_c \rightarrow D^{*-} p)/\Gamma_{\text{total}}$ Γ_{493}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|---------------------------|------|------------------------------------|
| < 14 | 90 | ¹ AUBERT,B 06s | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\bar{\Sigma}_c^{--} \Delta^{++})/\Gamma_{\text{total}}$ Γ_{494}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------|-----|--------------------------|------|------------------------------------|
| $< 8 \times 10^{-4}$ | 90 | ¹ PROCARIO 94 | CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ PROCARIO 94 reports < 0.0012 from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Sigma}_c^{--} \Delta^{++})/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 0.043$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 6.28 \times 10^{-2}$.

$\Gamma(\bar{\Lambda}_c^- p \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{495}/Γ

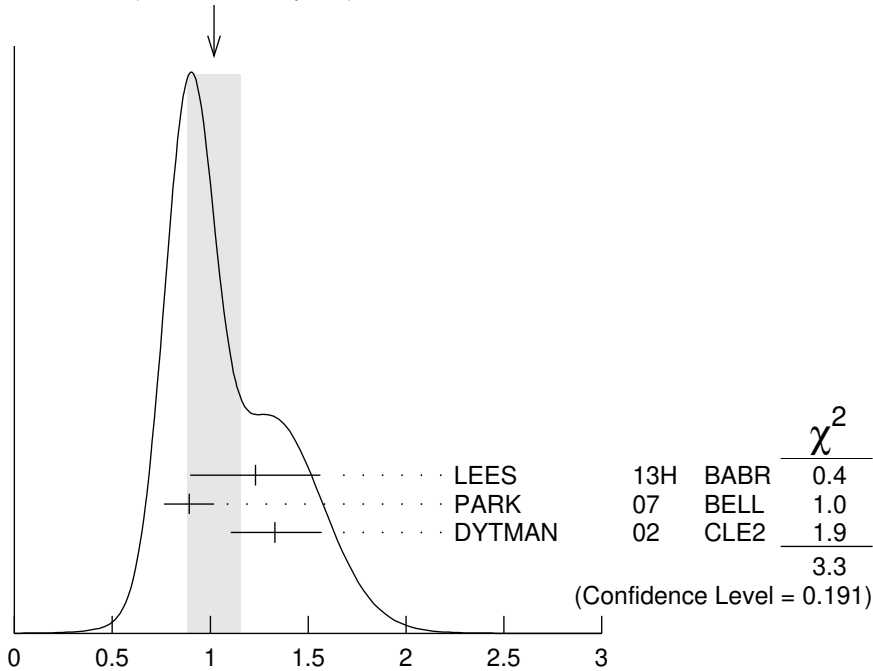
| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|---|------|---------|
| 1.02 ± 0.14 OUR AVERAGE | Error includes scale factor of 1.3. See the ideogram below. | | |

| | | | |
|---|---------------------|-----|---|
| 1.23 ± 0.05 ± 0.33 | ^{1,2} LEES | 13H | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.89 ± 0.11 ^{+0.05} _{-0.04} | ^{1,3} PARK | 07 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 1.33 ^{+0.22} _{-0.20} ± 0.07 | ⁴ DYTMAN | 02 | CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|---|-----------------------|----|-------------------------|
| 0.88 ± 0.16 ^{+0.05} _{-0.04} | ⁵ GABYSHEV | 02 | BELL Repl. by PARK 07 |
| 1.33 ^{+0.46} _{-0.42} ± 0.37 | ⁶ FU | 97 | CLE2 Repl. by DYTMAN 02 |

WEIGHTED AVERAGE
1.02 ± 0.14 (Error scaled by 1.3)



¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Uses $\Lambda_c^+ \rightarrow p K^- \pi^+$ mode. The second error includes the uncertainty of the branching fraction of the Λ_c^+ decay, $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3)\%$.

- ³ PARK 07 reports $(11.2 \pm 0.5 \pm 3.2) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Lambda}_c^- p \pi^+ \pi^-) / \Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ⁴ DYTMAN 02 reports $(1.67^{+0.27}_{-0.25}) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Lambda}_c^- p \pi^+ \pi^-) / \Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 0.05$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ⁵ GABYSHEV 02 reports $(1.1 \pm 0.2) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Lambda}_c^- p \pi^+ \pi^-) / \Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 0.05$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ⁶ FU 97 uses PDG 96 values of Λ_c branching fraction.
- $\Gamma(\bar{\Lambda}_c^- p \pi^+ \pi^-) / \Gamma_{\text{total}}$ (units 10^{-3})

$\Gamma(\bar{\Lambda}_c^- p) / \Gamma_{\text{total}}$ Γ_{496} / Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------|-----------|------------------------------------|
| 1.54 ± 0.18 OUR AVERAGE | | | | |
| 1.51 ± 0.16 ± 0.08 | | 1,2 AUBERT | 08BN BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 2.19 ^{+0.56} _{-0.49} ± 0.65 | | 1,3 GABYSHEV | 03 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 2.10 ^{+0.67 +0.77} _{-0.55 -0.46} | | 1,4 AUBERT | 07AV BABR | Repl. by AUBERT 08BN |
| < 9 | 90 | 1,5 DYTMAN | 02 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 3.1 | 90 | 1,4 GABYSHEV | 02 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 21 | 90 | ⁶ FU | 97 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

- ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
- ² AUBERT 08BN reports $(1.89 \pm 0.21 \pm 0.49) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Lambda}_c^- p) / \Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ³ The second error for GABYSHEV 03 includes the systematic and the error of $\Lambda_c \rightarrow \bar{p} K^+ \pi^-$ decay branching fraction.
- ⁴ Uses the value for $\Lambda_c \rightarrow p K^- \pi^+$ branching ratio $(5.0 \pm 1.3)\%$.
- ⁵ DYTMAN 02 measurement uses $B(\Lambda_c^- \rightarrow \bar{p} K^+ \pi^-) = 5.0 \pm 1.3\%$. The second error includes the systematic and the uncertainty of the branching ratio.
- ⁶ FU 97 uses PDG 96 values of Λ_c branching ratio.

$\Gamma(\bar{\Lambda}_c^- p \pi^0) / \Gamma_{\text{total}}$ Γ_{497} / Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-----|-------------|----------|------------------------------------|
| 1.55 ± 0.17 ± 0.08 | | | | |
| | | 1,2 AUBERT | 10H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

- <5.9 90 ³FU 97 CLE2 $e^+e^- \rightarrow \Upsilon(4S)$
- ¹AUBERT 10H reports $(1.94 \pm 0.17 \pm 0.52) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Lambda}_c^- p \pi^0)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
- ³ FU 97 uses PDG 96 values of Λ_c branching ratio.

$\Gamma(\Lambda_c^- p K^+ K^-)/\Gamma_{\text{total}}$ Γ_{510}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------|----------|-----------------------------------|
| $2.0 \pm 0.4 \pm 0.1$ | 90 | 1,2 LEES | 15B BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ LEES 15B reports $[\Gamma(B^0 \rightarrow \Lambda_c^- p K^+ K^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)] = (12.5 \pm 2.0 \pm 1.0) \times 10^{-7}$ which we divide by our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\Lambda_c^- p \phi)/\Gamma_{\text{total}}$ Γ_{511}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------|----------|-----------------------------------|
| $<1.0 \times 10^{-5}$ | 90 | 1,2 LEES | 15B BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ LEES 15B reports $<1.2 \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \Lambda_c^- p \phi)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 6.28 \times 10^{-2}$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\Sigma_c(2455)^- p)/\Gamma_{\text{total}}$ Γ_{498}/Γ

| VALUE (units 10^{-6}) | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------|-----|-------------|----------|-----------------------------------|
| <24 | 90 | 1,2 AUBERT | 10H BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AUBERT 10H reports $[\Gamma(B^0 \rightarrow \Sigma_c(2455)^- p)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)] < 1.5 \times 10^{-6}$ which we divide by our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 6.28 \times 10^{-2}$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\bar{\Lambda}_c^- p \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ Γ_{499}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------|---------|-----------------------------------|
| $<5.07 \times 10^{-3}$ | 90 | 1 FU | 97 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ FU 97 uses PDG 96 values of Λ_c branching ratio.

$\Gamma(\bar{\Lambda}_c^- p \pi^+ \pi^- \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{500}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------|---------|-----------------------------------|
| $<2.74 \times 10^{-3}$ | 90 | 1 FU | 97 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ FU 97 uses PDG 96 values of Λ_c branching ratio.

$\Gamma(\bar{\Lambda}_c^- p \pi^+ \pi^- (\text{nonresonant}))/\Gamma_{\text{total}}$ Γ_{501}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------------------------------|----------|----------------------------------|
| 5.5 ± 1.0 OUR AVERAGE | Error includes scale factor of 1.3. | | |
| 7.9 ± 0.4 ± 2.0 | 1,2 LEES | 13H BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| 5.1 ± 0.8 ± 0.3 | 1,3 PARK | 07 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Uses $\Lambda_c^+ \rightarrow p K^- \pi^+$ mode. The second error includes the uncertainty of the branching fraction of the Λ_c decay, $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3)\%$.

³ PARK 07 reports $(6.4 \pm 0.4 \pm 1.9) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Lambda}_c^- p \pi^+ \pi^- (\text{nonresonant}))/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\bar{\Sigma}_c(2520)^{--} p \pi^+)/\Gamma_{\text{total}}$ Γ_{502}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|----------|----------------------------------|
| 1.02 ± 0.18 OUR AVERAGE | | | |
| 1.15 ± 0.10 ± 0.30 | 1,2 LEES | 13H BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| 0.96 ± 0.21 ± 0.05 | 1,3 PARK | 07 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |

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

1.3 ± 0.5 ± 0.1 ⁴ GABYSHEV 02 BELL Repl. by PARK 07

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Uses $\Lambda_c^+ \rightarrow p K^- \pi^+$ mode. The second error includes the uncertainty of the branching fraction of the Λ_c decay, $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3)\%$.

³ PARK 07 reports $(1.2 \pm 0.1 \pm 0.4) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Sigma}_c(2520)^{--} p \pi^+)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ GABYSHEV 02 reports $(1.63^{+0.64}_{-0.58}) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Sigma}_c(2520)^{--} p \pi^+)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 0.05$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\bar{\Sigma}_c(2520)^0 p \pi^-)/\Gamma_{\text{total}}$ Γ_{503}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-----|--------------|----------|----------------------------------|
| <0.31 × 10⁻⁴ | 90 | 1,2 LEES | 13H BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| <0.38 × 10 ⁻⁴ | 90 | 1 PARK | 07 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| <1.21 × 10 ⁻⁴ | 90 | 1,2 GABYSHEV | 02 BELL | Repl. by PARK 07 |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Uses the value for $\Lambda_c \rightarrow p K^- \pi^+$ branching ratio $(5.0 \pm 1.3)\%$.

$\Gamma(\overline{\Sigma}_c(2455)^0 N^0, N^0 \rightarrow p\pi^-)/\Gamma_{\text{total}}$ Γ_{505}/Γ

N^0 is the $N(1440) P_{11}$ or $N(1535) S_{11}$ or an admixture of the two baryonic states.

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|--------------------------------------|
| 0.64±0.16±0.03 | 1,2 KIM | 08 | BELL $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² KIM 08 reports $(0.80 \pm 0.15 \pm 0.25) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \overline{\Sigma}_c(2455)^0 N^0, N^0 \rightarrow p\pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow pK^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\overline{\Sigma}_c(2455)^0 p\pi^-)/\Gamma_{\text{total}}$ Γ_{504}/Γ

| VALUE (units 10^{-4}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|-------------|------|---------|
| 1.08±0.16 OUR AVERAGE | | | | |

0.91±0.07±0.24 1,2 LEES 13H BABR $e^+e^- \rightarrow \gamma(4S)$

1.12±0.21±0.06 1,3 PARK 07 BELL $e^+e^- \rightarrow \gamma(4S)$

1.8 ±0.6 ±0.1 4 DYTMAN 02 CLE2 $e^+e^- \rightarrow \gamma(4S)$

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

0.38^{+0.37}_{-0.33}±0.02 90 5 GABYSHEV 02 BELL Repl. by PARK 07

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Uses $\Lambda_c^+ \rightarrow pK^- \pi^+$ mode. The second error includes the uncertainty of the branching fraction of the Λ_c decay, $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = (5.0 \pm 1.3)\%$.

³ PARK 07 reports $(1.4 \pm 0.2 \pm 0.4) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \overline{\Sigma}_c(2455)^0 p\pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow pK^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ DYTMAN 02 reports $(2.2 \pm 0.7) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \overline{\Sigma}_c(2455)^0 p\pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow pK^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = 0.05$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁵ GABYSHEV 02 reports $(0.48^{+0.46}_{-0.41}) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \overline{\Sigma}_c(2455)^0 p\pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow pK^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = 0.05$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\overline{\Sigma}_c(2455)^{--} p\pi^+)/\Gamma_{\text{total}}$ Γ_{506}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------|------|---------|
| 1.83±0.24 OUR AVERAGE | | | |

2.13±0.10±0.56 1,2 LEES 13H BABR $e^+e^- \rightarrow \gamma(4S)$

1.67±0.25^{+0.09}_{-0.08} 1,3 PARK 07 BELL $e^+e^- \rightarrow \gamma(4S)$

2.9 ±0.9 ^{+0.2}_{-0.1} 4 DYTMAN 02 CLE2 $e^+e^- \rightarrow \gamma(4S)$

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

1.9 $\begin{matrix} +0.6 \\ -0.5 \end{matrix} \pm 0.1$ ⁵ GABYSHEV 02 BELL Repl. by PARK 07

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Uses $\Lambda_c^+ \rightarrow \rho K^- \pi^+$ mode. The second error includes the uncertainty of the branching fraction of the Λ_c decay, $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (5.0 \pm 1.3)\%$.

³ PARK 07 reports $(2.1 \pm 0.2 \pm 0.6) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Sigma}_c(2455)^{--} \rho \pi^+)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow \rho K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ DYTMAN 02 reports $(3.7 \pm 1.1) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Sigma}_c(2455)^{--} \rho \pi^+)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow \rho K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = 0.05$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁵ GABYSHEV 02 reports $(2.38_{-0.69}^{+0.75}) \times 10^{-4}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Sigma}_c(2455)^{--} \rho \pi^+)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow \rho K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = 0.05$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Lambda_c^- \rho K^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{507}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|-----------|------------------------------------|
| $3.4 \pm 0.7 \pm 0.2$ | 1,2 AUBERT | 09AG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ AUBERT 09AG reports $(4.33 \pm 0.82 \pm 0.33 \pm 1.13) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \Lambda_c^- \rho K^+ \pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow \rho K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\bar{\Sigma}_c(2455)^{--} \rho K^+, \bar{\Sigma}_c^{--} \rightarrow \bar{\Lambda}_c^- \pi^-)/\Gamma_{\text{total}}$ Γ_{508}/Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|-----------|------------------------------------|
| $0.88 \pm 0.25_{-0.04}^{+0.05}$ | 1,2 AUBERT | 09AG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ AUBERT 09AG reports $(1.11 \pm 0.30 \pm 0.09 \pm 0.29) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Sigma}_c(2455)^{--} \rho K^+, \bar{\Sigma}_c^{--} \rightarrow \bar{\Lambda}_c^- \pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow \rho K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\Lambda_c^- \rho K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{509}/Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-----|-------------|-----------|------------------------------------|
| <2.42 | 90 | 1 AUBERT | 09AG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\Lambda_c^- p \bar{p} p) / \Gamma_{\text{total}}$ Γ_{512} / Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|------|---|
| <2.8 | ¹ LEES | 14C | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 0.050 \pm 0.013$.

$\Gamma(\bar{\Lambda}_c^- \Lambda K^+) / \Gamma_{\text{total}}$ Γ_{513} / Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|------|---|
| $4.8 \pm 1.1^{+0.2}_{-0.3}$ | ^{1,2} LEES | 11F | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^0 and B^+ from Upsilon(4S) decays.

² LEES 11F reports $(3.8 \pm 0.8 \pm 0.2 \pm 1.0) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \bar{\Lambda}_c^- \Lambda K^+) / \Gamma_{\text{total}}] / [B(\Lambda_c^+ \rightarrow p K^- \pi^+)] / [B(\Lambda \rightarrow p \pi^-)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, $B(\Lambda \rightarrow p \pi^-) = (63.9 \pm 0.5) \times 10^{-2}$, which we rescale to our best values $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$, $B(\Lambda \rightarrow p \pi^-) = (63.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values. The reported uncertainties are statistical, systematic, and $\bar{\Lambda}_c^-$ branching fraction uncertainty.

$\Gamma(\bar{\Lambda}_c^- \Lambda_c^+) / \Gamma_{\text{total}}$ Γ_{514} / Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------|------|--------------------|
| <1.6 | 95 | ¹ AAIJ | 14AA | LHCB pp at 7 TeV |

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

| | | | | |
|------|----|---------------------|----|---|
| <6.2 | 90 | ² UCHIDA | 08 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------|----|---------------------|----|---|

¹ Uses $B(\bar{B}^0 \rightarrow D^+ D_s^-) = (7.2 \pm 0.8) \times 10^{-3}$.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\bar{\Lambda}_c(2593)^- / \bar{\Lambda}_c(2625)^- p) / \Gamma_{\text{total}}$ Γ_{515} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-----------------------|------|---|
| <1.1 $\times 10^{-4}$ | 90 | ^{1,2} DYTMAN | 02 | CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² DYTMAN 02 measurement uses $B(\Lambda_c^- \rightarrow \bar{p} K^+ \pi^-) = 5.0 \pm 1.3\%$. The second error includes the systematic and the uncertainty of the branching ratio.

$\Gamma(\Xi_c^- \Lambda_c^+) / \Gamma_{\text{total}}$ Γ_{516} / Γ

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|------|---|
| $1.2 \pm 0.7 \pm 0.3$ | ^{1,2} LI | 19C | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses fully reconstructed B^0 on tag side with recoil against Λ_c^+ .

² LI 19C reports $(1.16 \pm 0.74 \pm 0.33) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \rightarrow \Xi_c^- \Lambda_c^+) / \Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$.

$\Gamma(\Xi_c^- \Lambda_c^+, \Xi_c^- \rightarrow \Xi^+ \pi^- \pi^-) / \Gamma_{\text{total}}$ Γ_{517} / Γ

| VALUE (units 10^{-5}) | DOCUMENT ID | TECN | COMMENT |
|---|-------------------------------------|------|---|
| 2.4 ± 1.1 OUR AVERAGE | Error includes scale factor of 1.8. | | |
| $3.3 \pm 0.7 \pm 0.3$ | ¹ LI | 19C | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $1.2 \pm 0.9 \pm 0.1$ | ^{2,3} AUBERT | 08H | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

7.4^{+3.3}_{-2.7} ± 0.4 3,4 CHISTOV 06A BELL Repl. by LI 19C

¹ LI 19C reports $(3.32 \pm 0.74 \pm 0.33) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \Xi_c^- \Lambda_c^+, \Xi_c^- \rightarrow \Xi^+ \pi^- \pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$.

² AUBERT 08H reports $(1.5 \pm 1.07 \pm 0.44) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \Xi_c^- \Lambda_c^+, \Xi_c^- \rightarrow \Xi^+ \pi^- \pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ CHISTOV 06A reports $(9.3^{+3.7}_{-2.8} \pm 3.1) \times 10^{-5}$ from a measurement of $[\Gamma(B^0 \rightarrow \Xi_c^- \Lambda_c^+, \Xi_c^- \rightarrow \Xi^+ \pi^- \pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Xi_c^- \Lambda_c^+, \Xi_c^- \rightarrow \bar{p} K^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{518}/Γ

| VALUE (units 10^{-6}) | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----------------|----------|------------------------------------|
| 5.3 ± 1.5 ± 0.7 | ¹ LI | 19C BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ LI 19C reports $(5.27 \pm 1.51 \pm 0.69) \times 10^{-6}$ from a measurement of $[\Gamma(B^0 \rightarrow \Xi_c^- \Lambda_c^+, \Xi_c^- \rightarrow \bar{p} K^+ \pi^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow p K^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$.

$\Gamma(\Lambda_c^+ \Lambda_c^- K^0)/\Gamma_{\text{total}}$ Γ_{519}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------|------|---------|
| 4.0 ± 0.9 OUR AVERAGE | | | |

3.99 ± 0.76 ± 0.51 ¹ LI 18D BELL $e^+ e^- \rightarrow \Upsilon(4S)$

3.8 ± 3.1 ± 2.1 2,3 AUBERT 08H BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

7.9^{+2.9}_{-2.3} ± 4.3 2,3 GABYSHEV 06 BELL Repl. by LI 18D

¹ Assumes $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 48.6 \pm 0.6\%$ and $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 6.23 \pm 0.33\%$.

² Assumes $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 5.0 \pm 1.3\%$.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\Xi_c(2930)^- \Lambda_c^+, \Xi_c^- \rightarrow \Lambda_c^- K^0)/\Gamma_{\text{total}}$ Γ_{520}/Γ

| VALUE (units 10^{-4}) | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-----------------|----------|------------------------------------|
| 2.37 ± 0.51 ± 0.31 | ¹ LI | 18D BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 48.6 \pm 0.6\%$ and $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 6.23 \pm 0.33\%$.

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ Γ_{521}/Γ

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-----|------------------------------|------|------------------------------------|
| < 3.2 × 10⁻⁷ | 90 | ¹ DEL-AMO-SA..11A | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-----------------------|----|-----------------------|-----|------|---------------------------------|
| $<6.2 \times 10^{-7}$ | 90 | ¹ VILLA | 06 | BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| $<1.7 \times 10^{-6}$ | 90 | ¹ AUBERT | 01i | BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| $<3.9 \times 10^{-5}$ | 90 | ² ACCIARRI | 95i | L3 | $e^+e^- \rightarrow Z$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² ACCIARRI 95i assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.

$\Gamma(e^+e^-)/\Gamma_{\text{total}}$ **Γ_{522}/Γ**

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-------------------|------|---------------------------|
| $< 2.5 \times 10^{-9}$ | 90 | ¹ AAIJ | 20W | LHCB pp at 7, 8, 13 TeV |

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

| | | | | | |
|------------------------|----|-----------------------|-----|------|---------------------------------|
| $< 8.3 \times 10^{-8}$ | 90 | AALTONEN | 09P | CDF | $p\bar{p}$ at 1.96 TeV |
| $<11.3 \times 10^{-8}$ | 90 | ² AUBERT | 08P | BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| $< 6.1 \times 10^{-8}$ | 90 | ² AUBERT | 05W | BABR | Repl. by AUBERT 08P |
| $< 1.9 \times 10^{-7}$ | 90 | ² CHANG | 03 | BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| $< 8.3 \times 10^{-7}$ | 90 | ² BERGFELD | 00B | CLE2 | $e^+e^- \rightarrow \gamma(4S)$ |
| $< 1.4 \times 10^{-5}$ | 90 | ³ ACCIARRI | 97B | L3 | $e^+e^- \rightarrow Z$ |
| $< 5.9 \times 10^{-6}$ | 90 | AMMAR | 94 | CLE2 | Repl. by BERGFELD 00B |
| $< 2.6 \times 10^{-5}$ | 90 | ⁴ AVERY | 89B | CLEO | $e^+e^- \rightarrow \gamma(4S)$ |
| $< 7.6 \times 10^{-5}$ | 90 | ⁵ ALBRECHT | 87D | ARG | $e^+e^- \rightarrow \gamma(4S)$ |
| $< 6.4 \times 10^{-5}$ | 90 | ⁶ AVERY | 87 | CLEO | $e^+e^- \rightarrow \gamma(4S)$ |
| $< 3 \times 10^{-4}$ | 90 | GILES | 84 | CLEO | Repl. by AVERY 87 |

¹ Assumes no contribution from $B_s^0 \rightarrow e^+e^-$ decays.

² Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

³ ACCIARRI 97B assume PDG 96 production fractions for B^+ , B^0 , B_s , and Λ_b .

⁴ AVERY 89B reports $< 3 \times 10^{-5}$ assuming the $\gamma(4S)$ decays 43% to $B^0\bar{B}^0$. We rescale to 50%.

⁵ ALBRECHT 87D reports $< 8.5 \times 10^{-5}$ assuming the $\gamma(4S)$ decays 45% to $B^0\bar{B}^0$. We rescale to 50%.

⁶ AVERY 87 reports $< 8 \times 10^{-5}$ assuming the $\gamma(4S)$ decays 40% to $B^0\bar{B}^0$. We rescale to 50%.

$\Gamma(e^+e^-\gamma)/\Gamma_{\text{total}}$ **Γ_{523}/Γ**

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------|------|--------------------------------------|
| $<1.2 \times 10^{-7}$ | 90 | AUBERT | 08C | BABR $e^+e^- \rightarrow \gamma(4S)$ |

$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$ **Γ_{524}/Γ**

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE (units 10^{-9}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

$0.07^{+0.13}_{-0.11}$ OUR AVERAGE Error includes scale factor of 1.8.

| | | | | |
|---------------------------------|-----------------------|-----|------|----------------------|
| $0.12^{+0.08}_{-0.07} \pm 0.01$ | ¹ AAIJ | 22 | LHCB | pp at 7, 8, 13 TeV |
| $- 0.19 \pm 0.16$ | ^{2,3} AABOUD | 19L | ATLS | pp at 7, 8, 13 TeV |

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

| | | | | |
|----------------------------------|----|---------------------------|-----------|--------------------------------|
| < 0.36 | 95 | ⁴ SIRUNYAN | 20AG | pp at 7, 8, 13 TeV |
| $0.15^{+0.12+0.02}_{-0.10-0.01}$ | | ⁵ AAIJ | 17AI LHCb | Repl. by AAIJ 22 |
| – 0.25±0.20 | | ⁶ AABOUD | 16L ATLS | Repl. by AABOUD 19L |
| $0.39^{+0.16}_{-0.14}$ | | ⁷ KHACHATRY... | 15BE LHC | pp at 7, 8 TeV |
| < 0.80 | 90 | ⁸ AAIJ | 13B LHCb | Repl. by AAIJ 13BA |
| < 0.63 | 90 | ⁹ AAIJ | 13BA LHCb | Repl. by KHACHA- TRYAN 15BE |
| < 3.8 | 90 | ¹⁰ AALTONEN | 13F CDF | $p\bar{p}$ at 1.96 TeV |
| $0.35^{+0.21}_{-0.18}$ | | ¹¹ CHATRCHYAN | 13AW CMS | Repl. by SIRUN- YAN 20AG |
| < 2.6 | 90 | ⁸ AAIJ | 12A LHCb | Repl. by AAIJ 12W |
| < 0.81 | 90 | ¹² AAIJ | 12W LHCb | Repl. by AAIJ 13B |
| < 1.4 | 90 | ¹² CHATRCHYAN | 12A CMS | pp at 7 TeV |
| < 12 | 90 | ¹³ AAIJ | 11B LHCb | Repl. by AAIJ 12A |
| < 5.0 | 90 | ¹² AALTONEN | 11AG CDF | $p\bar{p}$ at 1.96 TeV |
| < 3.7 | 90 | ¹² CHATRCHYAN | 11T CMS | Repl. by CHA- TRCHYAN 12A |

¹ Corresponds to a 95% CL upper limit of $< 2.6 \times 10^{-10}$.

² Corresponds to a 95% CL upper limit of $< 2.1 \times 10^{-10}$.

³ Uses normalization mode $B(B^+ \rightarrow J/\psi K^+) = (1.010 \pm 0.029) \times 10^{-3}$ and B production ratio $f(b \rightarrow B_s^0)/f(b \rightarrow B^0) = 0.256 \pm 0.013$.

⁴ Uses normalization mode $B(B^+ \rightarrow J/\psi K^+) = (1.01 \pm 0.03) \times 10^{-3}$.

⁵ Corresponds to a 95% CL upper limit of $< 3.4 \times 10^{-10}$.

⁶ This value is obtained from a profile-likelihood fit, see Fig. 9. It corresponds to an upper limit of $< 0.42 \times 10^{-9}$ at 95% C.L.

⁷ Derived from the combined fit to CMS and LHCb data. Uncertainty includes both statistical and systematic component. Also reports $B(B^0 \rightarrow \mu^+ \mu^-)/B(B_s \rightarrow \mu^+ \mu^-) = 0.14^{+0.08}_{-0.06}$.

⁸ Uses $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$ and $B(B^0 \rightarrow K^+ \pi^-) = (1.94 \pm 0.06) \times 10^{-5}$ for normalization.

⁹ Reports also a limit of $< 7.4 \times 10^{-10}$ at 95% CL. Uses normalization modes $B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+$ and $B^0 \rightarrow K^+ \pi^-$.

¹⁰ Uses normalization mode $B(B^+ \rightarrow J/\psi K^+) = (10.22 \pm 0.35) \times 10^{-4}$.

¹¹ Reports also a limit of $< 9.2 \times 10^{-10}$ at 90% CL. and uses $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (6.0 \pm 0.2) \times 10^{-5}$ for normalization.

¹² Uses $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$.

¹³ Uses B production ratio $f(\bar{b} \rightarrow B^+)/f(\bar{b} \rightarrow B_s^0) = 3.71 \pm 0.47$ and three normalization modes.

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

Γ_{525}/Γ

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------|-----|-------------------|---------|----------------------|
| $< 2.0 \times 10^{-9}$ | 95 | ¹ AAIJ | 22 LHCb | pp at 7, 8, 13 TeV |

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

| | | | | |
|------------------------|----|--------|----------|----------------------------------|
| $< 1.6 \times 10^{-7}$ | 90 | AUBERT | 08C BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
|------------------------|----|--------|----------|----------------------------------|

¹ The exclusion is limited to the range $m_{\mu\mu} > 4.9 \text{ GeV}/c^2$.

$\Gamma(\tau^+\tau^-)/\Gamma_{\text{total}}$ Γ_{528}/Γ Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

| | | | | |
|-----------------------|----|-------------------|-----------|------------------|
| $<2.1 \times 10^{-3}$ | 95 | ¹ AAIJ | 17AJ LHCB | pp at 7, 8 TeV |
|-----------------------|----|-------------------|-----------|------------------|

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

| | | | | |
|-----------------------|----|---------------------|----------|-----------------------------------|
| $<4.1 \times 10^{-3}$ | 90 | ² AUBERT | 06S BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----------------------|----|---------------------|----------|-----------------------------------|

¹ Assuming no contribution from $B_S^0 \rightarrow \tau^+\tau^-$.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\mu^+\mu^-\mu^+\mu^-)/\Gamma_{\text{total}}$ Γ_{526}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

| | | | | |
|------------------------|----|------|----------|------------------|
| $<6.9 \times 10^{-10}$ | 95 | AAIJ | 17N LHCB | pp at 7, 8 TeV |
|------------------------|----|------|----------|------------------|

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

| | | | | |
|-----------------------|----|-------------------|-----------|-------------------|
| $<5.3 \times 10^{-9}$ | 90 | ¹ AAIJ | 13AW LHCB | Repl. by AAIJ 17N |
|-----------------------|----|-------------------|-----------|-------------------|

¹ Also reports a limit of $<6.6 \times 10^{-9}$ at 95% CL. $\Gamma(SP, S \rightarrow \mu^+\mu^-, P \rightarrow \mu^+\mu^-)/\Gamma_{\text{total}}$ Γ_{527}/Γ Here S and P are the hypothetical scalar and pseudoscalar particles with masses of 2.5 GeV/ c^2 and 214.3 MeV/ c^2 , respectively.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

| | | | | |
|------------------------|----|------|----------|------------------|
| $<6.0 \times 10^{-10}$ | 95 | AAIJ | 17N LHCB | pp at 7, 8 TeV |
|------------------------|----|------|----------|------------------|

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

| | | | | |
|-----------------------|----|-------------------|-----------|-------------------|
| $<5.1 \times 10^{-9}$ | 90 | ¹ AAIJ | 13AW LHCB | Repl. by AAIJ 17N |
|-----------------------|----|-------------------|-----------|-------------------|

¹ Also reports a limit of $<6.3 \times 10^{-9}$ at 95% CL. $\Gamma(\pi^0\ell^+\ell^-)/\Gamma_{\text{total}}$ Γ_{529}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

| | | | | |
|-----------------------|----|-------------------|----------|-----------------------------------|
| $<5.3 \times 10^{-8}$ | 90 | ¹ LEES | 13M BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----------------------|----|-------------------|----------|-----------------------------------|

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

| | | | | |
|-----------------------|----|------------------|----------|-----------------------------------|
| $<1.5 \times 10^{-7}$ | 90 | ¹ WEI | 08A BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----------------------|----|------------------|----------|-----------------------------------|

| | | | | |
|-----------------------|----|---------------------|-----------|-------------------|
| $<1.2 \times 10^{-7}$ | 90 | ¹ AUBERT | 07AG BABR | Repl. by LEES 13M |
|-----------------------|----|---------------------|-----------|-------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\pi^0\nu\bar{\nu})/\Gamma_{\text{total}}$ Γ_{535}/Γ Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

| | | | | |
|-----------------------|----|----------------------|---------|-----------------------------------|
| $<0.9 \times 10^{-5}$ | 90 | ¹ GRYGIER | 17 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----------------------|----|----------------------|---------|-----------------------------------|

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

| | | | | |
|-----------------------|----|-------------------|---------|-----------------------------------|
| $<6.9 \times 10^{-5}$ | 90 | ¹ LUTZ | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----------------------|----|-------------------|---------|-----------------------------------|

| | | | | |
|-----------------------|----|-------------------|----------|------------------|
| $<2.2 \times 10^{-4}$ | 90 | ¹ CHEN | 07D BELL | Repl. by LUTZ 13 |
|-----------------------|----|-------------------|----------|------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(\pi^0e^+e^-)/\Gamma_{\text{total}}$ Γ_{530}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-------|-----|-------------|------|---------|
|-------|-----|-------------|------|---------|

| | | | | |
|-----------------------|----|-------------------|----------|-----------------------------------|
| $<8.4 \times 10^{-8}$ | 90 | ¹ LEES | 13M BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----------------------|----|-------------------|----------|-----------------------------------|

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

| | | | | |
|-----------------------|----|------------------|----------|-----------------------------------|
| $<2.3 \times 10^{-7}$ | 90 | ¹ WEI | 08A BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
|-----------------------|----|------------------|----------|-----------------------------------|

| | | | | |
|-----------------------|----|---------------------|-----------|-------------------|
| $<1.4 \times 10^{-7}$ | 90 | ¹ AUBERT | 07AG BABR | Repl. by LEES 13M |
|-----------------------|----|---------------------|-----------|-------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\pi^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$ Γ_{531}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|---------------------|-----------|--|
| <6.9 × 10⁻⁸ | 90 | ¹ LEES | 13M BABR | e ⁺ e ⁻ → $\gamma(4S)$ |
| <1.8 × 10 ⁻⁷ | 90 | ¹ WEI | 08A BELL | e ⁺ e ⁻ → $\gamma(4S)$ |
| <5.1 × 10 ⁻⁷ | 90 | ¹ AUBERT | 07AG BABR | e ⁺ e ⁻ → $\gamma(4S)$ |

¹ Assumes equal production of B⁺ and B⁰ at the $\gamma(4S)$.

$\Gamma(\eta \ell^+ \ell^-)/\Gamma_{\text{total}}$ Γ_{532}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|-------------------|----------|--|
| <6.4 × 10⁻⁸ | 90 | ¹ LEES | 13M BABR | e ⁺ e ⁻ → $\gamma(4S)$ |

¹ Assumes equal production of B⁺ and B⁰ at the $\gamma(4S)$.

$\Gamma(\eta e^+ e^-)/\Gamma_{\text{total}}$ Γ_{533}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-----|-------------------|----------|--|
| <10.8 × 10⁻⁸ | 90 | ¹ LEES | 13M BABR | e ⁺ e ⁻ → $\gamma(4S)$ |

¹ Assumes equal production of B⁺ and B⁰ at the $\gamma(4S)$.

$\Gamma(\eta \mu^+ \mu^-)/\Gamma_{\text{total}}$ Γ_{534}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-----|-------------------|----------|--|
| <11.2 × 10⁻⁸ | 90 | ¹ LEES | 13M BABR | e ⁺ e ⁻ → $\gamma(4S)$ |

¹ Assumes equal production of B⁺ and B⁰ at the $\gamma(4S)$.

$\Gamma(K^0 \ell^+ \ell^-)/\Gamma_{\text{total}}$ Γ_{536}/Γ

| VALUE (units 10 ⁻⁷) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|-------------|------|---------|
| 3.3 ± 0.6 OUR AVERAGE | | | | |

3.51^{+0.69}_{-0.60} ± 0.10 CHOUDHURY 21 BELL e⁺e⁻ → $\gamma(4S)$

2.1^{+1.5}_{-1.3} ± 0.2 ¹ AUBERT 09T BABR e⁺e⁻ → $\gamma(4S)$

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

3.4^{+0.9}_{-0.8} ± 0.2 ^{1,2} WEI 09A BELL e⁺e⁻ → $\gamma(4S)$

2.9^{+1.6}_{-1.3} ± 0.3 ¹ AUBERT,B 06J BABR Repl. by AUBERT 09T

<6.8 90 ¹ ISHIKAWA 03 BELL e⁺e⁻ → $\gamma(4S)$

¹ Assumes equal production of B⁰ and B⁺ at $\gamma(4S)$.

² Superseded by CHOUDHURY 21.

$\Gamma(K^0 e^+ e^-)/\Gamma_{\text{total}}$ Γ_{537}/Γ

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE (units 10 ⁻⁷) | CL% | DOCUMENT ID | TECN | COMMENT |
|--|-----|-------------|------|-------------------------------------|
| 2.5^{+1.1}_{-0.9} OUR AVERAGE | | | | Error includes scale factor of 1.3. |

3.1^{+1.0}_{-0.9} ± 0.08 CHOUDHURY 21 BELL e⁺e⁻ → $\gamma(4S)$

0.8^{+1.5}_{-1.2} ± 0.1 ¹ AUBERT 09T BABR e⁺e⁻ → $\gamma(4S)$

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

| | | | | |
|-------------------------------|----|------------|----------|---------------------------------|
| $2.0^{+1.4}_{-1.0} \pm 0.1$ | | 1,2 WEI | 09A BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| $1.3^{+1.6}_{-1.1} \pm 0.2$ | | 1 AUBERT,B | 06J BABR | Repl. by AUBERT 09T |
| – $2.1^{+2.3}_{-1.6} \pm 0.8$ | | 1 AUBERT | 03U BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| < 5.4 | 90 | 3 ISHIKAWA | 03 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| < 27 | 90 | 1 ABE | 02 BELL | Repl. by ISHIKAWA 03 |
| < 38 | 90 | 1 AUBERT | 02L BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| < 84.5 | 90 | 4 ANDERSON | 01B CLE2 | $e^+e^- \rightarrow \gamma(4S)$ |
| < 3000 | 90 | ALBRECHT | 91E ARG | $e^+e^- \rightarrow \gamma(4S)$ |
| < 5200 | 90 | 5 AVERY | 87 CLEO | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Superseded by CHOUDHURY 21.

³ Assumes equal production of B^0 and B^+ at $\gamma(4S)$.

⁴ The result is for di-lepton masses above 0.5 GeV.

⁵ AVERY 87 reports $< 6.5 \times 10^{-4}$ assuming the $\gamma(4S)$ decays 40% to $B^0\bar{B}^0$. We rescale to 50%.

$\Gamma(K^0\nu\bar{\nu})/\Gamma_{\text{total}}$

Γ_{539}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------|-----|-------------|---------|---------------------------------|
| < 2.6×10^{-5} | 90 | 1 GRYGIER | 17 BELL | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|-------------------------|----|-------------------|----------|---------------------------------|
| < 4.9×10^{-5} | 90 | 1,2 LEES | 13I BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| < 19.4×10^{-5} | 90 | 1 LUTZ | 13 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| < 5.6×10^{-5} | 90 | 1 DEL-AMO-SA..10Q | BABR | Repl. by LEES 13I |
| < 1.6×10^{-4} | 90 | 1 CHEN | 07D BELL | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Also reported a limit $< 8.1 \times 10^{-5}$ at 90% CL obtained using a fully reconstructed hadronic B -tag events.

$\Gamma(\rho^0\nu\bar{\nu})/\Gamma_{\text{total}}$

Γ_{540}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------|-----|-------------|---------|---------------------------------|
| < 4.0×10^{-5} | 90 | 1 GRYGIER | 17 BELL | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|-------------------------|----|--------|----------|---------------------------------|
| < 2.08×10^{-4} | 90 | 1 LUTZ | 13 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| < 4.4×10^{-4} | 90 | 1 CHEN | 07D BELL | Repl. by LUTZ 13 |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

$\Gamma(K^0\mu^+\mu^-)/\Gamma_{\text{total}}$

Γ_{538}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE (units 10^{-7}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------|------|---------|
|--------------------------|-----|-------------|------|---------|

3.39 ± 0.35 OUR FIT Error includes scale factor of 1.1.

3.39 ± 0.35 OUR AVERAGE

| | | | | |
|-----------------------------|--|---------------------|----------|---------------------------------|
| $3.9^{+1.0}_{-0.8} \pm 0.3$ | | CHOUDHURY 21 | BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| $3.27 \pm 0.34 \pm 0.17$ | | ¹ AAIJ | 14M LHCb | pp at 7, 8 TeV |
| $4.9^{+2.9}_{-2.5} \pm 0.3$ | | ² AUBERT | 09T BABR | $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|-------|---|-----------------------|-----------|-----------------------------------|
| 3.1 | $\begin{smallmatrix} +0.7 \\ -0.6 \end{smallmatrix}$ | AAIJ | 12AH LHCb | Repl. by AAIJ 14M |
| 4.4 | $\begin{smallmatrix} +1.3 \\ -1.1 \end{smallmatrix} \pm 0.3$ | ^{2,3} WEI | 09A BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 5.9 | $\begin{smallmatrix} +3.3 \\ -2.6 \end{smallmatrix} \pm 0.7$ | ² AUBERT,B | 06J BABR | Repl. by AUBERT 09T |
| 1.63 | $\begin{smallmatrix} +0.82 \\ -0.63 \end{smallmatrix} \pm 0.14$ | ² AUBERT | 03U BABR | Repl. by AUBERT,B 06J |
| 5.6 | $\begin{smallmatrix} +2.9 \\ -2.3 \end{smallmatrix} \pm 0.5$ | ⁴ ISHIKAWA | 03 BELL | Repl. by WEI 09A |
| <33 | 90 | ² ABE | 02 BELL | Repl. by ISHIKAWA 03 |
| <36 | 90 | AUBERT | 02L BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <66.4 | 90 | ⁵ ANDERSON | 01B CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <5200 | 90 | ALBRECHT | 91E ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <3600 | 90 | ⁶ AVERY | 87 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Uses $B(B^0 \rightarrow J/\psi(1S)K^0) = (0.928 \pm 0.013 \pm 0.037) \times 10^{-3}$ for normalization.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ Superseded by CHOUDHURY 21.

⁴ Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. The second error is a total of systematic uncertainties including model dependence.

⁵ The result is for di-lepton masses above 0.5 GeV.

⁶ AVERY 87 reports $< 4.5 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0\bar{B}^0$. We rescale to 50%.

$\Gamma(K^0 \mu^+ \mu^-) / \Gamma(J/\psi(1S) K^0)$ $\Gamma_{538} / \Gamma_{200}$

| <u>VALUE (units 10^{-3})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|----------------------------|
| 0.38 ± 0.04 OUR FIT | Error includes scale factor of 1.1. | | |
| 0.37 ± 0.12 ± 0.02 | AALTONEN | 11A1 | CDF $p\bar{p}$ at 1.96 TeV |

$\Gamma(K^*(892)^0 \ell^+ \ell^-) / \Gamma_{\text{total}}$ Γ_{541} / Γ

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|----------------|
| 9.9^{+1.2}_{-1.1} OUR AVERAGE | | | |

| | | | |
|--|---------------------|-----|--|
| 10.3 ^{+2.2} _{-2.1} ± 0.7 | ¹ AUBERT | 09T | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 9.7 ^{+1.3} _{-1.1} ± 0.7 | ¹ WEI | 09A | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|--|-----------------------|-----|--------------------------|
| 8.1 ^{+2.1} _{-1.9} ± 0.9 | ¹ AUBERT,B | 06J | BABR Repl. by AUBERT 09T |
| 11.7 ^{+3.0} _{-2.7} ± 0.9 | ¹ ISHIKAWA | 03 | BELL Repl. by WEI 09A |

¹ Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$.

$\Gamma(K^*(892)^0 e^+ e^-) / \Gamma_{\text{total}}$ Γ_{542} / Γ

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| <u>VALUE (units 10^{-7})</u> | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------|--------------------|-------------|----------------|
| 10.3^{+1.9}_{-1.7} OUR AVERAGE | | | | |

| | | | |
|--|---------------------|-----|--|
| 8.6 ^{+2.6} _{-2.4} ± 0.5 | ¹ AUBERT | 09T | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| 11.8 ^{+2.7} _{-2.2} ± 0.9 | ¹ WEI | 09A | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|------------------------------|----|-----------------------|-----|------|-----------------------------------|
| $10.4^{+3.3}_{-2.9} \pm 1.1$ | | ¹ AUBERT,B | 06J | BABR | Repl. by AUBERT 09T |
| $11.1^{+5.6}_{-4.7} \pm 1.1$ | | ¹ AUBERT | 03U | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 24 | 90 | ² ISHIKAWA | 03 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 64 | 90 | ¹ ABE | 02 | BELL | Repl. by ISHIKAWA 03 |
| < 67 | 90 | ¹ AUBERT | 02L | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <2900 | 90 | ALBRECHT | 91E | ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

² Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$.

$\Gamma(K^*(892)^0 \mu^+ \mu^-) / \Gamma_{\text{total}}$ Γ_{543} / Γ

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE (units 10^{-7}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------------------|-----|---------------------|------|--|
| 9.4 ± 0.5 OUR FIT | | | | |
| 9.4 ± 0.6 OUR AVERAGE | | | | |
| $9.04^{+0.16}_{-0.15} \pm 0.62$ | | ¹ AAIJ | 17Q | LHCB $p\bar{p}$ at 7, 8 TeV |
| $13.5^{+4.0}_{-3.7} \pm 1.0$ | | ² AUBERT | 09T | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| $10.6^{+1.9}_{-1.4} \pm 0.7$ | | ² WEI | 09A | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|----------------------------------|----|-----------------------|------|------|-----------------------------------|
| $10.36^{+0.18}_{-0.17} \pm 0.71$ | | ¹ AAIJ | 16AO | LHCB | Repl. by AAIJ 17Q |
| $8.7^{+3.8}_{-3.3} \pm 1.2$ | | ² AUBERT,B | 06J | BABR | Repl. by AUBERT 09T |
| $8.6^{+7.9}_{-5.8} \pm 1.1$ | | ² AUBERT | 03U | BABR | Repl. by AUBERT,B 06J |
| $13.3^{+4.2}_{-3.7} \pm 1.1$ | | ³ ISHIKAWA | 03 | BELL | Repl. by WEI 09A |
| <42 | 90 | ² ABE | 02 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <33 | 90 | AUBERT | 02L | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <40 | 90 | ⁴ AFFOLDER | 99B | CDF | $p\bar{p}$ at 1.8 TeV |

¹ Uses $B(B^0 \rightarrow J/\psi K^*(892)^0) = (1.19 \pm 0.01 \pm 0.08) \times 10^{-3}$. The second error is the total systematic uncertainty.

² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

³ Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. The second error is a total of systematic uncertainties including model dependence.

⁴ AFFOLDER 99B measured relative to $B^0 \rightarrow J/\psi(1S) K^*(892)^0$.

$\Gamma(K^*(892)^0 \mu^+ \mu^-) / \Gamma(J/\psi(1S) K^*(892)^0)$ $\Gamma_{543} / \Gamma_{202}$

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|----------------------------|-------------|------|----------------------------|
| 0.75 ± 0.05 OUR FIT | | | |
| 0.77 ± 0.08 ± 0.03 | AALTONEN | 11AI | CDF $p\bar{p}$ at 1.96 TeV |
| $0.80 \pm 0.10 \pm 0.06$ | AALTONEN | 11L | CDF Repl. by AALTONEN 11AI |
| $0.61 \pm 0.23 \pm 0.07$ | AALTONEN | 09B | CDF Repl. by AALTONEN 11L |

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

$\Gamma(K^*(892)^0 \chi, \chi \rightarrow \mu^+ \mu^-) / \Gamma_{\text{total}}$ Γ_{544} / Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------|-----|-------------------|------|-----------------------|
| $< \sim 10^{-9}$ | 95 | ¹ AAIJ | 15AZ | LHCB pp at 7, 8 TeV |

¹ The limit is obtained as a function of di-muon mass. A normalizing mode branching fraction value of $B(B^0 \rightarrow K^{*0} \mu^+ \mu^-) = (1.6 \pm 0.3) \times 10^{-7}$ is used.

 $\Gamma(\pi^+ \pi^- \mu^+ \mu^-) / \Gamma_{\text{total}}$ Γ_{545} / Γ

| VALUE (units 10^{-8}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-------------------|------|-----------------------|
| $2.1 \pm 0.5 \pm 0.1$ | | ¹ AAIJ | 15S | LHCB pp at 7, 8 TeV |

¹ AAIJ 15S reports $(2.11 \pm 0.51 \pm 0.15 \pm 0.16) \times 10^{-8}$ from a measurement of $[\Gamma(B^0 \rightarrow \pi^+ \pi^- \mu^+ \mu^-) / \Gamma_{\text{total}}] / [B(B^0 \rightarrow J/\psi(1S) K^*(892)^0)]$ assuming $B(B^0 \rightarrow J/\psi(1S) K^*(892)^0) = (1.3 \pm 0.1) \times 10^{-3}$, which we rescale to our best value $B(B^0 \rightarrow J/\psi(1S) K^*(892)^0) = (1.27 \pm 0.05) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^*(892)^0 \nu \bar{\nu}) / \Gamma_{\text{total}}$ Γ_{546} / Γ

Test for $\Delta B=1$ weak neutral current. Allowed by higher-order electroweak interactions.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|------------------------|-----|----------------------|------|---|
| $< 1.8 \times 10^{-5}$ | 90 | ¹ GRYGIER | 17 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
| • • • | | | | We do not use the following data for averages, fits, limits, etc. • • • |
| $< 1.2 \times 10^{-4}$ | 90 | ^{1,2} LEES | 13I | BABR $e^+ e^- \rightarrow \gamma(4S)$ |
| $< 5.5 \times 10^{-5}$ | 90 | ¹ LUTZ | 13 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
| $< 1.2 \times 10^{-4}$ | 90 | AUBERT | 08BC | BABR Repl. by LEES 13I |
| $< 3.4 \times 10^{-4}$ | 90 | ¹ CHEN | 07D | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
| $< 1.0 \times 10^{-3}$ | 90 | ³ ADAM | 96D | DLPH $e^+ e^- \rightarrow Z$ |

¹ Assumes equal production of B^+ and B^0 at the $\gamma(4S)$.

² Also reported a limit $< 9.3 \times 10^{-5}$ at 90% CL obtained using a fully reconstructed hadronic B -tag events.

³ ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.

 $\Gamma(\text{invisible}) / \Gamma_{\text{total}}$ Γ_{547} / Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-----------------------|------|---|
| < 2.4 | 90 | ¹ LEES | 12T | BABR $e^+ e^- \rightarrow \gamma(4S)$ |
| • • • | | | | We do not use the following data for averages, fits, limits, etc. • • • |
| < 7.8 | 90 | ² KU | 20 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
| < 13 | 90 | ³ HSU | 12 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
| < 22 | 90 | ¹ AUBERT,B | 04J | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Uses the fully reconstructed $B^0 \rightarrow D^{(*)-} \ell^+ \nu_\ell$ events as a tag.

² Identified by fully reconstructing a hadronic decay of the accompanying B meson.

³ Identified by fully reconstructing a hadronic decay of the accompanying B meson and requiring no other particles in the event.

 $\Gamma(\nu \bar{\nu} \gamma) / \Gamma_{\text{total}}$ Γ_{548} / Γ

| VALUE (units 10^{-5}) | CL% | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----|-----------------|------|---------------------------------------|
| < 1.6 | 90 | ¹ KU | 20 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |

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

| | | | | | |
|------|----|-----------------------|-----|------|-----------------------------------|
| <1.7 | 90 | ² LEES | 12T | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <4.7 | 90 | ² AUBERT,B | 04J | BABR | Repl. by LEES 12T |

¹ Identified by fully reconstructing a hadronic decay of the accompanying B meson .

² Uses the fully reconstructed $B^0 \rightarrow D^{(*)-} \ell^+ \nu_\ell$ events as a tag.

$\Gamma(\phi\nu\bar{\nu})/\Gamma_{\text{total}}$ **Γ_{549}/Γ**

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interaction.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-----|-------------------|------|--|
| <1.27 × 10⁻⁴ | 90 | ¹ LUTZ | 13 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | | |
|-------------------------|----|-------------------|-----|------|------------------|
| <5.8 × 10 ⁻⁵ | 90 | ¹ CHEN | 07D | BELL | Repl. by LUTZ 13 |
|-------------------------|----|-------------------|-----|------|------------------|

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(e^\pm \mu^\mp)/\Gamma_{\text{total}}$ **Γ_{550}/Γ**

Test of lepton family number conservation. Allowed by higher-order electroweak interactions.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-----|-------------------|------|-----------------------|
| < 1.0 × 10⁻⁹ | 90 | ¹ AAIJ | 18T | LHCB pp at 7, 8 TeV |

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

| | | | | |
|--------------------------|----|-----------------------|----------|--|
| < 2.8 × 10 ⁻⁹ | 90 | ² AAIJ | 13BMLHCB | Repl. by AAIJ 18T |
| < 6.4 × 10 ⁻⁸ | 90 | AALTONEN | 09P | CDF $p\bar{p}$ at 1.96 TeV |
| < 9.2 × 10 ⁻⁸ | 90 | ³ AUBERT | 08P | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1.8 × 10 ⁻⁷ | 90 | ³ AUBERT | 05W | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 1.7 × 10 ⁻⁷ | 90 | ³ CHANG | 03 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| <15 × 10 ⁻⁷ | 90 | ³ BERGFELD | 00B | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 3.5 × 10 ⁻⁶ | 90 | ABE | 98V | CDF $p\bar{p}$ at 1.8 TeV |
| < 1.6 × 10 ⁻⁵ | 90 | ⁴ ACCIARRI | 97B | L3 $e^+e^- \rightarrow Z$ |
| < 5.9 × 10 ⁻⁶ | 90 | AMMAR | 94 | CLE2 $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 3.4 × 10 ⁻⁵ | 90 | ⁵ AVERY | 89B | CLEO $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 4.5 × 10 ⁻⁵ | 90 | ⁶ ALBRECHT | 87D | ARG $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 7.7 × 10 ⁻⁵ | 90 | ⁷ AVERY | 87 | CLEO $e^+e^- \rightarrow \Upsilon(4S)$ |
| < 3 × 10 ⁻⁴ | 90 | GILES | 84 | CLEO Repl. by AVERY 87 |

¹ AAIJ 18T uses normalization modes $B(B^0 \rightarrow K^+ \pi^-) = (19.6 \pm 0.5) \times 10^{-6}$ and $B(B^+ \rightarrow J/\psi K^+) = (1.026 \pm 0.031) \times 10^{-3}$.

² Uses normalization mode $B(B^0 \rightarrow K^+ \pi^-) = (19.4 \pm 0.6) \times 10^{-6}$.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

⁴ ACCIARRI 97B assume PDG 96 production fractions for B^+ , B^0 , B_s , and Λ_b .

⁵ Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0 \bar{B}^0$. We rescale to 50%.

⁶ ALBRECHT 87D reports $< 5 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0 \bar{B}^0$. We rescale to 50%.

⁷ AVERY 87 reports $< 9 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0 \bar{B}^0$. We rescale to 50%.

$\Gamma(\pi^0 e^\pm \mu^\mp)/\Gamma_{\text{total}}$ **Γ_{551}/Γ**

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----|---------------------|------|--|
| <1.4 × 10⁻⁷ | 90 | ¹ AUBERT | 07AG | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(K^0 e^\pm \mu^\mp)/\Gamma_{\text{total}}$ Γ_{552}/Γ

Test of lepton family number conservation.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|----------|------------------------------------|
| $< 3.8 \times 10^{-8}$ | 90 | CHOUDHURY 21 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $< 2.7 \times 10^{-7}$ | 90 | ¹ AUBERT,B | 06J BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $< 40 \times 10^{-7}$ | 90 | ¹ AUBERT | 02L BABR | Repl. by AUBERT,B 06J |

¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(K^*(892)^0 e^+ \mu^-)/\Gamma_{\text{total}}$ Γ_{553}/Γ

| VALUE (units 10^{-7}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|----------|------------------------------------|
| < 1.6 | 90 | ¹ SANDILYA | 18 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| < 5.3 | 90 | ² AUBERT,B | 06J BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 0.486 \pm 0.006$.² Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. $\Gamma(K^*(892)^0 e^- \mu^+)/\Gamma_{\text{total}}$ Γ_{554}/Γ

| VALUE (units 10^{-7}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|----------|------------------------------------|
| < 1.2 | 90 | ¹ SANDILYA | 18 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| < 3.4 | 90 | ² AUBERT,B | 06J BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 0.486 \pm 0.006$.² Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. $\Gamma(K^*(892)^0 e^\pm \mu^\mp)/\Gamma_{\text{total}}$ Γ_{555}/Γ

Test of lepton family number conservation.

| VALUE (units 10^{-7}) | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|----------|------------------------------------|
| < 1.8 | 90 | ¹ SANDILYA | 18 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| < 5.8 | 90 | ² AUBERT,B | 06J BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| < 34 | 90 | ² AUBERT | 02L BABR | Repl. by AUBERT,B 06J |

¹ Uses $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 0.486 \pm 0.006$.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. $\Gamma(e^\pm \tau^\mp)/\Gamma_{\text{total}}$ Γ_{556}/Γ

Test of lepton family number conservation. Allowed by higher-order electroweak interactions.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|----------------------|-----------|------------------------------------|
| $< 1.6 \times 10^{-5}$ | 90 | ¹ ATMACAN | 21 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $< 2.8 \times 10^{-5}$ | 90 | ² AUBERT | 08AD BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $< 1.1 \times 10^{-4}$ | 90 | BORNHEIM | 04 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $< 5.3 \times 10^{-4}$ | 90 | AMMAR | 94 CLE2 | Repl. by BORNHEIM 04 |

¹ Uses events in which one B meson is fully reconstructed in a hadronic decay mode.² Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\mu^\pm \tau^\mp)/\Gamma_{\text{total}}$ Γ_{557}/Γ

Test of lepton family number conservation. Allowed by higher-order electroweak interactions.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|----------------------|-----------|------------------------------------|
| $<1.4 \times 10^{-5}$ | 95 | ¹ AAIJ | 19AK LHCB | pp at 7, 8 TeV |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $<1.5 \times 10^{-5}$ | 90 | ² ATMACAN | 21 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $<2.2 \times 10^{-5}$ | 90 | ³ AUBERT | 08AD BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $<3.8 \times 10^{-5}$ | 90 | BORNHEIM | 04 CLE2 | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $<8.3 \times 10^{-4}$ | 90 | AMMAR | 94 CLE2 | Repl. by BORNHEIM 04 |

¹ Assuming no contribution from $B_s^0 \rightarrow \mu^\pm \tau^\mp$.

² Uses events in which one B meson is fully reconstructed in a hadronic decay mode.

³ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\Lambda_c^+ \mu^-)/\Gamma_{\text{total}}$ Γ_{558}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-----|--------------------------------|------|------------------------------------|
| $<1.4 \times 10^{-6}$ | 90 | ^{1,2} DEL-AMO-SA..11k | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ DEL-AMO-SANCHEZ 11k reports $< 180 \times 10^{-8}$ from a measurement of $[\Gamma(B^0 \rightarrow \Lambda_c^+ \mu^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow pK^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = 6.28 \times 10^{-2}$.

² Uses $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^+ B^-) = (48.4 \pm 0.6)\%$.

$\Gamma(\Lambda_c^+ e^-)/\Gamma_{\text{total}}$ Γ_{559}/Γ

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---------------------|-----|--------------------------------|------|------------------------------------|
| $<4 \times 10^{-6}$ | 90 | ^{1,2} DEL-AMO-SA..11k | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ DEL-AMO-SANCHEZ 11k reports $< 520 \times 10^{-8}$ from a measurement of $[\Gamma(B^0 \rightarrow \Lambda_c^+ e^-)/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \rightarrow pK^- \pi^+)]$ assuming $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = 6.28 \times 10^{-2}$.

² Uses $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = (51.6 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^+ B^-) = (48.4 \pm 0.6)\%$.

B_s^0 CROSS-PARTICLE BRANCHING RATIOS

$\Gamma([K^+ K^-]_D K^*(892)^0)/\Gamma_{\text{total}} \times B(B_s^0 \rightarrow [K^+ K^-]_D K^*(892)^0)$ $\Gamma_{143}/\Gamma \times B$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|-----------|------------------|
| $0.10 \pm 0.02 \pm 0.01$ | AAIJ | 14BN LHCB | pp at 7, 8 TeV |

$\Gamma([\pi^+ \pi^-]_D K^*(892)^0)/\Gamma_{\text{total}} \times B(B_s^0 \rightarrow [\pi^+ \pi^-]_D K^*(892)^0)$ $\Gamma_{144}/\Gamma \times B$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|-----------|------------------|
| $0.15 \pm 0.04 \pm 0.01$ | AAIJ | 14BN LHCB | pp at 7, 8 TeV |

See the related review(s):

[Polarization in \$B\$ Decays](#)

POLARIZATION IN B^0 DECAY

In decays involving two vector mesons, one can distinguish among the states in which meson polarizations are both longitudinal (L) or both are transverse and parallel (\parallel) or perpendicular (\perp) to each other with the parameters Γ_L/Γ , Γ_\perp/Γ , and the relative phases ϕ_\parallel and ϕ_\perp . See the definitions in the note on “Polarization in B Decays” review in the B^0 Particle Listings.

Γ_L/Γ in $B^0 \rightarrow J/\psi(1S)K^*(892)^0$

| <u>VALUE</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------------------------|-------------|-----------------------|-------------|-----------------------------------|
| 0.571±0.007 OUR AVERAGE | | | | |
| 0.572±0.006±0.014 | | ¹ AAIJ | 13AT LHCb | pp at 7 TeV |
| 0.587±0.011±0.013 | | ² ABAZOV | 09E D0 | $p\bar{p}$ at 1.96 TeV |
| 0.556±0.009±0.010 | | ³ AUBERT | 07AD BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.562±0.026±0.018 | | ACOSTA | 05 CDF | $p\bar{p}$ at 1.96 TeV |
| 0.574±0.012±0.009 | | ITOH | 05 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.59 ±0.06 ±0.01 | | ⁴ AFFOLDER | 00N CDF | $p\bar{p}$ at 1.8 TeV |
| 0.52 ±0.07 ±0.04 | | ⁵ JESSOP | 97 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.65 ±0.10 ±0.04 | 65 | ABE | 95Z CDF | $p\bar{p}$ at 1.8 TeV |
| 0.97 ±0.16 ±0.15 | 13 | ⁶ ALBRECHT | 94G ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|-------------------|----|---------------------|----------|----------------------|
| 0.566±0.012±0.005 | | ³ AUBERT | 05P BABR | Repl. by AUBERT 07AD |
| 0.62 ±0.02 ±0.03 | | ⁷ ABE | 02N BELL | Repl. by ITOH 05 |
| 0.597±0.028±0.024 | | ⁸ AUBERT | 01H BABR | Repl. by AUBERT 07AD |
| 0.80 ±0.08 ±0.05 | 42 | ⁶ ALAM | 94 CLE2 | Sup. by JESSOP 97 |

¹ AAIJ 13AT obtains $\Gamma_\parallel/\Gamma = 0.227 \pm 0.004 \pm 0.011$. The relation $1 = (\Gamma_L + \Gamma_\perp + \Gamma_\parallel)/\Gamma$ is used to obtain Γ_L/Γ .

² Measured the angular and lifetime parameters for the time-dependent angular untagged decays $B_d^0 \rightarrow J/\psi K^{*0}$ and $B_s^0 \rightarrow J/\psi \phi$.

³ Obtained by combining the B^0 and B^+ modes.

⁴ AFFOLDER 00N measurements are based on 190 B^0 candidates obtained from a data sample of 89 pb^{-1} . The P -wave fraction is found to be $0.13^{+0.12}_{-0.09} \pm 0.06$.

⁵ JESSOP 97 is the average over a mixture of B^0 and B^+ decays. The P -wave fraction is found to be $0.16 \pm 0.08 \pm 0.04$.

⁶ Averaged over an admixture of B^0 and B^+ decays.

⁷ Averaged over an admixture of B^0 and B^+ decays and the P wave fraction is $(19 \pm 2 \pm 3)\%$.

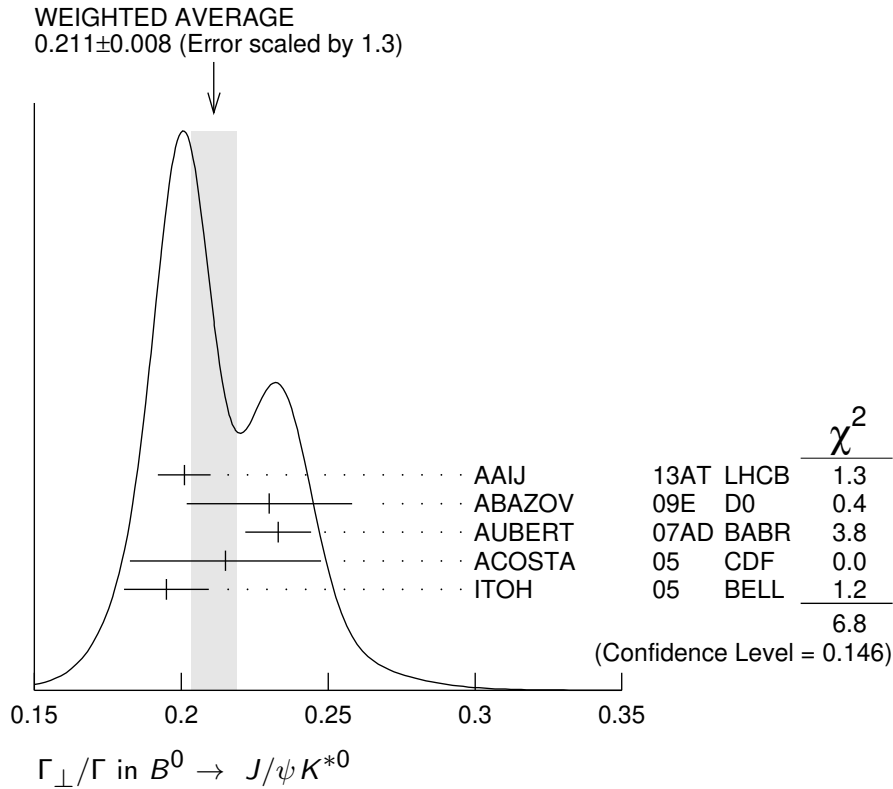
⁸ Averaged over an admixture of B^0 and B^- decays and the P wave fraction is $(16.0 \pm 3.2 \pm 1.4) \times 10^{-2}$.

Γ_\perp/Γ in $B^0 \rightarrow J/\psi K^{*0}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------|-------------|-----------------------------------|
| 0.211±0.008 OUR AVERAGE | | | |
| Error includes scale factor of 1.3. See the ideogram below. | | | |
| 0.201±0.004±0.008 | AAIJ | 13AT LHCb | pp at 7 TeV |
| 0.230±0.013±0.025 | ¹ ABAZOV | 09E D0 | $p\bar{p}$ at 1.96 TeV |
| 0.233±0.010±0.005 | ² AUBERT | 07AD BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.215±0.032±0.006 | ACOSTA | 05 CDF | $p\bar{p}$ at 1.96 TeV |
| 0.195±0.012±0.008 | ITOH | 05 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Measured the angular and lifetime parameters for the time-dependent angular untagged decays $B_d^0 \rightarrow J/\psi K^{*0}$ and $B_s^0 \rightarrow J/\psi \phi$.

² Obtained by combining the B^0 and B^+ modes.

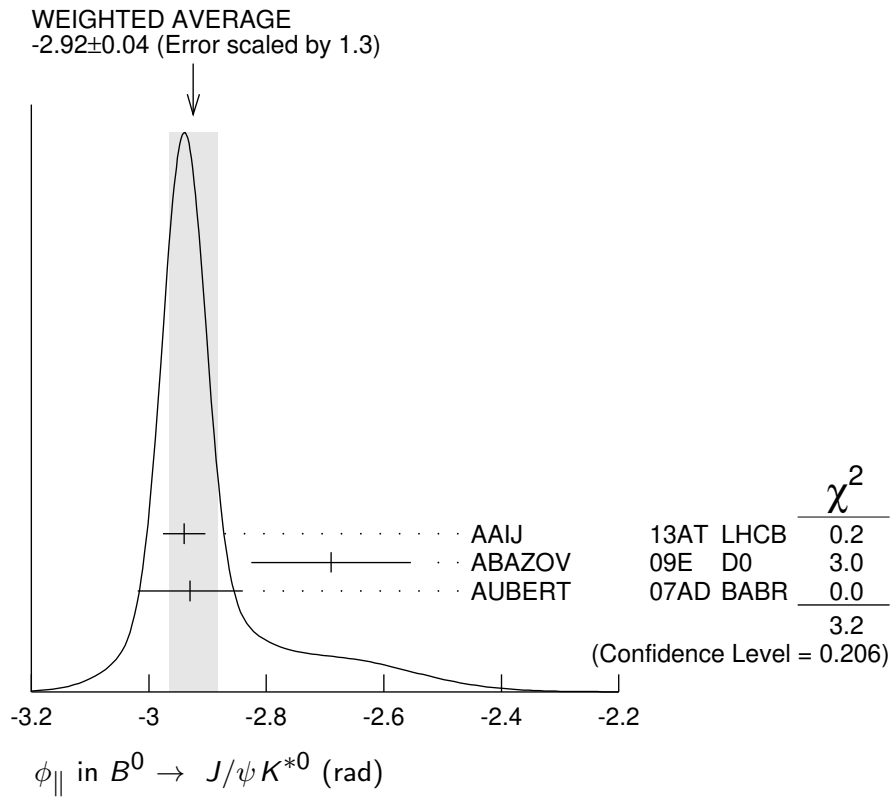


ϕ_{\parallel} in $B^0 \rightarrow J/\psi K^{*0}$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|---|-------------|---------------------------------|
| -2.92 ± 0.04 OUR AVERAGE | Error includes scale factor of 1.3. See the ideogram below. | | |
| $-2.94 \pm 0.02 \pm 0.03$ | AAIJ | 13AT LHCb | pp at 7 TeV |
| $-2.69 \pm 0.08 \pm 0.11$ | ¹ ABAZOV | 09E D0 | $p\bar{p}$ at 1.96 TeV |
| $-2.93 \pm 0.08 \pm 0.04$ | ² AUBERT | 07AD BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Obtained ϕ_{\parallel} as $\delta_2 - \delta_1$, assuming they are uncorrelated.

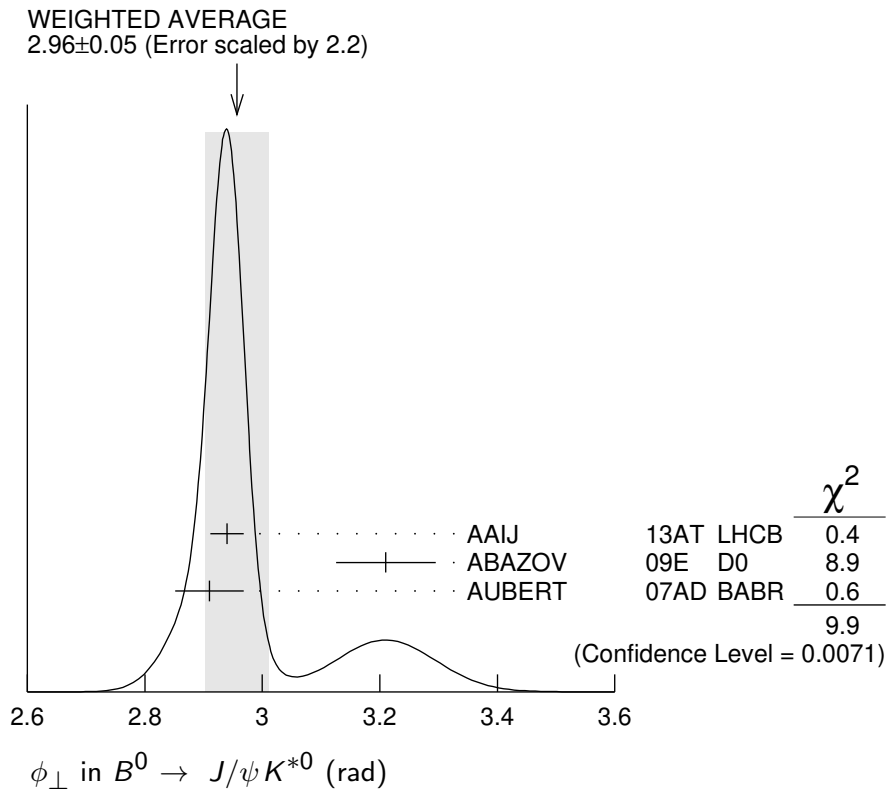
² Obtained by combining the B^0 and B^+ modes.



ϕ_{\perp} in $B^0 \rightarrow J/\psi K^{*0}$

| VALUE (rad) | DOCUMENT ID | TECN | COMMENT |
|---|---|-----------|---------------------------------|
| 2.96 ± 0.05 OUR AVERAGE | Error includes scale factor of 2.2. See the ideogram below. | | |
| $2.94 \pm 0.02 \pm 0.02$ | AAIJ | 13AT LHCb | pp at 7 TeV |
| $3.21 \pm 0.06 \pm 0.06$ | ABAZOV | 09E D0 | $p\bar{p}$ at 1.96 TeV |
| $2.91 \pm 0.05 \pm 0.03$ | ¹ AUBERT | 07AD BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Obtained by combining the B^0 and B^+ modes.



Γ_L/Γ in $B^0 \rightarrow \psi(2S)K^{*0}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

0.463^{+0.028}_{-0.040} OUR AVERAGE

| | | | | |
|---|----------|----|------|---------------------------------|
| 0.455 ^{+0.031} _{-0.029} ^{+0.014} _{-0.049} | CHILIKIN | 13 | BELL | $e^+e^- \rightarrow \gamma(4S)$ |
|---|----------|----|------|---------------------------------|

| | | | | |
|--------------------|---------------------|------|------|---------------------------------|
| 0.48 ± 0.05 ± 0.02 | ¹ AUBERT | 07AD | BABR | $e^+e^- \rightarrow \gamma(4S)$ |
|--------------------|---------------------|------|------|---------------------------------|

| | | | | |
|--------------------|-----------------------|----|------|---------------------------------|
| 0.45 ± 0.11 ± 0.04 | ² RICHICHI | 01 | CLE2 | $e^+e^- \rightarrow \gamma(4S)$ |
|--------------------|-----------------------|----|------|---------------------------------|

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

| | | | | |
|---|-------|----|------|---------------------------------|
| 0.448 ^{+0.040} _{-0.027} ^{+0.040} _{-0.053} | MIZUK | 09 | BELL | $e^+e^- \rightarrow \gamma(4S)$ |
|---|-------|----|------|---------------------------------|

¹ Obtained by combining the B^0 and B^+ modes.

² Averages between charged and neutral B mesons.

Γ_{\perp}/Γ in $B^0 \rightarrow \psi(2S)K^{*0}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

| | | | | |
|---------------------------|---------------------|------|------|---------------------------------|
| 0.30 ± 0.06 ± 0.02 | ¹ AUBERT | 07AD | BABR | $e^+e^- \rightarrow \gamma(4S)$ |
|---------------------------|---------------------|------|------|---------------------------------|

¹ Obtained by combining the B^0 and B^+ modes.

ϕ_{\parallel} in $B^0 \rightarrow \psi(2S)K^{*0}$

| VALUE (rad) | DOCUMENT ID | TECN | COMMENT |
|-------------|-------------|------|---------|
|-------------|-------------|------|---------|

| | | | | |
|-------------------------|---------------------|------|------|---------------------------------|
| -2.8 ± 0.4 ± 0.1 | ¹ AUBERT | 07AD | BABR | $e^+e^- \rightarrow \gamma(4S)$ |
|-------------------------|---------------------|------|------|---------------------------------|

¹ Obtained by combining the B^0 and B^+ modes.

ϕ_{\perp} in $B^0 \rightarrow \psi(2S)K^{*0}$

| VALUE (rad) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|-----------|-----------------------------------|
| $2.8 \pm 0.3 \pm 0.1$ | ¹ AUBERT | 07AD BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Obtained by combining the B^0 and B^+ modes.

 Γ_{\perp}/Γ in $B^0 \rightarrow \chi_{c1}K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------------------------------|------|---------|
| $0.83^{+0.06}_{-0.08}$ OUR AVERAGE | Error includes scale factor of 1.3. | | |

0.947^{+0.038+0.046}_{-0.048-0.099} MIZUK 08 BELL $e^+e^- \rightarrow \Upsilon(4S)$

0.77 ± 0.07 ± 0.04 ¹ AUBERT 07AD BABR $e^+e^- \rightarrow \Upsilon(4S)$

¹ Obtained by combining the B^0 and B^+ modes.

 Γ_{\perp}/Γ in $B^0 \rightarrow \chi_{c1}K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|---------------------|-----------|-----------------------------------|
| $0.03 \pm 0.04 \pm 0.02$ | ¹ AUBERT | 07AD BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Obtained by combining the B^0 and B^+ modes.

 ϕ_{\parallel} in $B^0 \rightarrow \chi_{c1}K^*(892)^0$

| VALUE (rad) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|-----------|-----------------------------------|
| $0.0 \pm 0.3 \pm 0.1$ | ¹ AUBERT | 07AD BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Obtained by combining the B^0 and B^+ modes.

 Γ_L/Γ in $B^0 \rightarrow D_s^{*+}D^{*-}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|----------|-----------------------------------|
| 0.574 ± 0.014 OUR AVERAGE | | | |
| $0.578 \pm 0.010 \pm 0.011$ | ¹ AAIJ | 21S LHCB | pp at 13 TeV |
| $0.519 \pm 0.050 \pm 0.028$ | ² AUBERT | 03i BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $0.506 \pm 0.139 \pm 0.036$ | AHMED | 00B CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AAIJ 21S uses $D_s^{*+} \rightarrow D_s^+ \gamma$ decays.

² Measurement performed using partial reconstruction of D^{*-} decay.

 $|H_+|$ in $B^0 \rightarrow D_s^{*+}D^{*-}$

H_+ , H_- define parity-even (\parallel) and parity-odd (\perp) polarization transversity amplitudes

$$A_{\parallel,\perp} = (H_+ \pm H_-)/\sqrt{2}.$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|----------|----------------|
| $0.195 \pm 0.022 \pm 0.032$ | ¹ AAIJ | 21S BELL | pp at 13 TeV |

¹ AAIJ 21S uses $D_s^{*+} \rightarrow D_s^+ \gamma$ decays.

 $|H_-|$ in $B^0 \rightarrow D_s^{*+}D^{*-}$

H_+ , H_- define parity-even (\parallel) and parity-odd (\perp) polarization transversity amplitudes

$$A_{\parallel,\perp} = (H_+ \pm H_-)/\sqrt{2}.$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|----------|----------------|
| $0.620 \pm 0.011 \pm 0.013$ | ¹ AAIJ | 21S LHCB | pp at 13 TeV |

¹ AAIJ 21S uses $D_s^{*+} \rightarrow D_s^+ \gamma$ decays.

ϕ_+ in $B^0 \rightarrow D_s^{*+} D^{*-}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------------|------|---------------------|
| $-0.046 \pm 0.102 \pm 0.020$ | ¹ AAIJ | 21S | LHCB pp at 13 TeV |
| ¹ AAIJ 21S uses $D_s^{*+} \rightarrow D_s^+ \gamma$ decays. | | | |

 ϕ_- in $B^0 \rightarrow D_s^{*+} D^{*-}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------------|------|---------------------|
| $0.108 \pm 0.170 \pm 0.051$ | ¹ AAIJ | 21S | LHCB pp at 13 TeV |
| ¹ AAIJ 21S uses $D_s^{*+} \rightarrow D_s^+ \gamma$ decays. | | | |

 Γ_L/Γ in $B^0 \rightarrow D^{*-} \rho^+$

| VALUE | EVTS | DOCUMENT ID | TECN | COMMENT |
|---|------|-------------|------|---|
| $0.885 \pm 0.016 \pm 0.012$ | | CSORNA | 03 | CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $0.93 \pm 0.05 \pm 0.05$ | 76 | ALAM | 94 | CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ |

 Γ_L/Γ in $B^0 \rightarrow D_s^{*+} \rho^-$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|---------------------|------|---|
| $0.84^{+0.26}_{-0.28} \pm 0.13$ | ¹ AUBERT | 08AJ | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | |

 Γ_L/Γ in $B^0 \rightarrow D_s^{*+} K^{*-}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|---------------------|------|---|
| $0.92^{+0.37}_{-0.31} \pm 0.07$ | ¹ AUBERT | 08AJ | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. | | | |

 Γ_L/Γ in $B^0 \rightarrow D^{*+} D^{*-}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|----------------|------|------------------------------------|
| $0.624 \pm 0.029 \pm 0.011$ | KRONENBIT...12 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.57 \pm 0.08 \pm 0.02$ | MIYAKE | 05 | BELL Repl. by KRONENBITTER 12 |

 Γ_{\perp}/Γ in $B^0 \rightarrow D^{*+} D^{*-}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|----------------|------|---|
| 0.147 ± 0.019 OUR AVERAGE | | | |
| $0.138 \pm 0.024 \pm 0.006$ | KRONENBIT...12 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.158 \pm 0.028 \pm 0.006$ | AUBERT | 09C | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.125 \pm 0.043 \pm 0.023$ | VERVINK | 09 | BELL Repl. by KRONENBITTER 12 |
| $0.143 \pm 0.034 \pm 0.008$ | AUBERT | 07B0 | BABR Repl. by AUBERT 09C |
| $0.125 \pm 0.044 \pm 0.007$ | AUBERT,BE | 05A | BABR Repl. by AUBERT 07B0 |
| $0.19 \pm 0.08 \pm 0.01$ | MIYAKE | 05 | BELL Repl. by VERVINK 09 |
| $0.063 \pm 0.055 \pm 0.009$ | AUBERT | 03Q | BABR Repl. by AUBERT,BE 05A |

Γ_L/Γ in $B^0 \rightarrow \bar{D}^{*0}\omega$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|--------------------------------------|
| $0.665 \pm 0.047 \pm 0.015$ | LEES | 11M | BABR $e^+e^- \rightarrow \gamma(4S)$ |

 Γ_L/Γ in $B^0 \rightarrow \bar{D}_1(2430)^0\omega$

| VALUE (%) | DOCUMENT ID | TECN | COMMENT |
|--|---------------|------|--------------------------------------|
| $63.0 \pm 9.1^{+6.5}_{-6.0}$ | 1,2 MATVIENKO | 15 | BELL $e^+e^- \rightarrow \gamma(4S)$ |

¹ Obtained by amplitude analysis of $\bar{B}^0 \rightarrow D^{*-}\omega\pi^+$. The second uncertainty combines in quadrature experimental systematic and model uncertainties.

² Assumes equal production of B^0 and B^+ at $\gamma(4S)$.

 Γ_L/Γ in $B^0 \rightarrow \bar{D}_1(2420)^0\omega$

| VALUE (%) | DOCUMENT ID | TECN | COMMENT |
|---|---------------|------|--------------------------------------|
| $67.1 \pm 11.7^{+2.3}_{-5.0}$ | 1,2 MATVIENKO | 15 | BELL $e^+e^- \rightarrow \gamma(4S)$ |

¹ Obtained by amplitude analysis of $\bar{B}^0 \rightarrow D^{*-}\omega\pi^+$. The second uncertainty combines in quadrature experimental systematic and model uncertainties.

² Assumes equal production of B^0 and B^+ at $\gamma(4S)$.

 Γ_L/Γ in $B^0 \rightarrow \bar{D}_2^*(2460)^0\omega$

| VALUE (%) | DOCUMENT ID | TECN | COMMENT |
|---|---------------|------|--------------------------------------|
| $76.0^{+18.3+3.5}_{-8.5-2.8}$ | 1,2 MATVIENKO | 15 | BELL $e^+e^- \rightarrow \gamma(4S)$ |

¹ Obtained by amplitude analysis of $\bar{B}^0 \rightarrow D^{*-}\omega\pi^+$. The second uncertainty combines in quadrature experimental systematic and model uncertainties.

² Assumes equal production of B^0 and B^+ at $\gamma(4S)$.

 Γ_L/Γ in $B^0 \rightarrow D^{*-}\omega\pi^+$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|------|--------------------------------------|
| $0.654 \pm 0.042 \pm 0.016$ | ¹ AUBERT | 06L | BABR $e^+e^- \rightarrow \gamma(4S)$ |

¹ Invariant mass of the $[\omega\pi]$ system is restricted in the region 1.1 and 1.9 GeV.

 Γ_L/Γ in $B^0 \rightarrow \omega K^{*0}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---------------|------|--------------------------------------|
| 0.69 ± 0.11 OUR AVERAGE | | | |
| $0.68 \pm 0.17 \pm 0.16$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |
| $0.72 \pm 0.14 \pm 0.02$ | AUBERT | 09H | BABR $e^+e^- \rightarrow \gamma(4S)$ |
| $0.56 \pm 0.29^{+0.18}_{-0.08}$ | GOLDENZWE..08 | BELL | $e^+e^- \rightarrow \gamma(4S)$ |

 Γ_{\perp}/Γ in $B^0 \rightarrow \omega K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------|------|-----------------------|
| $0.10 \pm 0.09 \pm 0.09$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

 A_{CP}^0 in $B^0 \rightarrow \omega K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|-----------------------|
| $-0.13 \pm 0.27 \pm 0.13$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

A_{CP}^\perp in $B^0 \rightarrow \omega K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-------------|------|-----------------------|
| $0.3 \pm 0.8 \pm 0.4$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

 A_{CP}^\parallel in $B^0 \rightarrow \omega K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|-----------------------|
| $0.26 \pm 0.55 \pm 0.22$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

 ϕ_0 in $B^0 \rightarrow \omega K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|------|-----------------------|
| $-0.86 \pm 0.29 \pm 0.71$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

 ϕ_\perp in $B^0 \rightarrow \omega K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-------------|------|-----------------------|
| $1.6 \pm 0.4 \pm 0.6$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

 ϕ_\parallel in $B^0 \rightarrow \omega K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|------|-----------------------|
| $-1.83 \pm 0.29 \pm 0.32$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

 Γ_L/Γ in $B^0 \rightarrow \omega K_2^*(1430)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|------|--------------------------------------|
| $0.45 \pm 0.12 \pm 0.02$ | AUBERT | 09H | BABR $e^+e^- \rightarrow \gamma(4S)$ |

 Γ_L/Γ in $B^0 \rightarrow K^{*0} \bar{K}^{*0}$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|------|--------------------------------------|
| 0.74 ± 0.05 OUR AVERAGE | | | |
| $0.724 \pm 0.051 \pm 0.016$ | ¹ AAIJ | 19L | LHCB pp at 7 and 8 TeV |
| $0.80^{+0.10}_{-0.12} \pm 0.06$ | AUBERT | 08I | BABR $e^+e^- \rightarrow \gamma(4S)$ |

¹ Untagged and time-integrated analysis within 150 MeV of the K^{*0} mass.

 Γ_L/Γ in $B^0 \rightarrow \phi K^*(892)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|------|--------------------------------------|
| 0.497 ± 0.017 OUR AVERAGE | | | |
| $0.497 \pm 0.019 \pm 0.015$ | AAIJ | 14A | LHCB pp at 7 TeV |
| $0.499 \pm 0.030 \pm 0.018$ | PRIM | 13 | BELL $e^+e^- \rightarrow \gamma(4S)$ |
| $0.494 \pm 0.034 \pm 0.013$ | AUBERT | 08BG | BABR $e^+e^- \rightarrow \gamma(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| $0.506 \pm 0.040 \pm 0.015$ | AUBERT | 07D | BABR Repl. by AUBERT 08BG |
| $0.45 \pm 0.05 \pm 0.02$ | CHEN | 05A | BELL Repl. by PRIM 13 |
| $0.52 \pm 0.05 \pm 0.02$ | ¹ AUBERT,B | 04W | BABR Repl. by AUBERT 07D |
| $0.65 \pm 0.07 \pm 0.02$ | AUBERT | 03V | BABR Repl. by AUBERT,B 04W |
| $0.41 \pm 0.10 \pm 0.04$ | CHEN | 03B | BELL Repl. by CHEN 05A |

¹ AUBERT,B 04W also measures the fraction of parity-odd transverse contribution $f_\perp = 0.22 \pm 0.05 \pm 0.02$ and the phases of the parity-even and parity-odd transverse amplitudes relative to the longitudinal amplitude.

Γ_{\perp}/Γ in $B^0 \rightarrow \phi K^*(892)^0$

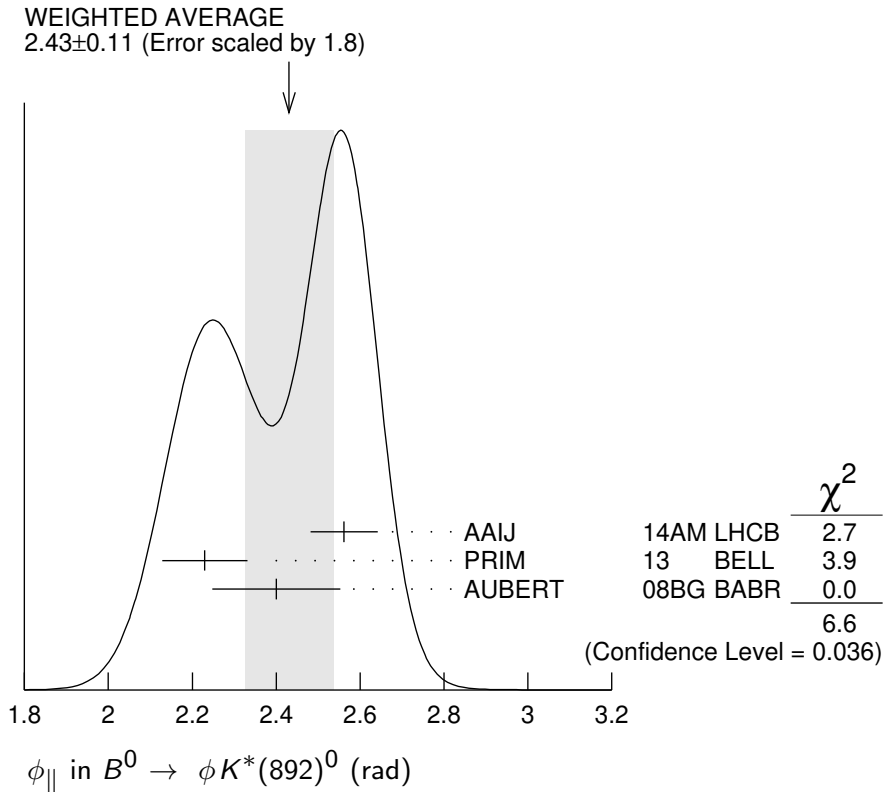
| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-----------------------------------|
| 0.224 ± 0.015 OUR AVERAGE | | | |
| 0.221 ± 0.016 ± 0.013 | AAIJ | 14AMLHCB | pp at 7 TeV |
| 0.238 ± 0.026 ± 0.008 | PRIM | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.212 ± 0.032 ± 0.013 | AUBERT | 08BG BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.227 ± 0.038 ± 0.013 | AUBERT | 07D BABR | Repl. by AUBERT 08BG |
| 0.31 $^{+0.06}_{-0.05}$ ± 0.02 | ¹ CHEN | 05A BELL | Repl. by PRIM 13 |
| 0.22 ± 0.05 ± 0.02 | AUBERT,B | 04W BABR | Repl. by AUBERT 07D |

¹ This quantity was recalculated by the BELLE authors from numbers in the original paper.

ϕ_{\parallel} in $B^0 \rightarrow \phi K^*(892)^0$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---|-------------|-----------------------------------|
| 2.43 ± 0.11 OUR AVERAGE | Error includes scale factor of 1.8. See the ideogram below. | | |
| 2.562 ± 0.069 ± 0.040 | AAIJ | 14AMLHCB | pp at 7 TeV |
| 2.23 ± 0.10 ± 0.02 | PRIM | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.40 ± 0.13 ± 0.08 | AUBERT | 08BG BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 2.31 ± 0.14 ± 0.08 | AUBERT | 07D BABR | Repl. by AUBERT 08BG |
| 2.40 $^{+0.28}_{-0.24}$ ± 0.07 | ¹ CHEN | 05A BELL | Repl. by PRIM 13 |
| 2.34 $^{+0.23}_{-0.20}$ ± 0.05 | AUBERT,B | 04W BABR | Repl. by AUBERT 07D |

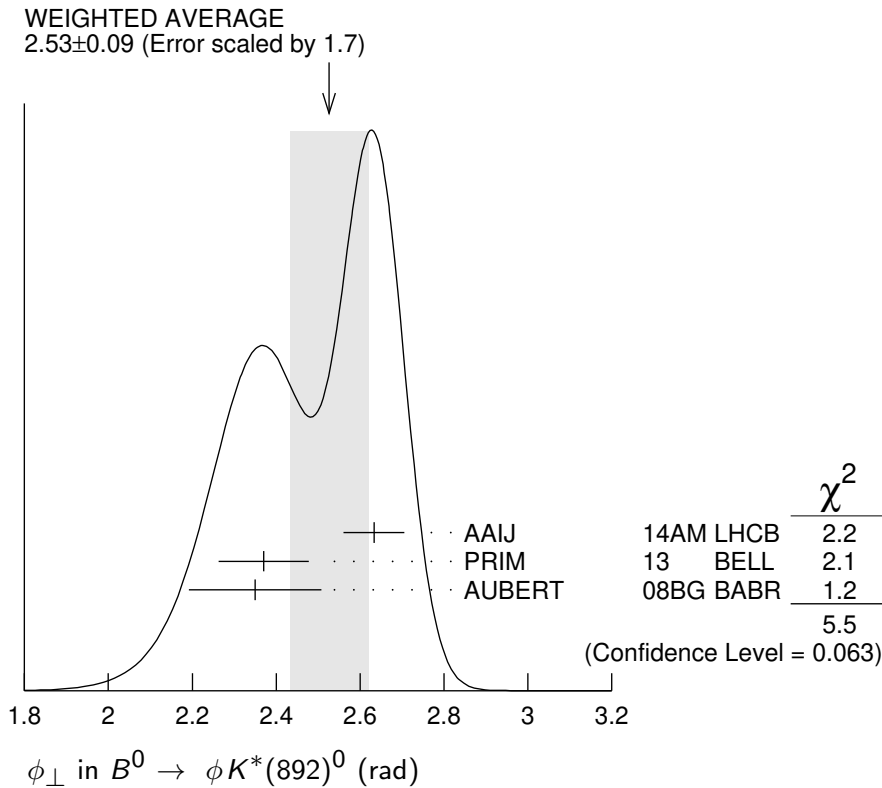
¹ This quantity was recalculated by the BELLE authors from numbers in the original paper.



ϕ_{\perp} in $B^0 \rightarrow \phi K^*(892)^0$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---|-------------|-----------------------------------|
| 2.53 ± 0.09 OUR AVERAGE | Error includes scale factor of 1.7. See the ideogram below. | | |
| 2.633 ± 0.062 ± 0.037 | AAIJ | 14AMLHCB | pp at 7 TeV |
| 2.37 ± 0.10 ± 0.04 | PRIM | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.35 ± 0.13 ± 0.09 | AUBERT | 08BG BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 2.24 ± 0.15 ± 0.09 | AUBERT | 07D BABR | Repl. by AUBERT 08BG |
| 2.51 ± 0.25 ± 0.06 | ¹ CHEN | 05A BELL | Repl. by PRIM 13 |
| 2.47 ± 0.25 ± 0.05 | AUBERT,B | 04W BABR | Repl. by AUBERT 07D |

¹ This quantity was recalculated by the BELLE authors from numbers in the original paper.



$\delta_0(B^0 \rightarrow \phi K^*(892)^0)$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-----------------------------------|
| 2.88 ± 0.10 OUR AVERAGE | | | |
| 2.91 ± 0.10 ± 0.08 | PRIM | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 2.82 ± 0.15 ± 0.09 | AUBERT | 08BG BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 2.78 ± 0.17 ± 0.09 | AUBERT | 07D BABR | Repl. by AUBERT 08BG |

A_{CP}^0 in $B^0 \rightarrow \phi K^*(892)^0$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------------------------|--------------------|-------------|-----------------------------------|
| -0.007 ± 0.030 OUR AVERAGE | | | |
| -0.003 ± 0.038 ± 0.005 | AAIJ | 14AMLHCB | pp at 7 TeV |
| -0.030 ± 0.061 ± 0.007 | PRIM | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.01 ± 0.07 ± 0.02 | AUBERT | 08BG BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---------------------------|-------------------|-----|------|----------------------|
| $-0.03 \pm 0.08 \pm 0.02$ | AUBERT | 07D | BABR | Repl. by AUBERT 08BG |
| $0.13 \pm 0.12 \pm 0.04$ | ¹ CHEN | 05A | BELL | Repl. by PRIM 13 |
| $-0.06 \pm 0.10 \pm 0.01$ | AUBERT,B | 04W | BABR | Repl. by AUBERT 07D |

¹ This quantity was recalculated by the BELLE authors from numbers in the original paper.

A_{CP}^{\perp} in $B^0 \rightarrow \phi K^*(892)^0$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|-----------------------------------|
| -0.02 ± 0.06 OUR AVERAGE | | | |
| $0.047 \pm 0.074 \pm 0.009$ | AAIJ | 14AMLHCB | pp at 7 TeV |
| $-0.14 \pm 0.11 \pm 0.01$ | PRIM | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $-0.04 \pm 0.15 \pm 0.06$ | AUBERT | 08BG BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---------------------------|-------------------|-----|------|----------------------|
| $-0.03 \pm 0.16 \pm 0.05$ | AUBERT | 07D | BABR | Repl. by AUBERT 08BG |
| $-0.20 \pm 0.18 \pm 0.04$ | ¹ CHEN | 05A | BELL | Repl. by PRIM 13 |
| $-0.10 \pm 0.24 \pm 0.05$ | AUBERT,B | 04W | BABR | Repl. by AUBERT 07D |

¹ This quantity was recalculated by the BELLE authors from numbers in the original paper.

$\Delta\phi_{\parallel}$ in $B^0 \rightarrow \phi K^*(892)^0$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-----------------------------------|
| 0.05 ± 0.05 OUR AVERAGE | | | |
| $0.045 \pm 0.069 \pm 0.015$ | AAIJ | 14AMLHCB | pp at 7 TeV |
| $-0.02 \pm 0.10 \pm 0.01$ | PRIM | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $0.22 \pm 0.12 \pm 0.08$ | AUBERT | 08BG BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--|-------------------|-----|------|----------------------|
| $0.24 \pm 0.14 \pm 0.08$ | AUBERT | 07D | BABR | Repl. by AUBERT 08BG |
| $-0.32 \pm 0.27 \pm 0.07$ | ¹ CHEN | 05A | BELL | Repl. by PRIM 13 |
| $0.27 \begin{smallmatrix} +0.20 \\ -0.23 \end{smallmatrix} \pm 0.05$ | AUBERT,B | 04W | BABR | Repl. by AUBERT 07D |

¹ This quantity was recalculated by the BELLE authors from numbers in the original paper.

$\Delta\phi_{\perp}$ in $B^0 \rightarrow \phi K^*(892)^0$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-----------------------------------|
| 0.08 ± 0.05 OUR AVERAGE | | | |
| $0.062 \pm 0.062 \pm 0.005$ | AAIJ | 14AMLHCB | pp at 7 TeV |
| $0.05 \pm 0.10 \pm 0.02$ | PRIM | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $0.21 \pm 0.13 \pm 0.08$ | AUBERT | 08BG BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---------------------------|-------------------|-----|------|----------------------|
| $0.19 \pm 0.15 \pm 0.08$ | AUBERT | 07D | BABR | Repl. by AUBERT 08BG |
| $-0.30 \pm 0.25 \pm 0.06$ | ¹ CHEN | 05A | BELL | Repl. by PRIM 13 |
| $0.36 \pm 0.25 \pm 0.05$ | AUBERT,B | 04W | BABR | Repl. by AUBERT 07D |

¹ This quantity was recalculated by the BELLE authors from numbers in the original paper.

$\Delta\delta_0(B^0 \rightarrow \phi K^*(892)^0)$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-----------------------------------|
| 0.13 ± 0.09 OUR AVERAGE | | | |
| $0.08 \pm 0.10 \pm 0.01$ | PRIM | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $0.27 \pm 0.14 \pm 0.08$ | AUBERT | 08BG BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--------------------------|--------|-----|------|----------------------|
| $0.21 \pm 0.17 \pm 0.08$ | AUBERT | 07D | BABR | Repl. by AUBERT 08BG |
|--------------------------|--------|-----|------|----------------------|

$\Delta\phi_{00}(B^0 \rightarrow \phi K_0^*(1430)^0)$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|------------------------------------|
| $0.28 \pm 0.42 \pm 0.04$ | AUBERT | 08BG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 Γ_{\perp}/Γ in $B^0 \rightarrow \phi K_2^*(1430)^0$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
| $0.913^{+0.028}_{-0.050}$ OUR AVERAGE | | | |

| | | | |
|-------------------------------------|------|---------|------------------------------------|
| $0.918^{+0.029}_{-0.060} \pm 0.012$ | PRIM | 13 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-------------------------------------|------|---------|------------------------------------|

| | | | |
|-------------------------------------|--------|-----------|------------------------------------|
| $0.901^{+0.046}_{-0.058} \pm 0.037$ | AUBERT | 08BG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-------------------------------------|--------|-----------|------------------------------------|

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

| | | | |
|-------------------------------------|--------|----------|----------------------|
| $0.853^{+0.061}_{-0.069} \pm 0.036$ | AUBERT | 07D BABR | Repl. by AUBERT 08BG |
|-------------------------------------|--------|----------|----------------------|

 Γ_{\perp}/Γ in $B^0 \rightarrow \phi K_2^*(1430)^0$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-------------------------------------|
| $0.027^{+0.031}_{-0.025}$ OUR AVERAGE | | | Error includes scale factor of 1.1. |

| | | | |
|-------------------------------------|------|---------|------------------------------------|
| $0.056^{+0.050}_{-0.035} \pm 0.009$ | PRIM | 13 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-------------------------------------|------|---------|------------------------------------|

| | | | |
|-------------------------------------|--------|-----------|------------------------------------|
| $0.002^{+0.018}_{-0.002} \pm 0.031$ | AUBERT | 08BG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-------------------------------------|--------|-----------|------------------------------------|

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

| | | | |
|-------------------------------------|--------|----------|----------------------|
| $0.045^{+0.049}_{-0.040} \pm 0.013$ | AUBERT | 07D BABR | Repl. by AUBERT 08BG |
|-------------------------------------|--------|----------|----------------------|

 ϕ_{\parallel} in $B^0 \rightarrow \phi K_2^*(1430)^0$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
| 4.0 ± 0.4 OUR AVERAGE | | | |

| | | | |
|--------------------------|------|---------|------------------------------------|
| $3.76 \pm 2.88 \pm 1.32$ | PRIM | 13 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|------|---------|------------------------------------|

| | | | |
|--------------------------|--------|-----------|------------------------------------|
| $3.96 \pm 0.38 \pm 0.06$ | AUBERT | 08BG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|--------|-----------|------------------------------------|

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

| | | | |
|--------------------------|--------|----------|----------------------|
| $2.90 \pm 0.39 \pm 0.06$ | AUBERT | 07D BABR | Repl. by AUBERT 08BG |
|--------------------------|--------|----------|----------------------|

 ϕ_{\perp} in $B^0 \rightarrow \phi K_2^*(1430)^0$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| $4.45^{+0.43}_{-0.38} \pm 0.13$ | PRIM | 13 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|---------------------------------|--------|----------|----------------------|
| $5.72^{+0.55}_{-0.87} \pm 0.11$ | AUBERT | 07D BABR | Repl. by AUBERT 08BG |
|---------------------------------|--------|----------|----------------------|

 $\delta_0(B^0 \rightarrow \phi K_2^*(1430)^0)$

| <u>VALUE (rad)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
| 3.46 ± 0.14 OUR AVERAGE | | | |

| | | | |
|--------------------------|------|---------|------------------------------------|
| $3.53 \pm 0.11 \pm 0.19$ | PRIM | 13 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|------|---------|------------------------------------|

| | | | |
|--------------------------|--------|-----------|------------------------------------|
| $3.41 \pm 0.13 \pm 0.13$ | AUBERT | 08BG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|--------|-----------|------------------------------------|

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

| | | | |
|---------------------------------|--------|----------|----------------------|
| $3.54^{+0.12}_{-0.14} \pm 0.06$ | AUBERT | 07D BABR | Repl. by AUBERT 08BG |
|---------------------------------|--------|----------|----------------------|

A_{CP}^0 in $B^0 \rightarrow \phi K_2^*(1430)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------|-----------|---------------------------------|
| -0.03 ± 0.04 OUR AVERAGE | | | |
| $-0.016^{+0.066}_{-0.051} \pm 0.008$ | PRIM | 13 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| $-0.05 \pm 0.06 \pm 0.01$ | AUBERT | 08BG BABR | $e^+e^- \rightarrow \gamma(4S)$ |

 A_{CP}^\perp in $B^0 \rightarrow \phi K_2^*(1430)^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------|---------|---------------------------------|
| $-0.01^{+0.85}_{-0.67} \pm 0.09$ | | | |
| | PRIM | 13 BELL | $e^+e^- \rightarrow \gamma(4S)$ |

 $\Delta\phi_{\parallel}(B^0 \rightarrow \phi K_2^*(1430)^0)$

| VALUE (rad) | DOCUMENT ID | TECN | COMMENT |
|--|-------------|-----------|---------------------------------|
| -0.9 ± 0.4 OUR AVERAGE | | | |
| $-0.02 \pm 1.08 \pm 1.01$ | PRIM | 13 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| $-1.00 \pm 0.38 \pm 0.09$ | AUBERT | 08BG BABR | $e^+e^- \rightarrow \gamma(4S)$ |

 $\Delta\phi_{\perp}(B^0 \rightarrow \phi K_2^*(1430)^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|---------|---------------------------------|
| $-0.19 \pm 0.42 \pm 0.11$ | | | |
| | PRIM | 13 BELL | $e^+e^- \rightarrow \gamma(4S)$ |

 $\Delta\delta_0$ in $B^0 \rightarrow \phi K_2^*(1430)^0$

| VALUE (rad) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|-----------|---------------------------------|
| 0.08 ± 0.09 OUR AVERAGE | | | |
| $0.06 \pm 0.11 \pm 0.02$ | PRIM | 13 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| $0.11 \pm 0.13 \pm 0.06$ | AUBERT | 08BG BABR | $e^+e^- \rightarrow \gamma(4S)$ |

 Γ_L/Γ in $B^0 \rightarrow K^*(892)^0 \rho^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|----------|---------------------------------|
| 0.173 ± 0.026 OUR AVERAGE | | | |
| $0.164 \pm 0.015 \pm 0.022$ | AAIJ | 19J LHCB | pp at 7, 8 TeV |
| $0.40 \pm 0.08 \pm 0.11$ | LEES | 12K BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| $0.57 \pm 0.09 \pm 0.08$ | AUBERT,B | 06G BABR | Repl. by LEES 12K |

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

 Γ_{\perp}/Γ in $B^0 \rightarrow K^*(892)^0 \rho^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|----------|------------------|
| $0.401 \pm 0.016 \pm 0.037$ | | | |
| | AAIJ | 19J LHCB | pp at 7, 8 TeV |

 A_{CP}^0 in $B^0 \rightarrow K^*(892)^0 \rho^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|----------|------------------|
| $-0.62 \pm 0.09 \pm 0.09$ | | | |
| | AAIJ | 19J LHCB | pp at 7, 8 TeV |

 A_{CP}^\perp in $B^0 \rightarrow K^*(892)^0 \rho^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|----------|------------------|
| $0.050 \pm 0.039 \pm 0.015$ | | | |
| | AAIJ | 19J LHCB | pp at 7, 8 TeV |

 A_{CP}^{\parallel} in $B^0 \rightarrow K^*(892)^0 \rho^0$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|----------|------------------|
| $0.188 \pm 0.037 \pm 0.022$ | | | |
| | AAIJ | 19J LHCB | pp at 7, 8 TeV |

ϕ_0 in $B^0 \rightarrow K^*(892)^0 \rho^0$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------------------|--------------------|-------------|-----------------------|
| $1.57 \pm 0.08 \pm 0.18$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

 ϕ_{\perp} in $B^0 \rightarrow K^*(892)^0 \rho^0$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|------------------------------|--------------------|-------------|-----------------------|
| $-2.365 \pm 0.032 \pm 0.054$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

 ϕ_{\parallel} in $B^0 \rightarrow K^*(892)^0 \rho^0$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------------------|--------------------|-------------|-----------------------|
| $0.795 \pm 0.030 \pm 0.068$ | AAIJ | 19J | LHCB pp at 7, 8 TeV |

 Γ_L/Γ in $B^0 \rightarrow K^{*+} \rho^-$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------------------|--------------------|-------------|---|
| $0.38 \pm 0.13 \pm 0.03$ | LEES | 12K | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

 Γ_L/Γ in $B^0 \rightarrow \rho^+ \rho^-$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|----------------|
|--------------|--------------------|-------------|----------------|

0.990^{+0.021}_{-0.019} OUR AVERAGE

| | | | | |
|-----------------------------|-----------|----|------|------------------------------------|
| $0.988 \pm 0.012 \pm 0.023$ | VANHOEFER | 16 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------------------|-----------|----|------|------------------------------------|

| | | | | |
|-------------------------------------|--------|------|------|------------------------------------|
| $0.992 \pm 0.024^{+0.026}_{-0.013}$ | AUBERT | 07BF | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-------------------------------------|--------|------|------|------------------------------------|

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

| | | | | |
|-------------------------------------|-------|----|------|-----------------------|
| $0.941^{+0.034}_{-0.040} \pm 0.030$ | SOMOV | 06 | BELL | Repl. by VANHOEFER 16 |
|-------------------------------------|-------|----|------|-----------------------|

| | | | | |
|-------------------------------------|----------|-----|------|----------------------|
| $0.978 \pm 0.014^{+0.021}_{-0.029}$ | AUBERT,B | 05C | BABR | Repl. by AUBERT 07BF |
|-------------------------------------|----------|-----|------|----------------------|

| | | | | |
|---------------------------------|--------|-----|------|-----------------------|
| $0.98^{+0.02}_{-0.08} \pm 0.03$ | AUBERT | 04G | BABR | Repl. by AUBERT,B 04R |
|---------------------------------|--------|-----|------|-----------------------|

| | | | | |
|---------------------------------|----------|-----|------|-----------------------|
| $0.99 \pm 0.03^{+0.04}_{-0.03}$ | AUBERT,B | 04R | BABR | Repl. by AUBERT,B 05C |
|---------------------------------|----------|-----|------|-----------------------|

 Γ_L/Γ in $B^0 \rightarrow \rho^0 \rho^0$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|----------------|
|--------------|--------------------|-------------|----------------|

0.71^{+0.08}_{-0.09} OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.

| | | | | |
|-------------------------------------|------|-----|------|------------------|
| $0.745^{+0.048}_{-0.058} \pm 0.034$ | AAIJ | 15T | LHCB | pp at 7, 8 TeV |
|-------------------------------------|------|-----|------|------------------|

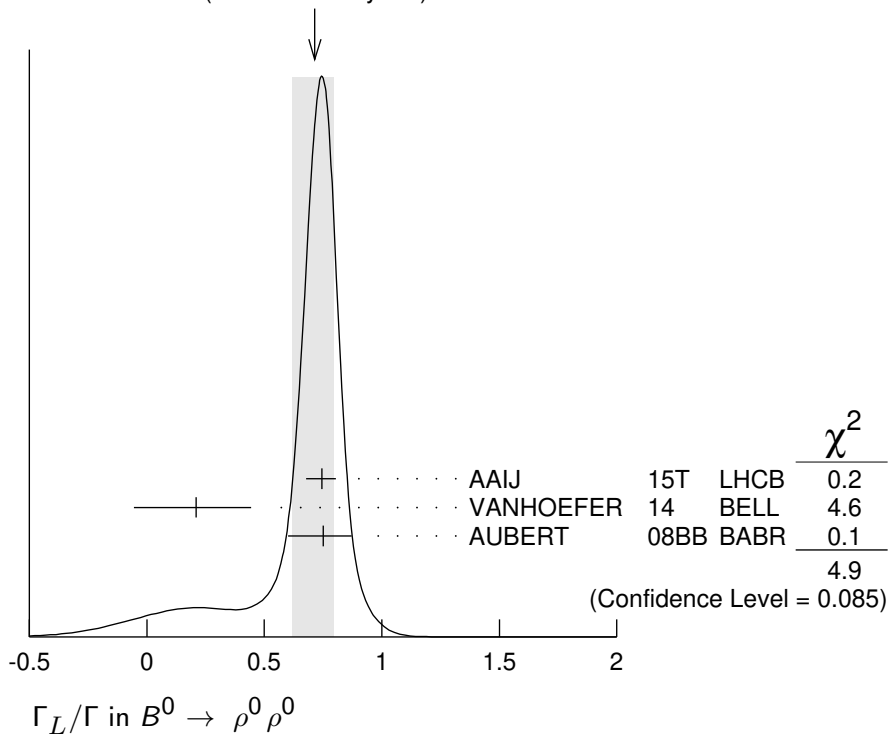
| | | | | |
|---------------------------------|-----------|----|------|------------------------------------|
| $0.21^{+0.18}_{-0.22} \pm 0.15$ | VANHOEFER | 14 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---------------------------------|-----------|----|------|------------------------------------|

| | | | | |
|---------------------------------|--------|------|------|------------------------------------|
| $0.75^{+0.11}_{-0.14} \pm 0.05$ | AUBERT | 08BB | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|---------------------------------|--------|------|------|------------------------------------|

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

| | | | | |
|--------------------------|--------|-----|------|----------------------|
| $0.87 \pm 0.13 \pm 0.04$ | AUBERT | 07G | BABR | Repl. by AUBERT 08BB |
|--------------------------|--------|-----|------|----------------------|

WEIGHTED AVERAGE
 0.71±0.08-0.09 (Error scaled by 1.6)



Γ_L/Γ in B⁰ → a₁(1260)⁺ a₁(1260)⁻

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-------------|-----------|---------------------------------------|
| 0.31±0.22±0.10 | AUBERT | 09AL BABR | e ⁺ e ⁻ → γ(4S) |

Γ_L/Γ in B⁰ → ρ⁰ K*(892)⁰

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-------------|----------|---------------------------------------|
| 1.01±0.13±0.03 | CHEN | 08c BELL | e ⁺ e ⁻ → γ(4S) |

Γ_L/Γ in B⁰ → Λ⁰ K*(892)⁰

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-------------|---------|---------------------------------------|
| 0.60±0.22±0.08 | CHANG | 09 BELL | e ⁺ e ⁻ → γ(4S) |

Γ_L/Γ in B⁰ → K*(892)⁰ μ⁺ μ⁻ (0.04 < q² < 6.0 GeV²/c⁴)

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|---------------------|-----------|-------------|
| 0.50±0.06±0.04 | ¹ AABOUD | 18BY ATLS | pp at 8 TeV |

¹ A set of angular parameters obtained for this decay is also presented.

Γ_L/Γ in B⁰ → K*(892)⁰ e⁺ e⁻ (at low q²)

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|-----------|--------------------|
| 0.044±0.026±0.014 | ¹ AAIJ | 20AO LHCb | pp at 7, 8, 13 TeV |

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

| | | | |
|------------------|-------------------|----------|--------------------|
| 0.16 ±0.06 ±0.03 | ² AAIJ | 15Z LHCb | Repl. by AAIJ 20AO |
|------------------|-------------------|----------|--------------------|

¹ Determined in the effective dielectron invariant mass range 0.0008 < q² < 0.257 GeV²/c⁴.

² Determined in the effective dielectron invariant mass range 0.002 < q² < 1.120 GeV²/c⁴.

$A_T^{(2)}$ in $B^0 \rightarrow K^*(892)^0 e^+ e^-$ (at low q^2)

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|-----------|----------------------|
| $0.11 \pm 0.10 \pm 0.02$ | ¹ AAIJ | 20AO LHCB | pp at 7, 8, 13 TeV |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.23 \pm 0.23 \pm 0.05$ | ² AAIJ | 15Z LHCB | Repl. by AAIJ 20AO |
| ¹ Determined in the effective dielectron invariant mass range $0.0008 < q^2 < 0.257 \text{ GeV}^2/c^4$. | | | |
| ² Determined in the effective dielectron invariant mass range $0.002 < q^2 < 1.120 \text{ GeV}^2/c^4$. | | | |

 A_T^{Im} in $B^0 \rightarrow K^*(892)^0 e^+ e^-$ (at low q^2)

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|-----------|----------------------|
| $0.02 \pm 0.10 \pm 0.01$ | ¹ AAIJ | 20AO LHCB | pp at 7, 8, 13 TeV |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.14 \pm 0.22 \pm 0.05$ | ² AAIJ | 15Z LHCB | Repl. by AAIJ 20AO |
| ¹ Determined in the effective dielectron invariant mass range $0.0008 < q^2 < 0.257 \text{ GeV}^2/c^4$. | | | |
| ² Determined in the effective dielectron invariant mass range $0.002 < q^2 < 1.120 \text{ GeV}^2/c^4$. | | | |

 A_T^{Re} in $B^0 \rightarrow K^*(892)^0 e^+ e^-$ (at low q^2)

Related to A_{FB} , F_L by $A_T^{Re} = (4/3) A_{FB} / (1 - F_L)$.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|-----------|----------------------|
| $-0.06 \pm 0.08 \pm 0.02$ | ¹ AAIJ | 20AO LHCB | pp at 7, 8, 13 TeV |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.10 \pm 0.18 \pm 0.05$ | ² AAIJ | 15Z LHCB | Repl. by AAIJ 20AO |
| ¹ Determined in the effective dielectron invariant mass range $0.0008 < q^2 < 0.257 \text{ GeV}^2/c^4$. | | | |
| ² Determined in the effective dielectron invariant mass range $0.002 < q^2 < 1.120 \text{ GeV}^2/c^4$. | | | |

See the related review(s):

[B⁰ — B⁰ Mixing](#)

B⁰-B⁰ MIXING PARAMETERS

For a discussion of B⁰-B⁰ mixing see the note on “B⁰-B⁰ Mixing” in the B⁰ Particle Listings above.

χ_d is a measure of the time-integrated B⁰-B⁰ mixing probability that a produced B⁰(B⁰) decays as a B⁰(B⁰). Mixing violates $\Delta B \neq 2$ rule.

$$\chi_d = \frac{x_d^2}{2(1+x_d^2)}$$

$$x_d = \frac{\Delta m_{B^0}}{\Gamma_{B^0}} = (m_{B_H^0} - m_{B_L^0}) \tau_{B^0} ,$$

where H, L stand for heavy and light states of two B⁰ CP eigenstates and $\tau_{B^0} = \frac{1}{0.5(\Gamma_{B_H^0} + \Gamma_{B_L^0})}$.

χ_d

This $B^0\text{-}\bar{B}^0$ mixing parameter is the probability (integrated over time) that a produced B^0 (or \bar{B}^0) decays as a \bar{B}^0 (or B^0), e.g. for inclusive lepton decays

$$\chi_d = \Gamma(B^0 \rightarrow \ell^- X \text{ (via } \bar{B}^0)) / \Gamma(B^0 \rightarrow \ell^\pm X) \\ = \Gamma(\bar{B}^0 \rightarrow \ell^+ X \text{ (via } B^0)) / \Gamma(\bar{B}^0 \rightarrow \ell^\pm X)$$

Where experiments have measured the parameter $r = \chi/(1-\chi)$, we have converted to χ . Mixing violates the $\Delta B \neq 2$ rule.

Note that the measurement of χ at energies higher than the $\Upsilon(4S)$ have not separated χ_d from χ_s where the subscripts indicate $B^0(\bar{b}d)$ or $B_s^0(\bar{b}s)$. They are listed in the $B^\pm/B^0/B_s^0/b$ -baryon ADMIXTURE section.

The experiments at $\Upsilon(4S)$ make an assumption about the $B^0\bar{B}^0$ fraction and about the ratio of the B^\pm and B^0 semileptonic branching ratios (usually that it equals one).

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements, includes χ_d calculated from Δm_{B^0} and τ_{B^0} .

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|---|-----|-----------------------|----------|-----------------------------------|
| 0.1858 ± 0.0011 OUR EVALUATION | | | | |
| 0.182 ± 0.015 OUR AVERAGE | | | | |
| 0.198 ± 0.013 ± 0.014 | | ¹ BEHRENS | 00B CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.16 ± 0.04 ± 0.04 | | ² ALBRECHT | 94 ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.149 ± 0.023 ± 0.022 | | ³ BARTELT | 93 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.171 ± 0.048 | | ⁴ ALBRECHT | 92L ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 0.20 ± 0.13 ± 0.12 | | ⁵ ALBRECHT | 96D ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.19 ± 0.07 ± 0.09 | | ⁶ ALBRECHT | 96D ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.24 ± 0.12 | | ⁷ ELSEN | 90 JADE | e^+e^- 35–44 GeV |
| 0.158 $\begin{smallmatrix} +0.052 \\ -0.059 \end{smallmatrix}$ | | ARTUSO | 89 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.17 ± 0.05 | | ⁸ ALBRECHT | 87I ARG | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <0.19 | 90 | ⁹ BEAN | 87B CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |
| <0.27 | 90 | ¹⁰ AVERY | 84 CLEO | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ BEHRENS 00B uses high-momentum lepton tags and partially reconstructed $\bar{B}^0 \rightarrow D^{*+}\pi^-, \rho^-$ decays to determine the flavor of the B meson.

² ALBRECHT 94 reports $r=0.194 \pm 0.062 \pm 0.054$. We convert to χ for comparison. Uses tagged events (lepton + pion from D^*).

³ BARTELT 93 analysis performed using tagged events (lepton+pion from D^*). Using dilepton events they obtain $0.157 \pm 0.016 \begin{smallmatrix} +0.033 \\ -0.028 \end{smallmatrix}$.

⁴ ALBRECHT 92L is a combined measurement employing several lepton-based techniques. It uses all previous ARGUS data in addition to new data and therefore supersedes ALBRECHT 87I. A value of $r = 20.6 \pm 7.0\%$ is directly measured. The value can be used to measure $x = \Delta M/\Gamma = 0.72 \pm 0.15$ for the B_d meson. Assumes $f_{+-}/f_0 = 1.0 \pm 0.05$ and uses $\tau_{B^\pm}/\tau_{B^0} = (0.95 \pm 0.14) (f_{+-}/f_0)$.

⁵ Uses $D^{*+}K^\pm$ correlations.

⁶ Uses $(D^{*+}\ell^-)K^\pm$ correlations.

⁷ These experiments see a combination of B_s and B_d mesons.

⁸ ALBRECHT 87I is inclusive measurement with like-sign dileptons, with tagged B decays plus leptons, and one fully reconstructed event. Measures $r=0.21 \pm 0.08$. We convert to χ for comparison. Superseded by ALBRECHT 92L.

⁹ BEAN 87B measured $r < 0.24$; we converted to χ .

¹⁰ Same-sign dilepton events. Limit assumes semileptonic BR for B^+ and B^0 equal. If B^0/B^\pm ratio < 0.58 , no limit exists. The limit was corrected in BEAN 87B from $r < 0.30$ to $r < 0.37$. We converted this limit to χ .

$$\Delta m_{B^0} = m_{B_H^0} - m_{B_L^0}$$

Δm_{B^0} is a measure of 2π times the $B^0-\bar{B}^0$ oscillation frequency in time-dependent mixing experiments.

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| VALUE ($10^{12} \hbar s^{-1}$) | DOCUMENT ID | TECN | COMMENT |
|---|--------------------------|-----------|-----------------------------------|
| 0.5065 ± 0.0019 OUR EVALUATION | | | |
| 0.5050 ± 0.0021 ± 0.0010 | ¹ AAIJ | 16AV LHCb | pp at 7, 8 TeV |
| 0.503 ± 0.011 ± 0.013 | ² AAIJ | 13CF LHCb | pp at 7 TeV |
| 0.5156 ± 0.0051 ± 0.0033 | ³ AAIJ | 13F LHCb | pp at 7 TeV |
| 0.499 ± 0.032 ± 0.003 | ⁴ AAIJ | 12I LHCb | pp at 7 TeV |
| 0.506 ± 0.020 ± 0.016 | ⁵ ABAZOV | 06W D0 | $p\bar{p}$ at 1.96 TeV |
| 0.511 ± 0.007 $\begin{smallmatrix} +0.007 \\ -0.006 \end{smallmatrix}$ | ⁶ AUBERT | 06G BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.511 ± 0.005 ± 0.006 | ⁷ ABE | 05B BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.531 ± 0.025 ± 0.007 | ⁸ ABDALLAH | 03B DLPH | $e^+e^- \rightarrow Z$ |
| 0.492 ± 0.018 ± 0.013 | ⁹ AUBERT | 03C BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.503 ± 0.008 ± 0.010 | ¹⁰ HASTINGS | 03 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.509 ± 0.017 ± 0.020 | ¹¹ ZHENG | 03 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.516 ± 0.016 ± 0.010 | ¹² AUBERT | 02I BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.493 ± 0.012 ± 0.009 | ¹³ AUBERT | 02J BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.497 ± 0.024 ± 0.025 | ¹⁴ ABBIENDI,G | 00B OPAL | $e^+e^- \rightarrow Z$ |
| 0.503 ± 0.064 ± 0.071 | ¹⁵ ABE | 99K CDF | $p\bar{p}$ at 1.8 TeV |
| 0.500 ± 0.052 ± 0.043 | ¹⁶ ABE | 99Q CDF | $p\bar{p}$ at 1.8 TeV |
| 0.516 ± 0.099 $\begin{smallmatrix} +0.029 \\ -0.035 \end{smallmatrix}$ | ¹⁷ AFFOLDER | 99C CDF | $p\bar{p}$ at 1.8 TeV |
| 0.471 $\begin{smallmatrix} +0.078 \\ -0.068 \end{smallmatrix}$ $\begin{smallmatrix} +0.033 \\ -0.034 \end{smallmatrix}$ | ¹⁸ ABE | 98C CDF | $p\bar{p}$ at 1.8 TeV |
| 0.458 ± 0.046 ± 0.032 | ¹⁹ ACCIARRI | 98D L3 | $e^+e^- \rightarrow Z$ |
| 0.437 ± 0.043 ± 0.044 | ²⁰ ACCIARRI | 98D L3 | $e^+e^- \rightarrow Z$ |
| 0.472 ± 0.049 ± 0.053 | ²¹ ACCIARRI | 98D L3 | $e^+e^- \rightarrow Z$ |
| 0.523 ± 0.072 ± 0.043 | ²² ABREU | 97N DLPH | $e^+e^- \rightarrow Z$ |
| 0.493 ± 0.042 ± 0.027 | ²⁰ ABREU | 97N DLPH | $e^+e^- \rightarrow Z$ |
| 0.499 ± 0.053 ± 0.015 | ²³ ABREU | 97N DLPH | $e^+e^- \rightarrow Z$ |
| 0.480 ± 0.040 ± 0.051 | ¹⁹ ABREU | 97N DLPH | $e^+e^- \rightarrow Z$ |
| 0.444 ± 0.029 $\begin{smallmatrix} +0.020 \\ -0.017 \end{smallmatrix}$ | ²⁰ ACKERSTAFF | 97U OPAL | $e^+e^- \rightarrow Z$ |
| 0.430 ± 0.043 $\begin{smallmatrix} +0.028 \\ -0.030 \end{smallmatrix}$ | ¹⁹ ACKERSTAFF | 97V OPAL | $e^+e^- \rightarrow Z$ |

| | | | |
|---|---------------|----------|-----------------------------------|
| 0.482 ±0.044 ±0.024 | 24 BUSKULIC | 97D ALEP | $e^+e^- \rightarrow Z$ |
| 0.404 ±0.045 ±0.027 | 20 BUSKULIC | 97D ALEP | $e^+e^- \rightarrow Z$ |
| 0.452 ±0.039 ±0.044 | 19 BUSKULIC | 97D ALEP | $e^+e^- \rightarrow Z$ |
| 0.539 ±0.060 ±0.024 | 25 ALEXANDER | 96V OPAL | $e^+e^- \rightarrow Z$ |
| 0.567 ±0.089 $\begin{smallmatrix} +0.029 \\ -0.023 \end{smallmatrix}$ | 26 ALEXANDER | 96V OPAL | $e^+e^- \rightarrow Z$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.516 ±0.016 ±0.010 | 27 AUBERT | 02N BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.494 ±0.012 ±0.015 | 28 HARA | 02 BELL | Repl. by ABE 05B |
| 0.528 ±0.017 ±0.011 | 29 TOMURA | 02 BELL | Repl. by ABE 05B |
| 0.463 ±0.008 ±0.016 | 13 ABE | 01D BELL | Repl. by HASTINGS 03 |
| 0.444 ±0.028 ±0.028 | 30 ACCIARRI | 98D L3 | $e^+e^- \rightarrow Z$ |
| 0.497 ±0.035 | 31 ABREU | 97N DLPH | $e^+e^- \rightarrow Z$ |
| 0.467 ±0.022 $\begin{smallmatrix} +0.017 \\ -0.015 \end{smallmatrix}$ | 32 ACKERSTAFF | 97V OPAL | $e^+e^- \rightarrow Z$ |
| 0.446 ±0.032 | 33 BUSKULIC | 97D ALEP | $e^+e^- \rightarrow Z$ |
| 0.531 $\begin{smallmatrix} +0.050 \\ -0.046 \end{smallmatrix}$ ±0.078 | 34 ABREU | 96Q DLPH | Sup. by ABREU 97N |
| 0.496 $\begin{smallmatrix} +0.055 \\ -0.051 \end{smallmatrix}$ ±0.043 | 19 ACCIARRI | 96E L3 | Repl. by ACCIARRI 98D |
| 0.548 ±0.050 $\begin{smallmatrix} +0.023 \\ -0.019 \end{smallmatrix}$ | 35 ALEXANDER | 96V OPAL | $e^+e^- \rightarrow Z$ |
| 0.496 ±0.046 | 36 AKERS | 95J OPAL | Repl. by ACKERSTAFF 97V |
| 0.462 $\begin{smallmatrix} +0.040 \\ -0.053 \end{smallmatrix}$ $\begin{smallmatrix} +0.052 \\ -0.035 \end{smallmatrix}$ | 19 AKERS | 95J OPAL | Repl. by ACKERSTAFF 97V |
| 0.50 ±0.12 ±0.06 | 22 ABREU | 94M DLPH | Sup. by ABREU 97N |
| 0.508 ±0.075 ±0.025 | 25 AKERS | 94C OPAL | Repl. by ALEXANDER 96V |
| 0.57 ±0.11 ±0.02 | 26 AKERS | 94H OPAL | Repl. by ALEXANDER 96V |
| 0.50 $\begin{smallmatrix} +0.07 \\ -0.06 \end{smallmatrix}$ $\begin{smallmatrix} +0.11 \\ -0.10 \end{smallmatrix}$ | 19 BUSKULIC | 94B ALEP | Sup. by BUSKULIC 97D |
| 0.52 $\begin{smallmatrix} +0.10 \\ -0.11 \end{smallmatrix}$ $\begin{smallmatrix} +0.04 \\ -0.03 \end{smallmatrix}$ | 26 BUSKULIC | 93K ALEP | Sup. by BUSKULIC 97D |

¹ Uses semileptonic decays of $B^0 \rightarrow D^- \mu^+ \nu_\mu X$ and $B^0 \rightarrow D^{(*)-} \mu^+ \nu_\mu X$, where the D mesons are reconstructed in $D^- \rightarrow K^+ \pi^- \pi^-$ and $D^{(*)-} \rightarrow \bar{D}^0 \pi^-$ with $\bar{D}^0 \rightarrow K^+ \pi^-$.

² Uses semileptonic decays of $B^0 \rightarrow D^- \mu^+ \nu_\mu X$ where the D^- mesons are reconstructed in $D^- \rightarrow K^+ K^- \pi^-$.

³ Measured using $B^0 \rightarrow D^- \pi^+$ and $B^0 \rightarrow J/\psi K^*(892)^0$ decays.

⁴ Measured using $B^0 \rightarrow D^- \pi^+$.

⁵ Uses opposite-side flavor-tagging with $B \rightarrow D^{(*)} \mu \nu_\mu X$ events.

⁶ Measured using a simultaneous fit of the B^0 lifetime and $\bar{B}^0 B^0$ oscillation frequency Δm_d in the partially reconstructed $B^0 \rightarrow D^{*-} \ell \nu$ decays.

⁷ Measurement performed using a combined fit of CP -violation, mixing and lifetimes.

⁸ Events with a high transverse momentum lepton were removed and an inclusively reconstructed vertex was required.

⁹ AUBERT 03C uses a sample of approximately 14,000 exclusively reconstructed $B^0 \rightarrow D^*(2010)^- \ell \nu$ and simultaneously measures the lifetime and oscillation frequency.

¹⁰ HASTINGS 03 measurement based on the time evolution of dilepton events. It also reports $f_+/f_0 = 1.01 \pm 0.03 \pm 0.09$ and CPT violation parameters in B^0 - \bar{B}^0 mixing.

¹¹ ZHENG 03 data analyzed using partially reconstructed $\bar{B}^0 \rightarrow D^{*-} \pi^+$ decay and a flavor tag based on the charge of the lepton from the accompanying B decay.

¹² Uses a tagged sample of fully-reconstructed neutral B decays at $\Upsilon(4S)$.

- 13 Measured based on the time evolution of dilepton events in $\Upsilon(4S)$ decays.
- 14 Data analyzed using partially reconstructed $\bar{B}^0 \rightarrow D^{*+} \ell^- \bar{\nu}$ decay and a combination of flavor tags from the rest of the event.
- 15 Uses di-muon events.
- 16 Uses jet-charge and lepton-flavor tagging.
- 17 Uses $\ell^- D^{*+} - \ell$ events.
- 18 Uses $\pi-B$ in the same side.
- 19 Uses $\ell-\ell$.
- 20 Uses $\ell-Q_{\text{hem}}$.
- 21 Uses $\ell-\ell$ with impact parameters.
- 22 Uses $D^{*\pm}-Q_{\text{hem}}$.
- 23 Uses $\pi_s^\pm \ell-Q_{\text{hem}}$.
- 24 Uses $D^{*\pm}-\ell/Q_{\text{hem}}$.
- 25 Uses $D^{*\pm} \ell-Q_{\text{hem}}$.
- 26 Uses $D^{*\pm}-\ell$.
- 27 AUBERT 02N result based on the same analysis and data sample reported in AUBERT 02I.
- 28 Uses a tagged sample of B^0 decays reconstructed in the mode $B^0 \rightarrow D^* \ell \nu$.
- 29 Uses a tagged sample of fully-reconstructed hadronic B^0 decays at $\Upsilon(4S)$.
- 30 ACCIARRI 98D combines results from $\ell-\ell$, $\ell-Q_{\text{hem}}$, and $\ell-\ell$ with impact parameters.
- 31 ABREU 97N combines results from $D^{*\pm}-Q_{\text{hem}}$, $\ell-Q_{\text{hem}}$, $\pi_s^\pm \ell-Q_{\text{hem}}$, and $\ell-\ell$.
- 32 ACKERSTAFF 97V combines results from $\ell-\ell$, $\ell-Q_{\text{hem}}$, $D^*-\ell$, and $D^{*\pm}-Q_{\text{hem}}$.
- 33 BUSKULIC 97D combines results from $D^{*\pm}-\ell/Q_{\text{hem}}$, $\ell-Q_{\text{hem}}$, and $\ell-\ell$.
- 34 ABREU 96Q analysis performed using lepton, kaon, and jet-charge tags.
- 35 ALEXANDER 96V combines results from $D^{*\pm}-\ell$ and $D^{*\pm} \ell-Q_{\text{hem}}$.
- 36 AKERS 95J combines results from charge measurement, $D^{*\pm} \ell-Q_{\text{hem}}$ and $\ell-\ell$.

$$\chi_d = \Delta m_{B^0} / \Gamma_{B^0}$$

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements and includes Δm_d calculated from χ_d measured at $\Upsilon(4S)$.

| VALUE | DOCUMENT ID |
|-------------------------------------|-------------|
| 0.769 ± 0.004 OUR EVALUATION | |

$\text{Re}(\lambda_{CP} / |\lambda_{CP}|) \text{Re}(z)$

The λ_{CP} characterizes B^0 and \bar{B}^0 decays to states of charmonium plus K_L^0 . Parameter z is used to describe CPT violation in mixing, see the review on “ CP Violation” in the reviews section.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------------|------|---|
| 0.047 ± 0.022 ± 0.003 | ¹ LEES | 16E | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|-----------------------|-----------------------|-----|------------------------|
| 0.014 ± 0.035 ± 0.034 | ² AUBERT,B | 04C | BABR Repl. by LEES 16E |
|-----------------------|-----------------------|-----|------------------------|

¹ The first uncertainty is the uncertainty from $\text{Re}(z)$ and the second uncertainty is from $\text{Re}(\lambda/|\lambda|)$.

² Corresponds to 90% confidence range $[-0.072, 0.101]$.

$\Delta\Gamma \operatorname{Re}(z)$

| <u>VALUE (ps⁻¹)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|----------------------------------|--------------------|-------------|---|
| -0.0071 ± 0.0039 ± 0.0020 | AUBERT | 06T | BABR e ⁺ e ⁻ → $\Upsilon(4S)$ |

Re(z)

| <u>VALUE (units 10⁻²)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|---|
| -4 ± 4 OUR AVERAGE | Error includes scale factor of 1.4. | | |
| -6.5 ± 2.8 ± 1.4 | ¹ LEES | 16E | BABR e ⁺ e ⁻ → $\Upsilon(4S)$ |
| 1.9 ± 3.7 ± 3.3 | ² HIGUCHI | 12 | BELL e ⁺ e ⁻ → $\Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0 ± 12 ± 1 | ³ HASTINGS | 03 | BELL Repl. by HIGUCHI 12 |
| ¹ Measurement uses decays $B^0/\bar{B}^0 \rightarrow c\bar{c}K_S^0/K_L^0$. | | | |
| ² Measured using $B^0 \rightarrow J/\psi K_S^0, J/\psi K_L^0, D^-\pi^+, D^{*-}\pi^+, D^{*-}\rho^+, \text{ and } D^{*-}\ell^+\nu$ decays. | | | |
| ³ Measured using inclusive dilepton events from B^0 decay. | | | |

Im(z)

| <u>VALUE (units 10⁻²)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-----------------------|-------------|---|
| -0.8 ± 0.4 OUR AVERAGE | | | |
| 1.0 ± 3.0 ± 1.3 | ¹ LEES | 16E | BABR e ⁺ e ⁻ → $\Upsilon(4S)$ |
| -0.57 ± 0.33 ± 0.33 | ² HIGUCHI | 12 | BELL e ⁺ e ⁻ → $\Upsilon(4S)$ |
| -1.39 ± 0.73 ± 0.32 | ³ AUBERT | 06T | BABR e ⁺ e ⁻ → $\Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 3.8 ± 2.9 ± 2.5 | ⁴ AUBERT,B | 04C | BABR Repl. by AUBERT 06T |
| -3 ± 1 ± 3 | ⁵ HASTINGS | 03 | BELL Repl. by HIGUCHI 12 |
| ¹ Measurement uses decays $B^0/\bar{B}^0 \rightarrow c\bar{c}K_S^0/K_L^0$. | | | |
| ² Measured using $B^0 \rightarrow J/\psi K_S^0, J/\psi K_L^0, D^-\pi^+, D^{*-}\pi^+, D^{*-}\rho^+, \text{ and } D^{*-}\ell^+\nu$ decays. | | | |
| ³ Measurement uses $B^0/\bar{B}^0 \rightarrow \ell^+X/\ell^-X$ decays. Assuming $\Delta\Gamma = 0$, the result becomes $\operatorname{Im}(z) = (-0.37 \pm 0.54) \times 10^{-2}$. | | | |
| ⁴ Corresponds to 90% confidence range [-0.028, 0.104]. | | | |
| ⁵ Measured using inclusive dilepton events from B^0 decay. | | | |

CP VIOLATION PARAMETERS **$\operatorname{Re}(\epsilon_{B^0})/(1+|\epsilon_{B^0}|^2)$**

CP impurity in B_d^0 system. It is obtained from either $a_{\ell\ell}$, the charge asymmetry in like-sign dilepton events or a_{CP} , the time-dependent asymmetry of inclusive B^0 and \bar{B}^0 decays.

"OUR EVALUATION" is an average obtained by the Heavy Flavor Averaging Group (HFLAV) and described at <https://hflav.web.cern.ch/>. It is the result of a fit to B_d and B_s CP asymmetries, which includes the B_d measurements listed below and the B_s measurements listed in the B_s section, taking into account correlations between those measurements.

| VALUE (units 10^{-3}) | DOCUMENT ID | TECN | COMMENT |
|---|--------------------------|----------|-----------------------------------|
| – 0.5 ± 0.4 | OUR EVALUATION | | |
| – 0.1 ± 0.4 | OUR AVERAGE | | |
| – 0.05 ± 0.48 ± 0.75 | ¹ AAIJ | 15F LHCb | $p\bar{p}$ at 7, 8 TeV |
| – 0.975 ± 0.875 ± 0.475 | ² LEES | 15A BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.55 ± 1.05 | ³ ABAZOV | 14 D0 | $p\bar{p}$ at 1.96 TeV |
| 0.15 ± 0.42 ^{+0.94} _{–0.81} | ⁴ LEES | 13N BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| – 1.7 ± 1.1 ± 0.4 | ⁵ ABAZOV | 12AC D0 | $p\bar{p}$ at 1.96 TeV |
| 0.4 ± 1.3 ± 0.9 | ⁶ AUBERT | 06T BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| – 0.3 ± 2.0 ± 2.1 | ⁷ NAKANO | 06 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 3.5 ± 10.3 ± 1.5 | ⁸ JAFFE | 01 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| – 0.3 ± 1.3 | ⁹ ABAZOV | 11U D0 | Repl. by ABAZOV 14 |
| – 2.3 ± 1.1 ± 0.8 | ¹⁰ ABAZOV | 06S D0 | Repl. by ABAZOV 11U |
| – 14.7 ± 6.7 ± 5.7 | ¹¹ AUBERT,B | 04C BABR | Repl. by AUBERT 06T |
| 1.2 ± 2.9 ± 3.6 | ² AUBERT | 02K BABR | Repl. by LEES 15A |
| – 3.2 ± 6.5 | ¹² BARATE | 01D ALEP | $e^+e^- \rightarrow Z$ |
| 4 ± 18 ± 3 | ¹³ BEHRENS | 00B CLE2 | Repl. by JAFFE 01 |
| 1.2 ± 13.8 ± 3.2 | ¹⁴ ABBIENDI | 99J OPAL | $e^+e^- \rightarrow Z$ |
| 2 ± 7 ± 3 | ¹⁵ ACKERSTAFF | 97U OPAL | $e^+e^- \rightarrow Z$ |
| < 45 | ¹⁶ BARTELT | 93 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AAIJ 15F uses semileptonic B^0 decays in the inclusive final states $D^- \mu^+$ and $D^{*-} \mu^+$, where the D^- meson decays into the $K^+ \pi^- \pi^-$ final state, and the D^{*-} meson into the $\bar{D}^0 (\rightarrow K^+ \pi^-) \pi^-$ final state. Reports $A_{SL}^d = (-0.02 \pm 0.19 \pm 0.30)\%$, which equals to $4\text{Re}(\epsilon_{B^0})/(1+|\epsilon_{B^0}|^2)$.

² Uses the charge asymmetry in like-sign dilepton events. LEES 15A reports $A_{SL}^d = (-3.9 \pm 3.5 \pm 1.9) \times 10^{-3}$.

³ ABAZOV 14 uses the dimuon charge asymmetry with different impact parameters from which it reports $A_{SL}^d = (-0.62 \pm 0.42) \times 10^{-2}$.

⁴ Uses $B^0 \rightarrow D^{*-} X \ell^+ \nu_\ell$ and a kaon-tagged sample which yields measurement of $A_{SL}^d = (0.06 \pm 0.17^{+0.38}_{-0.32})\%$, corresponding to $\Delta_{CP} = 1 - |q/p| = (0.29 \pm 0.84^{+1.88}_{-1.61}) \times 10^{-3}$.

⁵ ABAZOV 12AC uses $B^0 \rightarrow D^- \mu^+ X$ and $B^0 \rightarrow D^{*-} \mu^+ X$ decays without initial state flavor tagging which yields measurement of $A_{SL}^d = (6.8 \pm 4.5 \pm 1.4) \times 10^{-3}$.

⁶ AUBERT 06T reports $|q/p| - 1 = (-0.8 \pm 2.7 \pm 1.9) \times 10^{-3}$. We convert to $(1 - |q/p|^2)/4$.

⁷ Uses the charge asymmetry in like-sign dilepton events and reports $|q/p| = 1.0005 \pm 0.0040 \pm 0.0043$.

⁸ JAFFE 01 finds $a_{\ell\ell} = 0.013 \pm 0.050 \pm 0.005$ and combines with the previous BEHRENS 00B independent measurement.

⁹ ABAZOV 11U uses the dimuon charge asymmetry with different impact parameters from which it reports $A_{SL}^d = (-1.2 \pm 5.2) \times 10^{-3}$.

¹⁰ Uses the dimuon charge asymmetry.

¹¹ AUBERT 04C reports $|q/p| = 1.029 \pm 0.013 \pm 0.011$ and we converted it to $(1 - |q/p|^2)/4$.

¹² BARATE 01D measured by investigating time-dependent asymmetries in semileptonic and fully inclusive B_d^0 decays.

¹³ BEHRENS 00B uses high-momentum lepton tags and partially reconstructed $\bar{B}^0 \rightarrow D^{*+} \pi^-$, ρ^- decays to determine the flavor of the B meson.

- ¹⁴ Data analyzed using the time-dependent asymmetry of inclusive B^0 decay. The production flavor of B^0 mesons is determined using both the jet charge and the charge of secondary vertex in the opposite hemisphere.
- ¹⁵ ACKERSTAFF 97U assumes CPT and is based on measuring the charge asymmetry in a sample of B^0 decays defined by lepton and Q_{hem} tags. If CPT is not invoked, $\text{Re}(\epsilon_B) = -0.006 \pm 0.010 \pm 0.006$ is found. The indirect CPT violation parameter is determined to $\text{Im}(\delta B) = -0.020 \pm 0.016 \pm 0.006$.
- ¹⁶ BARTELT 93 finds $a_{\ell\ell} = 0.031 \pm 0.096 \pm 0.032$ which corresponds to $|a_{\ell\ell}| < 0.18$, which yields the above $|\text{Re}(\epsilon_{B^0})/(1+|\epsilon_{B^0}|^2)|$.

 $A_{T/CP}$ $A_{T/CP}$ is defined as

$$\frac{P(\bar{B}^0 \rightarrow B^0) - P(B^0 \rightarrow \bar{B}^0)}{P(\bar{B}^0 \rightarrow B^0) + P(B^0 \rightarrow \bar{B}^0)},$$

the CPT invariant asymmetry between the oscillation probabilities $P(\bar{B}^0 \rightarrow B^0)$ and $P(B^0 \rightarrow \bar{B}^0)$.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|---------------------|----------|-----------------------------------|
| 0.005±0.012±0.014 | ¹ AUBERT | 02K BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ AUBERT 02K uses the charge asymmetry in like-sign dilepton events. **$A_{CP}(B^0 \rightarrow D^*(2010)^+ D^-)$** A_{CP} is defined as

$$\frac{B(\bar{B}^0 \rightarrow \bar{f}) - B(B^0 \rightarrow f)}{B(\bar{B}^0 \rightarrow \bar{f}) + B(B^0 \rightarrow f)},$$

the CP -violation charge asymmetry of exclusive B^0 and \bar{B}^0 decay.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|---------------------|----------|-----------------------------------|
| 0.013±0.014 OUR AVERAGE | | | |
| 0.008±0.014±0.006 | AAIJ | 20L LHCB | pp at 7, 8, 13 TeV |
| 0.06 ±0.05 ±0.02 | ROHRKEN | 12 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.008±0.048±0.013 | AUBERT | 09C BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.07 ±0.08 ±0.04 | ¹ AUSHEV | 04 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|-------------------|----------|-----------|-----------------------|
| -0.12 ±0.06 ±0.02 | AUBERT | 07AI BABR | Repl. by AUBERT 09C |
| -0.03 ±0.10 ±0.02 | AUBERT,B | 06A BABR | Repl. by AUBERT 07AI |
| -0.03 ±0.11 ±0.05 | AUBERT | 03J BABR | Repl. by AUBERT,B 06B |

¹ Combines results from fully and partially reconstructed $B^0 \rightarrow D^{*\pm} D^\mp$ decays. **$A_{CP}(B^0 \rightarrow [K^+ K^-]_D K^*(892)^0)$**

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------|-------------|----------|----------------------|
| -0.05±0.10±0.01 | AAIJ | 19N LHCB | pp at 7, 8, 13 TeV |

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

| | | | |
|-----------------|------|-----------|--------------------|
| -0.20±0.15±0.02 | AAIJ | 14BN LHCB | Repl. by AAII 16S |
| -0.45±0.23±0.02 | AAIJ | 13L LHCB | Repl. by AAII 14BN |

 $A_{CP}(B^0 \rightarrow [K^+ \pi^-]_D K^*(892)^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|----------|----------------------|
| 0.047±0.027±0.010 | AAIJ | 19N LHCB | pp at 7, 8, 13 TeV |

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

−0.03 ±0.04 ±0.02 AAIJ 14BN LHCB Repl. by AAIJ 19N
 −0.08 ±0.08 ±0.01 AAIJ 13L LHCB Repl. by AAIJ 14BN

$A_{CP}(B^0 \rightarrow [K^+ \pi^- \pi^+ \pi^-]_D K^*(892)^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|----------|---------------------------|
| 0.037±0.032±0.010 | AAIJ | 19N LHCB | <i>pp</i> at 7, 8, 13 TeV |

$A_{CP}(B^0 \rightarrow [K^- \pi^+]_D K^*(892)^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-------------|----------|---------------------------|
| 0.19±0.19±0.01 | AAIJ | 19N LHCB | <i>pp</i> at 7, 8, 13 TeV |

$A_{CP}(B^0 \rightarrow [K^- \pi^+ \pi^+ \pi^-]_D K^*(892)^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------|-------------|----------|---------------------------|
| −0.01±0.24±0.01 | AAIJ | 19N LHCB | <i>pp</i> at 7, 8, 13 TeV |

$R_d^+ = \Gamma(B^0 \rightarrow [\pi^+ K^-]_D K^{*0}) / \Gamma(B^0 \rightarrow [\pi^- K^+]_D K^{*0})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|----------|---------------------------|
| 0.064±0.021±0.002 | AAIJ | 19N LHCB | <i>pp</i> at 7, 8, 13 TeV |

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

0.06 ±0.03 ±0.01 AAIJ 14BN LHCB Repl. by AAIJ 19N

$R_d^- = \Gamma(\bar{B}^0 \rightarrow [\pi^- K^+]_D K^{*0}) / \Gamma(\bar{B}^0 \rightarrow [\pi^+ K^-]_D K^{*0})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|----------|---------------------------|
| 0.095±0.021±0.003 | AAIJ | 19N LHCB | <i>pp</i> at 7, 8, 13 TeV |

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

0.06 ±0.03 ±0.01 AAIJ 14BN LHCB Repl. by AAIJ 19N

$A_{CP}(B^0 \rightarrow [\pi^+ \pi^-]_D K^*(892)^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------|-------------|----------|---------------------------|
| −0.18±0.14±0.01 | AAIJ | 19N LHCB | <i>pp</i> at 7, 8, 13 TeV |

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

−0.09±0.22±0.02 AAIJ 14BN LHCB Repl. by AAIJ 16S

$A_{CP}(B^0 \rightarrow [\pi^+ \pi^- \pi^+ \pi^-]_D K^*(892)^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------|-------------|----------|---------------------------|
| −0.03±0.15±0.01 | AAIJ | 19N LHCB | <i>pp</i> at 7, 8, 13 TeV |

$R_d^+ = \Gamma(B^0 \rightarrow [\pi^+ K^- \pi^+ \pi^-]_D K^{*0}) / \Gamma(B^0 \rightarrow [\pi^- K^+ \pi^+ \pi^-]_D K^{*0})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|----------|---------------------------|
| 0.074±0.026±0.002 | AAIJ | 19N LHCB | <i>pp</i> at 7, 8, 13 TeV |

$R_d^- = \Gamma(\bar{B}^0 \rightarrow [\pi^- K^+ \pi^+ \pi^-]_D K^{*0}) / \Gamma(\bar{B}^0 \rightarrow [\pi^+ K^- \pi^+ \pi^-]_D K^{*0})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------|----------|---------------------------|
| 0.072±0.025±0.003 | AAIJ | 19N LHCB | <i>pp</i> at 7, 8, 13 TeV |

$A_{CP}(B^0 \rightarrow K^+ \pi^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-----------------------|-------------|-----------------------------------|
| -0.0834 ± 0.0032 OUR AVERAGE | | | |
| $-0.0824 \pm 0.0033 \pm 0.0033$ | AAIJ | 21O LHCb | $p\bar{p}$ at 13 TeV |
| $-0.084 \pm 0.004 \pm 0.003$ | AAIJ | 18O LHCb | $p\bar{p}$ at 7, 8 TeV |
| $-0.083 \pm 0.013 \pm 0.004$ | AALTONEN | 14P CDF | $p\bar{p}$ at 1.96 TeV |
| $-0.069 \pm 0.014 \pm 0.007$ | DUH | 13 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $-0.107 \pm 0.016 \begin{smallmatrix} +0.006 \\ -0.004 \end{smallmatrix}$ | LEES | 13D BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| -0.04 ± 0.16 | ¹ CHEN | 00 CLE2 | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| $-0.080 \pm 0.007 \pm 0.003$ | AAIJ | 13AX LHCb | Repl. by AAIJ 18O |
| $-0.088 \pm 0.011 \pm 0.008$ | AAIJ | 12V LHCb | Repl. by AAIJ 13AX |
| $-0.086 \pm 0.023 \pm 0.009$ | AALTONEN | 11N CDF | Repl. by AALTONEN 14P |
| $-0.094 \pm 0.018 \pm 0.008$ | LIN | 08 BELL | Repl. by DUH 13 |
| $-0.107 \pm 0.018 \begin{smallmatrix} +0.007 \\ -0.004 \end{smallmatrix}$ | AUBERT | 07AF BABR | Repl. by LEES 13D |
| $-0.013 \pm 0.078 \pm 0.012$ | ABULENCIA,A | 06D CDF | Repl. by AALTONEN 11N |
| $-0.088 \pm 0.035 \pm 0.013$ | ² CHAO | 05A BELL | Repl. by CHAO 04B |
| $-0.133 \pm 0.030 \pm 0.009$ | ³ AUBERT,B | 04K BABR | Repl. by AUBERT 07AF |
| $-0.101 \pm 0.025 \pm 0.005$ | ⁴ CHAO | 04B BELL | Repl. by LIN 08 |
| $-0.07 \pm 0.08 \pm 0.02$ | ⁵ AUBERT | 02D BABR | Repl. by AUBERT 02Q |
| $-0.102 \pm 0.050 \pm 0.016$ | ⁶ AUBERT | 02Q BABR | Repl. by AUBERT,B 04K |
| $-0.06 \pm 0.09 \begin{smallmatrix} +0.01 \\ -0.02 \end{smallmatrix}$ | ⁷ CASEY | 02 BELL | Repl. by CHAO 04B |
| $0.044 \begin{smallmatrix} +0.186 \\ -0.167 \end{smallmatrix} \begin{smallmatrix} +0.018 \\ -0.021 \end{smallmatrix}$ | ⁸ ABE | 01K BELL | Repl. by CASEY 02 |
| $-0.19 \pm 0.10 \pm 0.03$ | ⁹ AUBERT | 01E BABR | Repl. by AUBERT 02Q |

¹ Corresponds to 90% confidence range $-0.30 < A_{CP} < 0.22$.² Corresponds to a 90% CL interval of $-0.15 < A_{CP} < -0.03$.³ Based on a total signal yield of $N(K^- \pi^+) + N(K^+ \pi^-) = 1606 \pm 51$ events.⁴ CHAO 04B reports significance of 3.9 standard deviation for deviation of A_{CP} from zero.⁵ Corresponds to 90% confidence range $-0.21 < A_{CP} < 0.07$.⁶ Corresponds to 90% confidence range $-0.188 < A_{CP} < -0.016$.⁷ Corresponds to 90% confidence range $-0.21 < A_{CP} < +0.09$.⁸ Corresponds to 90% confidence range $-0.25 < A_{CP} < 0.37$.⁹ Corresponds to 90% confidence range $-0.35 < A_{CP} < -0.03$. **$A_{CP}(B^0 \rightarrow \eta' K^*(892)^0)$**

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------|-------------|-----------------------------------|
| -0.07 ± 0.18 OUR AVERAGE | | | |
| $-0.22 \pm 0.29 \pm 0.07$ | SATO | 14 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $0.02 \pm 0.23 \pm 0.02$ | DEL-AMO-SA..10A | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| $0.08 \pm 0.25 \pm 0.02$ | ¹ AUBERT | 07E BABR | Repl. by DEL-AMO-SANCHEZ 10A |

¹ Reports A_{CP} with the opposite sign convention. **$A_{CP}(B^0 \rightarrow \eta' K_0^*(1430)^0)$**

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-----------------------------------|
| $-0.19 \pm 0.17 \pm 0.02$ | DEL-AMO-SA..10A | BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

$A_{CP}(B^0 \rightarrow \eta' K_2^*(1430)^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|------------------------------------|
| $0.14 \pm 0.18 \pm 0.02$ | DEL-AMO-SA..10A | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow \eta K^*(892)^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| 0.19 ± 0.05 OUR AVERAGE | | | |
| $0.17 \pm 0.08 \pm 0.01$ | WANG | 07B BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.21 \pm 0.06 \pm 0.02$ | AUBERT,B | 06H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.02 \pm 0.11 \pm 0.02$ | AUBERT,B | 04D BABR | Repl. by AUBERT,B 06H |

 $A_{CP}(B^0 \rightarrow \eta K_0^*(1430)^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|------------------------------------|
| $0.06 \pm 0.13 \pm 0.02$ | AUBERT,B | 06H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow \eta K_2^*(1430)^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| $-0.07 \pm 0.19 \pm 0.02$ | AUBERT,B | 06H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow b_1 K^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| $-0.07 \pm 0.12 \pm 0.02$ | AUBERT | 07BI BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow \omega K^{*0})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|------------------------------------|
| $0.45 \pm 0.25 \pm 0.02$ | AUBERT | 09H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow \omega(K\pi)_0^{*0})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| $-0.07 \pm 0.09 \pm 0.02$ | AUBERT | 09H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow \omega K_2^*(1430)^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| $-0.37 \pm 0.17 \pm 0.02$ | AUBERT | 09H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow K^+ \pi^- \pi^0)$

| <u>VALUE (units 10^{-2})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------|-------------|------------------------------------|
| 0 ± 6 OUR AVERAGE | | | |
| $-3.0^{+4.5}_{-5.1} \pm 5.5$ | ¹ AUBERT | 08AQ BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $7 \pm 11 \pm 1$ | ² CHANG | 04 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.² Corresponds to 90% confidence range $-0.12 < A^{CP} < 0.26$.

$A_{CP}(B^0 \rightarrow \rho^- K^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---|
| 0.20 ± 0.11 OUR AVERAGE | | | |
| $0.20 \pm 0.09 \pm 0.08$ | ¹ LEES | 11 | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.22^{+0.22+0.06}_{-0.23-0.02}$ | ² CHANG | 04 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|---------------------------------|---------------------|------|---------------------------|
| $0.11^{+0.14}_{-0.15} \pm 0.07$ | ¹ AUBERT | 08AQ | BABR Repl. by LEES 11 |
| $-0.28 \pm 0.17 \pm 0.08$ | ³ AUBERT | 03T | BABR Repl. by AUBERT 08AQ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

² Corresponds to 90% confidence range $-0.18 < A_{CP} < 0.64$.

³ The result reported corresponds to $-A_{CP}$.

 $A_{CP}(B^0 \rightarrow \rho(1450)^- K^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---|
| $-0.10 \pm 0.32 \pm 0.09$ | ¹ LEES | 11 | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

 $A_{CP}(B^0 \rightarrow \rho(1700)^- K^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---|
| $-0.36 \pm 0.57 \pm 0.23$ | ¹ LEES | 11 | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

 $A_{CP}(B^0 \rightarrow K^+ \pi^- \pi^0 \text{ nonresonant})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---|
| $0.10 \pm 0.16 \pm 0.08$ | ¹ LEES | 11 | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|----------------------------------|---------------------|------|-----------------------|
| $0.23^{+0.19+0.11}_{-0.27-0.10}$ | ¹ AUBERT | 08AQ | BABR Repl. by LEES 11 |
|----------------------------------|---------------------|------|-----------------------|

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays. The quoted value is only for the flat part of the non-resonant component.

 $A_{CP}(B^0 \rightarrow K^0 \pi^+ \pi^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------|-------------|---|
| $-0.01 \pm 0.05 \pm 0.01$ | ¹ AUBERT | 09AU | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used.

 $A_{CP}(B^0 \rightarrow K^*(892)^+ \pi^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|-------------------------|-------------|---|
| -0.27 ± 0.04 OUR AVERAGE | | | |
| $-0.308 \pm 0.060 \pm 0.016$ | ¹ AAIJ | 18F | LHCB pp at 7, 8 TeV |
| $-0.29 \pm 0.11 \pm 0.02$ | ² LEES | 11 | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.21 \pm 0.10 \pm 0.02$ | ^{3,4} AUBERT | 09AU | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.21 \pm 0.11 \pm 0.07$ | ⁵ DALSENO | 09 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.26^{+0.33+0.10}_{-0.34-0.08}$ | ⁶ EISENSTEIN | 03 | CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|----------------------------------|---------------------|-----------|----------------------|
| $-0.19^{+0.20}_{-0.15} \pm 0.04$ | ² AUBERT | 08AQ BABR | Repl. by LEES 11 |
| $-0.11 \pm 0.14 \pm 0.05$ | ³ AUBERT | 06i BABR | Repl. by AUBERT 09AU |
| $0.23 \pm 0.18^{+0.09}_{-0.06}$ | AUBERT,B | 04O BABR | Repl. by AUBERT 06i |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays.

² Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

³ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays.

⁴ The first of two equivalent solutions is used.

⁵ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two consistent solutions that may be preferred.

⁶ Corresponds to 90% confidence range $-0.31 < A_{CP} < 0.78$.

$A_{CP}(B^0 \rightarrow (K\pi)_0^{*+} \pi^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|---------|
| 0.02 ± 0.04 OUR AVERAGE | | | |

| | | | |
|------------------------------|---------------------|-----------|------------------------------------|
| $-0.032 \pm 0.047 \pm 0.031$ | ¹ AAIJ | 18F LHCB | pp at 7, 8 TeV |
| $0.07 \pm 0.14 \pm 0.01$ | ² LEES | 11 BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.09 \pm 0.07 \pm 0.03$ | ³ AUBERT | 09AU BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|---------------------------------|---------------------|-----------|------------------|
| $0.17^{+0.11}_{-0.16} \pm 0.22$ | ² AUBERT | 08AQ BABR | Repl. by LEES 11 |
|---------------------------------|---------------------|-----------|------------------|

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final states decays.

² Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

³ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used.

$A_{CP}(B^0 \rightarrow K_2^*(1430)^+ \pi^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|----------|------------------|
| $-0.29 \pm 0.22 \pm 0.09$ | ¹ AAIJ | 18F LHCB | pp at 7, 8 TeV |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays.

$A_{CP}(B^0 \rightarrow K^*(1680)^+ \pi^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|----------|------------------|
| $-0.07 \pm 0.13 \pm 0.04$ | ¹ AAIJ | 18F LHCB | pp at 7, 8 TeV |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays.

$A_{CP}(B^0 \rightarrow f_0(980) K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------------|----------|------------------|
| $0.28 \pm 0.27 \pm 0.15$ | ¹ AAIJ | 18F LHCB | pp at 7, 8 TeV |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ final state decays.

$A_{CP}(B^0 \rightarrow (K\pi)_0^{*0} \pi^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|---------|------------------------------------|
| $-0.15 \pm 0.10 \pm 0.04$ | ¹ LEES | 11 BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|----------------------------------|---------------------|-----------|------------------|
| $-0.22 \pm 0.12^{+0.30}_{-0.29}$ | ¹ AUBERT | 08AQ BABR | Repl. by LEES 11 |
|----------------------------------|---------------------|-----------|------------------|

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

$A_{CP}(B^0 \rightarrow K^{*0} \pi^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---------------------------------------|
| $-0.15 \pm 0.12 \pm 0.04$ | ¹ LEES | 11 | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|----------------------------------|---------------------|------|-----------------------|
| $-0.09^{+0.21}_{-0.24} \pm 0.09$ | ¹ AUBERT | 08AQ | BABR Repl. by LEES 11 |
|----------------------------------|---------------------|------|-----------------------|

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^+ \pi^- \pi^0$ decays.

 $A_{CP}(B^0 \rightarrow K^*(892)^0 \pi^+ \pi^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---------------------------------------|
| $0.07 \pm 0.04 \pm 0.03$ | AUBERT | 07AS | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

 $A_{CP}(B^0 \rightarrow K^*(892)^0 \rho^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---------------------------------------|
| $-0.06 \pm 0.09 \pm 0.02$ | LEES | 12K | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|--------------------------|----------|-----|------------------------|
| $0.09 \pm 0.19 \pm 0.02$ | AUBERT,B | 06G | BABR Repl. by LEES 12K |
|--------------------------|----------|-----|------------------------|

 $A_{CP}(B^0 \rightarrow K^{*0} f_0(980))$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---------------------------------------|
| $0.07 \pm 0.10 \pm 0.02$ | LEES | 12K | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

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

| | | | |
|---------------------------|----------|-----|------------------------|
| $-0.17 \pm 0.28 \pm 0.02$ | AUBERT,B | 06G | BABR Repl. by LEES 12K |
|---------------------------|----------|-----|------------------------|

 $A_{CP}(B^0 \rightarrow K^{*+} \rho^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---------------------------------------|
| $0.21 \pm 0.15 \pm 0.02$ | LEES | 12K | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

 $A_{CP}(B^0 \rightarrow K^*(892)^0 K^+ K^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---------------------------------------|
| $0.01 \pm 0.05 \pm 0.02$ | AUBERT | 07AS | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

 $A_{CP}(B^0 \rightarrow a_1^- K^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---------------------------------------|
| $-0.16 \pm 0.12 \pm 0.01$ | AUBERT | 08F | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

 $A_{CP}(B^0 \rightarrow K^0 K^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---------------------------------------|
| $-0.58^{+0.73}_{-0.66} \pm 0.04$ | LIN | 07 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |

 $A_{CP}(B^0 \rightarrow K^*(892)^0 \phi)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---------------------------------------|
| 0.00 ± 0.04 OUR AVERAGE | | | |
| $-0.007 \pm 0.048 \pm 0.021$ | PRIM | 13 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
| $0.01 \pm 0.06 \pm 0.03$ | AUBERT | 08BG | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|-------------------------------------|---------------------|-----|------|----------------------|
| $-0.03 \pm 0.07 \pm 0.03$ | AUBERT | 07D | BABR | Repl. by AUBERT 08BG |
| $0.02 \pm 0.09 \pm 0.02$ | ¹ CHEN | 05A | BELL | Repl. by PRIM 13 |
| $-0.01 \pm 0.09 \pm 0.02$ | AUBERT,B | 04W | BABR | Repl. by AUBERT 07D |
| $0.04 \pm 0.12 \pm 0.02$ | AUBERT | 03V | BABR | Repl. by AUBERT 04W |
| $0.07 \pm 0.15 \pm^{+0.05}_{-0.03}$ | ² CHEN | 03B | BELL | Repl. by CHEN 05A |
| $0.00 \pm 0.27 \pm 0.03$ | ³ AUBERT | 02E | BABR | Repl. by AUBERT 03V |

¹ Corresponds to 90% confidence range $-0.14 < A_{CP} < 0.17$.

² Corresponds to 90% confidence range $-0.18 < A_{CP} < 0.33$.

³ Corresponds to 90% confidence range $-0.44 < A_{CP} < 0.44$.

$A_{CP}(B^0 \rightarrow K^*(892)^0 K^- \pi^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---|
| $0.22 \pm 0.33 \pm 0.20$ | AUBERT | 07AS | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

$A_{CP}(B^0 \rightarrow \phi(K\pi)_0^{*0})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---|
| 0.12 ± 0.08 OUR AVERAGE | | | |
| $0.093 \pm 0.094 \pm 0.017$ | PRIM | 13 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.20 \pm 0.14 \pm 0.06$ | AUBERT | 08BG | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--------------------------|--------|-----|------|----------------------|
| $0.17 \pm 0.15 \pm 0.03$ | AUBERT | 07D | BABR | Repl. by AUBERT 08BG |
|--------------------------|--------|-----|------|----------------------|

$A_{CP}(B^0 \rightarrow \phi K_2^*(1430)^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---|
| -0.11 ± 0.10 OUR AVERAGE | | | |
| $-0.155 \pm^{+0.152}_{-0.133} \pm 0.033$ | PRIM | 13 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.08 \pm 0.12 \pm 0.05$ | AUBERT | 08BG | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---------------------------|--------|-----|------|----------------------|
| $-0.12 \pm 0.14 \pm 0.04$ | AUBERT | 07D | BABR | Repl. by AUBERT 08BG |
|---------------------------|--------|-----|------|----------------------|

$A_{CP}(B^0 \rightarrow K^*(892)^0 \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|------------------------|-------------|---|
| -0.006 ± 0.011 OUR AVERAGE | | | |
| $-0.013 \pm 0.017 \pm 0.004$ | ¹ HORIGUCHI | 17 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.008 \pm 0.017 \pm 0.009$ | AAIJ | 13 | LHCB pp at 7 TeV |
| $-0.016 \pm 0.022 \pm 0.007$ | AUBERT | 09A0 | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses $B(\Upsilon(4S) \rightarrow B^+ B^-) = (51.4 \pm 0.6)\%$ and $B(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = (48.6 \pm 0.6)\%$.

$A_{CP}(B^0 \rightarrow K_2^*(1430)^0 \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---|
| $-0.08 \pm 0.15 \pm 0.01$ | AUBERT,B | 04U | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

$A_{CP}(B^0 \rightarrow X_s \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-----------------------|-------------|---|
| $-0.0094 \pm 0.0174 \pm 0.0047$ | ¹ WATANUKI | 19 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Using a sum-of-exclusive technique with $m_{X_s} < 2.8 \text{ GeV}/c^2$.

$A_{CP}(B^0 \rightarrow \rho^+ \pi^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|-------------------------------------|-------------|------------------------------------|
| 0.13 ± 0.06 OUR AVERAGE | Error includes scale factor of 1.1. | | |
| $0.09^{+0.05}_{-0.06} \pm 0.04$ | ¹ LEES | 13J BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.21 \pm 0.08 \pm 0.04$ | ¹ KUSAKA | 07 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.03 \pm 0.07 \pm 0.04$ | AUBERT | 07AA BABR | Repl. by LEES 13J |
| $-0.02 \pm 0.16^{+0.05}_{-0.02}$ | WANG | 05 BELL | Repl. by KUSAKA 07 |
| $-0.18 \pm 0.08 \pm 0.03$ | AUBERT | 03T BABR | Repl. by AUBERT 07AA |
| ¹ Uses time-dependent Dalitz plot analysis of $B^0 \rightarrow \pi^+ \pi^- \pi^0$ decays. | | | |

 $A_{CP}(B^0 \rightarrow \rho^- \pi^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|---------------------|-------------|------------------------------------|
| -0.08 ± 0.08 OUR AVERAGE | | | |
| $-0.12 \pm 0.08^{+0.04}_{-0.05}$ | ¹ LEES | 13J BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.08 \pm 0.16 \pm 0.11$ | ¹ KUSAKA | 07 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.37 \pm 0.16^{+0.09}_{-0.10}$ | AUBERT | 07AA BABR | Repl. by LEES 13J |
| $-0.53 \pm 0.29^{+0.09}_{-0.04}$ | WANG | 05 BELL | Repl. by KUSAKA 07 |
| ¹ Uses time-dependent Dalitz plot analysis of $B^0 \rightarrow \pi^+ \pi^- \pi^0$ decays. | | | |

 $A_{CP}(B^0 \rightarrow a_1(1260)^\pm \pi^\mp)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|------------------------------------|
| -0.07 ± 0.06 OUR AVERAGE | | | |
| $-0.06 \pm 0.05 \pm 0.07$ | DALSENO | 12 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.07 \pm 0.07 \pm 0.02$ | AUBERT | 07O BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow b_1^- \pi^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| $-0.05 \pm 0.10 \pm 0.02$ | AUBERT | 07BI BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow \rho^0 K^*(892)^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| 0.05 ± 0.12 OUR AVERAGE | | | |
| $-0.08 \pm 0.20 \pm 0.02$ | CHEN | 08C BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.11 \pm 0.13 \pm 0.06$ | AUBERT | 07AV BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow \rho^0 \pi^+ \pi^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| 0.04 ± 0.07 OUR AVERAGE | | | |
| $0.10 \pm 0.10 \pm 0.02$ | AUBERT | 09AC BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.02 \pm 0.10 \pm 0.03$ | WANG | 07C BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow K^{*0} \ell^+ \ell^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|------------------------------------|
| -0.05 ± 0.10 OUR AVERAGE | | | |
| $0.02 \pm 0.20 \pm 0.02$ | AUBERT | 09T BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.08 \pm 0.12 \pm 0.02$ | WEI | 09A BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

$A_{CP}(B^0 \rightarrow K^{*0} e^+ e^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---|
| $-0.21 \pm 0.19 \pm 0.02$ | WEI | 09A | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $A_{CP}(B^0 \rightarrow K^{*0} \mu^+ \mu^-)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---|
| -0.034 ± 0.024 OUR AVERAGE | | | |
| $-0.035 \pm 0.024 \pm 0.003$ | AAIJ | 14AN | LHCB pp at 7, 8 TeV |
| $0.00 \pm 0.15 \pm 0.03$ | WEI | 09A | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.072 \pm 0.040 \pm 0.005$ | AAIJ | 13E | LHCB Repl. by AAIJ 14AN |

 $C_{D^{*(2010)^-} D^+}(B^0 \rightarrow D^{*(2010)^-} D^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|----------------------|-------------|---|
| -0.02 ± 0.08 OUR AVERAGE | | | |
| $-0.028 \pm 0.130 \pm 0.026$ | ¹ AAIJ | 20L | LHCB pp at 7, 8, 13 TeV |
| $-0.13 \pm 0.16 \pm 0.05$ | ² ROHRKEN | 12 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.00 \pm 0.17 \pm 0.03$ | AUBERT | 09C | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.23 \pm 0.25 \pm 0.06$ | ³ AUSHEV | 04 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.23 \pm 0.15 \pm 0.04$ | AUBERT | 07AI | BABR Repl. by AUBERT 09C |
| $0.17 \pm 0.24 \pm 0.04$ | AUBERT,B | 05Z | BABR Repl. by AUBERT 07AI |
| $-0.22 \pm 0.37 \pm 0.10$ | AUBERT | 03J | BABR Repl. by AUBERT,B 05Z |

¹ AAIJ 20L reports the measurements of $C = -0.059 \pm 0.092 \pm 0.020$ and $\Delta C = -0.031 \pm 0.092 \pm 0.016$ such that $C_{D^{*(2010)^-} D^+} = C - \Delta C$.

² ROHRKEN 12 reports the measurements of $C = -0.01 \pm 0.11 \pm 0.04$ and $\Delta C = 0.12 \pm 0.11 \pm 0.03$ such that $C_{D^{*(2010)^-} D^+} = C - \Delta C$.

³ Combines results from fully and partially reconstructed $B^0 \rightarrow D^{*\pm} D^\mp$ decays.

 $S_{D^{*(2010)^-} D^+}(B^0 \rightarrow D^{*(2010)^-} D^+)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|----------------------|-------------|---|
| -0.83 ± 0.09 OUR AVERAGE | | | |
| $-0.880 \pm 0.107 \pm 0.022$ | ¹ AAIJ | 20L | LHCB pp at 7, 8, 13 TeV |
| $-0.65 \pm 0.22 \pm 0.07$ | ² ROHRKEN | 12 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.73 \pm 0.23 \pm 0.050$ | AUBERT | 09C | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.96 \pm 0.43 \pm 0.12$ | ³ AUSHEV | 04 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.44 \pm 0.22 \pm 0.06$ | AUBERT | 07AI | BABR Repl. by AUBERT 09C |
| $-0.29 \pm 0.33 \pm 0.07$ | AUBERT,B | 05Z | BABR Repl. by AUBERT 07AI |
| $-0.24 \pm 0.69 \pm 0.12$ | AUBERT | 03J | BABR Repl. by AUBERT,B 05Z |

¹ AAIJ 20L reports the measurements of $S = -0.861 \pm 0.077 \pm 0.019$ and $\Delta S = 0.019 \pm 0.075 \pm 0.012$ such that $S_{D^{*(2010)^-} D^+} = S - \Delta S$.

² ROHRKEN 12 reports the measurements of $S = -0.78 \pm 0.15 \pm 0.05$ and $\Delta S = -0.13 \pm 0.15 \pm 0.04$ such that $S_{D^{*(2010)^+} D^-} = S - \Delta S$.

³ Combines results from fully and partially reconstructed $B^0 \rightarrow D^{*\pm} D^\mp$ decays.

$C_{D^*(2010)^+ D^-} (B^0 \rightarrow D^*(2010)^+ D^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------------------------|------|---|
| -0.03 ± 0.09 OUR AVERAGE | Error includes scale factor of 1.1. | | |
| -0.090 ± 0.130 ± 0.026 | ¹ AAIJ | 20L | LHCB pp at 7, 8, 13 TeV |
| 0.11 ± 0.14 ± 0.06 | ² ROHRKEN | 12 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.08 ± 0.17 ± 0.04 | AUBERT | 09C | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| -0.37 ± 0.22 ± 0.06 | ³ AUSHEV | 04 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 0.18 ± 0.15 ± 0.04 | AUBERT | 07Ai | BABR Repl. by AUBERT 09C |
| 0.09 ± 0.25 ± 0.06 | AUBERT,B | 05Z | BABR Repl. by AUBERT 07Ai |
| -0.47 ± 0.40 ± 0.12 | AUBERT | 03J | BABR Repl. by AUBERT,B 05Z |

¹ AAIJ 20L reports the measurements of $C = -0.059 \pm 0.092 \pm 0.020$ and $\Delta C = -0.031 \pm 0.092 \pm 0.016$ such that $C_{D^*(2010)^+ D^-} = C + \Delta C$.

² ROHRKEN 12 reports the measurements of $C = -0.01 \pm 0.11 \pm 0.04$ and $\Delta C = 0.12 \pm 0.11 \pm 0.03$ such that $C_{D^*(2010)^+ D^-} = C + \Delta C$.

³ Combines results from fully and partially reconstructed $B^0 \rightarrow D^{*\pm} D^\mp$ decays.

 $S_{D^*(2010)^+ D^-} (B^0 \rightarrow D^*(2010)^+ D^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|----------------------|------|---|
| -0.80 ± 0.09 OUR AVERAGE | | | |
| -0.842 ± 0.107 ± 0.022 | ¹ AAIJ | 20L | LHCB pp at 7, 8, 13 TeV |
| -0.90 ± 0.21 ± 0.07 | ² ROHRKEN | 12 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| -0.62 ± 0.21 ± 0.03 | AUBERT | 09C | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| -0.55 ± 0.39 ± 0.12 | ³ AUSHEV | 04 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| -0.79 ± 0.21 ± 0.06 | AUBERT | 07Ai | BABR Repl. by AUBERT 09C |
| -0.54 ± 0.35 ± 0.07 | AUBERT,B | 05Z | BABR Repl. by AUBERT 07Ai |
| -0.82 ± 0.75 ± 0.14 | AUBERT | 03J | BABR Repl. by AUBERT,B 05Z |

¹ AAIJ 20L reports the measurements of $S = -0.861 \pm 0.077 \pm 0.019$ and $\Delta S = 0.019 \pm 0.075 \pm 0.012$ such that $S_{D^*(2010)^+ D^-} = S + \Delta S$.

² ROHRKEN 12 reports the measurements of $S = -0.78 \pm 0.15 \pm 0.05$ and $\Delta S = -0.13 \pm 0.15 \pm 0.04$ such that $S_{D^*(2010)^+ D^-} = S + \Delta S$.

³ Combines results from fully and partially reconstructed $B^0 \rightarrow D^{*\pm} D^\mp$ decays.

 $C_{D^{*+} D^{*-}} (B^0 \rightarrow D^{*+} D^{*-})$

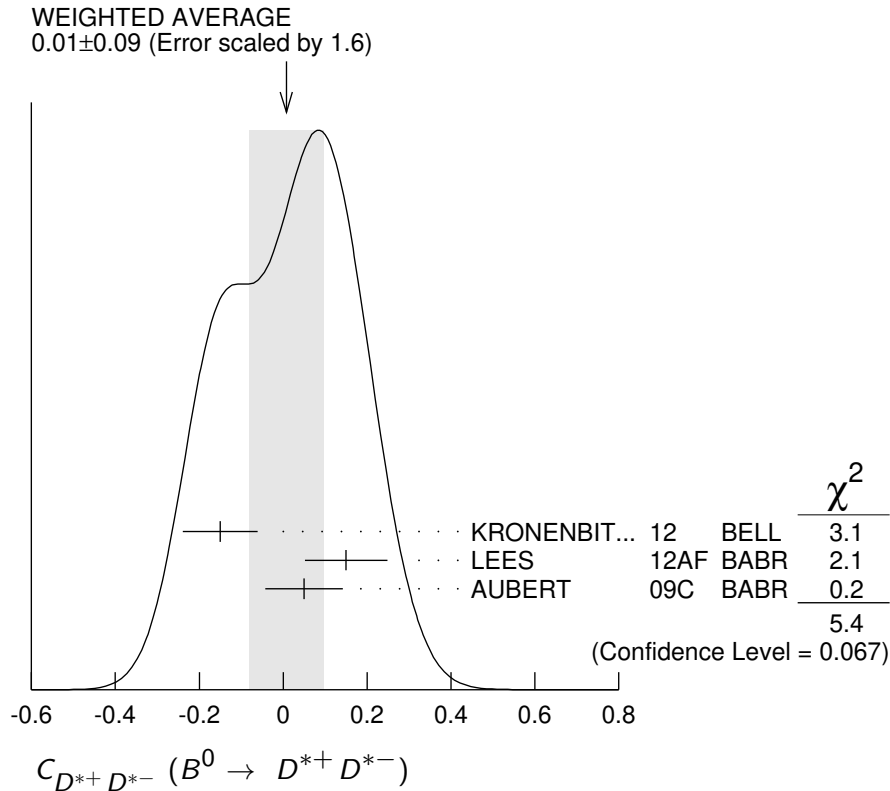
| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---|------|---|
| 0.01 ± 0.09 OUR AVERAGE | Error includes scale factor of 1.6. See the ideogram below. | | |
| -0.15 ± 0.08 ± 0.04 | ^{1,2} KRONENBIT...12 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| +0.15 ± 0.09 ± 0.04 | ³ LEES | 12AF | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.05 ± 0.09 ± 0.02 | AUBERT | 09C | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| -0.15 ± 0.13 ± 0.04 | ² VERVINK | 09 | BELL Repl. by KRONENBITTER 12 |
| -0.02 ± 0.11 ± 0.02 | ¹ AUBERT | 07BO | BABR Repl. by AUBERT 09C |
| 0.26 ± 0.26 ± 0.06 | ² MIYAKE | 05 | BELL Repl. by VERVINK 09 |
| 0.28 ± 0.23 ± 0.02 | ⁴ AUBERT | 03Q | BABR Repl. by AUBERT 07BO |

¹ Assumes both CP -even and CP -odd states having the CP asymmetry.

² Belle Collab. quotes $A_{D^{*+} D^{*-}}$ which is equal to $-C_{D^{*+} D^{*-}}$.

³ Measured partially reconstructed candidates when one D^0 meson is not explicitly reconstructed. Analysis does not separate CP -even and CP -odd component.

⁴ AUBERT 03Q reports $|\lambda|=0.75 \pm 0.19 \pm 0.02$ and $\text{Im}(\lambda)=0.05 \pm 0.29 \pm 0.10$. We convert them to S and C parameters taking into account correlations.



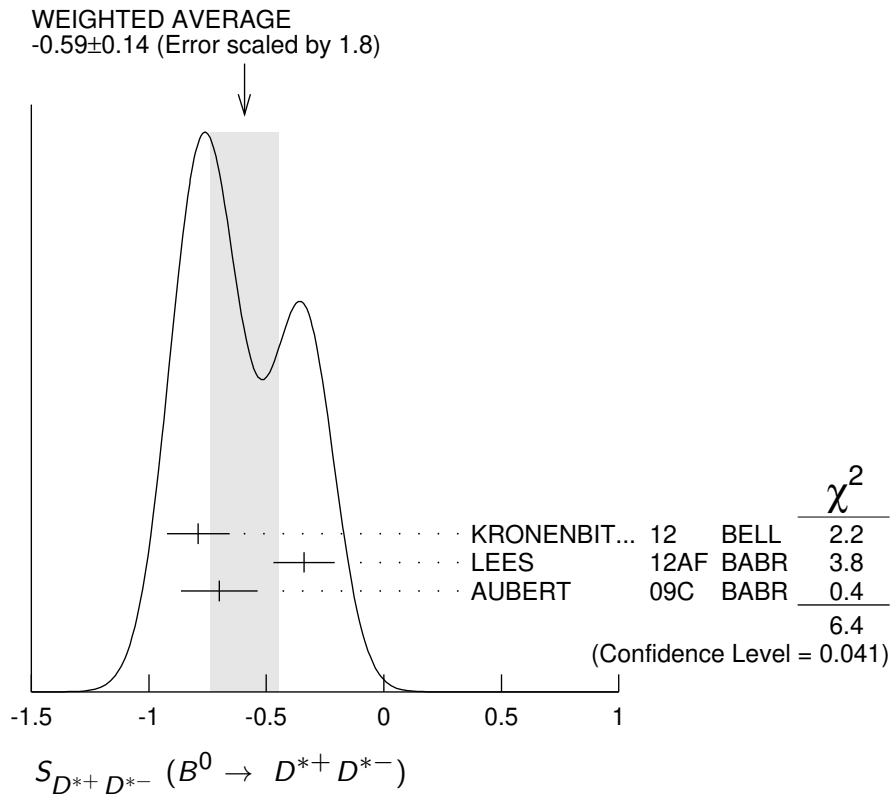
$S_{D^{*+}D^{*-}} (B^0 \rightarrow D^{*+}D^{*-})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---|-----------|-----------------------------------|
| -0.59 ± 0.14 OUR AVERAGE | Error includes scale factor of 1.8. See the ideogram below. | | |
| $-0.79 \pm 0.13 \pm 0.03$ | ¹ KRONENBIT...12 | BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $-0.34 \pm 0.12 \pm 0.05$ | ² LEES | 12AF BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $-0.70 \pm 0.16 \pm 0.03$ | ¹ AUBERT | 09C BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| $-0.96 \pm 0.25^{+0.13}_{-0.16}$ | VERVINK | 09 BELL | Repl. by KRONENBITTER 12 |
| $-0.66 \pm 0.19 \pm 0.04$ | ¹ AUBERT | 07B0 BABR | Repl. by AUBERT 09C |
| $-0.75 \pm 0.56 \pm 0.12$ | MIYAKE | 05 BELL | Repl. by VERVINK 09 |
| $0.06 \pm 0.37 \pm 0.13$ | ³ AUBERT | 03Q BABR | Repl. by AUBERT 07B0 |

¹ Assumes both CP -even and CP -odd states having the CP asymmetry.

² Measured partially reconstructed candidates when one D^0 meson is not explicitly reconstructed. Analysis does not separate CP -even and CP -odd component.

³ AUBERT 03Q reports $|\lambda|=0.75 \pm 0.19 \pm 0.02$ and $\text{Im}(\lambda)=0.05 \pm 0.29 \pm 0.10$. We convert them to S and C parameters taking into account correlations.



$C_+ (B^0 \rightarrow D^{*+}D^{*-})$

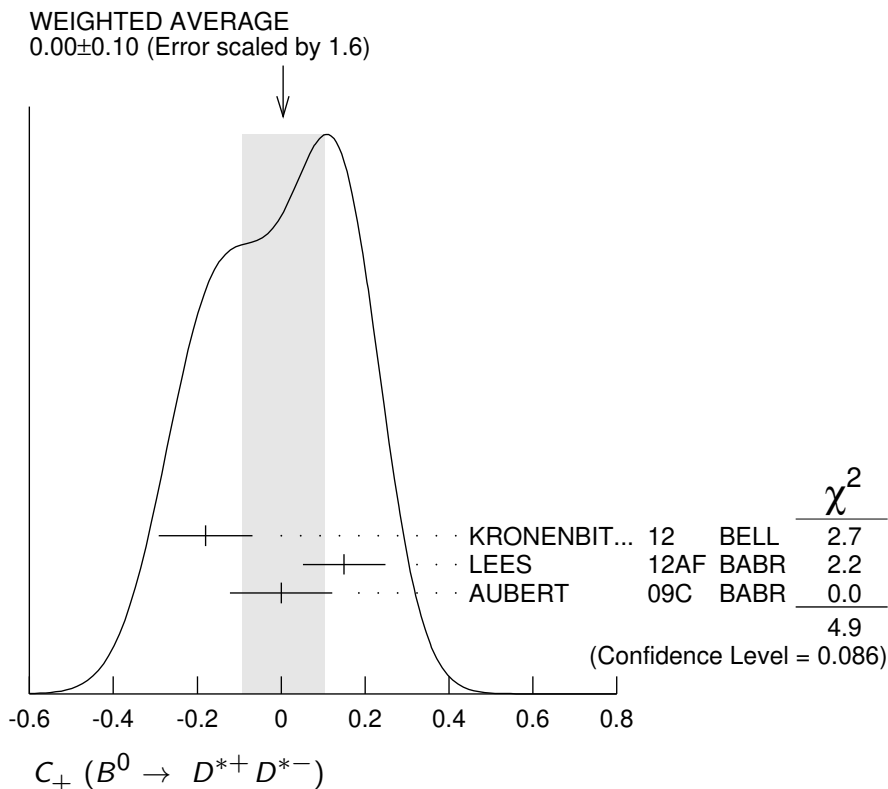
See the note in the $C_{\pi\pi}$ datablock, but for CP even final state.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---|-----------|-----------------------------------|
| 0.00 ± 0.10 OUR AVERAGE | Error includes scale factor of 1.6. See the ideogram below. | | |
| $-0.18 \pm 0.10 \pm 0.05$ | ¹ KRONENBIT... | 12 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $+0.15 \pm 0.09 \pm 0.04$ | ² LEES | 12AF BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $0.00 \pm 0.12 \pm 0.02$ | AUBERT | 09C BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| $-0.05 \pm 0.14 \pm 0.02$ | AUBERT | 07B0 BABR | Repl. by AUBERT 09C |
| $0.06 \pm 0.17 \pm 0.03$ | ³ AUBERT, BE | 05A BABR | Repl. by AUBERT 07B0 |

¹ Belle Collab. quotes $A_{D^{*+}D^{*-}}$ which is equal to $-C_{D^{*+}D^{*-}}$.

² Measured partially reconstructed candidates when one D^0 meson is not explicitly reconstructed. Extracted under assumption of equal C_+ and C_- .

³ AUBERT, BE 05A reports a CP -odd fraction $R_{\perp} = 0.125 \pm 0.044 \pm 0.007$.



$S_+ (B^0 \rightarrow D^{*+} D^{*-})$

See the note in the $S_{\pi\pi}$ datablock, but for CP even final state.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------------|-----------|------------------------------------|
| -0.73 ± 0.09 OUR AVERAGE | | | |
| $-0.81 \pm 0.13 \pm 0.03$ | KRONENBIT...12 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.49 \pm 0.18 \pm 0.08$ | ¹ LEES | 12AF BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.76 \pm 0.16 \pm 0.04$ | AUBERT | 09C BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.72 \pm 0.19 \pm 0.05$ | AUBERT | 07BO BABR | Repl. by AUBERT 09C |
| $-0.75 \pm 0.25 \pm 0.03$ | ² AUBERT, BE | 05A BABR | Repl. by AUBERT 07BO |

¹ Measured partially reconstructed candidates when one D^0 meson is not explicitly reconstructed. Analysis does not separate CP -even and CP -odd component. Value is obtained from $S = -0.34 \pm 0.12 \pm 0.05$ using $S = S_+ (1 - 2 R_\perp)$ with $R_\perp = 0.158 \pm 0.029$.

² AUBERT, BE 05A reports a CP -odd fraction $R_\perp = 0.125 \pm 0.044 \pm 0.007$.

$C_- (B^0 \rightarrow D^{*+} D^{*-})$

See the note in the $C_{\pi\pi}$ datablock, but for CP odd final state.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------------|-----------|------------------------------------|
| 0.19 ± 0.31 OUR AVERAGE | | | |
| $0.05 \pm 0.39 \pm 0.08$ | ¹ KRONENBIT...12 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.41 \pm 0.49 \pm 0.08$ | AUBERT | 09C BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.23 \pm 0.67 \pm 0.10$ | AUBERT | 07BO BABR | Repl. by AUBERT 09C |
| $-0.20 \pm 0.96 \pm 0.11$ | ² AUBERT, BE | 05A BABR | Repl. by AUBERT 07BO |

¹ Belle Collab. quotes $A_{D^{*+} D^{*-}}$ which is equal to $-C_{D^{*+} D^{*-}}$.

² AUBERT, BE 05A reports a CP -odd fraction $R_\perp = 0.125 \pm 0.044 \pm 0.007$.

$S_-(B^0 \rightarrow D^{*+} D^{*-})$ See the note in the $S_{\pi\pi}$ datablock, but for CP odd final state.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------------------------------|-----------|------------------------------------|
| 0.1 ± 1.6 OUR AVERAGE | Error includes scale factor of 3.5. | | |
| 1.52 ± 0.62 ± 0.12 | KRONENBIT...12 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| −1.80 ± 0.70 ± 0.16 | AUBERT | 09C BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| −1.83 ± 1.04 ± 0.23 | AUBERT | 07BO BABR | Repl. by AUBERT 09C |
| −1.75 ± 1.78 ± 0.22 | ¹ AUBERT, BE | 05A BABR | Repl. by AUBERT 07BO |
| ¹ AUBERT, BE 05A reports a CP -odd fraction $R_{\perp} = 0.125 \pm 0.044 \pm 0.007$. | | | |

 $C(B^0 \rightarrow D^{*(2010)+} D^{*(2010)-} K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|----------------------|---------|------------------------------------|
| 0.01 ± 0.28 ± 0.09 | ¹ DALSENO | 07 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ Reports value of A which is equal to $-C$. | | | |

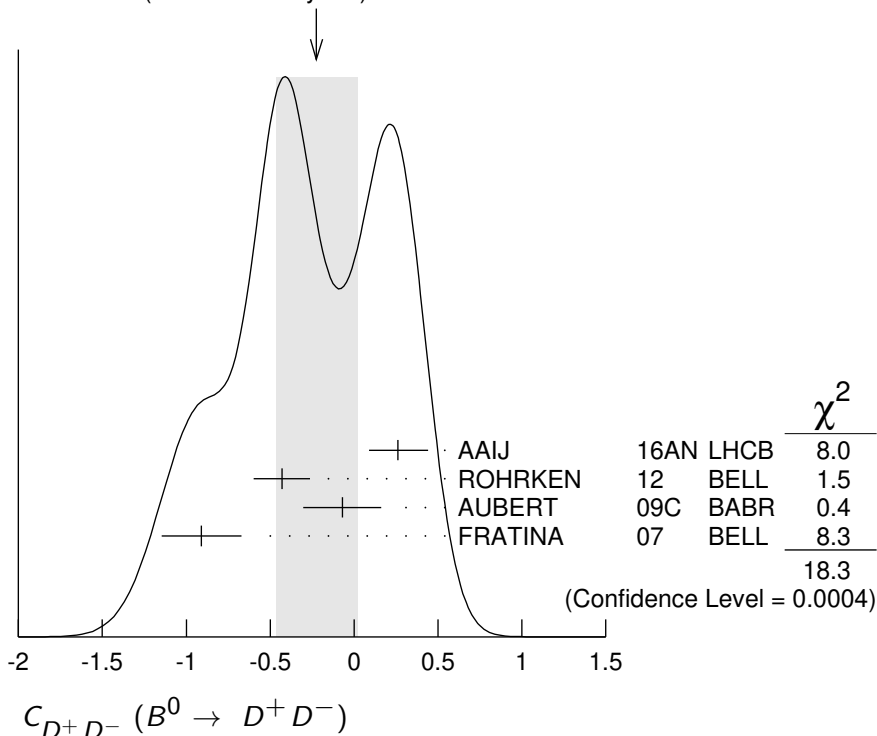
 $S(B^0 \rightarrow D^{*(2010)+} D^{*(2010)-} K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|----------------------|---------|------------------------------------|
| 0.06^{+0.45}_{−0.44} ± 0.06 | ¹ DALSENO | 07 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ¹ This value includes an unknown CP dilution factor D due to possible contributions from intermediate resonances and different partial waves. | | | |

 $C_{D^+ D^-}(B^0 \rightarrow D^+ D^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---|-----------|------------------------------------|
| −0.22 ± 0.24 OUR AVERAGE | Error includes scale factor of 2.5. See the ideogram below. | | |
| 0.26 ^{+0.18} _{−0.17} ± 0.02 | AAIJ | 16AN LHCB | pp at 7, 8 TeV |
| −0.43 ± 0.16 ± 0.05 | ROHRKEN | 12 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| −0.07 ± 0.23 ± 0.03 | AUBERT | 09C BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| −0.91 ± 0.23 ± 0.06 | ¹ FRATINA | 07 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 0.11 ± 0.22 ± 0.07 | AUBERT | 07AI BABR | Repl. by AUBERT 09C |
| 0.11 ± 0.35 ± 0.06 | AUBERT, B | 05Z BABR | Repl. by AUBERT 07AI |
| ¹ The paper reports A , which is equal to $-C$. | | | |

WEIGHTED AVERAGE
 -0.22 ± 0.24 (Error scaled by 2.5)



$S_{D^+ D^-} (B^0 \rightarrow D^+ D^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|-----------|-------------------------------------|
| $-0.76^{+0.15}_{-0.13}$ OUR AVERAGE | | | Error includes scale factor of 1.2. |
| $-0.54^{+0.17}_{-0.16} \pm 0.05$ | AAIJ | 16AN LHCb | pp at 7, 8 TeV |
| $-1.06^{+0.21}_{-0.14} \pm 0.08$ | ROHRKEN | 12 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| $-0.63 \pm 0.36 \pm 0.05$ | AUBERT | 09C BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| $-1.13 \pm 0.37 \pm 0.09$ | FRATINA | 07 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.54 \pm 0.34 \pm 0.06$ | AUBERT | 07AI BABR | Repl. by AUBERT 09C |
| $-0.29 \pm 0.63 \pm 0.06$ | AUBERT,B | 05Z BABR | Repl. by AUBERT 07AI |

$C_{J/\psi(1S)\pi^0} (B^0 \rightarrow J/\psi(1S)\pi^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|----------------------|-----------|-------------------------------------|
| 0.03 ± 0.17 OUR AVERAGE | | | Error includes scale factor of 1.5. |
| $0.15 \pm 0.14^{+0.04}_{-0.03}$ | ¹ PAL | 18 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| $-0.20 \pm 0.19 \pm 0.03$ | AUBERT | 08AU BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.08 \pm 0.16 \pm 0.05$ | ¹ LEE | 08A BELL | Repl. by PAL 18 |
| $-0.21 \pm 0.26 \pm 0.06$ | AUBERT,B | 06B BABR | Repl. by AUBERT 08AU |
| $0.01 \pm 0.29 \pm 0.03$ | ¹ KATAOKA | 04 BELL | Repl. by LEE 08A |
| $0.38 \pm 0.41 \pm 0.09$ | AUBERT | 03N BABR | Repl. by AUBERT,B 06B |
| ¹ BELLE Collab. quotes $A_{J/\psi \pi^0}$ which is equal to $-C_{J/\psi \pi^0}$. | | | |

$S_{J/\psi(1S)\pi^0} (B^0 \rightarrow J/\psi(1S)\pi^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|-----------|--|
| -0.88 ± 0.32 OUR AVERAGE | | | Error includes scale factor of 2.2. |
| $-0.59 \pm 0.19 \pm 0.03$ | PAL | 18 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| $-1.23 \pm 0.21 \pm 0.04$ | AUBERT | 08AU BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.65 \pm 0.21 \pm 0.05$ | LEE | 08A | BELL Repl. by PAL 18 |
| $-0.68 \pm 0.30 \pm 0.04$ | AUBERT,B | 06B BABR | Repl. by AUBERT 08AU |
| $-0.72 \pm 0.42 \pm 0.09$ | KATAOKA | 04 | BELL Repl. by LEE 08A |
| $0.05 \pm 0.49 \pm 0.16$ | AUBERT | 03N BABR | Repl. by AUBERT,B 06B |

 $C(B^0 \rightarrow J/\psi(1S)\rho^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------------|------|-----------------------|
| $-0.063 \pm 0.056^{+0.019}_{-0.014}$ | ¹ AAIJ | 15J | LHCB pp at 7, 8 TeV |

¹ Time-dependent CP violation is measured in the $B^0 \rightarrow J/\psi\rho^0$ and was used to limit the size of penguin amplitude contributions to ϕ_s in $B_s^0 \rightarrow J/\psi\phi$ decays to be between $[-1.05^\circ, 1.18^\circ]$ at 95% confidence level.

 $S(B^0 \rightarrow J/\psi(1S)\rho^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------|------|-----------------------|
| $-0.66^{+0.13+0.09}_{-0.12-0.03}$ | ¹ AAIJ | 15J | LHCB pp at 7, 8 TeV |

¹ Time-dependent CP violation is measured in the $B^0 \rightarrow J/\psi\rho^0$ and was used to limit the size of penguin amplitude contributions to ϕ_s in $B_s^0 \rightarrow J/\psi\phi$ decays to be between $[-1.05^\circ, 1.18^\circ]$ at 95% confidence level.

 $C_{D_{CP}^{(*)}h^0} (B^0 \rightarrow D_{CP}^{(*)}h^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|----------------------------|------|-----------------------------------|
| $-0.02 \pm 0.07 \pm 0.03$ | ¹ ABDESSALAM 15 | | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

$-0.23 \pm 0.16 \pm 0.04$ AUBERT 07AJ BABR Repl. by ABDESSALAM 15

¹ BABAR and BELLE combined analysis uses CP -eigenstate decay modes $D^0 \rightarrow K^+K^-$, $K_S^0\pi^0$, $K_S^0\omega$, and $h^0 = \pi^0, \eta, \omega$.

 $S_{D_{CP}^{(*)}h^0} (B^0 \rightarrow D_{CP}^{(*)}h^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|----------------------------|------|-----------------------------------|
| $-0.66 \pm 0.10 \pm 0.06$ | ¹ ABDESSALAM 15 | | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

$-0.56 \pm 0.23 \pm 0.05$ AUBERT 07AJ BABR Repl. by ABDESSALAM 15

¹ BABAR and BELLE combined analysis uses CP -eigenstate decay modes $D^0 \rightarrow K^+K^-$, $K_S^0\pi^0$, $K_S^0\omega$, and $h^0 = \pi^0, \eta, \omega$.

$C_{K^0\pi^0}(B^0 \rightarrow K^0\pi^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|-----------------------------------|
| 0.00±0.13 OUR AVERAGE | Error includes scale factor of 1.4. | | |
| −0.14±0.13±0.06 | ¹ FUJIKAWA | 10A BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.13±0.13±0.03 | AUBERT | 09I BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.24±0.15±0.03 | AUBERT | 08E BABR | Repl. by AUBERT 09I |
| 0.05±0.14±0.05 | ¹ CHAO | 07 BELL | Repl. by FUJIKAWA 10A |
| 0.06±0.18±0.03 | AUBERT | 05Y BABR | Repl. by AUBERT 08E |
| −0.16±0.29±0.05 | ^{1,2} CHAO | 05A BELL | Repl. by CHEN 05B |
| 0.11±0.20±0.09 | ¹ CHEN | 05B BELL | Repl. by CHAO 07 |
| −0.03±0.36±0.11 | ¹ AUBERT | 04M BABR | Repl. by AUBERT,B 04M |
| 0.40 ^{+0.27} _{−0.28} ±0.09 | ³ AUBERT,B | 04M BABR | Repl. by AUBERT 05Y |

¹ Reports A which is equal to $-C$.² Corresponds to a 90% CL interval of $-0.33 < A_{CP} < 0.64$.³ Based on a total signal yield of 122 ± 16 events. $S_{K^0\pi^0}(B^0 \rightarrow K^0\pi^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-----------------------|-------------|-----------------------------------|
| 0.58±0.17 OUR AVERAGE | | | |
| 0.67±0.31±0.08 | FUJIKAWA | 10A BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.55±0.20±0.03 | AUBERT | 09I BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.40±0.23±0.03 | AUBERT | 08E BABR | Repl. by AUBERT 09I |
| 0.33±0.35±0.08 | CHAO | 07 BELL | Repl. by FUJIKAWA 10A |
| 0.35 ^{+0.30} _{−0.33} ±0.04 | AUBERT | 05Y BABR | Repl. by AUBERT 08E |
| 0.32±0.61±0.13 | CHEN | 05B BELL | Repl. by CHAO 07 |
| 0.48 ^{+0.38} _{−0.47} ±0.06 | ¹ AUBERT,B | 04M BABR | Repl. by AUBERT 05Y |

¹ Based on a total signal yield of 122 ± 16 events. $C_{\eta'(958)K_S^0}(B^0 \rightarrow \eta'(958)K_S^0)$ See updated measurements in $C_{\eta'K^0}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|-----------------------------------|
| −0.04±0.20 OUR AVERAGE | Error includes scale factor of 2.5. | | |
| −0.21±0.10±0.02 | AUBERT | 05M BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.19±0.11±0.05 | ¹ CHEN | 05B BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| −0.26±0.22±0.03 | ¹ ABE | 03C BELL | Repl. by ABE 03H |
| 0.01±0.16±0.04 | ¹ ABE | 03H BELL | Repl. by CHEN 05B |
| 0.10±0.22±0.04 | AUBERT | 03W BABR | Repl. by AUBERT 05M |
| −0.13±0.32 ^{+0.06} _{−0.09} | ¹ CHEN | 02B BELL | Repl. by ABE 03C |

¹ BELLE Collab. quotes $A_{\eta'(958)K_S^0}$ which is equal to $-C_{\eta'(958)K_S^0}$.

$S_{\eta'(958)K_S^0} (B^0 \rightarrow \eta'(958)K_S^0)$ See updated measurements in $S_{\eta'K^0}$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|---------------------------------|
| 0.43±0.17 OUR AVERAGE | Error includes scale factor of 1.5. | | |
| 0.30±0.14±0.02 | AUBERT | 05M BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.65±0.18±0.04 | CHEN | 05B BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.71±0.37 ^{+0.05} _{-0.06} | ABE | 03C BELL | Repl. by ABE 03H |
| 0.43±0.27±0.05 | ABE | 03H BELL | Repl. by CHEN 05B |
| 0.02±0.34±0.03 | AUBERT | 03W BABR | Repl. by AUBERT 05M |
| 0.28±0.55 ^{+0.07} _{-0.08} | CHEN | 02B BELL | Repl. by ABE 03C |

 $C_{\eta'K^0} (B^0 \rightarrow \eta'K^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|----------------------|-------------|---------------------------------|
| -0.06±0.04 OUR AVERAGE | | | |
| -0.03±0.05±0.04 | ¹ SANTELJ | 14 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| -0.08±0.06±0.02 | AUBERT | 09I BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| -0.16±0.07±0.03 | ² AUBERT | 07A BABR | Repl. by AUBERT 09I |
| 0.01±0.07±0.05 | ^{1,2} CHEN | 07 BELL | Repl. by SANTELJ 14 |

¹ The paper reports A , which is equal to $-C$.² The mixing-induced CP violation is reported with a significance of more than 5 standard deviations in this $b \rightarrow s$ penguin dominated mode. $S_{\eta'K^0} (B^0 \rightarrow \eta'K^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------|-------------|---------------------------------|
| 0.63±0.06 OUR AVERAGE | | | |
| 0.68±0.07±0.03 | SANTELJ | 14 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.57±0.08±0.02 | AUBERT | 09I BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.58±0.10±0.03 | ¹ AUBERT | 07A BABR | Repl. by AUBERT 09I |
| 0.64±0.10±0.04 | ¹ CHEN | 07 BELL | Repl. by SANTELJ 14 |

¹ The mixing-induced CP violation is reported with a significance of more than 5 standard deviations in this $b \rightarrow s$ penguin dominated mode. $C_{\omega K_S^0} (B^0 \rightarrow \omega K_S^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|---------------------------------|
| 0.0 ±0.4 OUR AVERAGE | Error includes scale factor of 3.0. | | |
| 0.36±0.19±0.05 | ¹ CHOBANOVA | 14 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| -0.52 ^{+0.22} _{-0.20} ±0.03 | AUBERT | 09I BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.09±0.29±0.06 | ¹ CHAO | 07 BELL | Repl. by CHOBANOVA 14 |
| -0.55 ^{+0.28} _{-0.26} ±0.03 | AUBERT,B | 06E BABR | Repl. by AUBERT 09I |
| -0.27±0.48±0.15 | ¹ CHEN | 05B BELL | Repl. by CHAO 07 |

¹ Belle Collab. quotes $A_{\omega K_S^0}$ which is equal to $-C_{\omega K_S^0}$.

$S_{\omega K_S^0} (B^0 \rightarrow \omega K_S^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------------------|
| 0.70 ± 0.21 OUR AVERAGE | | | |
| $0.91 \pm 0.32 \pm 0.05$ | CHOBANOVA 14 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.55^{+0.26}_{-0.29} \pm 0.02$ | AUBERT 09I | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.11 \pm 0.46 \pm 0.07$ | CHAO 07 | BELL | Repl. by CHOBANOVA 14 |
| $0.51^{+0.35}_{-0.39} \pm 0.02$ | AUBERT,B 06E | BABR | Repl. by AUBERT 09I |
| $0.76 \pm 0.65^{+0.13}_{-0.16}$ | CHEN 05B | BELL | Repl. by CHAO 07 |

 $C (B^0 \rightarrow K_S^0 \pi^0 \pi^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|----------------------|-------------|------------------------------------|
| -0.21 ± 0.20 OUR AVERAGE | | | |
| $-0.28 \pm 0.21 \pm 0.04$ | ¹ YUSA 19 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.23 \pm 0.52 \pm 0.13$ | AUBERT 07AQ | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹Reports value of A which is equal to $-C$. $S (B^0 \rightarrow K_S^0 \pi^0 \pi^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|------------------------------------|
| $0.89^{+0.27}_{-0.30}$ OUR AVERAGE | | | |
| $0.92^{+0.27}_{-0.31} \pm 0.11$ | YUSA 19 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.72 \pm 0.71 \pm 0.08$ | AUBERT 07AQ | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $C_{\rho^0 K_S^0} (B^0 \rightarrow \rho^0 K_S^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|---------------------------|-------------|------------------------------------|
| -0.04 ± 0.20 OUR AVERAGE | | | |
| $-0.05 \pm 0.26 \pm 0.10$ | ¹ AUBERT 09AU | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.03^{+0.24}_{-0.23} \pm 0.15$ | ^{2,3} DALSENO 09 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

 $0.64 \pm 0.41 \pm 0.20$ AUBERT 07F BABR Repl. by AUBERT 09AU¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used.² Quotes $A_{\rho^0 (KS)^0}$ which is equal to $-C_{\rho^0 K_S^0}$.³ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two consistent solutions that may be preferred. $S_{\rho^0 K_S^0} (B^0 \rightarrow \rho^0 K_S^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------------|-------------|------------------------------------|
| $0.50^{+0.17}_{-0.21}$ OUR AVERAGE | | | |
| $0.35^{+0.26}_{-0.31} \pm 0.07$ | ¹ AUBERT 09AU | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.64^{+0.19}_{-0.25} \pm 0.13$ | ² DALSENO 09 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

0.20±0.52±0.24 AUBERT 07F BABR Repl. by AUBERT 09AU

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used.

² Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two consistent solutions that may be preferred.

$C_{f_0(980)K_S^0} (B^0 \rightarrow f_0(980)K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

0.29±0.20 OUR AVERAGE

0.28±0.24±0.09 ¹ LEES 12O BABR $e^+e^- \rightarrow \Upsilon(4S)$

0.30±0.29±0.14 ^{2,3} NAKAHAMA 10 BELL $e^+e^- \rightarrow \Upsilon(4S)$

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

0.08±0.19±0.05 ⁴ AUBERT 09AU BABR Repl. by LEES 12O

0.06±0.17±0.11 ^{2,5} DALSENO 09 BELL Repl. by NAKAHAMA 10

−0.41±0.23±0.07 ² AUBERT 07AX BABR Repl. by AUBERT 09AU

0.15±0.15±0.07 ² CHAO 07 BELL Repl. by DALSENO 09

0.39±0.27±0.09 ² CHEN 05B BELL Repl. by CHAO 07

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 K^+ K^-$ decay.

² Quotes $A_{f_0(980)K_S^0}$ which is equal to $-C_{f_0(980)K_S^0}$.

³ Uses Dalitz plot analysis of $B^0 \rightarrow K_S^0 K^+ K^-$ decays and the first of four consistent solutions that may be preferred.

⁴ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used.

⁵ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two consistent solutions that may be preferred.

$S_{f_0(980)K_S^0} (B^0 \rightarrow f_0(980)K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

−0.50±0.16 OUR AVERAGE

−0.55±0.18±0.12 ¹ LEES 12O BABR $e^+e^- \rightarrow \Upsilon(4S)$

−0.43^{+0.22}_{−0.20}±0.14 ² DALSENO 09 BELL $e^+e^- \rightarrow \Upsilon(4S)$

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

−0.96^{+0.21}_{−0.04}±0.04 ³ AUBERT 09AU BABR Repl. by LEES 12O

−0.25±0.26±0.10 ⁴ AUBERT 07AX BABR Repl. by AUBERT 09AU

0.18±0.23±0.11 CHAO 07 BELL Repl. by DALSENO 09

0.47±0.41±0.08 CHEN 05B BELL Repl. by CHAO 07

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 K^+ K^-$ decay.

² Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two consistent solutions that may be preferred.

³ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used.

⁴ Reports β_{eff} . We quote S obtained from epaps: E-PRLTAO-99-076741.

$S_{f_2(1270)K_S^0} (B^0 \rightarrow f_2(1270)K_S^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---------------------------|---------------------|-------------|---------------------------------|
| $-0.48 \pm 0.52 \pm 0.12$ | ¹ AUBERT | 09AU BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0\pi^+\pi^-$ decays and the first of two equivalent solutions is used.

 $C_{f_2(1270)K_S^0} (B^0 \rightarrow f_2(1270)K_S^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---------------------------------|---------------------|-------------|---------------------------------|
| $0.28^{+0.35}_{-0.40} \pm 0.11$ | ¹ AUBERT | 09AU BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0\pi^+\pi^-$ decays and the first of two equivalent solutions is used.

 $S_{f_x(1300)K_S^0} (B^0 \rightarrow f_x(1300)K_S^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---------------------------|---------------------|-------------|---------------------------------|
| $-0.20 \pm 0.52 \pm 0.10$ | ¹ AUBERT | 09AU BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0\pi^+\pi^-$ decays and the first of two equivalent solutions is used.

 $C_{f_x(1300)K_S^0} (B^0 \rightarrow f_x(1300)K_S^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---------------------------------|---------------------|-------------|---------------------------------|
| $0.13^{+0.33}_{-0.35} \pm 0.10$ | ¹ AUBERT | 09AU BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0\pi^+\pi^-$ decays and the first of two equivalent solutions is used.

 $S_{K^0\pi^+\pi^-} (B^0 \rightarrow K^0\pi^+\pi^- \text{ nonresonant})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---------------------------|---------------------|-------------|---------------------------------|
| $-0.01 \pm 0.31 \pm 0.10$ | ¹ AUBERT | 09AU BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0\pi^+\pi^-$ decays and the first of two equivalent solutions is used.

 $C_{K^0\pi^+\pi^-} (B^0 \rightarrow K^0\pi^+\pi^- \text{ nonresonant})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------------------|---------------------|-------------|---------------------------------|
| $0.01 \pm 0.25 \pm 0.08$ | ¹ AUBERT | 09AU BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0\pi^+\pi^-$ decays and the first of two equivalent solutions is used.

 $C_{K_S^0 K_S^0} (B^0 \rightarrow K_S^0 K_S^0)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|---------------------------------|
| 0.0 ± 0.4 OUR AVERAGE | Error includes scale factor of 1.4. | | |
| $0.38 \pm 0.38 \pm 0.05$ | ¹ NAKAHAMA | 08 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| $-0.40 \pm 0.41 \pm 0.06$ | AUBERT, BE | 06C BABR | $e^+e^- \rightarrow \gamma(4S)$ |

¹ Reports $A_{K_S^0 K_S^0}$ which equals to $-C_{K_S^0 K_S^0}$.

$S_{K_S^0 K_S^0} (B^0 \rightarrow K_S^0 K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|---------------|------|------------------------------------|
| -0.8 ± 0.5 OUR AVERAGE | | | |
| $-0.38^{+0.69}_{-0.77} \pm 0.09$ | NAKAHAMA 08 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-1.28^{+0.80+0.11}_{-0.73-0.16}$ | AUBERT,BE 06c | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $C_{K^+ K^- K_S^0} (B^0 \rightarrow K^+ K^- K_S^0 \text{ nonresonant})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|----------------------------|------|------------------------------------|
| 0.06 ± 0.08 OUR AVERAGE | | | |
| $0.02 \pm 0.09 \pm 0.03$ | ^{1,2} LEES 120 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.14 \pm 0.11 \pm 0.09$ | ^{3,4} NAKAHAMA 10 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.054 \pm 0.102 \pm 0.060$ | ^{3,5} AUBERT 07AX | BABR | Repl. by LEES 120 |
| $0.09 \pm 0.10 \pm 0.05$ | ^{3,5} CHAO 07 | BELL | Repl. by NAKAHAMA 10 |
| $0.10 \pm 0.14 \pm 0.04$ | ⁵ AUBERT 05T | BABR | Repl. by AUBERT 07AX |
| $0.09 \pm 0.12 \pm 0.07$ | ³ CHEN 05B | BELL | Repl. by CHAO 07 |
| $-0.10 \pm 0.19 \pm 0.10$ | ⁵ AUBERT,B 04V | BABR | Repl. by AUBERT 05T |
| $0.40 \pm 0.33^{+0.28}_{-0.10}$ | ³ ABE 03C | BELL | Repl. by ABE 03H |
| $0.17 \pm 0.16 \pm 0.04$ | ^{3,5} ABE 03H | BELL | Repl. by CHEN 05B |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 K^+ K^-$ decay.

² This measurement is performed on all the isobar components, excluding ϕK_S^0 and $f_0(980) K_S^0$.

³ Quotes $A_{K^+ K^- K_S^0}$ which is equal to $-C_{K^+ K^- K_S^0}$.

⁴ Uses Dalitz plot analysis of $B^0 \rightarrow K_S^0 K^+ K^-$ decays and the first of four consistent solutions that may be preferred.

⁵ Excludes the events from $B^0 \rightarrow \phi K_S^0$ decay. The results are derived from a combined sample of $K^+ K^- K_S^0$ and $K^+ K^- K_L^0$ decays.

 $S_{K^+ K^- K_S^0} (B^0 \rightarrow K^+ K^- K_S^0 \text{ nonresonant})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------------|------|------------------------------------|
| -0.66 ± 0.11 OUR AVERAGE | | | |
| $-0.65 \pm 0.12 \pm 0.03$ | ^{1,2} LEES 120 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.68 \pm 0.15^{+0.21}_{-0.13}$ | ³ CHAO 07 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.764 \pm 0.111^{+0.071}_{-0.040}$ | ^{3,4} AUBERT 07AX | BABR | Repl. by LEES 120 |
| $-0.42 \pm 0.17 \pm 0.03$ | ^{3,5} AUBERT 05T | BABR | Repl. by AUBERT 07AX |
| $-0.49 \pm 0.18 \pm 0.04$ | CHEN 05B | BELL | Repl. by CHAO 07 |
| $-0.56 \pm 0.25 \pm 0.04$ | ^{3,6} AUBERT,B 04V | BABR | Repl. by AUBERT 05T |
| $-0.49 \pm 0.43 \pm 0.11$ | ABE 03C | BELL | Repl. by ABE 03H |
| $-0.51 \pm 0.26 \pm 0.05$ | ^{3,7} ABE 03H | BELL | Repl. by CHEN 05B |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 K^+ K^-$ decay.

² This measurement is performed on all the isobar components, excluding ϕK_S^0 and $f_0(980) K_S^0$. Note that the nonresonant component is not a CP eigenstate.

³ Excludes events from $B^0 \rightarrow \phi K_S^0$ decay. The results are derived from a combined sample of $K^+ K^- K_S^0$ and $K^+ K^- K_L^0$ decays.

⁴ Reports β_{eff} . We quote S obtained from epaps: E-PRLTAO-99-076741.

⁵ The measured CP -even final states fraction is $0.89 \pm 0.08 \pm 0.06$.

⁶ The measured CP -even final states fraction is $0.98 \pm 0.15 \pm 0.04$.

⁷ The measured CP -even final states fraction is $1.03 \pm 0.15 \pm 0.05$.

$C_{K^+ K^- K_S^0} (B^0 \rightarrow K^+ K^- K_S^0 \text{ inclusive})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------|-----------|----------------------------------|
| 0.015 ± 0.077 ± 0.053 | 1,2 AUBERT | 07AX BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Measured using full Dalitz plot fit including ϕ component.

² The results are derived from a combined sample of $K^+ K^- K_S^0$ and $K^+ K^- K_L^0$ decays.

$S_{K^+ K^- K_S^0} (B^0 \rightarrow K^+ K^- K_S^0 \text{ inclusive})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|---------------------|-----------|----------------------------------|
| -0.647 ± 0.116 ± 0.040 | ¹ AUBERT | 07AX BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Measured using full Dalitz plot fit including ϕ component.

$C_{\phi K_S^0} (B^0 \rightarrow \phi K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|------|---------|
| 0.01 ± 0.14 OUR AVERAGE | | | |

0.05 ± 0.18 ± 0.05 ¹ LEES 120 BABR $e^+ e^- \rightarrow \gamma(4S)$

-0.04 ± 0.20 ± 0.10 ^{2,3} NAKAHAMA 10 BELL $e^+ e^- \rightarrow \gamma(4S)$

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

0.08 ± 0.18 ± 0.04 ^{2,4} AUBERT 07AX BABR Repl. by LEES 120

-0.07 ± 0.15 ± 0.05 ^{2,4} CHEN 07 BELL Repl. by NAKAHAMA 10

0.00 ± 0.23 ± 0.05 ⁴ AUBERT 05T BABR Repl. by AUBERT 07AX

-0.08 ± 0.22 ± 0.09 ^{2,4} CHEN 05B BELL Repl. by CHEN 07

0.01 ± 0.33 ± 0.10 ⁴ AUBERT,B 04G BABR Repl. by AUBERT 05T

0.56 ± 0.41 ± 0.16 ² ABE 03C BELL Repl. by ABE 03H

0.15 ± 0.29 ± 0.07 ² ABE 03H BELL Repl. by CHEN 05B

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 K^+ K^-$ decay.

² Quotes $A_{\phi K_S^0}$ which is equal to $-C_{\phi K_S^0}$.

³ Uses Dalitz plot analysis of $B^0 \rightarrow K_S^0 K^+ K^-$ decays and the first of four consistent solutions that may be preferred.

⁴ Result combines B -meson final states ϕK_S^0 and ϕK_L^0 by assuming $S_{\phi K_S^0} = -S_{\phi K_L^0}$

$S_{\phi K_S^0} (B^0 \rightarrow \phi K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|------|---------|
| 0.59 ± 0.14 OUR AVERAGE | | | |

0.66 ± 0.17 ± 0.07 ¹ LEES 120 BABR $e^+ e^- \rightarrow \gamma(4S)$

0.50 ± 0.21 ± 0.06 ² CHEN 07 BELL $e^+ e^- \rightarrow \gamma(4S)$

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

0.21 ± 0.26 ± 0.11 ^{2,3} AUBERT 07AX BABR Repl. by LEES 120

0.50 ± 0.25 ^{+0.07} _{-0.04} ² AUBERT 05T BABR Repl. by AUBERT 07AX

| | | | | |
|----------------------------------|-----------------------|-----|------|---------------------|
| $0.08 \pm 0.33 \pm 0.09$ | ² CHEN | 05B | BELL | Repl. by CHEN 07 |
| $0.47 \pm 0.34^{+0.08}_{-0.06}$ | ² AUBERT,B | 04G | BABR | Repl. by AUBERT 05T |
| $-0.73 \pm 0.64 \pm 0.22$ | ABE | 03C | BELL | Repl. by ABE 03H |
| $-0.96 \pm 0.50^{+0.09}_{-0.11}$ | ABE | 03H | BELL | Repl. by CHEN 05B |

¹ Uses Dalitz plot analysis of the $B^0 \rightarrow K_S^0 K^+ K^-$ decay.

² Result combines B -meson final states ϕK_S^0 and ϕK_L^0 by assuming $S_{\phi K_S^0} = -S_{\phi K_L^0}$

³ Reports β_{eff} . We quote S obtained from epaps: E-PRLTAO-99-076741.

$C_{K_S K_S K_S}(B^0 \rightarrow K_S K_S K_S)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|------|---|
| -0.14 ± 0.12 OUR AVERAGE | | | |
| $-0.12 \pm 0.16 \pm 0.05$ | ¹ KANG | 21 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.17 \pm 0.18 \pm 0.04$ | LEES | 12I | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.02 \pm 0.21 \pm 0.05$ | AUBERT | 07AT | BABR Repl. by LEES 12I |
| $-0.31 \pm 0.20 \pm 0.07$ | ¹ CHEN | 07 | BELL Repl. by KANG 21 |
| $-0.34^{+0.28}_{-0.25} \pm 0.05$ | AUBERT,B | 05 | BABR Repl. by AUBERT 07AT |
| $-0.54 \pm 0.34 \pm 0.09$ | ¹ SUMISAWA | 05 | BELL Repl. by CHEN 07 |

¹ KANG 21 quotes $A_{K_S^0 K_S^0 K_S^0}$ which is equal to $-C_{K_S^0 K_S^0 K_S^0}$.

$S_{K_S K_S K_S}(B^0 \rightarrow K_S K_S K_S)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|---|
| -0.82 ± 0.17 OUR AVERAGE | | | |
| $-0.71 \pm 0.23 \pm 0.05$ | KANG | 21 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.94^{+0.24}_{-0.21} \pm 0.06$ | LEES | 12I | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $-0.71 \pm 0.24 \pm 0.04$ | AUBERT | 07AT | BABR Repl. by LEES 12I |
| $0.30 \pm 0.32 \pm 0.08$ | CHEN | 07 | BELL Repl. by KANG 21 |
| $-0.71^{+0.38}_{-0.32} \pm 0.04$ | AUBERT,B | 05 | BABR Repl. by AUBERT 07AT |
| $1.26 \pm 0.68 \pm 0.20$ | SUMISAWA | 05 | BELL Repl. by CHEN 07. |

$C_{K_S^0 \pi^0 \gamma}(B^0 \rightarrow K_S^0 \pi^0 \gamma)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------------|------|---|
| $0.36 \pm 0.33 \pm 0.04$ | ¹ AUBERT | 08BA | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.20 \pm 0.20 \pm 0.06$ | ^{2,3} USHIRODA | 06 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-1.0 \pm 0.5 \pm 0.2$ | ¹ AUBERT,B | 05P | BABR Repl. by AUBERT 08BA |
| $-0.03 \pm 0.34 \pm 0.11$ | ³ USHIRODA | 05 | BELL Repl. by USHIRODA 06 |

¹ Requires $1.1 < M_{K_S^0 \pi^0} < 1.8$ GeV/c².

² Requires $M_{K_S^0 \pi^0} < 1.8$ GeV/c².

³ Reports $A_{K_S^0 \pi^0 \gamma}$, which is $-C_{K_S^0 \pi^0 \gamma}$.

$S_{K_S^0 \pi^0 \gamma}(B^0 \rightarrow K_S^0 \pi^0 \gamma)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----------------------|-----------|------------------------------------|
| $-0.78 \pm 0.59 \pm 0.09$ | ¹ AUBERT | 08BA BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.10 \pm 0.31 \pm 0.07$ | ² USHIRODA | 06 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.9 \pm 1.0 \pm 0.2$ | ¹ AUBERT,B | 05P BABR | Repl. by AUBERT 08BA |
| $-0.58^{+0.46}_{-0.38} \pm 0.11$ | USHIRODA | 05 BELL | Repl. by USHIRODA 06 |

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

¹ Requires $1.1 < M_{K_S^0 \pi^0} < 1.8 \text{ GeV}/c^2$.

² Requires $M_{K_S^0 \pi^0} < 1.8 \text{ GeV}/c^2$.

 $C_{K_S^0 \pi^+ \pi^- \gamma}(B^0 \rightarrow K_S^0 \pi^+ \pi^- \gamma)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|----------------------------------|-----------------------------|------|------------------------------------|
| $-0.39 \pm 0.20^{+0.03}_{-0.02}$ | ¹ DEL-AMO-SA..16 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Requires $M_{K \pi \pi} < 1.8 \text{ GeV}/c^2$, $0.6 \text{ GeV}/c^2 < m_{\pi^+ \pi^-} < 0.9 \text{ GeV}/c^2$, $m_{K \pi} < 0.845 \text{ GeV}/c^2$ or $m_{K \pi} > 0.945 \text{ GeV}/c^2$.

 $S_{K_S^0 \pi^+ \pi^- \gamma}(B^0 \rightarrow K_S^0 \pi^+ \pi^- \gamma)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-----------------------------|------|------------------------------------|
| $0.14 \pm 0.25 \pm 0.03$ | ¹ DEL-AMO-SA..16 | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Requires $M_{K \pi \pi} < 1.8 \text{ GeV}/c^2$, $0.6 \text{ GeV}/c^2 < m_{\pi^+ \pi^-} < 0.9 \text{ GeV}/c^2$, $m_{K \pi} < 0.845 \text{ GeV}/c^2$ or $m_{K \pi} > 0.945 \text{ GeV}/c^2$.

 $C_{K^*(892)^0 \gamma}(B^0 \rightarrow K^*(892)^0 \gamma)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------------------------------------|-------------------------------------|-----------|------------------------------------|
| -0.04 ± 0.16 OUR AVERAGE | Error includes scale factor of 1.2. | | |
| $-0.14 \pm 0.16 \pm 0.03$ | ¹ AUBERT | 08BA BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.20 \pm 0.24 \pm 0.05$ | ^{1,2} USHIRODA | 06 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|---------------------------|-----------------------|----------|-----------------------|
| $-0.40 \pm 0.23 \pm 0.03$ | AUBERT,B | 05P BABR | Repl. by AUBERT 08BA |
| $-0.57 \pm 0.32 \pm 0.09$ | ³ AUBERT,B | 04Z BABR | Repl. by AUBERT,B 05P |

¹ Requires $0.8 < M_{K_S^0 \pi^0} < 1.0 \text{ GeV}/c^2$.

² Reports value of A which is equal to $-C$.

³ Based on a total signal of 105 ± 14 events with $K^*(892)^0 \rightarrow K_S^0 \pi^0$ only.

 $S_{K^*(892)^0 \gamma}(B^0 \rightarrow K^*(892)^0 \gamma)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------------------------------------|-----------------------|-----------|------------------------------------|
| -0.15 ± 0.22 OUR AVERAGE | | | |
| $-0.03 \pm 0.29 \pm 0.03$ | ¹ AUBERT | 08BA BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.32^{+0.36}_{-0.33} \pm 0.05$ | ¹ USHIRODA | 06 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|----------------------------------|-----------------------|-----|------|-----------------------|
| $-0.21 \pm 0.40 \pm 0.05$ | AUBERT,B | 05P | BABR | Repl. by AUBERT 08BA |
| $-0.79^{+0.63}_{-0.50} \pm 0.10$ | ² USHIRODA | 05 | BELL | Repl. by USHIRODA 06 |
| $0.25 \pm 0.63 \pm 0.14$ | ³ AUBERT,B | 04Z | BABR | Repl. by AUBERT,B 05P |

¹ Requires $0.8 < M_{K_S^0 \pi^0} < 1.0 \text{ GeV}/c^2$.

² Assumes $C(B^0 \rightarrow K^*(892)^0 \gamma) = 0$.

³ Based on a total signal of 105 ± 14 events with $K^*(892)^0 \rightarrow K_S^0 \pi^0$ only.

$C_{\eta K^0 \gamma} (B^0 \rightarrow \eta K^0 \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|---------------------------------------|
| 0.1 ± 0.4 OUR AVERAGE | Error includes scale factor of 1.4. | | |
| $0.48 \pm 0.41 \pm 0.07$ | ^{1,2} NAKANO | 18 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
| $-0.32^{+0.40}_{-0.39} \pm 0.07$ | ³ AUBERT | 09 | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assuming $m_{\eta K_S^0} < 2.1 \text{ GeV}$.

² Reversed the sign for C=-A.

³ Assuming $m_{\eta K} < 3.25 \text{ GeV}$.

$S_{\eta K^0 \gamma} (B^0 \rightarrow \eta K^0 \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|-------------------------------------|-------------|---------------------------------------|
| -0.5 ± 0.5 OUR AVERAGE | Error includes scale factor of 1.2. | | |
| $-1.32 \pm 0.77 \pm 0.36$ | ¹ NAKANO | 18 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
| $-0.18^{+0.49}_{-0.46} \pm 0.12$ | ² AUBERT | 09 | BABR $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Assuming $m_{\eta K_S^0} < 2.1 \text{ GeV}$.

² Assuming $m_{\eta K} < 3.25 \text{ GeV}$.

$C_{K^0 \phi \gamma} (B^0 \rightarrow K^0 \phi \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---------------------------------------|
| $-0.35 \pm 0.58^{+0.10}_{-0.23}$ | ¹ SAHOO | 11A | BELL $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Reports value of A, which is equal to $-C$.

$S_{K^0 \phi \gamma} (B^0 \rightarrow K^0 \phi \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|---------------------------------------|
| $0.74^{+0.72+0.10}_{-1.05-0.24}$ | SAHOO | 11A | BELL $e^+ e^- \rightarrow \gamma(4S)$ |

$C(B^0 \rightarrow K_S^0 \rho^0 \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---------------------------------------|
| $-0.05 \pm 0.18 \pm 0.06$ | ^{1,2} LI | 08F | BELL $e^+ e^- \rightarrow \gamma(4S)$ |

¹ Requires $M_{K_S^0 \pi^+ \pi^-} < 1.8 \text{ GeV}/c^2$ and $0.6 < M_{\pi^+ \pi^-} < 0.9 \text{ GeV}/c^2$.

² Reports value of A_{eff} which is equal to $-C$, and includes the non-resonant $\pi^+ \pi^-$ contribution in the ρ^0 region.

$S(B^0 \rightarrow K_S^0 \rho^0 \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|----------------|
|--------------|--------------------|-------------|----------------|

-0.04 ± 0.23 OUR AVERAGE

| | | | |
|--|-----------------------------|------|----------------------------------|
| -0.18 ± 0.32 ^{+0.06} _{-0.05} | ¹ DEL-AMO-SA..16 | BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
|--|-----------------------------|------|----------------------------------|

| | | | |
|---|-----------------|----------|----------------------------------|
| 0.11 ± 0.33 ^{+0.05} _{-0.09} | ² LI | 08F BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
|---|-----------------|----------|----------------------------------|

¹ Requires $M_{K\pi\pi} < 1.8 \text{ GeV}/c^2$, $0.6 \text{ GeV}/c^2 < m_{\pi^+\pi^-} < 0.9 \text{ GeV}/c^2$, $m_{K\pi} < 0.845 \text{ GeV}/c^2$ or $m_{K\pi} > 0.945 \text{ GeV}/c^2$.

² Requires $M_{K\pi\pi} < 1.8 \text{ GeV}/c^2$.

 $C(B^0 \rightarrow \rho^0 \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|----------------|
|--------------|--------------------|-------------|----------------|

| | | | |
|---------------------------|-----------------------|---------|----------------------------------|
| 0.44 ± 0.49 ± 0.14 | ¹ USHIRODA | 08 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
|---------------------------|-----------------------|---------|----------------------------------|

¹ Reports value of A which is equal to $-C$.

 $S(B^0 \rightarrow \rho^0 \gamma)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|----------------|
|--------------|--------------------|-------------|----------------|

| | | | |
|----------------------------|----------|---------|----------------------------------|
| -0.83 ± 0.65 ± 0.18 | USHIRODA | 08 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
|----------------------------|----------|---------|----------------------------------|

 $C_{\pi\pi}(B^0 \rightarrow \pi^+ \pi^-)$

$C_{\pi\pi}$ is defined as $(1-|\lambda|^2)/(1+|\lambda|^2)$, where the quantity $\lambda = q/p \bar{A}_f/A_f$ is a phase convention independent observable quantity for the final state f . For details, see the review on "CP Violation" in the Reviews section.

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|----------------|
|--------------|--------------------|-------------|----------------|

-0.314 ± 0.030 OUR AVERAGE

| | | | |
|------------------------|------|----------|----------------|
| -0.311 ± 0.045 ± 0.015 | AAIJ | 210 LHCb | pp at 13 TeV |
|------------------------|------|----------|----------------|

| | | | |
|---------------------|------|----------|------------------|
| -0.34 ± 0.06 ± 0.01 | AAIJ | 180 LHCb | pp at 7, 8 TeV |
|---------------------|------|----------|------------------|

| | | | |
|---------------------|----------------------|---------|----------------------------------|
| -0.33 ± 0.06 ± 0.03 | ¹ DALSENO | 13 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
|---------------------|----------------------|---------|----------------------------------|

| | | | |
|---------------------|------|----------|----------------------------------|
| -0.25 ± 0.08 ± 0.02 | LEES | 13D BABR | $e^+ e^- \rightarrow \gamma(4S)$ |
|---------------------|------|----------|----------------------------------|

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

| | | | |
|---------------------|------|-----------|-------------------|
| -0.38 ± 0.15 ± 0.02 | AAIJ | 13B0 LHCb | Repl. by AAIJ 180 |
|---------------------|------|-----------|-------------------|

| | | | |
|---------------------|--------|-----------|-------------------|
| -0.21 ± 0.09 ± 0.02 | AUBERT | 07AF BABR | Repl. by LEES 13D |
|---------------------|--------|-----------|-------------------|

| | | | |
|---------------------|---------------------|---------|---------------------|
| -0.55 ± 0.08 ± 0.05 | ¹ ISHINO | 07 BELL | Repl. by DALSENO 13 |
|---------------------|---------------------|---------|---------------------|

| | | | |
|---------------------|------------------|----------|--------------------|
| -0.56 ± 0.12 ± 0.06 | ¹ ABE | 05D BELL | Repl. by ISHINO 07 |
|---------------------|------------------|----------|--------------------|

| | | | |
|---------------------|------------|---------|----------------------|
| -0.09 ± 0.15 ± 0.04 | AUBERT, BE | 05 BABR | Repl. by AUBERT 07AF |
|---------------------|------------|---------|----------------------|

| | | | |
|---------------------|------------------|----------|------------------|
| -0.58 ± 0.15 ± 0.07 | ¹ ABE | 04E BELL | Repl. by ABE 05D |
|---------------------|------------------|----------|------------------|

| | | | |
|---------------------|------------------|----------|-------------------|
| -0.77 ± 0.27 ± 0.08 | ¹ ABE | 03G BELL | Repl. by ABE 04E. |
|---------------------|------------------|----------|-------------------|

| | | | |
|--|------------------|----------|------------------|
| -0.94 ^{+0.31} _{-0.25} ± 0.09 | ¹ ABE | 02M BELL | Repl. by ABE 03G |
|--|------------------|----------|------------------|

| | | | |
|--|---------------------|----------|---------------------|
| -0.25 ^{+0.45} _{-0.47} ± 0.14 | ² AUBERT | 02D BABR | Repl. by AUBERT 02Q |
|--|---------------------|----------|---------------------|

| | | | |
|---------------------|---------------------|----------|------------------------|
| -0.30 ± 0.25 ± 0.04 | ³ AUBERT | 02Q BABR | Repl. by AUBERT, BE 05 |
|---------------------|---------------------|----------|------------------------|

¹ Paper reports $A_{\pi\pi}$ which equals to $-C_{\pi\pi}$.

² Corresponds to 90% confidence range $-1.0 < C_{\pi\pi} < 0.47$.

³ Corresponds to 90% confidence range $-0.72 < C_{\pi\pi} < 0.12$.

$S_{\pi\pi}(B^0 \rightarrow \pi^+\pi^-)$ $S_{\pi\pi} = 2\text{Im}\lambda/(1+|\lambda|^2)$, see the note in the $C_{\pi\pi}$ datablock above.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|----------------------|------|--|
| -0.670±0.030 OUR AVERAGE | | | |
| -0.706±0.042±0.013 | AAIJ | 210 | LHCB pp at 13 TeV |
| -0.63 ±0.05 ±0.01 | AAIJ | 180 | LHCB pp at 7, 8 TeV |
| -0.64 ±0.08 ±0.03 | ¹ DALSENO | 13 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| -0.68 ±0.10 ±0.03 | LEES | 13D | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| -0.71 ±0.13 ±0.02 | AAIJ | 13B0 | LHCB Repl. by AAIJ 180 |
| -0.60 ±0.11 ±0.03 | AUBERT | 07AF | BABR Repl. by LEES 13D |
| -0.61 ±0.10 ±0.04 | ISHINO | 07 | BELL Repl. by DALSENO 13 |
| -0.67 ±0.16 ±0.06 | ² ABE | 05D | BELL Repl. by ISHINO 07 |
| -0.30 ±0.17 ±0.03 | AUBERT,BE | 05 | BABR Repl. by AUBERT 07AF |
| -1.00 ±0.21 ±0.07 | ³ ABE | 04E | BELL Repl. by ABE 05D |
| -1.23 ±0.41 $\begin{smallmatrix} +0.08 \\ -0.07 \end{smallmatrix}$ | ABE | 03G | BELL Repl. by ABE 04E. |
| -1.21 $\begin{smallmatrix} +0.38 \\ -0.27 \end{smallmatrix}$ $\begin{smallmatrix} +0.16 \\ -0.13 \end{smallmatrix}$ | ABE | 02M | BELL Repl. by ABE 03G |
| 0.03 $\begin{smallmatrix} +0.52 \\ -0.56 \end{smallmatrix}$ ±0.11 | ⁴ AUBERT | 02D | BABR Repl. by AUBERT 02Q |
| 0.02 ±0.34 ±0.05 | ⁵ AUBERT | 02Q | BABR Repl. by AUBERT,BE 05 |

¹ An isospin analysis using other BELLE measurements, disfavors the region of $23.8^\circ < \phi_2 < 66.8^\circ$ at 68% CL.² Rule out the CP -conserving case, $C_{\pi\pi} = S_{\pi\pi} = 0$, at the 5.4 sigma level.³ Rule out the CP -conserving case, $C_{\pi\pi} = S_{\pi\pi} = 0$, at the 5.2 sigma level.⁴ Corresponds to 90% confidence range $-0.89 < S_{\pi\pi} < 0.85$.⁵ Corresponds to 90% confidence range $-0.54 < S_{\pi\pi} < 0.58$. $C_{\pi^0\pi^0}(B^0 \rightarrow \pi^0\pi^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|------|--|
| -0.33±0.22 OUR AVERAGE | | | |
| -0.14±0.36±0.10 | ¹ JULIUS | 17 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
| -0.43±0.26±0.05 | LEES | 13D | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| -0.49±0.35±0.05 | AUBERT | 07BC | BABR Repl. by LEES 13D |
| -0.12±0.56±0.06 | ² AUBERT | 05L | BABR Repl. by AUBERT 07BC |
| -0.44 $\begin{smallmatrix} +0.52 \\ -0.53 \end{smallmatrix}$ ±0.17 | ¹ CHAO | 05 | BELL Repl. by JULIUS 17 |

¹ BELLE Collab. quotes $A_{\pi^0\pi^0}$ which is equal to $-C_{\pi^0\pi^0}$.² Corresponds to a 90% CL interval of $-0.88 < A_{CP} < 0.64$. $C_{\rho\pi}(B^0 \rightarrow \rho^+\pi^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|---------------------|------|--|
| -0.03 ±0.07 OUR AVERAGE | | | |
| 0.016±0.059±0.036 | ¹ LEES | 13J | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
| -0.13 ±0.09 ±0.05 | ¹ KUSAKA | 07 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |

Error includes scale factor of 1.2.

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

| | | | | |
|--|--------|------|------|----------------------|
| $0.15 \pm 0.09 \pm 0.05$ | AUBERT | 07AA | BABR | Repl. by LEES 13J |
| $0.25 \pm 0.17 \begin{smallmatrix} +0.02 \\ -0.06 \end{smallmatrix}$ | WANG | 05 | BELL | Repl. by KUSAKA 07 |
| $0.36 \pm 0.18 \pm 0.04$ | AUBERT | 03T | BABR | Repl. by AUBERT 07AA |

¹ Uses time-dependent Dalitz plot analysis of $B^0 \rightarrow \pi^+ \pi^- \pi^0$ decays.

$S_{\rho\pi}(B^0 \rightarrow \rho^+ \pi^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|------|---|
| 0.05 ± 0.07 OUR AVERAGE | | | |
| $0.053 \pm 0.081 \pm 0.034$ | ¹ LEES | 13J | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.06 \pm 0.13 \pm 0.05$ | ¹ KUSAKA | 07 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---|--------|------|------|----------------------|
| $-0.03 \pm 0.11 \pm 0.04$ | AUBERT | 07AA | BABR | Repl. by LEES 13J |
| $-0.28 \pm 0.23 \begin{smallmatrix} +0.10 \\ -0.08 \end{smallmatrix}$ | WANG | 05 | BELL | Repl. by KUSAKA 07 |
| $0.19 \pm 0.24 \pm 0.03$ | AUBERT | 03T | BABR | Repl. by AUBERT 07AA |

¹ Uses time-dependent Dalitz plot analysis of $B^0 \rightarrow \pi^+ \pi^- \pi^0$ decays.

$\Delta C_{\rho\pi}(B^0 \rightarrow \rho^+ \pi^-)$

$\Delta C_{\rho\pi}$ describes the asymmetry between the rates $\Gamma(B^0 \rightarrow \rho^+ \pi^-) + \Gamma(\bar{B}^0 \rightarrow \rho^- \pi^+)$ and $\Gamma(B^0 \rightarrow \rho^- \pi^+) + \Gamma(\bar{B}^0 \rightarrow \rho^+ \pi^-)$.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|------|---|
| 0.27 ± 0.06 OUR AVERAGE | | | |
| $0.234 \pm 0.061 \pm 0.048$ | ¹ LEES | 13J | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $0.36 \pm 0.10 \pm 0.05$ | ¹ KUSAKA | 07 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|--|--------|------|------|----------------------|
| $0.39 \pm 0.09 \pm 0.09$ | AUBERT | 07AA | BABR | Repl. by LEES 13J |
| $0.38 \pm 0.18 \begin{smallmatrix} +0.02 \\ -0.04 \end{smallmatrix}$ | WANG | 05 | BELL | Repl. by KUSAKA 07 |
| $0.28 \begin{smallmatrix} +0.18 \\ -0.19 \end{smallmatrix} \pm 0.04$ | AUBERT | 03T | BABR | Repl. by AUBERT 07AA |

¹ Uses time-dependent Dalitz plot analysis of $B^0 \rightarrow \pi^+ \pi^- \pi^0$ decays.

$\Delta S_{\rho\pi}(B^0 \rightarrow \rho^+ \pi^-)$

$\Delta S_{\rho\pi}$ is related to the strong phase difference between the amplitudes contributing to $B^0 \rightarrow \rho^+ \pi^-$.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|------|---|
| 0.01 ± 0.08 OUR AVERAGE | | | |
| $0.054 \pm 0.082 \pm 0.039$ | ¹ LEES | 13J | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-0.08 \pm 0.13 \pm 0.05$ | ¹ KUSAKA | 07 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | | |
|---------------------------|--------|------|------|----------------------|
| $-0.01 \pm 0.14 \pm 0.06$ | AUBERT | 07AA | BABR | Repl. by LEES 13J |
| $-0.30 \pm 0.24 \pm 0.09$ | WANG | 05 | BELL | Repl. by KUSAKA 07 |
| $0.15 \pm 0.25 \pm 0.03$ | AUBERT | 03T | BABR | Repl. by AUBERT 07AA |

¹ Uses time-dependent Dalitz plot analysis of $B^0 \rightarrow \pi^+ \pi^- \pi^0$ decays.

$C_{\rho^0\pi^0}(B^0 \rightarrow \rho^0\pi^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-----------------------|-----------|---------------------------------|
| 0.27±0.24 OUR AVERAGE | | | |
| 0.19±0.23±0.15 | ¹ LEES | 13J BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.49±0.36±0.28 | ^{1,2} KUSAKA | 07 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| -0.10±0.40±0.53 | AUBERT | 07AA BABR | Repl. by LEES 13J |
| 0.53 ^{+0.67+0.10} _{-0.84-0.15} | ² DRAGIC | 06 BELL | Repl. by KUSAKA 07 |
| ¹ Uses time-dependent Dalitz plot analysis of $B^0 \rightarrow \pi^+\pi^-\pi^0$ decays. | | | |
| ² Quotes $A_{\rho^0\pi^0}$ which is equal to $-C_{\rho^0\pi^0}$. | | | |

 $S_{\rho^0\pi^0}(B^0 \rightarrow \rho^0\pi^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|---------------------|-----------|---------------------------------|
| -0.23±0.34 OUR AVERAGE | | | |
| -0.37±0.34±0.20 | ¹ LEES | 13J BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.17±0.57±0.35 | ¹ KUSAKA | 07 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 0.04±0.44±0.18 | AUBERT | 07AA BABR | Repl. by LEES 13J |
| ¹ Uses time-dependent Dalitz plot analysis of $B^0 \rightarrow \pi^+\pi^-\pi^0$ decays. | | | |

 $C_{a_1\pi}(B^0 \rightarrow a_1(1260)^+\pi^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|-------------|----------|---------------------------------|
| -0.05±0.11 OUR AVERAGE | | | |
| -0.01±0.11±0.09 | DALSENO | 12 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| -0.10±0.15±0.09 | AUBERT | 07O BABR | $e^+e^- \rightarrow \gamma(4S)$ |

 $S_{a_1\pi}(B^0 \rightarrow a_1(1260)^+\pi^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------|----------|---------------------------------|
| -0.2 ±0.4 OUR AVERAGE Error includes scale factor of 3.2. | | | |
| -0.51±0.14±0.08 | DALSENO | 12 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.37±0.21±0.07 | AUBERT | 07O BABR | $e^+e^- \rightarrow \gamma(4S)$ |

 $\Delta C_{a_1\pi}(B^0 \rightarrow a_1(1260)^+\pi^-)$

$\Delta C_{a_1\pi}$ describes the asymmetry between the rates $\Gamma(B^0 \rightarrow a_1^+\pi^-) + \Gamma(\bar{B}^0 \rightarrow a_1^-\pi^+)$ and $\Gamma(B^0 \rightarrow a_1^-\pi^+) + \Gamma(\bar{B}^0 \rightarrow a_1^+\pi^-)$.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------|----------|---------------------------------|
| 0.43±0.14 OUR AVERAGE Error includes scale factor of 1.3. | | | |
| 0.54±0.11±0.07 | DALSENO | 12 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.26±0.15±0.07 | AUBERT | 07O BABR | $e^+e^- \rightarrow \gamma(4S)$ |

 $\Delta S_{a_1\pi}(B^0 \rightarrow a_1(1260)^+\pi^-)$

$\Delta S_{a_1\pi}$ is related to the strong phase difference between the amplitudes contributing to $B^0 \rightarrow a_1\pi$ decays.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------------------------------|-------------|----------|---------------------------------|
| -0.11±0.12 OUR AVERAGE | | | |
| -0.09±0.14±0.06 | DALSENO | 12 BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| -0.14±0.21±0.06 | AUBERT | 07O BABR | $e^+e^- \rightarrow \gamma(4S)$ |

$C(B^0 \rightarrow b_1^- K^+)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|-----------|------------------------------------|
| $-0.22 \pm 0.23 \pm 0.05$ | AUBERT | 07BI BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $\Delta C(B^0 \rightarrow b_1^- \pi^+)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|-----------|------------------------------------|
| $-1.04 \pm 0.23 \pm 0.08$ | AUBERT | 07BI BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $C_{\rho^0 \rho^0}(B^0 \rightarrow \rho^0 \rho^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-------------|-----------|------------------------------------|
| $0.2 \pm 0.8 \pm 0.3$ | AUBERT | 08BB BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $S_{\rho^0 \rho^0}(B^0 \rightarrow \rho^0 \rho^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------|-------------|-----------|------------------------------------|
| $0.3 \pm 0.7 \pm 0.2$ | AUBERT | 08BB BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $C_{\rho\rho}(B^0 \rightarrow \rho^+ \rho^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|---------|
| 0.00 ± 0.09 OUR AVERAGE | | | |

0.00 ± 0.10 ± 0.06

¹ VANHOEFER 16 BELL $e^+ e^- \rightarrow \Upsilon(4S)$

0.01 ± 0.15 ± 0.06

AUBERT 07BF BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

-0.16 ± 0.21 ± 0.08

¹ SOMOV 07 BELL Repl. by VANHOEFER 16

-0.00 ± 0.30 ± 0.09

¹ SOMOV 06 BELL Repl. by SOMOV 07

-0.03 ± 0.18 ± 0.09

AUBERT,B 05C BABR Repl. by AUBERT 07BF

-0.17 ± 0.27 ± 0.14

AUBERT,B 04R BABR Repl. by AUBERT,B 05C

¹ BELLE Collab. quotes A_{CP} which is equal to $-C$. $S_{\rho\rho}(B^0 \rightarrow \rho^+ \rho^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------|------|---------|
| -0.14 ± 0.13 OUR AVERAGE | | | |

-0.13 ± 0.15 ± 0.05

VANHOEFER 16 BELL $e^+ e^- \rightarrow \Upsilon(4S)$ -0.17 ± 0.20^{+0.05}_{-0.06}AUBERT 07BF BABR $e^+ e^- \rightarrow \Upsilon(4S)$

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

0.19 ± 0.30 ± 0.08

SOMOV 07 BELL Repl. by VANHOEFER 16

0.08 ± 0.41 ± 0.09

SOMOV 06 BELL Repl. by SOMOV 07

-0.33 ± 0.24^{+0.08}_{-0.14}

AUBERT,B 05C BABR Repl. by AUBERT 07BF

-0.42 ± 0.42 ± 0.14

AUBERT,B 04R BABR Repl. by AUBERT,B 05C

 $|\lambda|(B^0 \rightarrow J/\psi K^*(892)^0)$

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------|-----|-----------------------|----------|------------------------------------|
| <0.25 | 95 | ¹ AUBERT,B | 04H BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses the measured cosine coefficients C and \bar{C} and assumes $|q/p| = 1$.

$\cos 2\beta (B^0 \rightarrow J/\psi K^*(892)^0)$

$\beta (\phi_1)$ is one of the angles of CKM unitarity triangle, see the review on “*CP*” Violation in the Reviews section.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

1.7^{+0.7}_{-0.9} OUR AVERAGE Error includes scale factor of 1.6.

| | | | |
|---|---------------------|-----|--|
| 2.72 ^{+0.50} _{-0.79} ± 0.27 | ¹ AUBERT | 05P | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|---|---------------------|-----|--|

| | | | |
|--------------------|-------------------|----|--|
| 0.87 ± 0.74 ± 0.12 | ² ITOH | 05 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------------------|-------------------|----|--|

¹ The measurement is obtained when $\sin 2\beta$ is fixed to 0.726 and the sign of $\cos 2\beta$ is positive with 86% confidence level.

² The measurement is obtained with $\sin 2\beta$ fixed to 0.731.

 $\cos 2\beta (B^0 \rightarrow [K_S^0 \pi^+ \pi^-]_{D^{(*)}} h^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

| | | | |
|---------------------------|---------------------|----|-----------------------------------|
| 0.91 ± 0.22 ± 0.11 | ¹ ADACHI | 18 | $e^+e^- \rightarrow \Upsilon(4S)$ |
|---------------------------|---------------------|----|-----------------------------------|

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

| | | | |
|---|-----------------------|----|--|
| 1.06 ± 0.33 ^{+0.21} _{-0.15} | ² VOROBYEV | 16 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
|---|-----------------------|----|--|

| | | | |
|--------------------|---------------------|------|--|
| 0.42 ± 0.49 ± 0.16 | ³ AUBERT | 07BH | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|--------------------|---------------------|------|--|

| | | | |
|--|-----------------------|----|---------------------------|
| 1.87 ^{+0.40} _{-0.53} ^{+0.22} _{-0.32} | ⁴ KROKOVNY | 06 | BELL Repl. by VOROBYEV 16 |
|--|-----------------------|----|---------------------------|

¹ Analyzes joint data sample of Belle and BaBar using Dalitz plot analysis of $D \rightarrow K_S^0 \pi^+ \pi^-$; the second error combines experimental systematic uncertainty and the Dalitz plot model uncertainty.

² A model-independent measurement uses the binned Dalitz plot technique.

³ AUBERT 07BH evaluates the likelihoods for the positive and negative solutions assuming $\sin(2\beta_{eff}) = 0.678$. It quotes $L_+ / (L_+ + L_-) = 0.86$ corresponding to a likelihood ratio of $L_+/L_- = 6.14$ in favor of the positive solution.

⁴ KROKOVNY 06 evaluates the likelihoods for the positive and negative solutions assuming $\sin(2\beta_{eff}) = 0.689$. It quotes $L_+ / (L_+ + L_-) = 0.983$ corresponding to a likelihood ratio of $L_+/L_- = 57.8$ in favor of the positive solution.

 $(S_+ + S_-)/2 (B^0 \rightarrow D^{*-} \pi^+)$

$S_{\pm} = -\frac{2\text{Im}(\lambda_{\pm})}{1+|\lambda_{\pm}|^2}$ where λ_+ and λ_- are defined in the $C_{\pi\pi}$ datablock above for

$B^0 \rightarrow D^{*-} \pi^+$ and $\bar{B}^0 \rightarrow D^{*+} \pi^-$.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-------|-------------|------|---------|
|-------|-------------|------|---------|

-0.039 ± 0.011 OUR AVERAGE

| | | | |
|------------------------|-------------------------|----|--|
| -0.046 ± 0.013 ± 0.015 | ¹ BAHINIPATI | 11 | BELL $e^+e^- \rightarrow \Upsilon(4S)$ |
|------------------------|-------------------------|----|--|

| | | | |
|------------------------|---------------------|-----|--|
| -0.040 ± 0.023 ± 0.010 | ² AUBERT | 06Y | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|------------------------|---------------------|-----|--|

| | | | |
|------------------------|---------------------|-----|--|
| -0.034 ± 0.014 ± 0.009 | ¹ AUBERT | 05Z | BABR $e^+e^- \rightarrow \Upsilon(4S)$ |
|------------------------|---------------------|-----|--|

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

| | | | |
|------------------------|--------------------|----|-----------------------------|
| -0.039 ± 0.020 ± 0.013 | ³ RONGA | 06 | BELL Repl. by BAHINIPATI 11 |
|------------------------|--------------------|----|-----------------------------|

| | | | |
|------------------------|----------------------|----|------------------------|
| -0.030 ± 0.028 ± 0.018 | ¹ GERSHON | 05 | BELL Repl. by RONGA 06 |
|------------------------|----------------------|----|------------------------|

| | | | |
|------------------------|---------------------|-----|--------------------------|
| -0.068 ± 0.038 ± 0.020 | ² AUBERT | 04V | BABR Repl. by AUBERT 06Y |
|------------------------|---------------------|-----|--------------------------|

| | | | |
|------------------------|---------------------|-----|--------------------------|
| -0.063 ± 0.024 ± 0.014 | ¹ AUBERT | 04W | BABR Repl. by AUBERT 05Z |
|------------------------|---------------------|-----|--------------------------|

| | | | |
|-----------------------|----------------------|----|------------------------|
| 0.060 ± 0.040 ± 0.019 | ² SARANGI | 04 | BELL Repl. by RONGA 06 |
|-----------------------|----------------------|----|------------------------|

¹ Uses partially reconstructed $B^0 \rightarrow D^{*\pm} \pi^{\mp}$ decays.

² Uses fully reconstructed $B^0 \rightarrow D^{*\pm} \pi^{\mp}$ decays.

³ Combines the results from fully reconstructed and partially reconstructed $D^* \pi$ events by taking weighted averages. Assumes that systematic errors from physics parameters and fit biases in the two measurements are 100% correlated.

$(S_- - S_+)/2 (B^0 \rightarrow D^{*-} \pi^+)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-------------------------|------|---|
| -0.009±0.015 OUR AVERAGE | | | |
| -0.015±0.013±0.015 | ¹ BAHINIPATI | 11 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| 0.049±0.042±0.015 | ² AUBERT | 06Y | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| -0.019±0.022±0.013 | ¹ AUBERT | 05Z | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| -0.011±0.020±0.013 | ³ RONGA | 06 | BELL Repl. by BAHINIPATI 11 |
| -0.005±0.028±0.018 | ¹ GERSHON | 05 | BELL Repl. by RONGA 06 |
| 0.031±0.070±0.033 | ² AUBERT | 04V | BABR Repl. by AUBERT 06Y |
| -0.004±0.037±0.014 | ¹ AUBERT | 04W | BABR Repl. by AUBERT 05Z |
| 0.049±0.040±0.019 | ² SARANGI | 04 | BELL Repl. by RONGA 06 |

¹ Uses partially reconstructed $B^0 \rightarrow D^{*\pm} \pi^\mp$ decays.² Uses fully reconstructed $B^0 \rightarrow D^{*\pm} \pi^\mp$ decays.³ Combines the results from fully reconstructed and partially reconstructed $D^* \pi$ events by taking weighted averages. Assumes that systematic errors from physics parameters and fit biases in the two measurements are 100% correlated. $(S_+ + S_-)/2 (B^0 \rightarrow D^- \pi^+)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|----------------------|------|---|
| -0.046±0.023 OUR AVERAGE | | | |
| -0.010±0.023±0.07 | ¹ AUBERT | 06Y | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| -0.050±0.021±0.012 | ² RONGA | 06 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| -0.022±0.038±0.020 | ¹ AUBERT | 04V | BABR Repl. by AUBERT 06Y |
| -0.062±0.037±0.018 | ¹ SARANGI | 04 | BELL Repl. by RONGA 06 |

¹ Uses fully reconstructed $B^0 \rightarrow D^\pm \pi^\mp$ decays.² Combines the results from fully reconstructed and partially reconstructed $D\pi$ events by taking weighted averages. Assumes that systematic errors from physics parameters and fit biases in the two measurements are 100% correlated. $(S_- - S_+)/2 (B^0 \rightarrow D^- \pi^+)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|----------------------|------|---|
| -0.022±0.021 OUR AVERAGE | | | |
| -0.033±0.042±0.012 | ¹ AUBERT | 06Y | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |
| -0.019±0.021±0.012 | ² RONGA | 06 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.025±0.068±0.033 | ¹ AUBERT | 04V | BABR Repl. by AUBERT 06Y |
| -0.025±0.037±0.018 | ¹ SARANGI | 04 | BELL Repl. by RONGA 06 |

¹ Uses fully reconstructed $B^0 \rightarrow D^\pm \pi^\mp$ decays.² Combines the results from fully reconstructed and partially reconstructed $D\pi$ events by taking weighted averages. Assumes that systematic errors from physics parameters and fit biases in the two measurements are 100% correlated. $S_+ (B^0 \rightarrow D^- \pi^+)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------|-------------------|------|-----------------------|
| 0.058±0.020±0.011 | ¹ AAIJ | 18Z | LHCB pp at 7, 8 TeV |

¹ Measured in the simultaneous analysis of $B^0 \rightarrow D^\mp \pi^\pm$ decays. AAIJ 18Z reports a statistical (systematic) correlation of 0.6 (-0.41) with the measured value of $S_- (B^0 \rightarrow D^+ \pi^-)$.

$S_- (B^0 \rightarrow D^+ \pi^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-----------------------|------|------------------|
| $0.038 \pm 0.020 \pm 0.007$ | ¹ AAIJ 18Z | LHCB | pp at 7, 8 TeV |

¹ Measured in the simultaneous analysis of $B^0 \rightarrow D^\mp \pi^\pm$ decays. AAIJ 18Z reports a statistical (systematic) correlation of 0.6 (−0.41) with the measured value of $S_+(B^0 \rightarrow D^- \pi^+)$.

 $(S_+ + S_-)/2 (B^0 \rightarrow D^- \rho^+)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------------------|------|------------------------------------|
| $-0.024 \pm 0.031 \pm 0.009$ | ¹ AUBERT 06Y | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses fully reconstructed $B^0 \rightarrow D^- \rho^+$ decays.

 $(S_- - S_+)/2 (B^0 \rightarrow D^- \rho^+)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|------------------------------|-------------------------|------|------------------------------------|
| $-0.098 \pm 0.055 \pm 0.018$ | ¹ AUBERT 06Y | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses fully reconstructed $B^0 \rightarrow D^- \rho^+$ decays.

 $C_{\eta_c K_S^0} (B^0 \rightarrow \eta_c K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-------------|------|------------------------------------|
| $0.080 \pm 0.124 \pm 0.029$ | AUBERT 09K | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $S_{\eta_c K_S^0} (B^0 \rightarrow \eta_c K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------------|-------------|------|------------------------------------|
| $0.925 \pm 0.160 \pm 0.057$ | AUBERT 09K | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $C_{c\bar{c}K^{(*)0}} (B^0 \rightarrow c\bar{c}K^{(*)0})$

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements.

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|---|----------------------|-----------|------------------------------------|
| -0.5 ± 1.5 OUR EVALUATION | | | |
| 0.0 ± 1.4 OUR AVERAGE | | | |
| -1.7 ± 2.9 | ^{1,2} AAIJ | 17BN LHCB | pp at 7, 8 TeV |
| $-0.6 \pm 1.6 \pm 1.2$ | ³ ADACHI | 12A BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $-29^{+53}_{-44} \pm 6$ | ⁴ AUBERT | 09AU BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| $2.4 \pm 2.0 \pm 1.6$ | ⁵ AUBERT | 09K BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| $-4 \pm 7 \pm 5$ | ⁶ SAHOO | 08 BELL | Repl. by ADACHI 12A |
| $4.9 \pm 2.3 \pm 1.8$ | ⁵ AUBERT | 07AY BABR | Repl. by AUBERT 09K |
| $-1.8 \pm 2.1 \pm 1.4$ | ⁷ CHEN | 07 BELL | Repl. by ADACHI 12A |
| $-0.7 \pm 4.1 \pm 3.3$ | ⁸ ABE | 05B BELL | Repl. by CHEN 07 |
| $5.1 \pm 3.2 \pm 1.4$ | ⁹ AUBERT | 05F BABR | Repl. by AUBERT 07AY |
| $5.1 \pm 5.1 \pm 2.6$ | ¹⁰ ABE | 02Z BELL | Repl. by ABE 05B |
| $5.3 \pm 5.4 \pm 3.2$ | ¹¹ AUBERT | 02P BABR | Repl. by AUBERT 05F |

¹ Measurement based on $B^0 \rightarrow J/\psi K_S^0$, $B^0 \rightarrow \psi(2S) K_S^0$ with $J/\psi \rightarrow \mu^+ \mu^-$, $J/\psi \rightarrow e^+ e^-$ and $\psi(2S) \rightarrow \mu^+ \mu^-$.

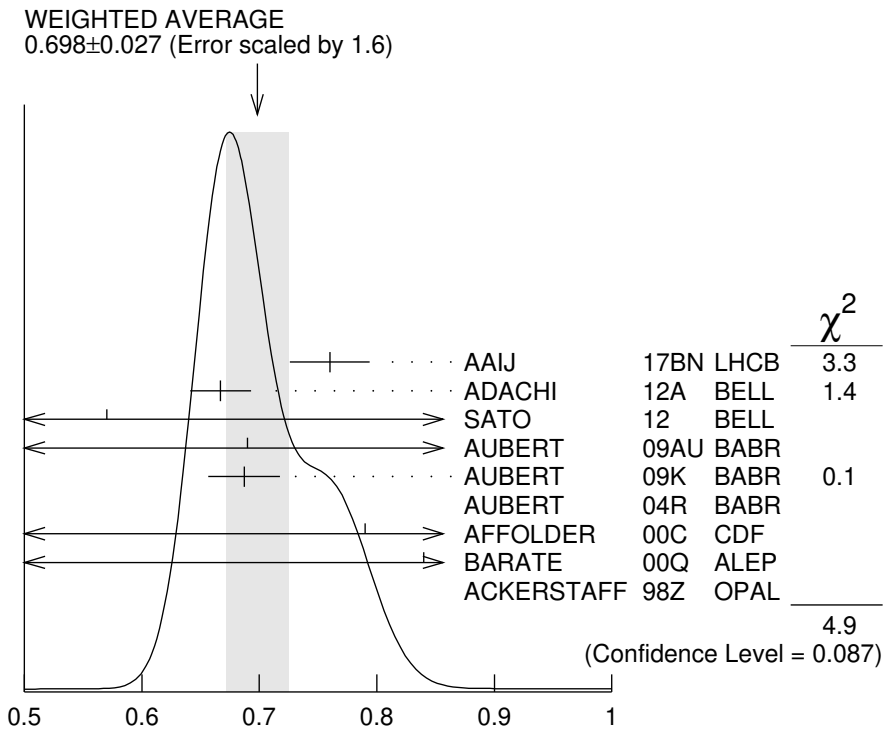
- ² AAIJ 17BN provides the correlation coefficient $\rho=0.42$ between the uncertainties of $S_{B^0 \rightarrow c\bar{c}K^{(*)0}}(B^0 \rightarrow c\bar{c}K^{(*)0})$ and $C_{c\bar{c}K^{(*)0}}(B^0 \rightarrow c\bar{c}K^{(*)0})$ measurements.
- ³ Measurement based on $B^0 \rightarrow J/\psi K_S^0$, $B^0 \rightarrow \psi(2S)K_S^0$, $B^0 \rightarrow J/\psi K_L^0$, and $B^0 \rightarrow \chi_{c1}(1P)K_S^0$ decays.
- ⁴ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used.
- ⁵ Measurement based on $B^0 \rightarrow c\bar{c}K^{(*)0}$ decays.
- ⁶ Reports value of A of $B^0 \rightarrow \psi(2S)K^0$ which is equal to $-C$.
- ⁷ Reports value of A of $B^0 \rightarrow J/\psi K^0$ which is equal to $-C$.
- ⁸ Measurement based on $152 \times 10^6 B\bar{B}$ pairs.
- ⁹ Measurement based on $227 \times 10^6 B\bar{B}$ pairs.
- ¹⁰ Measured with both $\eta_f = \pm 1$ samples.
- ¹¹ Measured with the high purity of $\eta_f = -1$ samples.

sin(2 β)

For a discussion of CP violation, see the review on “ CP Violation” in the Reviews section. $\sin(2\beta)$ is a measure of the CP -violating amplitude in the $B_d^0 \rightarrow J/\psi(1S)K_S^0$.

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|--------------------------|-----------|---|
| 0.699\pm0.017 OUR EVALUATION | | | |
| 0.698\pm0.027 OUR AVERAGE | | | Error includes scale factor of 1.6. See the ideogram below. |
| 0.760 \pm 0.034 | ^{1,2} AAIJ | 17BN LHCb | pp at 7, 8 TeV |
| 0.667 \pm 0.023 \pm 0.012 | ³ ADACHI | 12A BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.57 \pm 0.58 \pm 0.06 | ⁴ SATO | 12 BELL | $e^+e^- \rightarrow \Upsilon(5S)$ |
| 0.69 \pm 0.52 \pm 0.08 | ⁵ AUBERT | 09AU BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.687 \pm 0.028 \pm 0.012 | ⁶ AUBERT | 09K BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 1.56 \pm 0.42 \pm 0.21 | ⁷ AUBERT | 04R BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.79 $\begin{smallmatrix} +0.41 \\ -0.44 \end{smallmatrix}$ | ⁸ AFFOLDER | 00C CDF | $p\bar{p}$ at 1.8 TeV |
| 0.84 $\begin{smallmatrix} +0.82 \\ -1.04 \end{smallmatrix}$ \pm 0.16 | ⁹ BARATE | 00Q ALEP | $e^+e^- \rightarrow Z$ |
| 3.2 $\begin{smallmatrix} +1.8 \\ -2.0 \end{smallmatrix}$ \pm 0.5 | ¹⁰ ACKERSTAFF | 98Z OPAL | $e^+e^- \rightarrow Z$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.72 \pm 0.09 \pm 0.03 | ¹¹ SAHOO | 08 BELL | Repl. by ADACHI 12A |
| 0.714 \pm 0.032 \pm 0.018 | ⁶ AUBERT | 07AY BABR | Repl. by AUBERT 09K |
| 0.642 \pm 0.031 \pm 0.017 | CHEN | 07 BELL | Repl. by ADACHI 12A |
| 0.728 \pm 0.056 \pm 0.023 | ¹² ABE | 05B BELL | Repl. by CHEN 07 |
| 0.722 \pm 0.040 \pm 0.023 | ¹³ AUBERT | 05F BABR | Repl. by AUBERT 07AY |
| 0.99 \pm 0.14 \pm 0.06 | ¹⁴ ABE | 02U BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.719 \pm 0.074 \pm 0.035 | ¹⁵ ABE | 02Z BELL | Repl. by ABE 05B |
| 0.59 \pm 0.14 \pm 0.05 | ¹⁶ AUBERT | 02N BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 0.741 \pm 0.067 \pm 0.034 | ¹⁷ AUBERT | 02P BABR | Repl. by AUBERT 05F |
| 0.58 $\begin{smallmatrix} +0.32 & +0.09 \\ -0.34 & -0.10 \end{smallmatrix}$ | ABASHIAN | 01 BELL | Repl. by ABE 01G |
| 0.99 \pm 0.14 \pm 0.06 | ¹⁸ ABE | 01G BELL | Repl. by ABE 02Z |
| 0.34 \pm 0.20 \pm 0.05 | AUBERT | 01 BABR | Repl. by AUBERT 01B |
| 0.59 \pm 0.14 \pm 0.05 | ¹⁸ AUBERT | 01B BABR | Repl. by AUBERT 02P |
| 1.8 \pm 1.1 \pm 0.3 | ¹⁹ ABE | 98U CDF | Repl. by AFFOLDER 00C |



- 1 Measurement based on $B^0 \rightarrow J/\psi K_S^0$, $B^0 \rightarrow \psi(2S) K_S^0$ with $J/\psi \rightarrow \mu^+ \mu^-$, $J/\psi \rightarrow e^+ e^-$ and $\psi(2S) \rightarrow \mu^+ \mu^-$.
- 2 AAIJ 17BN provides the correlation coefficient $\rho = 0.42$ between the uncertainties of $\sin(2\beta)$ and $\cos(2\beta)$ measurements.
- 3 Measurement based on $B^0 \rightarrow J/\psi K_S^0$, $B^0 \rightarrow \psi(2S) K_S^0$, $B^0 \rightarrow J/\psi K_L^0$, and $B^0 \rightarrow \chi_{c1}(1P) K_S^0$ decays.
- 4 SATO 12 uses 121 fb^{-1} data collected on $Y(5S)$ resonance. Uses the "B - π tagging" where $B\pi^+$ and $B\pi^-$ tagged $J/\psi K_S^0$ events are compared.
- 5 Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions.
- 6 Measurement based on $B^0 \rightarrow c\bar{c}K^{(*)0}$ decays.
- 7 Measurement in which the J/ψ decays to hadrons or to muons that do not satisfy the standard identification criteria.
- 8 AFFOLDER 00C uses about 400 $B^0 \rightarrow J/\psi(1S) K_S^0$ events. The production flavor of B^0 was determined using three tagging algorithms: a same-side tag, a jet-charge tag, and a soft-lepton tag.
- 9 BARATE 00Q uses 23 candidates for $B^0 \rightarrow J/\psi(1S) K_S^0$ decays. A combination of jet-charge, vertex-charge, and same-side tagging techniques were used to determine the B^0 production flavor.
- 10 ACKERSTAFF 98Z uses 24 candidates for $B_d^0 \rightarrow J/\psi(1S) K_S^0$ decay. A combination of jet-charge and vertex-charge techniques were used to tag the B_d^0 production flavor.
- 11 Based on $B^0 \rightarrow \psi(2S) K_S^0$ decays.
- 12 Measurement based on $152 \times 10^6 B\bar{B}$ pairs.
- 13 Measurement based on $227 \times 10^6 B\bar{B}$ pairs.
- 14 ABE 02U result is based on the same analysis and data sample reported in ABE 01G.
- 15 ABE 02Z result is based on $85 \times 10^6 B\bar{B}$ pairs.
- 16 AUBERT 02N result based on the same analysis and data sample reported in AUBERT 01B.

¹⁷ AUBERT 02P result is based on $88 \times 10^6 B\bar{B}$ pairs.

¹⁸ First observation of CP violation in B^0 meson system.

¹⁹ ABE 98U uses $198 \pm 17 B_d^0 \rightarrow J/\psi(1S)K^0$ events. The production flavor of B^0 was determined using the same side tagging technique.
 $\sin(2\beta)$

$C_{J/\psi(nS)K^0} (B^0 \rightarrow J/\psi(nS)K^0)$

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| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--|---------------------|-----------|-----------------------------------|
| $- 0.8 \pm 1.7$ OUR EVALUATION | | | |
| $- 0.5 \pm 1.6$ OUR AVERAGE | | | |
| $- 1.7 \pm 2.9$ | 1,2 AAIJ | 17BN LHCB | pp at 7, 8 TeV |
| $1.5 \pm 2.1^{+2.3}_{-4.5}$ | 3,4 ADACHI | 12A BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $-10.4 \pm 5.5^{+2.7}_{-4.7}$ | 4,5 ADACHI | 12A BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $- 1.9 \pm 2.6^{+4.1}_{-1.7}$ | 4,6 ADACHI | 12A BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $8.9 \pm 7.6 \pm 2.0$ | ⁵ AUBERT | 09K BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $1.6 \pm 2.3 \pm 1.8$ | AUBERT | 09K BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|-------------------------|----------------------|-----------|---------------------|
| $- 1.4 \pm 3.0$ | ⁷ AAIJ | 17BN LHCB | pp at 7, 8 TeV |
| $- 5 \pm 10 \pm 1$ | ⁸ AAIJ | 17BN LHCB | pp at 7, 8 TeV |
| $- 3.8 \pm 3.2 \pm 0.5$ | ⁹ AAIJ | 15N LHCB | Repl. by AAIJ 17BN |
| $3 \pm 9 \pm 1$ | ¹⁰ AAIJ | 13K LHCB | Repl. by AAIJ 15N |
| $- 4 \pm 7 \pm 5$ | ^{4,5} SAHOO | 08 BELL | Repl. by ADACHI 12A |
| $- 1.8 \pm 2.1 \pm 1.4$ | ⁴ CHEN | 07 BELL | Repl. by ADACHI 12A |

¹ Measurement based on $B^0 \rightarrow J/\psi K_S^0$, $B^0 \rightarrow \psi(2S)K_S^0$ with $J/\psi \rightarrow \mu^+\mu^-$, $J/\psi \rightarrow e^+e^-$ and $\psi(2S) \rightarrow \mu^+\mu^-$.

² AAIJ 17BN provides the correlation coefficient $\rho = 0.42$ between the uncertainties of $S_{J/\psi(nS)K^0} (B^0 \rightarrow J/\psi(nS)K^0)$ and $C_{J/\psi(nS)K^0} (B^0 \rightarrow J/\psi(nS)K^0)$ measurements.

³ Uses $B^0 \rightarrow J/\psi K_S^0$ decays.

⁴ The paper reports A , which is equal to $-C$.

⁵ Uses $B^0 \rightarrow \psi(2S)K_S^0$ decays.

⁶ Uses $B^0 \rightarrow J/\psi K_L^0$ decays.

⁷ Measurement based on $B^0 \rightarrow J/\psi K_S^0$ with $J/\psi \rightarrow \mu^+\mu^-$ and $J/\psi \rightarrow e^+e^-$.

⁸ Measurement based on $B^0 \rightarrow \psi(2S)K_S^0$ with $\psi(2S) \rightarrow \mu^+\mu^-$.

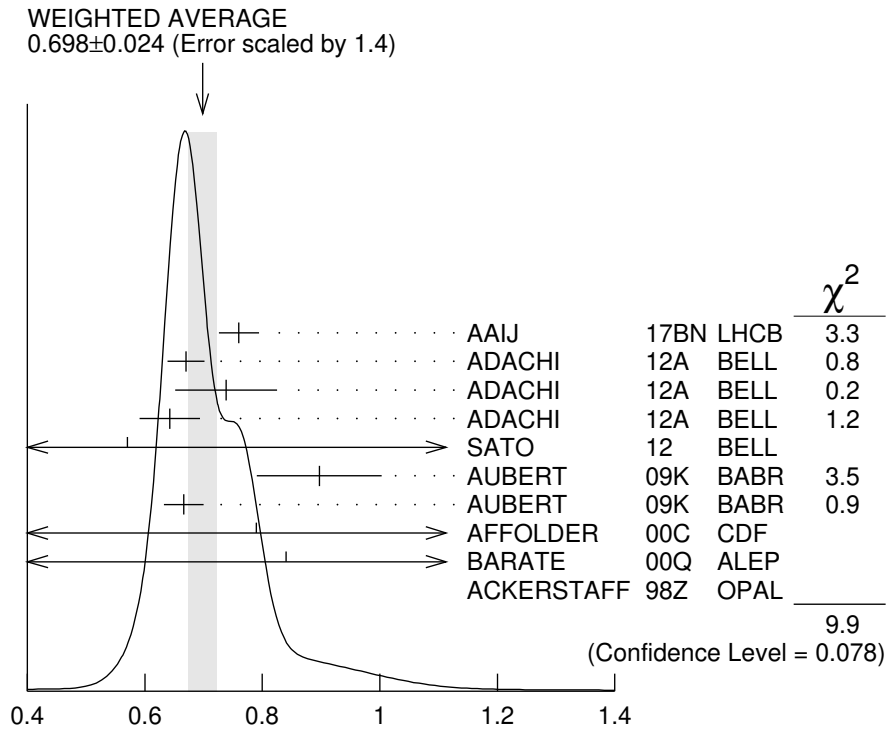
⁹ AAIJ 15N uses 41,560 flavor-tagged $B_d \rightarrow J/\psi K_S^0$ events from 3 fb^{-1} of integrated luminosity. Provides the correlation coefficient $\rho = 0.483$ between the statistical uncertainties of and measurements.

¹⁰ AAIJ 13K uses 8200 flavor-tagged $B_d \rightarrow J/\psi K_S^0$ events from 1 fb^{-1} of integrated luminosity. Provides the correlation coefficient $\rho = 0.42$ between the statistical uncertainties of $S_{J/\psi(nS)K^0} (B^0 \rightarrow J/\psi(nS)K^0)$ and $C_{J/\psi(nS)K^0} (B^0 \rightarrow J/\psi(nS)K^0)$ measurements.

$S_{J/\psi(nS)K^0} (B^0 \rightarrow J/\psi(nS)K^0)$

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements.

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---|-----------|---------------------------------|
| 0.701 ± 0.017 OUR EVALUATION | | | |
| 0.698 ± 0.024 OUR AVERAGE | Error includes scale factor of 1.4. See the ideogram below. | | |
| 0.760 ± 0.034 | 1,2 AAIJ | 17BN LHCb | pp at 7, 8 TeV |
| 0.670 ± 0.029 ± 0.013 | 3 ADACHI | 12A BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.738 ± 0.079 ± 0.036 | 4 ADACHI | 12A BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.642 ± 0.047 ± 0.021 | 5 ADACHI | 12A BELL | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.57 ± 0.58 ± 0.06 | 6 SATO | 12 BELL | $e^+e^- \rightarrow \gamma(5S)$ |
| 0.897 ± 0.100 ± 0.036 | 4 AUBERT | 09K BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.666 ± 0.031 ± 0.013 | AUBERT | 09K BABR | $e^+e^- \rightarrow \gamma(4S)$ |
| 0.79 ^{+0.41} _{-0.44} | 7 AFFOLDER | 00C CDF | $p\bar{p}$ at 1.8 TeV |
| 0.84 ^{+0.82} _{-1.04} ± 0.16 | 8 BARATE | 00Q ALEP | $e^+e^- \rightarrow Z$ |
| 3.2 ^{+1.8} _{-2.0} ± 0.5 | 9 ACKERSTAFF | 98Z OPAL | $e^+e^- \rightarrow Z$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.75 ± 0.04 | 10 AAIJ | 17BN LHCb | pp at 7, 8 TeV |
| 0.84 ± 0.10 ± 0.01 | 11 AAIJ | 17BN LHCb | pp at 7, 8 TeV |
| 0.731 ± 0.035 ± 0.020 | 12 AAIJ | 15N LHCb | Repl. by AAIJ 17BN |
| 0.73 ± 0.07 ± 0.04 | 13 AAIJ | 13K LHCb | Repl. by AAIJ 15N |
| 0.650 ± 0.029 ± 0.018 | 14 SAHOO | 08 BELL | Repl. by ADACHI 12A |
| 0.72 ± 0.09 ± 0.03 | 4 SAHOO | 08 BELL | Repl. by ADACHI 12A |
| 0.642 ± 0.031 ± 0.017 | CHEN | 07 BELL | Repl. by ADACHI 12A |



- ¹ Measurement based on $B^0 \rightarrow J/\psi K_S^0$, $B^0 \rightarrow \psi(2S) K_S^0$ with $J/\psi \rightarrow \mu^+ \mu^-$, $J/\psi \rightarrow e^+ e^-$ and $\psi(2S) \rightarrow \mu^+ \mu^-$.
- ² AAIJ 17BN provides the correlation coefficient $\rho = 0.42$ between the uncertainties of $S_{J/\psi(nS)K^0}$ ($B^0 \rightarrow J/\psi(nS)K^0$) and $C_{J/\psi(nS)K^0}$ ($B^0 \rightarrow J/\psi(nS)K^0$) measurements.
- ³ Uses $B^0 \rightarrow J/\psi K_S^0$ decays.
- ⁴ Based on $B^0 \rightarrow \psi(2S) K_S^0$ decays.
- ⁵ Uses $B^0 \rightarrow J/\psi K_L^0$ decays.
- ⁶ SATO 12 uses 121 fb^{-1} data collected at $\Upsilon(5S)$ resonance. Uses the "B - π tagging" where $B\pi^+$ and $B\pi^-$ tagged $J/\psi K_S^0$ events are compared.
- ⁷ AFFOLDER 00C uses about 400 $B^0 \rightarrow J/\psi(1S) K_S^0$ events. The production flavor of B^0 was determined using three tagging algorithms: a same-side tag, a jet-charge tag, and a soft-lepton tag.
- ⁸ BARATE 00Q uses 23 candidates for $B^0 \rightarrow J/\psi(1S) K_S^0$ decays. A combination of jet-charge, vertex-charge, and same-side tagging techniques were used to determine the B^0 production flavor.
- ⁹ ACKERSTAFF 98Z uses 24 candidates for $B_d^0 \rightarrow J/\psi(1S) K_S^0$ decay. A combination of jet-charge and vertex-charge techniques were used to tag the B_d^0 production flavor.
- ¹⁰ Measurement based on $B^0 \rightarrow J/\psi K_S^0$ with $J/\psi \rightarrow \mu^+ \mu^-$ and $J/\psi \rightarrow e^+ e^-$.
- ¹¹ Measurement based on $B^0 \rightarrow \psi(2S) K_S^0$ with $\psi(2S) \rightarrow \mu^+ \mu^-$.
- ¹² AAIJ 15N uses 41,560 flavor-tagged $B_d \rightarrow J/\psi K_S^0$ events from 3 fb^{-1} of integrated luminosity. Provides the correlation coefficient $\rho = 0.483$ between the statistical uncertainties of and measurements.
- ¹³ AAIJ 13K uses 8200 flavor-tagged $B_d \rightarrow J/\psi K_S^0$ events from 1 fb^{-1} of integrated luminosity. Provides the correlation coefficient $\rho = 0.42$ between the statistical uncertainties of $S_{J/\psi(nS)K^0}$ ($B^0 \rightarrow J/\psi(nS)K^0$) and $C_{J/\psi(nS)K^0}$ ($B^0 \rightarrow J/\psi(nS)K^0$) measurements.
- ¹⁴ Combined result of CHEN 07 and SAHOO 08.

$C_{J/\psi K^{*0}} (B^0 \rightarrow J/\psi K^{*0})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|------|---|
| $0.025 \pm 0.083 \pm 0.054$ | ¹ AUBERT | 09K | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Based on $B^0 \rightarrow J/\psi K^{*0}$, $K^{*0} \rightarrow K_S^0 \pi^0$.

$S_{J/\psi K^{*0}} (B^0 \rightarrow J/\psi K^{*0})$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------|------|---|
| $0.601 \pm 0.239 \pm 0.087$ | ^{1,2} AUBERT | 09K | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Based on $B^0 \rightarrow J/\psi K^{*0}$, $K^{*0} \rightarrow K_S^0 \pi^0$.

² This $S_{J/\psi K^{*0}}$ value has been corrected for the dilution of the $\sin(\Delta M \Delta t)$ coefficient of the CP asymmetry by a factor of $1 - R_{\perp}$, which arises from the mixture of CP -even and CP -odd B decay amplitudes.

$C_{\chi_{c0} K_S^0} (B^0 \rightarrow \chi_{c0} K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|---------------------|------|---|
| $-0.29^{+0.53}_{-0.44} \pm 0.06$ | ¹ AUBERT | 09AU | BABR $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used.

$S_{\chi_{c0} K_S^0} (B^0 \rightarrow \chi_{c0} K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|---------------------|-----------|------------------------------------|
| $-0.69 \pm 0.52 \pm 0.08$ | ¹ AUBERT | 09AU BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Uses Dalitz plot analysis of $B^0 \rightarrow K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used.

 $C_{\chi_{c1} K_S^0} (B^0 \rightarrow \chi_{c1} K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|------|---------|
| 0.06 ± 0.07 OUR AVERAGE | | | |

| | | | |
|-------------------------------------|--------|----------|------------------------------------|
| $0.017 \pm 0.083^{+0.026}_{-0.046}$ | ADACHI | 12A BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-------------------------------------|--------|----------|------------------------------------|

| | | | |
|-----------------------------|--------|----------|------------------------------------|
| $0.129 \pm 0.109 \pm 0.025$ | AUBERT | 09K BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------------------|--------|----------|------------------------------------|

 $S_{\chi_{c1} K_S^0} (B^0 \rightarrow \chi_{c1} K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------------------|-------------|------|---------|
| 0.63 ± 0.10 OUR AVERAGE | | | |

| | | | |
|-----------------------------|--------|----------|------------------------------------|
| $0.640 \pm 0.117 \pm 0.040$ | ADACHI | 12A BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------------------|--------|----------|------------------------------------|

| | | | |
|-----------------------------|--------|----------|------------------------------------|
| $0.614 \pm 0.160 \pm 0.040$ | AUBERT | 09K BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|-----------------------------|--------|----------|------------------------------------|

 $\sin(2\beta_{\text{eff}})(B^0 \rightarrow \phi K^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|-----------|------------------------------------|
| 0.22 ± 0.27 ± 0.12 | AUBERT | 07AX BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|---------------------------------|---------------------|----------|----------------------|
| $0.50 \pm 0.25^{+0.07}_{-0.04}$ | ¹ AUBERT | 05T BABR | Repl. by AUBERT 07AX |
|---------------------------------|---------------------|----------|----------------------|

¹ Obtained by constraining $C = 0$.

 $\sin(2\beta_{\text{eff}})(B^0 \rightarrow \phi K_0^*(1430)^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|-----------|------------------------------------|
| 0.97^{+0.03}_{-0.52} | ¹ AUBERT | 08BG BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

¹ Measured using the CP -violation phase difference $\Delta\phi_{00}$ between the B and \bar{B} decay amplitude.

 $\sin(2\beta_{\text{eff}})(B^0 \rightarrow K^+ K^- K_S^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|-------------|-----------|------------------------------------|
| 0.77 ± 0.11^{+0.07}_{-0.04} | AUBERT | 07AX BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|--------------------------|---------------------|----------|----------------------|
| $0.55 \pm 0.22 \pm 0.12$ | ¹ AUBERT | 05T BABR | Repl. by AUBERT 07AX |
|--------------------------|---------------------|----------|----------------------|

¹ Obtained by constraining $C = 0$.

 $\sin(2\beta_{\text{eff}})(B^0 \rightarrow [K_S^0 \pi^+ \pi^-]_{D^{(*)}} h^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|---------------------|------|------------------------------------|
| 0.80 ± 0.14 ± 0.07 | ¹ ADACHI | 18 | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|--------------------------|-----------------------|---------|------------------------------------|
| $0.43 \pm 0.27 \pm 0.08$ | ² VOROBYEV | 16 BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|-----------------------|---------|------------------------------------|

| | | | |
|--------------------------|--------|-----------|------------------------------------|
| $0.29 \pm 0.34 \pm 0.06$ | AUBERT | 07BH BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|--------------------------|--------|-----------|------------------------------------|

$0.78 \pm 0.44 \pm 0.22$

KROKOVNY 06 BELL Repl. by VOROBYEV 16

¹ Analyzes joint data sample of Belle and BaBar using Dalitz plot analysis of $D \rightarrow K_S^0 \pi^+ \pi^-$; the second error combines experimental systematic uncertainty and the Dalitz plot model uncertainty.

² A model-independent measurement uses the binned Dalitz plot technique.

 $\beta_{\text{eff}}(B^0 \rightarrow [K_S^0 \pi^+ \pi^-]_{D^{(*)}} h^0)$

| VALUE (°) | DOCUMENT ID | TECN | COMMENT |
|-------------------------|------------------------|------|------------------------------------|
| 22.5 ± 4.4 ± 1.3 | ¹ ADACHI 18 | | $e^+ e^- \rightarrow \Upsilon(4S)$ |

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

| | | | |
|------------------|--------------------------|------|------------------------------------|
| 11.7 ± 7.8 ± 2.1 | ² VOROBYEV 16 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
|------------------|--------------------------|------|------------------------------------|

¹ Analyzes joint data sample of Belle and BaBar using Dalitz plot analysis of $D \rightarrow K_S^0 \pi^+ \pi^-$; the second error combines experimental systematic uncertainty and the Dalitz plot model uncertainty.

² A model-independent measurement uses the binned Dalitz plot technique.

 $2\beta_{\text{eff}}(B^0 \rightarrow J/\psi \rho^0)$

| VALUE (°) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|------------------|
| 41.7 ± 9.6^{+2.8}_{-6.3} | AAIJ 15J | LHCB | pp at 7, 8 TeV |

 $|\lambda|(B^0 \rightarrow [K_S^0 \pi^+ \pi^-]_{D^{(*)}} h^0)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|------|------------------------------------|
| 1.01 ± 0.08 ± 0.02 | AUBERT 07BH | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

 $|\sin(2\beta + \gamma)|$

β (ϕ_1) and γ (ϕ_3) are angles of CKM unitarity triangle, see the review on “CP Violation” in the Reviews section.

| VALUE | CL% | DOCUMENT ID | TECN | COMMENT |
|-----------------|-----|-------------------------|------|------------------------------------|
| >0.40 | 90 | ¹ AUBERT 06Y | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| >0.77 | 68 | ² AAIJ 18Z | LHCB | pp at 7, 8 TeV |
| >0.13 | 95 | ³ RONGA 06 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| >0.07 | 95 | ³ RONGA 06 | BELL | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| >0.35 | 90 | ⁴ AUBERT 05Z | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| >0.69 | 68 | ⁵ AUBERT 04V | BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |
| >0.58 | 95 | ⁶ AUBERT 04W | BABR | Repl. by AUBERT 05Z |

¹ Uses fully reconstructed $B^0 \rightarrow D^{(*)\pm} \pi^\mp$ and $D^\pm \rho^\mp$ decays and some theoretical assumptions.

² Uses a time dependent CP violation measurement in $B^0 \rightarrow D^\mp \pi^\pm$ decays with external input and some theoretical assumptions.

³ Combines the results from fully reconstructed and partially reconstructed $D^{(*)} \pi$ events by taking weighted averages. Assumes that systematic errors from physics parameters and fit biases in the two measurements are 100% correlated.

⁴ Uses partially reconstructed $B^0 \rightarrow D^{*\pm} \pi^\mp$ decays and some theoretical assumptions.

⁵ Uses fully reconstructed $B^0 \rightarrow D^{(*)\pm} \pi^\mp$ decays and some theoretical assumptions, such as the SU(3) symmetry relation.

⁶ Combining this measurement with the results from AUBERT 04V for fully reconstructed $B^0 \rightarrow D^{(*)\pm} \pi^\mp$ and some theoretical assumptions, such as the SU(3) symmetry relation.

$2\beta + \gamma$

| VALUE (°) | DOCUMENT ID | TECN | COMMENT |
|--------------------------------------|---------------------|-----------|-----------------------------------|
| $83 \pm 53 \pm 20$ | ¹ AUBERT | 08AC BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |

¹ Used a time-dependent Dalitz-plot analysis of $B^0 \rightarrow D^\mp K^0 \pi^\pm$ assuming the ratio of the $b \rightarrow u$ and $b \rightarrow c$ decay amplitudes to be 0.3.

 α

For angle $\alpha(\phi_2)$ of the CKM unitarity triangle, see the review on “CP violation” in the reviews section.

“OUR EVALUATION” is provided by the Heavy Flavor Averaging Group (HFLAV).

| VALUE (°) | DOCUMENT ID | TECN | COMMENT |
|---|-------------|------|---------|
| $85.2^{+4.8}_{-4.3}$ OUR EVALUATION | | | |

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

| | | | |
|--------------------------|------------------------|----------|-----------------------------------|
| 93.7 ± 10.6 | ¹ VANHOEFER | 16 BELL | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 84.9 ± 13.5 | ¹ VANHOEFER | 14 BELL | Repl. by VANHOEFER 16 |
| $79 \pm 7 \pm 11$ | ² AUBERT | 10D BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| $92.4^{+6.0}_{-6.5}$ | ¹ AUBERT | 09G BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 78.6 ± 7.3 | ³ AUBERT | 07O BABR | $e^+e^- \rightarrow \Upsilon(4S)$ |
| 88 ± 17 | ⁴ SOMOV | 06 BELL | Repl. by VANHOEFER 14 |
| 100 ± 13 | ⁵ AUBERT,B | 05C BABR | Repl. by AUBERT 09G |
| $102^{+16}_{-12} \pm 14$ | ⁶ AUBERT,B | 04R BABR | Repl. by AUBERT,B 05C |

¹ Based on an isospin analysis of the $B \rightarrow \rho\rho$ system.

² Obtained using the time dependent analysis of $B^0 \rightarrow a_1(1260)^\pm \pi^\mp$ and branching fraction measurements of $B \rightarrow a_1(1260)K$ and $B \rightarrow K_1\pi$. Uses SU(3) flavor relations.

³ The angle α_{eff} is obtained using the measured CP parameters of $B^0 \rightarrow a_1(1260)^\pm \pi^\mp$ and choosing one of the four solutions that is compatible with the result of SM-based fits.

⁴ Obtained using isospin relation and selecting a solution closest to the CKM best fit average; the 90% CL allowed interval is $59^\circ < \phi_2 (\equiv \alpha) < 115^\circ$.

⁵ Obtained using isospin relation and selecting a solution closest to the CKM best fit average; 90% CL allowed interval is $79^\circ < \alpha < 123^\circ$.

⁶ Obtained from the measured CP parameters of the longitudinal polarization by selecting the solution closest to the CKM best fit central value of $\alpha = 95^\circ - 98^\circ$.

CP VIOLATION PARAMETERS IN $B^0 \rightarrow D^0 K^{*0}$ DECAY

The parameters r_{B^0} and δ_{B^0} are the magnitude ratio and strong phase difference between the amplitudes of $A(B^0 \rightarrow D^0 K^{*0})$ and $A(B^0 \rightarrow \bar{D}^0 K^{*0})$. The measured observables are defined as $x_\pm = r_{B^0} \cos(\delta_{B^0} \pm \gamma)$ and $y_\pm = r_{B^0} \sin(\delta_{B^0} \pm \gamma)$ where γ is the CKM angle γ .

“OUR EVALUATION” is provided by the Heavy Flavor Averaging Group (HFLAV). The CKM angle γ is listed in the B^+ section for “CP VIOLATION PARAMETERS IN $B^+ \rightarrow DK^+$ AND SIMILAR DECAYS.”

$x_+(B^0 \rightarrow DK^{*0})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-------------------|
| 0.04±0.17 OUR AVERAGE | | | |
| 0.04±0.16±0.11 | ¹ AAIJ | 16S LHCb | pp at 7, 8 TeV |
| 0.05±0.35±0.02 | AAIJ | 16Z LHCb | pp at 7, 8 TeV |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.05±0.24±0.04 | ² AAIJ | 16AA LHCb | Repl. by AAIJ 16Z |
| ¹ Uses Dalitz plot of $B^0 \rightarrow DK^+\pi^-$ with $D \rightarrow K^+K^-, \pi^+\pi^-,$ or $K^+\pi^-$. | | | |
| ² Uses Dalitz plot analysis of $D \rightarrow K_S^0\pi^+\pi^-$ decays coming from $B^0 \rightarrow DK^*(892)^0$ modes. | | | |

 $x_-(B^0 \rightarrow DK^{*0})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-------------------|
| -0.16±0.14 OUR AVERAGE | | | |
| -0.02±0.13±0.14 | ¹ AAIJ | 16S LHCb | pp at 7, 8 TeV |
| -0.31±0.20±0.04 | AAIJ | 16Z LHCb | pp at 7, 8 TeV |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| -0.15±0.14±0.03 | ² AAIJ | 16AA LHCb | Repl. by AAIJ 16Z |
| ¹ Uses Dalitz plot of $B^0 \rightarrow DK^+\pi^-$ with $D \rightarrow K^+K^-, \pi^+\pi^-,$ or $K^+\pi^-$. | | | |
| ² Uses Dalitz plot analysis of $D \rightarrow K_S^0\pi^+\pi^-$ decays coming from $B^0 \rightarrow DK^*(892)^0$ modes. | | | |

 $y_+(B^0 \rightarrow DK^{*0})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-------------------|
| -0.68±0.22 OUR AVERAGE | | | |
| -0.47±0.28±0.22 | ¹ AAIJ | 16S LHCb | pp at 7, 8 TeV |
| -0.81±0.28±0.06 | AAIJ | 16Z LHCb | pp at 7, 8 TeV |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| -0.65 ^{+0.24} _{-0.23} ±0.08 | ² AAIJ | 16AA LHCb | Repl. by AAIJ 16Z |
| ¹ Uses Dalitz plot of $B^0 \rightarrow DK^+\pi^-$ with $D \rightarrow K^+K^-, \pi^+\pi^-,$ or $K^+\pi^-$. | | | |
| ² Uses Dalitz plot analysis of $D \rightarrow K_S^0\pi^+\pi^-$ decays coming from $B^0 \rightarrow DK^*(892)^0$ modes. | | | |

 $y_-(B^0 \rightarrow DK^{*0})$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-------------------|
| 0.20±0.25 OUR AVERAGE Error includes scale factor of 1.2. | | | |
| -0.35±0.26±0.41 | ¹ AAIJ | 16S LHCb | pp at 7, 8 TeV |
| 0.31±0.21±0.05 | AAIJ | 16Z LHCb | pp at 7, 8 TeV |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.25±0.15±0.06 | ² AAIJ | 16AA LHCb | Repl. by AAIJ 16Z |
| ¹ Uses Dalitz plot of $B^0 \rightarrow DK^+\pi^-$ with $D \rightarrow K^+K^-, \pi^+\pi^-,$ or $K^+\pi^-$. | | | |
| ² Uses Dalitz plot analysis of $D \rightarrow K_S^0\pi^+\pi^-$ decays coming from $B^0 \rightarrow DK^*(892)^0$ modes. | | | |

 $r_{B^0}(B^0 \rightarrow DK^{*0})$

"OUR EVALUATION" is provided by the Heavy Flavor Averaging Group (HFLAV).

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
| 0.257^{+0.021}_{-0.023} OUR EVALUATION | | | |

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

| | | | |
|-------------|-------------------|-----------|------------------------|
| 0.39 ± 0.13 | ¹ AAIJ | 16AA LHCB | Repl. by AAIJ 16Z |
| 0.56 ± 0.17 | ² AAIJ | 16Z LHCB | $p\bar{p}$ at 7, 8 TeV |

¹ Uses Dalitz plot analysis of $D \rightarrow K_S^0 \pi^+ \pi^-$ decays coming from $B^0 \rightarrow DK^*(892)^0$ modes.

² Measurement is performed with $K^+ \pi^-$ masses within 50 MeV of the K^{*0} mass and an absolute value of the cosine of the K^{*0} helicity angle greater than 0.4. Angle γ is required to satisfy $0 < \gamma < 180$ degrees.

$\delta_{B^0}(B^0 \rightarrow DK^{*0})$

"OUR EVALUATION" is provided by the Heavy Flavor Averaging Group (HFLAV).

| VALUE (°) | DOCUMENT ID | TECN | COMMENT |
|-----------|-------------|------|---------|
|-----------|-------------|------|---------|

194.1⁺_{8.8} OUR EVALUATION

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

| | | | |
|-----------------------------------|-------------------|-----------|------------------------|
| 197 ⁺²⁴ ₋₂₀ | ¹ AAIJ | 16AA LHCB | Repl. by AAIJ 16Z |
| 204 ⁺²¹ ₋₂₀ | ² AAIJ | 16Z LHCB | $p\bar{p}$ at 7, 8 TeV |

¹ Uses Dalitz plot analysis of $D \rightarrow K_S^0 \pi^+ \pi^-$ decays coming from $B^0 \rightarrow DK^*(892)^0$ modes.

² Measurement is performed with $K^+ \pi^-$ masses within 50 MeV of the K^{*0} mass and an absolute value of the cosine of the K^{*0} helicity angle greater than 0.4. Angle γ is required to satisfy $0 < \gamma < 180$ degrees.

T and CPT VIOLATION PARAMETERS

Measured values of the T -, CP -, and CPT -asymmetry parameters, defined as the differences in $S_{\alpha,\beta}^{\pm}$ and $C_{\alpha,\beta}^{\pm}$ between symmetry-transformed transitions. The indices $\alpha = \ell^+, \ell^-$ and $\beta = K_S^0, K_L^0$ stand for reconstructed the flavor final state and the CP final states from $\Upsilon(4S)$ decay. The sign \pm indicates whether the decay to the flavor final state α occurs before or after the decay to the CP final state.

Alternatively, violations of CPT symmetry and Lorentz invariance are searched for by studying interference effects in B^0 mixing. Results are expressed in terms of the standard model extension parameter Δa , which describes the difference between the couplings of the valence quarks within B^0 meson with the Lorentz-violating fields.

$\Delta S_T^+ (S_{\ell^-, K_S^0}^- - S_{\ell^+, K_S^0}^+)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------|-------------|----------|------------------------------------|
| -1.37 ± 0.14 ± 0.06 | LEES | 12W BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

$\Delta S_T^- (S_{\ell^-, K_S^0}^+ - S_{\ell^+, K_S^0}^-)$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--------------------|-------------|----------|------------------------------------|
| 1.17 ± 0.18 ± 0.11 | LEES | 12W BABR | $e^+ e^- \rightarrow \Upsilon(4S)$ |

$$\Delta C_T^+ (C_{\ell^-, K_S^0}^- - C_{\ell^+, K_S^0}^+)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|----------|----------------------------------|
| 0.10 ± 0.14 ± 0.08 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

$$\Delta C_T^- (C_{\ell^-, K_S^0}^+ - C_{\ell^+, K_S^0}^-)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|----------|----------------------------------|
| 0.04 ± 0.14 ± 0.08 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

$$\Delta S_{CP}^+ (S_{\ell^-, K_S^0}^+ - S_{\ell^+, K_S^0}^+)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|----------------------------|-------------|----------|----------------------------------|
| -1.30 ± 0.11 ± 0.07 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

$$\Delta S_{CP}^- (S_{\ell^-, K_S^0}^- - S_{\ell^+, K_S^0}^-)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|----------|----------------------------------|
| 1.33 ± 0.12 ± 0.06 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

$$\Delta C_{CP}^+ (C_{\ell^-, K_S^0}^+ - C_{\ell^+, K_S^0}^+)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|----------|----------------------------------|
| 0.07 ± 0.09 ± 0.03 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

$$\Delta C_{CP}^- (C_{\ell^-, K_S^0}^- - C_{\ell^+, K_S^0}^-)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|----------|----------------------------------|
| 0.08 ± 0.10 ± 0.04 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

$$\Delta S_{CPT}^+ (S_{\ell^+, K_S^0}^- - S_{\ell^+, K_S^0}^+)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|----------|----------------------------------|
| 0.16 ± 0.21 ± 0.09 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

$$\Delta S_{CPT}^- (S_{\ell^+, K_S^0}^+ - S_{\ell^+, K_S^0}^-)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|----------------------------|-------------|----------|----------------------------------|
| -0.03 ± 0.13 ± 0.06 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

$$\Delta C_{CPT}^+ (C_{\ell^+, K_S^0}^- - C_{\ell^+, K_S^0}^+)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|----------|----------------------------------|
| 0.14 ± 0.15 ± 0.07 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

$$\Delta C_{CPT}^- (C_{\ell^+, K_S^0}^+ - C_{\ell^+, K_S^0}^-)$$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---------------------------|-------------|----------|----------------------------------|
| 0.03 ± 0.12 ± 0.08 | LEES | 12W BABR | $e^+ e^- \rightarrow \gamma(4S)$ |

Δa_{\parallel} CPT parameter in B^0 mixing

| VALUE (10^{-15} GeV) | DOCUMENT ID | TECN | COMMENT |
|----------------------------|-------------------|----------|------------------|
| -0.10 ± 0.82 ± 0.54 | ¹ AAIJ | 16E LHCB | pp at 7, 8 TeV |

¹ Uses $B^0 \rightarrow J/\psi K_S^0$ decays.

Δa_{\perp} CPT parameter in B^0 mixing

| <u>VALUE</u> (10^{-13} GeV) | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|-----------------------|
| $-0.20 \pm 0.22 \pm 0.04$ | ¹ AAIJ | 16E | LHCB pp at 7, 8 TeV |
| ¹ Uses $B^0 \rightarrow J/\psi K_S^0$ decays. | | | |

 Δa_{χ} CPT parameter in B^0 mixing

| <u>VALUE</u> (10^{-15} GeV) | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|-----------------------|
| $+1.97 \pm 1.30 \pm 0.29$ | ¹ AAIJ | 16E | LHCB pp at 7, 8 TeV |
| ¹ Uses $B^0 \rightarrow J/\psi K_S^0$ decays. | | | |

 Δa_{γ} CPT parameter in B^0 mixing

| <u>VALUE</u> (10^{-15} GeV) | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|-----------------------|
| $+0.44 \pm 1.26 \pm 0.29$ | ¹ AAIJ | 16E | LHCB pp at 7, 8 TeV |
| ¹ Uses $B^0 \rightarrow J/\psi K_S^0$ decays. | | | |

 $B^0 \rightarrow D^{*-} \ell^+ \nu_{\ell}$ FORM FACTORS R_1 (form factor ratio $\sim V/A_1$)

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------|-------------|--------------------------------------|
| 1.239 ± 0.029 OUR AVERAGE | | | |
| $1.229 \pm 0.028 \pm 0.009$ | ¹ WAHEED | 19 | BELL $e^+e^- \rightarrow \gamma(4S)$ |
| $1.56 \pm 0.07 \pm 0.15$ | AUBERT | 09A | BABR $e^+e^- \rightarrow \gamma(4S)$ |
| $1.18 \pm 0.30 \pm 0.12$ | DUBOSCQ | 96 | CLE2 $e^+e^- \rightarrow \gamma(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $1.401 \pm 0.034 \pm 0.018$ | ¹ DUNGEL | 10 | BELL Repl. by WAHEED 19 |
| $1.429 \pm 0.061 \pm 0.044$ | AUBERT | 08R | BABR Repl. by AUBERT 09A |
| $1.396 \pm 0.060 \pm 0.044$ | AUBERT,B | 06Z | BABR Repl. by AUBERT 08R |

¹ Uses fully reconstructed $D^{*-} \ell^+ \nu$ events ($\ell = e$ or μ). R_2 (form factor ratio $\sim A_2/A_1$)

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|--------------------------------------|
| 0.84 ± 0.04 OUR AVERAGE | Error includes scale factor of 1.8. | | |
| $0.852 \pm 0.021 \pm 0.006$ | ¹ WAHEED | 19 | BELL $e^+e^- \rightarrow \gamma(4S)$ |
| $0.66 \pm 0.05 \pm 0.09$ | AUBERT | 09A | BABR $e^+e^- \rightarrow \gamma(4S)$ |
| $0.71 \pm 0.22 \pm 0.07$ | DUBOSCQ | 96 | CLE2 $e^+e^- \rightarrow \gamma(4S)$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.864 \pm 0.024 \pm 0.008$ | ¹ DUNGEL | 10 | BELL Repl. by WAHEED 19 |
| $0.827 \pm 0.038 \pm 0.022$ | AUBERT | 08R | BABR Repl. by AUBERT 09A |
| $0.885 \pm 0.040 \pm 0.026$ | AUBERT,B | 06Z | BABR Repl. by AUBERT 08R |

¹ Uses fully reconstructed $D^{*-} \ell^+ \nu$ events ($\ell = e$ or μ). $\rho_{A_1}^2$ (form factor slope)

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|--------------------------------------|
| 1.12 ± 0.04 OUR AVERAGE | Error includes scale factor of 1.5. | | |
| $1.106 \pm 0.031 \pm 0.007$ | ¹ WAHEED | 19 | BELL $e^+e^- \rightarrow \gamma(4S)$ |
| $1.22 \pm 0.02 \pm 0.07$ | AUBERT | 09A | BABR $e^+e^- \rightarrow \gamma(4S)$ |
| $0.91 \pm 0.15 \pm 0.06$ | DUBOSCQ | 96 | CLE2 $e^+e^- \rightarrow \gamma(4S)$ |

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

| | | | | |
|-----------------------------|---------------------|-----|------|---------------------|
| $1.214 \pm 0.034 \pm 0.009$ | ¹ DUNGEL | 10 | BELL | Repl. by WAHEED 19 |
| $1.191 \pm 0.048 \pm 0.028$ | AUBERT | 08R | BABR | Repl. by AUBERT 09A |
| $1.145 \pm 0.059 \pm 0.046$ | AUBERT,B | 06Z | BABR | Repl. by AUBERT 08R |

¹ Uses fully reconstructed $D^{*-} \ell^+ \nu$ events ($\ell = e$ or μ).

PARTIAL BRANCHING FRACTIONS IN $B^0 \rightarrow K^{(*)0} \ell^+ \ell^-$

$B(B^0 \rightarrow K^{*0} e^+ e^-) (0.0009 < q^2 < 1.0 \text{ GeV}^2/c^4)$

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|--------------------|
| $3.1^{+0.9+0.2}_{-0.8-0.3} \pm 0.2$ | ¹ AAIJ | 13U | LHCB pp at 7 TeV |

¹ The last uncertainty is due to uncertainties of $B(B^0 \rightarrow J/\psi K^{*0})$ and $B(J/\psi \rightarrow e^+ e^-)$ branching fraction measurements.

$B(B^0 \rightarrow K^{*0} \ell^+ \ell^-) (0.1 < q^2 < 2.0 \text{ GeV}^2/c^4)$

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|-------------------------------------|-------------|----------------|
| $1.24^{+0.23}_{-0.27}$ OUR AVERAGE | Error includes scale factor of 1.6. | | |

| | | | |
|---------------------------------|----------|-----|--|
| $1.14 \pm 0.11^{+0.11}_{-0.15}$ | AAIJ | 13Y | LHCB pp at 7 TeV, $K^{*0} \mu^+ \mu^-$ |
| $1.80 \pm 0.36 \pm 0.11$ | AALTONEN | 11A | CDF $p\bar{p}$ at 1.96 TeV |

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

| | | | |
|---------------------------------|-------------------------|------|------------------------|
| $0.48^{+0.14}_{-0.12} \pm 0.04$ | ¹ CHATRCHYAN | 13BL | CMS pp at 7 TeV |
| $1.16 \pm 0.23 \pm 0.11$ | AAIJ | 12U | LHCB Repl. by AAIJ 13Y |

¹ CHATRCHYAN 13BL uses, for this bin, $1.0 < q^2 < 2.0 \text{ GeV}^2/c^4$.

$B(B^0 \rightarrow K^{*0} \ell^+ \ell^-) (2.0 < q^2 < 4.3 \text{ GeV}^2/c^4)$

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
| 0.76 ± 0.07 OUR AVERAGE | | | |

| | | | |
|-----------------------------|--------------|------|--|
| $0.759 \pm 0.115 \pm 0.046$ | KHACHATRY... | 16D | CMS pp at 8 TeV |
| $0.69 \pm 0.07 \pm 0.09$ | AAIJ | 13Y | LHCB pp at 7 TeV, $K^{*0} \mu^+ \mu^-$ |
| $0.87 \pm 0.16 \pm 0.07$ | CHATRCHYAN | 13BL | CMS pp at 7 TeV |
| $0.84 \pm 0.28 \pm 0.06$ | AALTONEN | 11A | CDF $p\bar{p}$ at 1.96 TeV |

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

| | | | |
|--------------------------|------|-----|------------------------|
| $0.78 \pm 0.21 \pm 0.05$ | AAIJ | 12U | LHCB Repl. by AAIJ 13Y |
|--------------------------|------|-----|------------------------|

$B(B^0 \rightarrow K^{*0} \ell^+ \ell^-) (4.3 < q^2 < 8.68 \text{ GeV}^2/c^4)$

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
| 1.87 ± 0.21 OUR AVERAGE | | | |

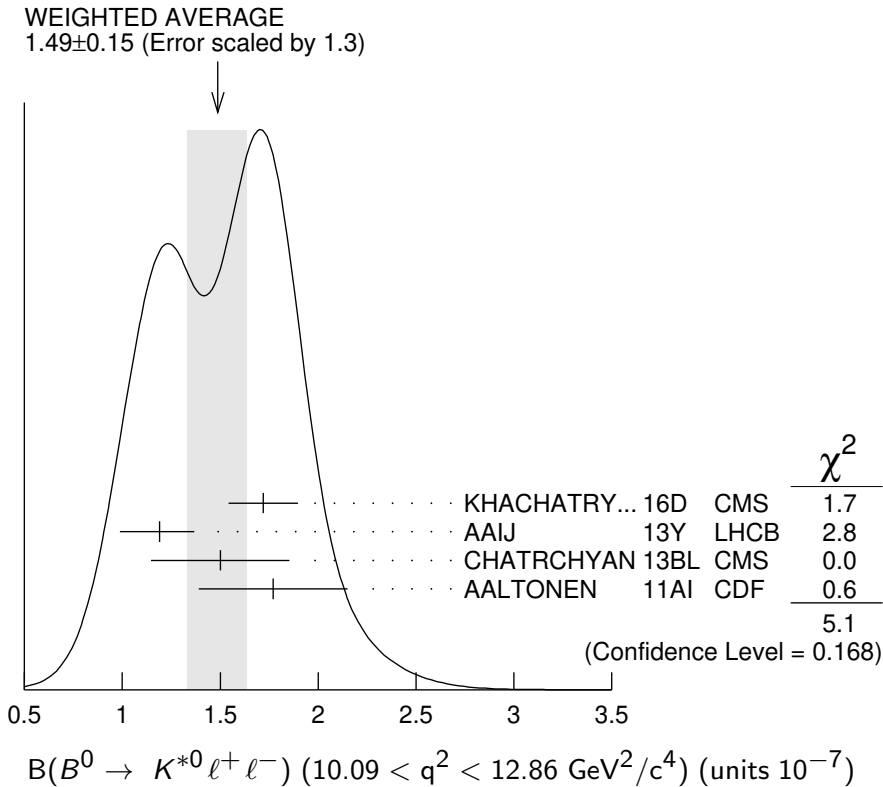
| | | | |
|---------------------------------|------------|------|--|
| $2.15 \pm 0.18^{+0.22}_{-0.28}$ | AAIJ | 13Y | LHCB pp at 7 TeV, $K^{*0} \mu^+ \mu^-$ |
| $1.62 \pm 0.31 \pm 0.18$ | CHATRCHYAN | 13BL | CMS pp at 7 TeV |
| $1.73 \pm 0.43 \pm 0.15$ | AALTONEN | 11A | CDF $p\bar{p}$ at 1.96 TeV |

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

| | | | |
|--------------------------|------|-----|------------------------|
| $3.02 \pm 0.35 \pm 0.22$ | AAIJ | 12U | LHCB Repl. by AAIJ 13Y |
|--------------------------|------|-----|------------------------|

$B(B^0 \rightarrow K^{*0} \ell^+ \ell^-) (10.09 < q^2 < 12.86 \text{ GeV}^2/c^4)$

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---|-------------|-------------------------------------|
| 1.49 ± 0.15 OUR AVERAGE | Error includes scale factor of 1.3. See the ideogram below. | | |
| $1.72 \pm 0.11 \pm 0.14$ | KHACHATRY...16D | CMS | pp at 8 TeV |
| $1.19 \pm 0.11^{+0.14}_{-0.17}$ | AAIJ | 13Y LHCb | pp at 7 TeV, $K^{*0} \mu^+ \mu^-$ |
| $1.50 \pm 0.25 \pm 0.25$ | CHATRCHYAN 13BL | CMS | pp at 7 TeV |
| $1.77 \pm 0.36 \pm 0.12$ | AALTONEN 11AI | CDF | $p\bar{p}$ at 1.96 TeV |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| $1.52 \pm 0.25 \pm 0.19$ | AAIJ | 12U LHCb | Repl. by AAIJ 13Y |



$B(B^0 \rightarrow K^{*0} \ell^+ \ell^-) (14.18 < q^2 < 16.0 \text{ GeV}^2/c^4)$

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|-------------------------------------|
| 1.09 ± 0.10 OUR AVERAGE | Error includes scale factor of 1.1. | | |
| $1.22 \pm 0.11 \pm 0.09$ | KHACHATRY...16D | CMS | pp at 8 TeV |
| $1.02 \pm 0.11^{+0.11}_{-0.15}$ | AAIJ | 13Y LHCb | pp at 7 TeV, $K^{*0} \mu^+ \mu^-$ |
| $0.84^{+0.16}_{-0.15} \pm 0.09$ | CHATRCHYAN 13BL | CMS | pp at 7 TeV |
| $1.34 \pm 0.26 \pm 0.08$ | AALTONEN 11AI | CDF | $p\bar{p}$ at 1.96 TeV |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| $1.15 \pm 0.20 \pm 0.09$ | AAIJ | 12U LHCb | Repl. by AAIJ 13Y |

$B(B^0 \rightarrow K^{*0} \ell^+ \ell^-)$ ($16.0 < q^2 < 19.0 \text{ GeV}^2/c^4$)

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-------------------------------------|
| 1.27±0.09 OUR AVERAGE | | | |
| 1.26±0.09±0.09 | KHACHATRY...16D | CMS | pp at 8 TeV |
| 1.23±0.12 ^{+0.15} _{-0.18} | AAIJ | 13Y LHCb | pp at 7 TeV, $K^{*0} \mu^+ \mu^-$ |
| 1.56±0.18±0.15 | CHATRCHYAN 13BL | CMS | pp at 7 TeV |
| 0.97±0.26±0.07 | AALTONEN 11A1 | CDF | $p\bar{p}$ at 1.96 TeV |
| ••• We do not use the following data for averages, fits, limits, etc. ••• | | | |
| 1.50±0.24±0.15 | AAIJ | 12U LHCb | Repl. by AAIJ 13Y |

 $B(B^0 \rightarrow K^*(892)^0 \ell^+ \ell^-)$ ($15.0 < q^2 < 19.0 \text{ GeV}^2/c^4$)

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------------------------|
| 1.80 ±0.13 OUR AVERAGE | | | |
| 2.2 ^{+0.5} _{-0.4} ±0.2 | ¹ WEHLE | 21 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| 2.0 ^{+0.6} _{-0.5} ±0.2 | ² WEHLE | 21 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| 1.744 ^{+0.072} _{-0.076} ±0.123 | ¹ AAIJ | 17Q LHCb | pp at 7, 8 TeV |
| ••• We do not use the following data for averages, fits, limits, etc. ••• | | | |
| 1.95 ^{+0.08} _{-0.09} ±0.13 | ¹ AAIJ | 16A0 LHCb | Repl. by AAIJ 17Q |

¹ Measured with $\mu^+ \mu^-$ as lepton pair.² Measured with $e^+ e^-$ as lepton pair. **$B(B^0 \rightarrow K^{*0} \ell^+ \ell^-)$ ($1.0 < q^2 < 6.0 \text{ GeV}^2/c^4$)**

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------------------------|-------------|----------------------------------|
| 1.74±0.11 OUR AVERAGE | | | |
| 1.9 ^{+0.6} _{-0.5} ±0.3 | ^{1,2} WEHLE | 21 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| 1.8 ^{+0.6} _{-0.6} ±0.2 | ^{1,3} WEHLE | 21 BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| 1.68±0.083±0.12 | ^{1,2} AAIJ | 17Q LHCb | pp at 7, 8 TeV |
| 1.90±0.20 | ² KHACHATRY...16D | CMS | pp at 7, 8 TeV |
| 1.42±0.41 ±0.12 | ² AALTONEN 11A1 | CDF | $p\bar{p}$ at 1.96 TeV |
| ••• We do not use the following data for averages, fits, limits, etc. ••• | | | |

1.92^{+0.10}_{-0.09} ±0.14 AAIJ 16A0 LHCb Repl. by AAIJ 17Q1.70±0.15^{+0.20}_{-0.25} AAIJ 13Y LHCb Repl. by AAIJ 16A0

2.20±0.30 ±0.20 CHATRCHYAN 13BL CMS Repl. by KHACHATRYAN 16D

2.10±0.30 ±0.15 AAIJ 12U LHCb Repl. by AAIJ 13Y

¹ Result is determined for the range $1.1 < q^2 < 6.0 \text{ GeV}^2/c^2$.² Measured with $\mu^+ \mu^-$ as lepton pair.³ Measured with $e^+ e^-$ as lepton pair. **$B(B^0 \rightarrow K^{*0} \ell^+ \ell^-)$ ($0.0 < q^2 < 4.3 \text{ GeV}^2/c^4$)**

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------------|
| 2.60±0.45±0.17 | AALTONEN 11A1 | CDF | $p\bar{p}$ at 1.96 TeV |

$B(B^0 \rightarrow K^{*0} \mu^+ \mu^-)/B(B^0 \rightarrow K^{*0} e^+ e^-)$ ($0.045 < q^2 < 1.1 \text{ GeV}^2/c^4$)

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|----------------|
| $0.65^{+0.11}_{-0.07}$ OUR AVERAGE | | | |

| | | | |
|---------------------------------|-------|----|---------------------------------------|
| $0.46^{+0.55}_{-0.27} \pm 0.13$ | WEHLE | 21 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
|---------------------------------|-------|----|---------------------------------------|

| | | | |
|---------------------------------|------|-----|-----------------------|
| $0.66^{+0.11}_{-0.07} \pm 0.03$ | AAIJ | 17W | LHCB pp at 7, 8 TeV |
|---------------------------------|------|-----|-----------------------|

 $B(B^0 \rightarrow K^{*0} \mu^+ \mu^-)/B(B^0 \rightarrow K^{*0} e^+ e^-)$ ($1.1 < q^2 < 6.0 \text{ GeV}^2/c^4$)

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|----------------|
| $0.71^{+0.12}_{-0.08}$ OUR AVERAGE | | | |

| | | | |
|---------------------------------|-------|----|---------------------------------------|
| $1.06^{+0.63}_{-0.38} \pm 0.13$ | WEHLE | 21 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |
|---------------------------------|-------|----|---------------------------------------|

| | | | |
|---------------------------------|------|-----|-----------------------|
| $0.69^{+0.11}_{-0.07} \pm 0.05$ | AAIJ | 17W | LHCB pp at 7, 8 TeV |
|---------------------------------|------|-----|-----------------------|

 $B(B^0 \rightarrow K^{*0} \mu^+ \mu^-)/B(B^0 \rightarrow K^{*0} e^+ e^-)$ ($15.0 < q^2 < 19.0 \text{ GeV}^2/c^4$)

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|---------------------------------------|
| $1.12^{+0.61}_{-0.36} \pm 0.10$ | WEHLE | 21 | BELL $e^+ e^- \rightarrow \gamma(4S)$ |

 $B(B^0 \rightarrow K^0 \ell^+ \ell^-)$ ($q^2 < 2.0 \text{ GeV}^2/c^4$)

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|----------------|
| $0.24^{+0.22}_{-0.20}$ OUR AVERAGE | | | |

| | | | |
|------------------------|------|------|--------------------|
| $0.21^{+0.27}_{-0.23}$ | AAIJ | 12AH | LHCB pp at 7 TeV |
|------------------------|------|------|--------------------|

| | | | |
|--------------------------|----------|------|----------------------------|
| $0.31 \pm 0.37 \pm 0.02$ | AALTONEN | 11AI | CDF $p\bar{p}$ at 1.96 TeV |
|--------------------------|----------|------|----------------------------|

 $B(B^0 \rightarrow K^0 \ell^+ \ell^-)$ ($2.0 < q^2 < 4.3 \text{ GeV}^2/c^4$)

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|-------------------------------------|
| $0.24^{+0.35}_{-0.30}$ OUR AVERAGE | | | Error includes scale factor of 1.6. |

| | | | |
|------------------------|------|------|--------------------|
| $0.07^{+0.25}_{-0.21}$ | AAIJ | 12AH | LHCB pp at 7 TeV |
|------------------------|------|------|--------------------|

| | | | |
|--------------------------|----------|------|----------------------------|
| $0.93 \pm 0.49 \pm 0.07$ | AALTONEN | 11AI | CDF $p\bar{p}$ at 1.96 TeV |
|--------------------------|----------|------|----------------------------|

 $B(B^0 \rightarrow K^0 \ell^+ \ell^-)$ ($4.3 < q^2 < 8.68 \text{ GeV}^2/c^4$)

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
| 1.08 ± 0.27 OUR AVERAGE | | | |

| | | | |
|-----------------|------|------|--------------------|
| 1.23 ± 0.31 | AAIJ | 12AH | LHCB pp at 7 TeV |
|-----------------|------|------|--------------------|

| | | | |
|--------------------------|----------|------|----------------------------|
| $0.66 \pm 0.51 \pm 0.05$ | AALTONEN | 11AI | CDF $p\bar{p}$ at 1.96 TeV |
|--------------------------|----------|------|----------------------------|

 $B(B^0 \rightarrow K^0 \ell^+ \ell^-)$ ($10.09 < q^2 < 12.86 \text{ GeV}^2/c^4$)

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|-------------------------------------|
| 0.27 ± 0.27 OUR AVERAGE | | | Error includes scale factor of 1.8. |

| | | | |
|------------------------|------|------|--------------------|
| $0.50^{+0.22}_{-0.19}$ | AAIJ | 12AH | LHCB pp at 7 TeV |
|------------------------|------|------|--------------------|

| | | | |
|---------------------------|----------|------|----------------------------|
| $-0.03 \pm 0.22 \pm 0.01$ | AALTONEN | 11AI | CDF $p\bar{p}$ at 1.96 TeV |
|---------------------------|----------|------|----------------------------|

$B(B^0 \rightarrow K^0 \ell^+ \ell^-)$ ($14.18 < q^2 < 16.0 \text{ GeV}^2/c^4$)

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
|---|--------------------|-------------|----------------|

 $0.29^{+0.21}_{-0.15}$ OUR AVERAGE Error includes scale factor of 1.8.

| | | | |
|--------------------------|----------|-----------|------------------------|
| $0.20^{+0.13}_{-0.09}$ | AAIJ | 12AH LHCb | pp at 7 TeV |
| $0.73 \pm 0.26 \pm 0.06$ | AALTONEN | 11AI CDF | $p\bar{p}$ at 1.96 TeV |

 $B(B^0 \rightarrow K^0 \ell^+ \ell^-)$ ($q^2 > 16.0 \text{ GeV}^2/c^4$)

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
|---|--------------------|-------------|----------------|

 $0.31^{+0.16}_{-0.12}$ OUR AVERAGE

| | | | |
|--------------------------|----------|-----------|------------------------|
| $0.35^{+0.21}_{-0.14}$ | AAIJ | 12AH LHCb | pp at 7 TeV |
| $0.21 \pm 0.18 \pm 0.16$ | AALTONEN | 11AI CDF | $p\bar{p}$ at 1.96 TeV |

 $B(B^0 \rightarrow K^0 \ell^+ \ell^-)$ ($1.0 < q^2 < 6.0 \text{ GeV}^2/c^4$)

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
|---|--------------------|-------------|----------------|

 $0.91^{+0.15}_{-0.13}$ OUR AVERAGE

| | | | |
|-------------------------------------|---------------------------|----------|----------------------------------|
| $0.62^{+0.44}_{-0.32} \pm 0.02$ | ¹ CHOUDHURY 21 | BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| $1.12^{+0.50}_{-0.40} \pm 0.04$ | ² CHOUDHURY 21 | BELL | $e^+ e^- \rightarrow \gamma(4S)$ |
| $0.916^{+0.172}_{-0.157} \pm 0.004$ | ³ AAIJ | 14M LHCb | pp at 7, 8 TeV |
| $0.98 \pm 0.61 \pm 0.08$ | AALTONEN | 11AI CDF | $p\bar{p}$ at 1.96 TeV |

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

| | | | |
|------------------------|------|-----------|-------------------|
| $0.65^{+0.45}_{-0.35}$ | AAIJ | 12AH LHCb | Repl. by AAIJ 14M |
|------------------------|------|-----------|-------------------|

¹ Measured for $B^0 \rightarrow K_S^0 \mu^+ \mu^-$ decays. Measurements in other q^2 bins are also reported.² Measured for $B^0 \rightarrow K_S^0 e^+ e^-$ decays. Measurements in other q^2 bins are also reported.³ Uses $B(B^0 \rightarrow J/\psi(1S) K^0) = (0.928 \pm 0.013 \pm 0.037) \times 10^{-3}$ for normalisation and $\mu^+ \mu^-$ as a lepton pair. Measured in $1.1 < q^2 < 6.0 \text{ GeV}^2/c^4$. **$B(B^0 \rightarrow K^0 \mu^+ \mu^-) / B(B^0 \rightarrow K^0 e^+ e^-)$ ($1.0 < q^2 < 6.0 \text{ GeV}^2/c^4$)**

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|----------------|
|--------------|--------------------|-------------|----------------|

 $0.55^{+0.46}_{-0.34} \pm 0.01$ ¹ CHOUDHURY 21 BELL $e^+ e^- \rightarrow \gamma(4S)$ ¹ Measured from the ratio of $K_S^0 \mu^+ \mu^-$ and $K_S^0 e^+ e^-$. Measurements in other q^2 bins are also reported. **$B(B^0 \rightarrow K^0 \ell^+ \ell^-)$ ($0.0 < q^2 < 4.3 \text{ GeV}^2/c^4$)**

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|----------------|
|---|--------------------|-------------|----------------|

 $1.27 \pm 0.62 \pm 0.10$ AALTONEN 11AI CDF $p\bar{p}$ at 1.96 TeV

$B(B^0 \rightarrow K^0 \ell^+ \ell^-) (15.0 < q^2 < 22.0 \text{ GeV}^2/c^4)$

| <u>VALUE (units 10^{-7})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|------------------|
| $0.67^{+0.11}_{-0.11} \pm 0.04$ | ¹ AAIJ | 14M LHCB | pp at 7, 8 TeV |

¹ Uses $B(B^0 \rightarrow J/\psi(1S) K^0) = (0.928 \pm 0.013 \pm 0.037) \times 10^{-3}$ for normalisation and $\mu^+ \mu^-$ as a lepton pair.

$B(B^0 \rightarrow K_{0,2}^*(1430)^0 \mu^+ \mu^-) (1.10 < q^2 < 6.00 \text{ GeV}^2/c^4)$

| <u>VALUE (units 10^{-8})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------|-------------|------------------|
| $4.02 \pm 0.44 \pm 0.31$ | ^{1,2} AAIJ | 16AP LHCB | pp at 7, 8 TeV |

¹ Measured the differential branching fraction and angular moments of the decay $B^0 \rightarrow K^+ \pi^- \mu^+ \mu^-$ in the $K^+ \pi^-$ invariant mass range $1330 < m(K^+ \pi^-) < 1530 \text{ MeV}/c^2$.

² The reported value is converted from the measured $dB/dq^2 = (0.82 \pm 0.09 \pm 0.063) \times 10^{-8} (\text{GeV}^2/c^4)^{-1}$ by multiplying by the $\Delta q^2 = 4.9 \text{ GeV}^2/c^4$ range.

$F_H(B^0 \rightarrow K^0 \mu^+ \mu^-) (1.1 < q^2 < 6.0 \text{ GeV}^2/c^4)$

F_H is a fractional contribution of (pseudo) scalar and tensor amplitudes to the decay width in the massless muon approximation.

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------------------|--------------------|-------------|------------------|
| $0.78 \pm 0.46 \pm 0.09$ | ¹ AAIJ | 14O LHCB | pp at 7, 8 TeV |

¹ AAIJ 14O reports 68% C.L. interval, which we encode as midpoint with uncertainty as half of the width of interval.

$F_H(B^0 \rightarrow K^0 \mu^+ \mu^-) (15.0 < q^2 < 22.0 \text{ GeV}^2/c^4)$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------------------|--------------------|-------------|------------------|
| $0.34 \pm 0.25 \pm 0.03$ | ¹ AAIJ | 14O LHCB | pp at 7, 8 TeV |

¹ AAIJ 14O reports 68% C.L. interval, which we encode as midpoint with uncertainty as half of the width of interval.

PRODUCTION ASYMMETRIES

$A_P(B^0)$

$$A_P(B^0) = [\sigma(\bar{B}^0) - \sigma(B^0)] / [\sigma(\bar{B}^0) + \sigma(B^0)]$$

| <u>VALUE (units 10^{-2})</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------------------------------|-------------|-------------------------|
| -0.3 ± 0.6 OUR AVERAGE | Error includes scale factor of 1.7. | | See the ideogram below. |

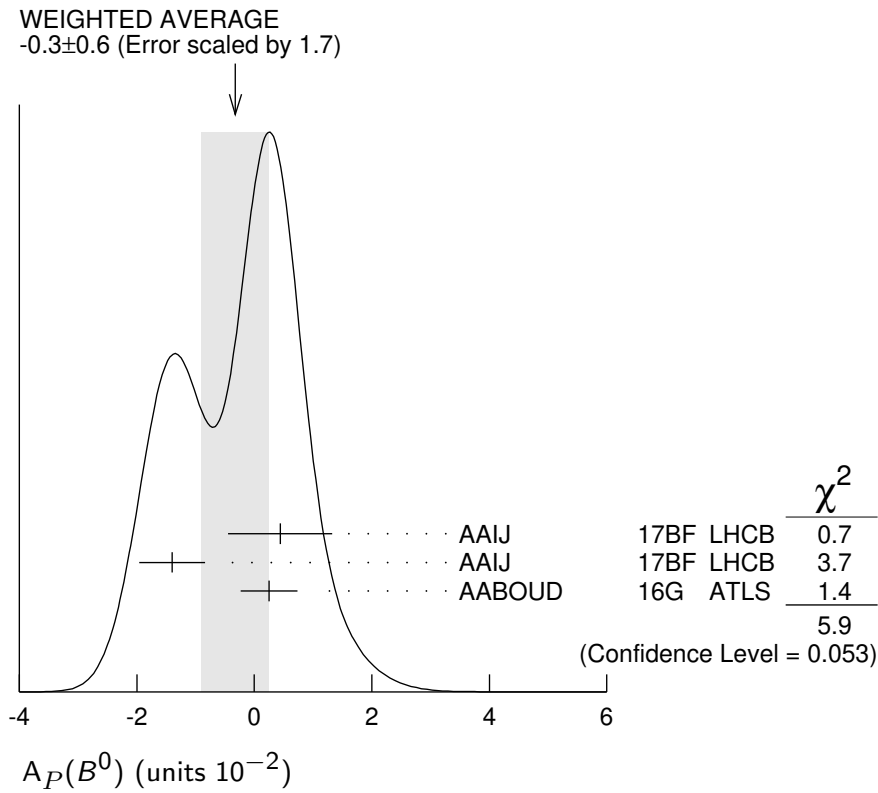
| | | | |
|---------------------------|---------------------|-----------|-----------------------------------|
| $0.44 \pm 0.88 \pm 0.11$ | ¹ AAIJ | 17BF LHCB | pp at 7 TeV |
| $-1.40 \pm 0.55 \pm 0.10$ | ¹ AAIJ | 17BF LHCB | pp at 8 TeV |
| $0.25 \pm 0.48 \pm 0.05$ | ² AABOUD | 16G ATLS | pp at 7, 8 TeV |
| $-0.35 \pm 0.76 \pm 0.28$ | ³ AAIJ | 14BP LHCB | Repl. by AAIJ 17BF, pp at 7 TeV |

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

¹ AAIJ 17BF uses $B^0 \rightarrow J/\psi K^{*0}$ decays with B^0 transverse momenta p_T and rapidities y in the region of $0 < p_T < 30 \text{ GeV}/c$ and $2.1 < y < 4.5$.

² Based on time-dependent analysis of $B^0 \rightarrow J/\psi K^{*0}$ decay in kinematic range $p_T > 10 \text{ GeV}/c$ and $|\eta| < 2.5$.

³ Based on time-dependent analysis of $B^0 \rightarrow J/\psi K^{*0}$ and $B^0 \rightarrow D^- \pi^+$ in kinematic range $4 < p_T < 30 \text{ GeV}/c$ and $2.5 < \eta < 4.5$.



$A(B^0 + \bar{B}^0)$ in $K_S^0 K^\mp \pi^\pm$

$$A(B^0 + \bar{B}^0) = [n(K_S^0 K^- \pi^+) - n(K_S^0 K^+ \pi^-)] / [n(K_S^0 K^- \pi^+) + n(K_S^0 K^+ \pi^-)]$$

| VALUE (units 10^{-2}) | DOCUMENT ID | TECN | COMMENT |
|--|-------------|------|---|
| $-8.5 \pm 8.9 \pm 0.2$ | LAI | 19 | BELL $e^+ e^- \rightarrow \Upsilon(4S)$ |

B^0 REFERENCES

| | | | | |
|-----------|------|-----------------|-----------------------------|-----------------|
| AAIJ | 22 | PRL 128 041801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| Also | | PR D105 012010 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| WAHEED | 22 | PR D105 012003 | E. Waheed <i>et al.</i> | (Belle Collab.) |
| AAIJ | 21K | CP C45 043001 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 21O | JHEP 2103 075 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 21S | JHEP 2106 177 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 21W | EPJ C81 314 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| ATMACAN | 21 | PR D104 L091105 | H. Atmacan <i>et al.</i> | (BELLE Collab.) |
| CAO | 21A | PR D104 012008 | L. Cao <i>et al.</i> | (BELLE Collab.) |
| CHOUDHURY | 21 | JHEP 2103 105 | S. Choudhury <i>et al.</i> | (BELLE Collab.) |
| KANG | 21 | PR D103 032003 | K.H. Kang <i>et al.</i> | (BELLE Collab.) |
| MOHANTY | 21 | PR D103 052013 | S. Mohanty <i>et al.</i> | (Belle Collab.) |
| WAHEED | 21 | PR D103 079901 | E. Waheed <i>et al.</i> | (BELLE Collab.) |
| WEHLE | 21 | PRL 126 161801 | S. Wehle <i>et al.</i> | (BELLE Collab.) |
| AAIJ | 20AG | PR D102 051102 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 20AN | JHEP 2012 139 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 20AO | JHEP 2012 081 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 20F | PR D102 012011 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 20L | JHEP 2003 147 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 20W | PRL 124 211802 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| CHILIKIN | 20 | JHEP 2005 034 | K. Chilikin <i>et al.</i> | (BELLE Collab.) |
| CHU | 20 | PR D101 052012 | K. Chu <i>et al.</i> | (BELLE Collab.) |
| KU | 20 | PR D102 012003 | Y. Ku <i>et al.</i> | (BELLE Collab.) |
| SIRUNYAN | 20AG | JHEP 2004 188 | A.M. Sirunyan <i>et al.</i> | (CMS Collab.) |
| AABOUD | 19L | JHEP 1904 098 | M. Aaboud <i>et al.</i> | (ATLAS Collab.) |
| AAIJ | 19AK | PRL 123 211801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |

| | | | | |
|---------------|------|----------------|----------------------------------|----------------------------|
| AAIJ | 19AP | JHEP 1912 155 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 19J | JHEP 1905 026 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 19L | JHEP 1907 032 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 19N | JHEP 1908 041 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 19U | PRL 122 191804 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| CHILIKIN | 19 | PR D100 012001 | K. Chilikin <i>et al.</i> | (BELLE Collab.) |
| CHOU | 19 | PR D100 012002 | P.-C. Chou <i>et al.</i> | (BELLE Collab.) |
| GARG | 19 | PR D99 071102 | R. Garg <i>et al.</i> | (BELLE Collab.) |
| LAI | 19 | PR D100 011101 | Y.-T. Lai <i>et al.</i> | (BELLE Collab.) |
| LI | 19C | PR D100 031101 | Y.B. Li <i>et al.</i> | (BELLE Collab.) |
| PAL | 19 | PR D99 091104 | B. Pal <i>et al.</i> | (BELLE Collab.) |
| WAHEED | 19 | PR D100 052007 | E. Waheed <i>et al.</i> | (BELLE Collab.) |
| WATANUKI | 19 | PR D99 032012 | S. Watanuki <i>et al.</i> | (BELLE Collab.) |
| YUSA | 19 | PR D99 011102 | Y. Yusa <i>et al.</i> | (BELLE Collab.) |
| AABOUD | 18BY | JHEP 1810 047 | M. Aaboud <i>et al.</i> | (ATLAS Collab.) |
| AAIJ | 18AN | EPJ C78 1019 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 18AY | PR D98 071103 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 18AZ | PR D98 072006 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 18D | PRL 120 171802 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 18F | PRL 120 261801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 18O | PR D98 032004 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 18T | JHEP 1803 078 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 18Z | JHEP 1806 084 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| ABAZOV | 18B | PR D98 052010 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ADACHI | 18 | PR D98 112012 | I. Adachi <i>et al.</i> | (BELLE and BABAR Collabs.) |
| Also | | PRL 121 261801 | I. Adachi <i>et al.</i> | (BELLE and BABAR Collabs.) |
| LEES | 18C | PR D98 071102 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LI | 18D | EPJ C78 928 | Y.B. Li <i>et al.</i> | (BELLE Collab.) |
| NAKANO | 18 | PR D97 092003 | H. Nakano <i>et al.</i> | (BELLE Collab.) |
| PAL | 18 | PR D98 112008 | B. Pal <i>et al.</i> | (BELLE Collab.) |
| PDG | 18 | PR D98 030001 | M. Tanabashi <i>et al.</i> | (PDG Collab.) |
| SANDILYA | 18 | PR D98 071101 | S. Sandilya <i>et al.</i> | (BELLE Collab.) |
| SIRUNYAN | 18BY | EPJ C78 457 | A.M. Sirunyan <i>et al.</i> | (CMS Collab.) |
| SIRUNYAN | 18DF | EPJ C78 939 | A.M. Sirunyan <i>et al.</i> | (CMS Collab.) |
| VOSSSEN | 18 | PR D98 012005 | A. Vossen <i>et al.</i> | (BELLE Collab.) |
| AAIJ | 17A | PR D95 012006 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17AI | PRL 118 191801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17AJ | PRL 118 251802 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17BD | PR D96 051103 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17BF | PL B774 139 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17BJ | PRL 119 232001 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17BN | JHEP 1711 170 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17BP | JHEP 1711 027 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17G | PRL 118 081801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17N | JHEP 1703 001 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17Q | JHEP 1704 142 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 17W | JHEP 1708 055 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| GRYGIER | 17 | PR D96 091101 | J. Grygier <i>et al.</i> | (BELLE Collab.) |
| HORIGUCHI | 17 | PRL 119 191802 | T. Horiguchi <i>et al.</i> | (BELLE Collab.) |
| JULIUS | 17 | PR D96 032007 | T. Julius <i>et al.</i> | (BELLE Collab.) |
| AABOUD | 16G | JHEP 1606 081 | M. Aaboud <i>et al.</i> | (ATLAS Collab.) |
| AABOUD | 16L | EPJ C76 513 | M. Aaboud <i>et al.</i> | (ATLAS Collab.) |
| AAIJ | 16 | JHEP 1601 012 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 16AA | JHEP 1608 137 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 16AN | PRL 117 261801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 16AO | JHEP 1611 047 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 16AP | JHEP 1612 065 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 16AV | EPJ C76 412 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 16E | PRL 116 241601 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 16S | PR D93 112018 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 16Z | JHEP 1606 131 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| BHARDWAJ | 16 | PR D93 052016 | V. Bhardwaj <i>et al.</i> | (BELLE Collab.) |
| CHOBANOVA | 16 | PR D93 031101 | V. Chobanova <i>et al.</i> | (BELLE Collab.) |
| DEL-AMO-SA... | 16 | PR D93 052013 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| GLATTAUER | 16 | PR D93 032006 | R. Glattauer <i>et al.</i> | (BELLE Collab.) |
| HAMER | 16 | PR D93 032007 | P. Hamer <i>et al.</i> | (BELLE Collab.) |
| KHACHATRY... | 16D | PL B753 424 | V. Khachatryan <i>et al.</i> | (CMS Collab.) |
| KING | 16 | PR D93 111101 | Z. King <i>et al.</i> | (BELLE Collab.) |
| LEES | 16 | PRL 116 041801 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 16E | PR D94 011101 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 16H | PR D94 091101 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |

| | | | | |
|--------------|------|-------------------------|-------------------------------|----------------------------|
| SATO | 16B | PR D94 072007 | Y. Sato <i>et al.</i> | (BELLE Collab.) |
| VANHOEFER | 16 | PR D93 032010 | P. Vanhoefer <i>et al.</i> | (BELLE Collab.) |
| Also | | PR D94 099903 (errata.) | P. Vanhoefer <i>et al.</i> | (BELLE Collab.) |
| VOROBYEV | 16 | PR D94 052004 | V. Vorobyev <i>et al.</i> | (BELLE Collab.) |
| AAIJ | 15AC | JHEP 1505 019 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15AS | JHEP 1510 053 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15AZ | PRL 115 161802 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15BB | PR D92 112002 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15D | JHEP 1501 024 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15F | PRL 114 041601 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15J | PL B742 38 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15N | PRL 115 031601 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15Q | PRL 115 111803 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15S | PL B743 46 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15T | PL B747 468 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15X | PR D92 012012 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15Y | PR D92 032002 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 15Z | JHEP 1504 064 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| ABAZOV | 15A | PRL 114 062001 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ABDESSALAM | 15 | PRL 115 121604 | A. Abdessalam <i>et al.</i> | (BABAR and BELLE Collabs.) |
| BALA | 15 | PR D91 051101 | A. Bala <i>et al.</i> | (BELLE Collab.) |
| CHANG | 15 | PRL 115 221803 | Y.-Y. Chang <i>et al.</i> | (BELLE Collab.) |
| CHOI | 15A | PR D91 092011 | S.-K. Choi <i>et al.</i> | (BELLE Collab.) |
| KHACHATRY... | 15BE | NAT 522 68 | V. Khachatryan <i>et al.</i> | (CMS and LHCb Collab.) |
| LEES | 15 | PR D91 012003 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 15A | PRL 114 081801 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 15B | PR D91 031102 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 15C | PR D91 052002 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| MATVIENKO | 15 | PR D92 012013 | D. Matvienko <i>et al.</i> | (BELLE Collab.) |
| PAL | 15 | PR D92 011101 | B. Pal <i>et al.</i> | (BELLE Collab.) |
| WIEHCZYN... | 15 | PR D91 032008 | J. Wiechczynski <i>et al.</i> | (BELLE Collab.) |
| AAIJ | 14AA | PRL 112 202001 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14AM | JHEP 1405 069 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14AN | JHEP 1409 177 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14BM | NJP 16 123001 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14BN | PR D90 112002 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14BP | PL B739 218 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14E | JHEP 1404 114 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14L | JHEP 1407 140 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14M | JHEP 1406 133 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14O | JHEP 1405 082 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14R | PL B736 446 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14X | PR D90 012003 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 14Y | PRL 112 091802 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AALTONEN | 14P | PRL 113 242001 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| ABAZOV | 14 | PR D89 012002 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| CHILIKIN | 14 | PR D90 112009 | K. Chilikin <i>et al.</i> | (BELLE Collab.) |
| CHOBANOVA | 14 | PR D90 012002 | V. Chobanova <i>et al.</i> | (BELLE Collab.) |
| IWASHITA | 14 | PTEP 2014 043C01 | T. Iwashita <i>et al.</i> | (BELLE Collab.) |
| LAI | 14 | PR D89 051103 | Y.-T. Lai <i>et al.</i> | (BELLE Collab.) |
| LEES | 14 | PR D89 051101 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 14B | PR D89 112002 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 14C | PR D89 071102 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| PDG | 14 | CP C38 070001 | K. Olive <i>et al.</i> | (PDG Collab.) |
| SANTELJ | 14 | JHEP 1410 165 | L. Santelj <i>et al.</i> | (BELLE Collab.) |
| SATO | 14 | PR D90 072009 | S. Sato <i>et al.</i> | (BELLE Collab.) |
| VANHOEFER | 14 | PR D89 072008 | P. Vanhoefer <i>et al.</i> | (BELLE Collab.) |
| AAD | 13U | PR D87 032002 | G. Aad <i>et al.</i> | (ATLAS Collab.) |
| AAIJ | 13 | NP B867 1 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13A | NP B867 547 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13AA | NP B871 403 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13AC | NP B874 663 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13AO | PR D87 092001 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13AP | PR D87 092007 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13AQ | PR D87 112009 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13AT | PR D88 052002 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13AW | PRL 110 211801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13AX | PRL 110 221601 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13B | PRL 110 021801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13BA | PRL 111 101805 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13BM | PRL 111 141801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |

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| AAIJ | 13BO | JHEP 1310 183 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13BP | JHEP 1310 143 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13BQ | JHEP 1310 005 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13BT | PR D88 072005 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13CF | EPJ C73 2655 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13E | PRL 110 031801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13F | PL B719 318 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13K | PL B721 24 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13L | JHEP 1303 067 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13M | PR D87 052001 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13P | JHEP 1304 001 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13U | JHEP 1305 159 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13Y | JHEP 1308 131 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 13Z | JHEP 1309 006 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AALTONEN | 13F | PR D87 072003 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| CHATRCHYAN | 13AW | PRL 111 101804 | S. Chatrchyan <i>et al.</i> | (CMS Collab.) |
| CHATRCHYAN | 13BL | PL B727 77 | S. Chatrchyan <i>et al.</i> | (CMS Collab.) |
| CHILIKIN | 13 | PR D88 074026 | K. Chilikin <i>et al.</i> | (BELLE Collab.) |
| DALSENO | 13 | PR D88 092003 | J. Dalseno <i>et al.</i> | (BELLE Collab.) |
| DUH | 13 | PR D87 031103 | Y. T. Duh <i>et al.</i> | (BELLE Collab.) |
| GAUR | 13 | PR D87 091101 | V. Gaur <i>et al.</i> | (BELLE Collab.) |
| LEES | 13D | PR D87 052009 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 13H | PR D87 092004 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 13I | PR D87 112005 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 13J | PR D88 012003 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 13M | PR D88 032012 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 13N | PRL 111 101802 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| Also | | PRL 111 159901(errat.) | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| Also | | PR D93 032001 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LUTZ | 13 | PR D87 111103 | O. Lutz <i>et al.</i> | (BELLE Collab.) |
| PRIM | 13 | PR D88 072004 | M. Prim <i>et al.</i> | (BELLE Collab.) |
| SIBIDANOV | 13 | PR D88 032005 | A. Sibidanov <i>et al.</i> | (BELLE Collab.) |
| AAIJ | 12A | PL B708 55 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12AH | JHEP 1207 133 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12AM | PRL 109 131801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12AR | JHEP 1210 037 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12AX | PR D86 112005 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12E | PL B708 241 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12I | PL B709 177 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12L | EPJ C72 2118 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12T | PRL 108 161801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12U | PRL 108 181806 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12V | PRL 108 201601 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 12W | PRL 108 231801 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AALTONEN | 12L | PRL 108 211803 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| ABAZOV | 12AC | PR D86 072009 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ABAZOV | 12U | PR D85 112003 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ADACHI | 12A | PRL 108 171802 | I. Adachi <i>et al.</i> | (BELLE Collab.) |
| CHANG | 12 | PR D85 091102 | M.-C. Chang <i>et al.</i> | (BELLE Collab.) |
| CHATRCHYAN | 12A | JHEP 1204 033 | S. Chatrchyan <i>et al.</i> | (CMS Collab.) |
| DALSENO | 12 | PR D86 092012 | J. Dalseno <i>et al.</i> | (BELLE Collab.) |
| DEL-AMO-SA... | 12 | PR D85 092017 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| HIGUCHI | 12 | PR D85 071105 | T. Higuchi <i>et al.</i> | (BELLE Collab.) |
| HOI | 12 | PRL 108 031801 | C.-T. Hoi <i>et al.</i> | (BELLE Collab.) |
| HSU | 12 | PR D86 032002 | C.-L. Hsu <i>et al.</i> | (BELLE Collab.) |
| KIM | 12A | PR D86 031101 | J.H. Kim <i>et al.</i> | (BELLE Collab.) |
| KRONENBIT... | 12 | PR D86 071103 | B. Kronenbitter <i>et al.</i> | (BELLE Collab.) |
| LEES | 12AA | PR D86 092004 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 12AF | PR D86 112006 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 12B | PR D85 052003 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 12D | PRL 109 101802 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| Also | | PR D88 072012 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 12I | PR D85 054023 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 12K | PR D85 072005 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 12O | PR D85 112010 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 12T | PR D86 051105 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 12W | PRL 109 211801 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| NEGISHI | 12 | PR D86 011101 | K. Negishi <i>et al.</i> | (BELLE Collab.) |
| PDG | 12 | PR D86 010001 | J. Beringer <i>et al.</i> | (PDG Collab.) |
| ROHRKEN | 12 | PR D85 091106 | M. Rohrken <i>et al.</i> | (BELLE Collab.) |
| SATO | 12 | PRL 108 171801 | Y. Sato <i>et al.</i> | (BELLE Collab.) |

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|---------------|------|--|----------------------------------|-----------------|
| AAIJ | 11B | PL B699 330 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AAIJ | 11E | PR D84 092001 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| Also | | PR D85 039904 (errat.) | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AALTONEN | 11 | PRL 106 121804 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| AALTONEN | 11AG | PRL 107 191801 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| Also | | PRL 107 239903 (errat.) | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| AALTONEN | 11AI | PRL 107 201802 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| AALTONEN | 11L | PRL 106 161801 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| AALTONEN | 11N | PRL 106 181802 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| ABAZOV | 11U | PR D84 052007 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| AUSHEV | 11 | PR D83 051102 | T. Aushev <i>et al.</i> | (BELLE Collab.) |
| BAHINIPATI | 11 | PR D84 021101 | S. Bahinipati <i>et al.</i> | (BELLE Collab.) |
| BHARDWAJ | 11 | PRL 107 091803 | V. Bhardwaj <i>et al.</i> | (BELLE Collab.) |
| CHATRCHYAN | 11T | PRL 107 191802 | S. Chatrchyan <i>et al.</i> | (CMS Collab.) |
| CHOI | 11 | PR D84 052004 | S.-K. Choi <i>et al.</i> | (BELLE Collab.) |
| DEL-AMO-SA... | 11A | PR D83 032006 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| DEL-AMO-SA... | 11B | PR D83 032004 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| DEL-AMO-SA... | 11C | PR D83 032007 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| DEL-AMO-SA... | 11F | PR D83 052011 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| DEL-AMO-SA... | 11K | PR D83 091101 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| HA | 11 | PR D83 071101 | H. Ha <i>et al.</i> | (BELLE Collab.) |
| LEES | 11 | PR D83 112010 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 11A | PR D84 012001 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 11F | PR D84 071102 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| LEES | 11M | PR D84 112007 | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| Also | | PR D87 039901 (errat.) | J.P. Lees <i>et al.</i> | (BABAR Collab.) |
| SAHOO | 11A | PR D84 071101 | H. Sahoo <i>et al.</i> | (BELLE Collab.) |
| AUBERT | 10 | PRL 104 011802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 10D | PR D81 052009 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 10H | PR D82 031102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUSHEV | 10 | PR D81 031103 | T. Aushev <i>et al.</i> | (BELLE Collab.) |
| CHIANG | 10 | PR D81 071101 | C.-C. Chiang <i>et al.</i> | (BELLE Collab.) |
| DAS | 10 | PR D82 051103 | A. Das <i>et al.</i> | (BELLE Collab.) |
| DEL-AMO-SA... | 10A | PR D82 011502 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| DEL-AMO-SA... | 10B | PR D82 011101 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| DEL-AMO-SA... | 10E | PR D82 031101 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| DEL-AMO-SA... | 10Q | PR D82 112002 | P. del Amo Sanchez <i>et al.</i> | (BABAR Collab.) |
| DUNGEL | 10 | PR D82 112007 | W. Dungenl <i>et al.</i> | (BELLE Collab.) |
| FUJIKAWA | 10A | PR D81 011101 | M. Fujikawa <i>et al.</i> | (BELLE Collab.) |
| HYUN | 10 | PRL 105 091801 | H.J. Hyun <i>et al.</i> | (BELLE Collab.) |
| JOSHI | 10 | PR D81 031101 | N.J. Joshi <i>et al.</i> | (BELLE Collab.) |
| NAKAHAMA | 10 | PR D82 073011 | Y. Nakahama <i>et al.</i> | (BELLE Collab.) |
| WEDD | 10 | PR D81 111104 | R. Wedd <i>et al.</i> | (BELLE Collab.) |
| AALTONEN | 09B | PR D79 011104 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| AALTONEN | 09C | PRL 103 031801 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| AALTONEN | 09E | PR D79 032001 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| AALTONEN | 09P | PRL 102 201801 | T. Aaltonen <i>et al.</i> | (CDF Collab.) |
| ABAZOV | 09E | PRL 102 032001 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| AUBERT | 09 | PR D79 011102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09A | PR D79 012002 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AA | PR D79 112001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AC | PR D79 112009 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AD | PR D80 011101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AE | PR D80 031102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AF | PR D80 051101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AG | PR D80 051105 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AL | PR D80 092007 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AO | PRL 103 211802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AU | PR D80 112001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09AV | PR D80 112002 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09B | PRL 102 132001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09C | PR D79 032002 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09G | PRL 102 141802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09H | PR D79 052005 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09I | PR D79 052003 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09K | PR D79 072009 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09S | PR D79 092002 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 09T | PRL 102 091803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| Also | | EPAPS Document No. E-PRLTAO-102-060910 | | (BABAR Collab.) |
| AUBERT | 09Y | PRL 103 051803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| CHANG | 09 | PR D79 052006 | Y.-W. Chang <i>et al.</i> | (BELLE Collab.) |

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|---------------|------|-------------------------------------|------------------------------|--------------------|
| DALSENO | 09 | PR D79 072004 | J. Dalseno <i>et al.</i> | (BELLE Collab.) |
| KYEONG | 09 | PR D80 051103 | S.-H. Kyeong <i>et al.</i> | (BELLE Collab.) |
| MIZUK | 09 | PR D80 031104 | R. Mizuk <i>et al.</i> | (BELLE Collab.) |
| VERVINK | 09 | PR D80 111104 | K. Vervink <i>et al.</i> | (BELLE Collab.) |
| WEI | 09A | PRL 103 171801 | J.-T. Wei <i>et al.</i> | (BELLE Collab.) |
| Also | | EPAPS Supplement EPAPS_appendix.pdf | | (BELLE Collab.) |
| ADACHI | 08 | PR D77 091101 | I. Adachi <i>et al.</i> | (BELLE Collab.) |
| AUBERT | 08AB | PR D78 012006 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AC | PR D77 071102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AD | PR D77 091104 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AF | PR D78 011103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AG | PR D78 011104 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AH | PR D78 011107 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AJ | PR D78 032005 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AP | PR D78 051103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AQ | PR D78 052005 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AU | PRL 101 021801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08AV | PRL 101 081801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08B | PR D77 011102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08BA | PR D78 071102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08BB | PR D78 071104 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08BC | PR D78 072007 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08BD | PR D78 091101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08BG | PR D78 092008 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08BH | PR D78 112001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08BK | PRL 101 201801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08BL | PRL 101 261802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08BN | PR D78 112003 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08C | PR D77 011104 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08E | PR D77 012003 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08F | PRL 100 051803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08G | PRL 100 171803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08H | PR D77 031101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08I | PRL 100 081801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08N | PRL 100 021801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| Also | | PR D79 092002 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08P | PR D77 032007 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08Q | PRL 100 151802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08R | PR D77 032002 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08W | PRL 101 082001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 08Y | PR D77 111101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| CHEN | 08C | PRL 100 251801 | J.-H. Chen <i>et al.</i> | (BELLE Collab.) |
| CHIANG | 08 | PR D78 111102 | C.C. Chiang <i>et al.</i> | (BELLE Collab.) |
| CHOI | 08 | PRL 100 142001 | S.-K. Choi <i>et al.</i> | (BELLE Collab.) |
| GOLDENZWEI... | 08 | PRL 101 231801 | P. Goldenzweig <i>et al.</i> | (BELLE Collab.) |
| KIM | 08 | PL B669 287 | H.O. Kim <i>et al.</i> | (BELLE Collab.) |
| KUMAR | 08 | PR D78 091104 | R. Kumar <i>et al.</i> | (BELLE Collab.) |
| KUSAKA | 08 | PR D77 072001 | A. Kusaka <i>et al.</i> | (BELLE Collab.) |
| LEE | 08A | PR D77 071101 | S.E. Lee <i>et al.</i> | (BELLE Collab.) |
| LI | 08F | PRL 101 251601 | J. Li <i>et al.</i> | (BELLE Collab.) |
| LIN | 08 | NAT 452 332 | S.-W. Lin <i>et al.</i> | (BELLE Collab.) |
| LIU | 08I | PR D78 011106 | Y. Liu <i>et al.</i> | (BELLE Collab.) |
| LIVENTSEV | 08 | PR D77 091503 | D. Liventsev <i>et al.</i> | (BELLE Collab.) |
| MIZUK | 08 | PR D78 072004 | R. Mizuk <i>et al.</i> | (BELLE Collab.) |
| NAKAHAMA | 08 | PRL 100 121601 | Y. Nakahama <i>et al.</i> | (BELLE Collab.) |
| PDG | 08 | PL B667 1 | C. Amsler <i>et al.</i> | (PDG Collab.) |
| SAHOO | 08 | PR D77 091103 | H. Sahoo <i>et al.</i> | (BELLE Collab.) |
| TANIGUCHI | 08 | PRL 101 111801 | N. Taniguchi <i>et al.</i> | (BELLE Collab.) |
| UCHIDA | 08 | PR D77 051101 | Y. Uchida <i>et al.</i> | (BELLE Collab.) |
| USHIRODA | 08 | PRL 100 021602 | Y. Ushiroda <i>et al.</i> | (BELLE Collab.) |
| WEI | 08A | PR D78 011101 | J.-T. Wei <i>et al.</i> | (BELLE Collab.) |
| ABAZOV | 07S | PRL 99 142001 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ABULENCIA | 07A | PRL 98 122001 | A. Abulencia <i>et al.</i> | (FNAL CDF Collab.) |
| ADAM | 07 | PRL 99 041802 | N.E. Adam <i>et al.</i> | (CLEO Collab.) |
| Also | | PR D76 012007 | D.M. Asner <i>et al.</i> | (CLEO Collab.) |
| AUBERT | 07A | PRL 98 031801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AA | PR D76 012004 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AC | PR D76 031101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AD | PR D76 031102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AE | PR D76 031103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AF | PRL 99 021603 | B. Aubert <i>et al.</i> | (BABAR Collab.) |

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| AUBERT | 07AG | PRL 99 051801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AI | PRL 99 071801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AJ | PRL 99 081801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AN | PR D76 051101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AO | PR D76 051103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AQ | PR D76 071101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AS | PR D76 071104 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AT | PR D76 091101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AV | PR D76 092004 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AX | PRL 99 161802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07AY | PRL 99 171803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07B | PR D75 012008 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07BC | PR D76 091102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07BF | PR D76 052007 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07BH | PRL 99 231802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07BI | PRL 99 241803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07BO | PR D76 111102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07D | PRL 98 051801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07E | PRL 98 051802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07F | PRL 98 051803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07G | PRL 98 111801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07H | PR D75 031101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07J | PRL 98 091801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07K | PRL 98 081801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07L | PRL 98 151802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07N | PR D75 072002 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07O | PRL 98 181803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07Q | PR D75 051102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07R | PRL 98 211804 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| Also | | PRL 100 189903E | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| Also | | PRL 100 199905E | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 07Y | PR D75 111102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| CHANG | 07A | PRL 98 131803 | M.-C. Chang <i>et al.</i> | (BELLE Collab.) |
| CHANG | 07B | PR D75 071104 | P. Chang <i>et al.</i> | (BELLE Collab.) |
| CHAO | 07 | PR D76 091103 | Y. Chao <i>et al.</i> | (BELLE Collab.) |
| CHEN | 07 | PRL 98 031802 | K.-F. Chen <i>et al.</i> | (BELLE Collab.) |
| CHEN | 07D | PRL 99 221802 | K.-F. Chen <i>et al.</i> | (BELLE Collab.) |
| DALSENO | 07 | PR D76 072004 | J. Dalseno <i>et al.</i> | (BELLE Collab.) |
| FRATINA | 07 | PRL 98 221802 | S. Fratina <i>et al.</i> | (BELLE Collab.) |
| GARMASH | 07 | PR D75 012006 | A. Garmash <i>et al.</i> | (BELLE Collab.) |
| HOKUUE | 07 | PL B648 139 | T. Hokuue <i>et al.</i> | (BELLE Collab.) |
| ISHINO | 07 | PRL 98 211801 | H. Ishino <i>et al.</i> | (BELLE Collab.) |
| KUSAKA | 07 | PRL 98 221602 | A. Kusaka <i>et al.</i> | (BELLE Collab.) |
| Also | | PR D77 072001 | A. Kusaka <i>et al.</i> | (BELLE Collab.) |
| KUZMIN | 07 | PR D76 012006 | A. Kuzmin <i>et al.</i> | (BELLE Collab.) |
| LIN | 07 | PRL 98 181804 | S.-W. Lin <i>et al.</i> | (BELLE Collab.) |
| LIN | 07A | PRL 99 121601 | S.-W. Lin <i>et al.</i> | (BELLE Collab.) |
| MATYJA | 07 | PRL 99 191807 | A. Matyja <i>et al.</i> | (BELLE Collab.) |
| MEDVEDEVA | 07 | PR D76 051102 | T. Medvedeva <i>et al.</i> | (BELLE Collab.) |
| PARK | 07 | PR D75 011101 | K.S. Park <i>et al.</i> | (BELLE Collab.) |
| SCHUEMANN | 07 | PR D75 092002 | J. Schuemann <i>et al.</i> | (BELLE Collab.) |
| SOMOV | 07 | PR D76 011104 | A. Somov <i>et al.</i> | (BELLE Collab.) |
| TSAI | 07 | PR D75 111101 | Y.-T. Tsai <i>et al.</i> | (BELLE Collab.) |
| URQUIJO | 07 | PR D75 032001 | P. Urquijo <i>et al.</i> | (BELLE Collab.) |
| WANG | 07B | PR D75 092005 | C.H. Wang <i>et al.</i> | (BELLE Collab.) |
| WANG | 07C | PR D76 052004 | M.-Z. Wang <i>et al.</i> | (BELLE Collab.) |
| XIE | 07 | PR D75 017101 | Q.L. Xie <i>et al.</i> | (BELLE Collab.) |
| ZUPANC | 07 | PR D75 091102 | A. Zupanc <i>et al.</i> | (BELLE Collab.) |
| ABAZOV | 06S | PR D74 092001 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ABAZOV | 06W | PR D74 112002 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ABULENCIA,A | 06D | PRL 97 211802 | A. Abulencia <i>et al.</i> | (CDF Collab.) |
| ACOSTA | 06 | PRL 96 202001 | D. Acosta <i>et al.</i> | (CDF Collab.) |
| AUBERT | 06 | PR D73 011101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06A | PRL 96 011803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06E | PRL 96 052002 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06G | PR D73 012004 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06I | PR D73 031101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06L | PR D74 012001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06N | PR D74 031103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06S | PRL 96 241802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06T | PRL 96 251802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |

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| AUBERT | 06V | PRL 97 051802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06W | PR D73 071102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06X | PR D73 071103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 06Y | PR D73 111101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06A | PR D73 112004 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06B | PR D74 011101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06C | PR D74 011102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06E | PR D74 011106 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06G | PRL 97 201801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06H | PRL 97 201802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06J | PR D73 092001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06K | PRL 97 211801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06L | PR D74 031101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06M | PR D74 031102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06O | PR D74 031104 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06P | PR D74 031105 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06Q | PR D74 091101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06R | PR D74 032005 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06S | PR D74 051101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06T | PR D74 051102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06V | PR D74 051106 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06Y | PR D74 091105 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 06Z | PR D74 092004 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 06C | PRL 97 171805 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 06H | PRL 97 261803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 06J | PR D74 111102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 06N | PR D74 072008 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| BLYTH | 06 | PR D74 092002 | S. Blyth <i>et al.</i> | (BELLE Collab.) |
| CHISTOV | 06A | PR D74 111105 | R. Chistov <i>et al.</i> | (BELLE Collab.) |
| DRAGIC | 06 | PR D73 111105 | J. Dragic <i>et al.</i> | (BELLE Collab.) |
| GABYSHEV | 06 | PRL 97 202003 | N. Gabyshev <i>et al.</i> | (BELLE Collab.) |
| GOKHROO | 06 | PRL 97 162002 | G. Gokhroo <i>et al.</i> | (BELLE Collab.) |
| JEN | 06 | PR D74 111101 | C.-M. Jen <i>et al.</i> | (BELLE Collab.) |
| KROKOVNY | 06 | PRL 97 081801 | P. Krokovny <i>et al.</i> | (BELLE Collab.) |
| MOHAPATRA | 06 | PRL 96 221601 | D. Mohapatra <i>et al.</i> | (BELLE Collab.) |
| NAKANO | 06 | PR D73 112002 | E. Nakano <i>et al.</i> | (BELLE Collab.) |
| RONGA | 06 | PR D73 092003 | F.J. Ronga <i>et al.</i> | (BELLE Collab.) |
| SCHUEMANN | 06 | PRL 97 061802 | J. Schuemann <i>et al.</i> | (BELLE Collab.) |
| SOMOV | 06 | PRL 96 171801 | A. Somov <i>et al.</i> | (BELLE Collab.) |
| SONI | 06 | PL B634 155 | N. Soni <i>et al.</i> | (BELLE Collab.) |
| USHIRODA | 06 | PR D74 111104 | Y. Ushiroda <i>et al.</i> | (BELLE Collab.) |
| VILLA | 06 | PR D73 051107 | S. Villa <i>et al.</i> | (BELLE Collab.) |
| ABAZOV | 05B | PRL 94 042001 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ABAZOV | 05C | PRL 94 102001 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ABAZOV | 05D | PRL 94 182001 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ABAZOV | 05W | PRL 95 171801 | V.M. Abazov <i>et al.</i> | (D0 Collab.) |
| ABE | 05A | PRL 94 221805 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 05B | PR D71 072003 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| Also | | PR D71 079903 (errat.) | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 05D | PRL 95 101801 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 05G | PRL 95 231802 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ACOSTA | 05 | PRL 94 101803 | D. Acosta <i>et al.</i> | (CDF Collab.) |
| AUBERT | 05 | PRL 94 011801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05B | PR D71 031501 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05E | PR D71 051502 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05F | PRL 94 161803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05I | PRL 94 131801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05J | PRL 94 141801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05K | PRL 94 171801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05L | PRL 94 181802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05M | PRL 94 191802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05O | PR D71 031103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05P | PR D71 032005 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05T | PR D71 091102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05U | PR D71 091103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05V | PR D71 091104 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05W | PRL 94 221803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05Y | PR D71 111102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 05Z | PR D71 112003 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 05 | PRL 95 011801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 05C | PRL 95 041805 | B. Aubert <i>et al.</i> | (BABAR Collab.) |

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| AUBERT,B | 05K | PRL 95 131803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 05O | PR D72 051102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 05P | PR D72 051103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 05Q | PR D72 051106 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 05Z | PRL 95 131802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 05 | PRL 95 151803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 05A | PRL 95 151804 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 05B | PRL 95 171802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 05C | PR D72 091103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 05E | PRL 95 221801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 05F | PR D72 111101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| CHANG | 05 | PR D71 072007 | M.-C. Chang <i>et al.</i> | (BELLE Collab.) |
| CHANG | 05A | PR D71 091106 | P. Chang <i>et al.</i> | (BELLE Collab.) |
| CHAO | 05 | PRL 94 181803 | Y. Chao <i>et al.</i> | (BELLE Collab.) |
| CHAO | 05A | PR D71 031502 | Y. Chao <i>et al.</i> | (BELLE Collab.) |
| CHEN | 05A | PRL 94 221804 | K.-F. Chen <i>et al.</i> | (BELLE Collab.) |
| CHEN | 05B | PR D72 012004 | K.-F. Chen <i>et al.</i> | (BELLE Collab.) |
| DRUTSKOY | 05 | PRL 94 061802 | A. Drutskoy <i>et al.</i> | (BELLE Collab.) |
| GERSHON | 05 | PL B624 11 | T. Gershon <i>et al.</i> | (BELLE Collab.) |
| ITOHO | 05 | PRL 95 091601 | R. Itoh <i>et al.</i> | (BELLE Collab.) |
| LIVENTSEV | 05 | PR D72 051109 | D. Liventsev <i>et al.</i> | (BELLE Collab.) |
| MAJUMDER | 05 | PRL 95 041803 | G. Majumder <i>et al.</i> | (BELLE Collab.) |
| MIYAKE | 05 | PL B618 34 | H. Miyake <i>et al.</i> | (BELLE Collab.) |
| MOHAPATRA | 05 | PR D72 011101 | D. Mohapatra <i>et al.</i> | (BELLE Collab.) |
| NISHIDA | 05 | PL B610 23 | S. Nishida <i>et al.</i> | (BELLE Collab.) |
| OKABE | 05 | PL B614 27 | T. Okabe <i>et al.</i> | (BELLE Collab.) |
| PARK | 05 | PRL 94 021801 | H.K. Park <i>et al.</i> | (FNAL HyperCP Collab.) |
| SCHUMANN | 05 | PR D72 011103 | J. Schumann <i>et al.</i> | (BELLE Collab.) |
| SUMISAWA | 05 | PRL 95 061801 | K. Sumisawa <i>et al.</i> | (BELLE Collab.) |
| USHIRODA | 05 | PRL 94 231601 | Y. Ushiroda <i>et al.</i> | (BELLE Collab.) |
| WANG | 05 | PRL 94 121801 | C.C. Wang <i>et al.</i> | (BELLE Collab.) |
| WANG | 05A | PL B617 141 | M.-Z. Wang <i>et al.</i> | (BELLE Collab.) |
| XIE | 05 | PR D72 051105 | Q.L. Xie <i>et al.</i> | (BELLE Collab.) |
| YANG | 05 | PRL 94 111802 | H. Yang <i>et al.</i> | (BELLE Collab.) |
| ZHANG | 05B | PR D71 091107 | L.M. Zhang <i>et al.</i> | (BELLE Collab.) |
| ABDALLAH | 04D | EPJ C33 213 | J. Abdallah <i>et al.</i> | (DELPHI Collab.) |
| ABDALLAH | 04E | EPJ C33 307 | J. Abdallah <i>et al.</i> | (DELPHI Collab.) |
| ABE | 04E | PRL 93 021601 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| AUBERT | 04A | PR D69 011102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04B | PR D69 032004 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04C | PRL 92 111801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04G | PR D69 031102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04H | PRL 92 061801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04M | PRL 92 201802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04R | PR D69 052001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04U | PR D69 091503 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04V | PRL 92 251801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04W | PRL 92 251802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04Y | PRL 93 041801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 04Z | PRL 93 051802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04B | PR D70 011101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04C | PR D70 012007 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| Also | | PRL 92 181801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04D | PR D70 032006 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04G | PRL 93 071801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04H | PRL 93 081801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04J | PRL 93 091802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04K | PRL 93 131801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04M | PRL 93 131805 | B. Aubert | (BABAR Collab.) |
| AUBERT,B | 04O | PR D70 091103 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04R | PRL 93 231801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04S | PRL 93 181801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04T | PR D70 091104 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04U | PR D70 091105 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04V | PRL 93 181805 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04W | PRL 93 231804 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04X | PRL 93 181806 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,B | 04Z | PRL 93 201801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 04 | PR D70 111102 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 04A | PR D70 112006 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT,BE | 04B | PR D70 091106 | B. Aubert <i>et al.</i> | (BABAR Collab.) |

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| AUSHEV | 04 | PRL 93 201802 | T. Aushev <i>et al.</i> | (BELLE Collab.) |
| BORNHEIM | 04 | PRL 93 241802 | A. Bornheim <i>et al.</i> | (CLEO Collab.) |
| CHANG | 04 | PL B599 148 | P. Chang <i>et al.</i> | (BELLE Collab.) |
| CHAO | 04 | PR D69 111102 | Y. Chao <i>et al.</i> | (BELLE Collab.) |
| CHAO | 04B | PRL 93 191802 | Y. Chao <i>et al.</i> | (BELLE Collab.) |
| DRAGIC | 04 | PRL 93 131802 | J. Dragic | (BELLE Collab.) |
| DRUTSKOY | 04 | PRL 92 051801 | A. Drutskoy <i>et al.</i> | (BELLE Collab.) |
| GARMASH | 04 | PR D69 012001 | A. Garmash <i>et al.</i> | (BELLE Collab.) |
| KATAOKA | 04 | PRL 93 261801 | S.U. Kataoka <i>et al.</i> | (BELLE Collab.) |
| MAJUMDER | 04 | PR D70 111103 | G. Majumder <i>et al.</i> | (BELLE Collab.) |
| NAKAO | 04 | PR D69 112001 | M. Nakao <i>et al.</i> | (BELLE Collab.) |
| SARANGI | 04 | PRL 93 031802 | T.R. Sarangi <i>et al.</i> | (BELLE Collab.) |
| WANG | 04 | PRL 92 131801 | M.Z. Wang <i>et al.</i> | (BELLE Collab.) |
| WANG | 04A | PR D70 012001 | C.H. Wang <i>et al.</i> | (BELLE Collab.) |
| ABDALLAH | 03B | EPJ C28 155 | J. Abdallah <i>et al.</i> | (DELPHI Collab.) |
| ABE | 03B | PR D67 032003 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 03C | PR D67 031102 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 03G | PR D68 012001 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 03H | PRL 91 261602 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ADAM | 03 | PR D67 032001 | N.E. Adam <i>et al.</i> | (CLEO Collab.) |
| ATHAR | 03 | PR D68 072003 | S.B. Athar <i>et al.</i> | (CLEO Collab.) |
| AUBERT | 03B | PRL 90 091801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03C | PR D67 072002 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03D | PRL 90 181803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03E | PRL 90 181801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03H | PR D67 091101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03I | PR D67 092003 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03J | PRL 90 221801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03K | PRL 90 231801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03L | PRL 91 021801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03N | PRL 91 061802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03O | PRL 91 071801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03Q | PRL 91 131801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03S | PRL 91 241801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03T | PRL 91 201802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03U | PRL 91 221802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03V | PRL 91 171802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03W | PRL 91 161801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 03X | PR D68 092001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| BORNHEIM | 03 | PR D68 052002 | A. Bornheim <i>et al.</i> | (CLEO Collab.) |
| CHANG | 03 | PR D68 111101 | M.-C. Chang <i>et al.</i> | (BELLE Collab.) |
| CHEN | 03B | PRL 91 201801 | K.-F. Chen <i>et al.</i> | (BELLE Collab.) |
| CSORNA | 03 | PR D67 112002 | S.E. Csorna <i>et al.</i> | (CLEO Collab.) |
| EISENSTEIN | 03 | PR D68 017101 | B.I. Eisenstein <i>et al.</i> | (CLEO Collab.) |
| FANG | 03 | PRL 90 071801 | F. Fang <i>et al.</i> | (BELLE Collab.) |
| GABYSHEV | 03 | PRL 90 121802 | N. Gabyshev <i>et al.</i> | (BELLE Collab.) |
| HASTINGS | 03 | PR D67 052004 | N.C. Hastings <i>et al.</i> | (BELLE Collab.) |
| ISHIKAWA | 03 | PRL 91 261601 | A. Ishikawa <i>et al.</i> | (BELLE Collab.) |
| KROKOVNY | 03 | PRL 90 141802 | P. Krokovny <i>et al.</i> | (BELLE Collab.) |
| KROKOVNY | 03B | PRL 91 262002 | P. Krokovny <i>et al.</i> | (BELLE Collab.) |
| LEE | 03 | PRL 91 261801 | S.H. Lee <i>et al.</i> | (BELLE Collab.) |
| SATPATHY | 03 | PL B553 159 | A. Satpathy <i>et al.</i> | (BELLE Collab.) |
| WANG | 03 | PRL 90 201802 | M.-Z. Wang <i>et al.</i> | (BELLE Collab.) |
| ZHENG | 03 | PR D67 092004 | Y. Zheng <i>et al.</i> | (BELLE Collab.) |
| ABE | 02 | PRL 88 021801 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02E | PL B526 258 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02F | PL B526 247 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02H | PRL 88 171801 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02J | PRL 88 052002 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02K | PRL 88 181803 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02M | PRL 89 071801 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02N | PL B538 11 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02O | PR D65 091103 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02Q | PRL 89 122001 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02U | PR D66 032007 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02W | PRL 89 151802 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 02Z | PR D66 071102 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ACOSTA | 02C | PR D65 092009 | D. Acosta <i>et al.</i> | (CDF Collab.) |
| ACOSTA | 02G | PR D66 112002 | D. Acosta <i>et al.</i> | (CDF Collab.) |
| AFFOLDER | 02B | PRL 88 071801 | T. Affolder <i>et al.</i> | (CDF Collab.) |
| AHMED | 02B | PR D66 031101 | S. Ahmed <i>et al.</i> | (CLEO Collab.) |

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| ASNER | 02 | PR D65 031103 | D.M. Asner <i>et al.</i> | (CLEO Collab.) |
| AUBERT | 02 | PR D65 032001 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02C | PRL 88 101805 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02D | PR D65 051502 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02E | PR D65 051101 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02H | PRL 89 011802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| Also | | PRL 89 169903 (errat.) | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02I | PRL 88 221802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02J | PRL 88 221803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02K | PRL 88 231801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02L | PRL 88 241801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02M | PRL 89 061801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02N | PR D66 032003 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02P | PRL 89 201802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 02Q | PRL 89 281802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| BRIERE | 02 | PRL 89 081803 | R. Briere <i>et al.</i> | (CLEO Collab.) |
| CASEY | 02 | PR D66 092002 | B.C.K. Casey <i>et al.</i> | (BELLE Collab.) |
| CHEN | 02B | PL B546 196 | K.-F. Chen <i>et al.</i> | (BELLE Collab.) |
| COAN | 02 | PRL 88 062001 | T.E. Coan <i>et al.</i> | (CLEO Collab.) |
| Also | | PRL 88 069902 (errat.) | T.E. Coan <i>et al.</i> | (CLEO Collab.) |
| DRUTSKOY | 02 | PL B542 171 | A. Drutskoy <i>et al.</i> | (BELLE Collab.) |
| DYTMAN | 02 | PR D66 091101 | S.A. Dytman <i>et al.</i> | (CLEO Collab.) |
| ECKHART | 02 | PRL 89 251801 | E. Eckhart <i>et al.</i> | (CLEO Collab.) |
| EDWARDS | 02 | PR D65 012002 | K.W. Edwards <i>et al.</i> | (CLEO Collab.) |
| GABYSHEV | 02 | PR D66 091102 | N. Gabyshev <i>et al.</i> | (BELLE Collab.) |
| GODANG | 02 | PRL 88 021802 | R. Godang <i>et al.</i> | (CLEO Collab.) |
| GORDON | 02 | PL B542 183 | A. Gordon <i>et al.</i> | (BELLE Collab.) |
| HARA | 02 | PRL 89 251803 | K. Hara <i>et al.</i> | (BELLE Collab.) |
| KROKOVNY | 02 | PRL 89 231804 | P. Korkovny <i>et al.</i> | (BELLE Collab.) |
| MAHAPATRA | 02 | PRL 88 101803 | R. Mahapatra <i>et al.</i> | (CLEO Collab.) |
| NISHIDA | 02 | PRL 89 231801 | S. Nishida <i>et al.</i> | (BELLE Collab.) |
| TOMURA | 02 | PL B542 207 | T. Tomura <i>et al.</i> | (BELLE Collab.) |
| ABASHIAN | 01 | PRL 86 2509 | A. Abashian <i>et al.</i> | (BELLE Collab.) |
| ABE | 01D | PRL 86 3228 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 01G | PRL 87 091802 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 01H | PRL 87 101801 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 01I | PRL 87 111801 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 01K | PR D64 071101 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 01L | PRL 87 161601 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABE | 01M | PL B517 309 | K. Abe <i>et al.</i> | (BELLE Collab.) |
| ABREU | 01H | PL B510 55 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| ALEXANDER | 01B | PR D64 092001 | J.P. Alexander <i>et al.</i> | (CLEO Collab.) |
| AMMAR | 01B | PRL 87 271801 | R. Ammar <i>et al.</i> | (CLEO Collab.) |
| ANDERSON | 01 | PRL 86 2732 | S. Anderson <i>et al.</i> | (CLEO Collab.) |
| ANDERSON | 01B | PRL 87 181803 | S. Anderson <i>et al.</i> | (CLEO Collab.) |
| AUBERT | 01 | PRL 86 2515 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 01B | PRL 87 091801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 01D | PRL 87 151801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 01E | PRL 87 151802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 01F | PRL 87 201803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 01G | PRL 87 221802 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 01H | PRL 87 241801 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| AUBERT | 01I | PRL 87 241803 | B. Aubert <i>et al.</i> | (BABAR Collab.) |
| BARATE | 01D | EPJ C20 431 | R. Barate <i>et al.</i> | (ALEPH Collab.) |
| BRIERE | 01 | PRL 86 3718 | R.A. Biere <i>et al.</i> | (CLEO Collab.) |
| EDWARDS | 01 | PRL 86 30 | K.W. Edwards <i>et al.</i> | (CLEO Collab.) |
| JAFFE | 01 | PRL 86 5000 | D. Jaffe <i>et al.</i> | (CLEO Collab.) |
| RICHICHI | 01 | PR D63 031103 | S.J. Richichi <i>et al.</i> | (CLEO Collab.) |
| ABBIENDI | 00Q | PL B482 15 | G. Abbiendi <i>et al.</i> | (OPAL Collab.) |
| ABBIENDI,G | 00B | PL B493 266 | G. Abbiendi <i>et al.</i> | (OPAL Collab.) |
| ABE | 00C | PR D62 071101 | K. Abe <i>et al.</i> | (SLD Collab.) |
| AFFOLDER | 00C | PR D61 072005 | T. Affolder <i>et al.</i> | (CDF Collab.) |
| AFFOLDER | 00N | PRL 85 4668 | T. Affolder <i>et al.</i> | (CDF Collab.) |
| AHMED | 00B | PR D62 112003 | S. Ahmed <i>et al.</i> | (CLEO Collab.) |
| ANASTASSOV | 00 | PRL 84 1393 | A. Anastassov <i>et al.</i> | (CLEO Collab.) |
| ARTUSO | 00 | PRL 84 4292 | M. Artuso <i>et al.</i> | (CLEO Collab.) |
| AVERY | 00 | PR D62 051101 | P. Avery <i>et al.</i> | (CLEO Collab.) |
| BARATE | 00Q | PL B492 259 | R. Barate <i>et al.</i> | (ALEPH Collab.) |
| BARATE | 00R | PL B492 275 | R. Barate <i>et al.</i> | (ALEPH Collab.) |
| BEHRENS | 00 | PR D61 052001 | B.H. Behrens <i>et al.</i> | (CLEO Collab.) |
| BEHRENS | 00B | PL B490 36 | B.H. Behrens <i>et al.</i> | (CLEO Collab.) |

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| BERGFELD | 00B | PR D62 091102 | T. Bergfeld <i>et al.</i> | (CLEO Collab.) |
| CHEN | 00 | PRL 85 525 | S. Chen <i>et al.</i> | (CLEO Collab.) |
| COAN | 00 | PRL 84 5283 | T.E. Coan <i>et al.</i> | (CLEO Collab.) |
| CRONIN-HEN... | 00 | PRL 85 515 | D. Cronin-Hennessy <i>et al.</i> | (CLEO Collab.) |
| CSORNA | 00 | PR D61 111101 | S.E. Csorna <i>et al.</i> | (CLEO Collab.) |
| JESSOP | 00 | PRL 85 2881 | C.P. Jessop <i>et al.</i> | (CLEO Collab.) |
| LIPELES | 00 | PR D62 032005 | E. Lipeles <i>et al.</i> | (CLEO Collab.) |
| RICHICHI | 00 | PRL 85 520 | S.J. Richichi <i>et al.</i> | (CLEO Collab.) |
| ABBIENDI | 99J | EPJ C12 609 | G. Abbiendi <i>et al.</i> | (OPAL Collab.) |
| ABE | 99K | PR D60 051101 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABE | 99Q | PR D60 072003 | F. Abe <i>et al.</i> | (CDF Collab.) |
| AFFOLDER | 99B | PRL 83 3378 | T. Affolder <i>et al.</i> | (CDF Collab.) |
| AFFOLDER | 99C | PR D60 112004 | T. Affolder <i>et al.</i> | (CDF Collab.) |
| ARTUSO | 99 | PRL 82 3020 | M. Artuso <i>et al.</i> | (CLEO Collab.) |
| BARTELT | 99 | PRL 82 3746 | J. Bartelt <i>et al.</i> | (CLEO Collab.) |
| COAN | 99 | PR D59 111101 | T.E. Coan <i>et al.</i> | (CLEO Collab.) |
| ABE | 98B | PR D57 5382 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABE | 98C | PRL 80 2057 | F. Abe <i>et al.</i> | (CDF Collab.) |
| Also | | PR D59 032001 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABE | 98O | PR D58 072001 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABE | 98Q | PR D58 092002 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABE | 98U | PRL 81 5513 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABE | 98V | PRL 81 5742 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ACCIARRI | 98D | EPJ C5 195 | M. Acciarri <i>et al.</i> | (L3 Collab.) |
| ACCIARRI | 98S | PL B438 417 | M. Acciarri <i>et al.</i> | (L3 Collab.) |
| ACKERSTAFF | 98Z | EPJ C5 379 | K. Ackerstaff <i>et al.</i> | (OPAL Collab.) |
| BARATE | 98Q | EPJ C4 387 | R. Barate <i>et al.</i> | (ALEPH Collab.) |
| BEHRENS | 98 | PRL 80 3710 | B.H. Behrens <i>et al.</i> | (CLEO Collab.) |
| BERGFELD | 98 | PRL 81 272 | T. Bergfeld <i>et al.</i> | (CLEO Collab.) |
| BRANDENB... | 98 | PRL 80 2762 | G. Brandenbrug <i>et al.</i> | (CLEO Collab.) |
| GODANG | 98 | PRL 80 3456 | R. Godang <i>et al.</i> | (CLEO Collab.) |
| NEMATI | 98 | PR D57 5363 | B. Nemati <i>et al.</i> | (CLEO Collab.) |
| ABE | 97J | PRL 79 590 | K. Abe <i>et al.</i> | (SLD Collab.) |
| ABREU | 97F | ZPHY C74 19 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| Also | | ZPHY C75 579 (erratum) | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| ABREU | 97N | ZPHY C76 579 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| ACCIARRI | 97B | PL B391 474 | M. Acciarri <i>et al.</i> | (L3 Collab.) |
| ACCIARRI | 97C | PL B391 481 | M. Acciarri <i>et al.</i> | (L3 Collab.) |
| ACKERSTAFF | 97G | PL B395 128 | K. Ackerstaff <i>et al.</i> | (OPAL Collab.) |
| ACKERSTAFF | 97U | ZPHY C76 401 | K. Ackerstaff <i>et al.</i> | (OPAL Collab.) |
| ACKERSTAFF | 97V | ZPHY C76 417 | K. Ackerstaff <i>et al.</i> | (OPAL Collab.) |
| ARTUSO | 97 | PL B399 321 | M. Artuso <i>et al.</i> | (CLEO Collab.) |
| ASNER | 97 | PRL 79 799 | D. Asner <i>et al.</i> | (CLEO Collab.) |
| ATHANAS | 97 | PRL 79 2208 | M. Athanas <i>et al.</i> | (CLEO Collab.) |
| BUSKULIC | 97 | PL B395 373 | D. Buskulic <i>et al.</i> | (ALEPH Collab.) |
| BUSKULIC | 97D | ZPHY C75 397 | D. Buskulic <i>et al.</i> | (ALEPH Collab.) |
| FU | 97 | PRL 79 3125 | X. Fu <i>et al.</i> | (CLEO Collab.) |
| JESSOP | 97 | PRL 79 4533 | C.P. Jessop <i>et al.</i> | (CLEO Collab.) |
| ABE | 96B | PR D53 3496 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABE | 96C | PRL 76 4462 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABE | 96H | PRL 76 2015 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABE | 96Q | PR D54 6596 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABREU | 96P | ZPHY C71 539 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| ABREU | 96Q | ZPHY C72 17 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| ACCIARRI | 96E | PL B383 487 | M. Acciarri <i>et al.</i> | (L3 Collab.) |
| ADAM | 96D | ZPHY C72 207 | W. Adam <i>et al.</i> | (DELPHI Collab.) |
| ALBRECHT | 96D | PL B374 256 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALEXANDER | 96T | PRL 77 5000 | J.P. Alexander <i>et al.</i> | (CLEO Collab.) |
| ALEXANDER | 96V | ZPHY C72 377 | G. Alexander <i>et al.</i> | (OPAL Collab.) |
| ASNER | 96 | PR D53 1039 | D.M. Asner <i>et al.</i> | (CLEO Collab.) |
| BARISH | 96B | PRL 76 1570 | B.C. Barish <i>et al.</i> | (CLEO Collab.) |
| BISHAI | 96 | PL B369 186 | M. Bishai <i>et al.</i> | (CLEO Collab.) |
| BUSKULIC | 96J | ZPHY C71 31 | D. Buskulic <i>et al.</i> | (ALEPH Collab.) |
| BUSKULIC | 96V | PL B384 471 | D. Buskulic <i>et al.</i> | (ALEPH Collab.) |
| DUBOSCQ | 96 | PRL 76 3898 | J.E. Duboscq <i>et al.</i> | (CLEO Collab.) |
| GIBAUT | 96 | PR D53 4734 | D. Gibaut <i>et al.</i> | (CLEO Collab.) |
| PDG | 96 | PR D54 1 | R. M. Barnett <i>et al.</i> | (PDG Collab.) |
| ABE | 95Z | PRL 75 3068 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABREU | 95N | PL B357 255 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| ABREU | 95Q | ZPHY C68 13 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| ACCIARRI | 95H | PL B363 127 | M. Acciarri <i>et al.</i> | (L3 Collab.) |

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| ACCIARRI | 95I | PL B363 137 | M. Acciarri <i>et al.</i> | (L3 Collab.) |
| ADAM | 95 | ZPHY C68 363 | W. Adam <i>et al.</i> | (DELPHI Collab.) |
| AKERS | 95J | ZPHY C66 555 | R. Akers <i>et al.</i> | (OPAL Collab.) |
| AKERS | 95T | ZPHY C67 379 | R. Akers <i>et al.</i> | (OPAL Collab.) |
| ALEXANDER | 95 | PL B341 435 | J. Alexander <i>et al.</i> | (CLEO Collab.) |
| Also | | PL B347 469 (erratum) | J. Alexander <i>et al.</i> | (CLEO Collab.) |
| BARISH | 95 | PR D51 1014 | B.C. Barish <i>et al.</i> | (CLEO Collab.) |
| BUSKULIC | 95N | PL B359 236 | D. Buskulic <i>et al.</i> | (ALEPH Collab.) |
| ABE | 94D | PRL 72 3456 | F. Abe <i>et al.</i> | (CDF Collab.) |
| ABREU | 94M | PL B338 409 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| AKERS | 94C | PL B327 411 | R. Akers <i>et al.</i> | (OPAL Collab.) |
| AKERS | 94H | PL B336 585 | R. Akers <i>et al.</i> | (OPAL Collab.) |
| AKERS | 94J | PL B337 196 | R. Akers <i>et al.</i> | (OPAL Collab.) |
| AKERS | 94L | PL B337 393 | R. Akers <i>et al.</i> | (OPAL Collab.) |
| ALAM | 94 | PR D50 43 | M.S. Alam <i>et al.</i> | (CLEO Collab.) |
| ALBRECHT | 94 | PL B324 249 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 94G | PL B340 217 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| AMMAR | 94 | PR D49 5701 | R. Ammar <i>et al.</i> | (CLEO Collab.) |
| ATHANAS | 94 | PRL 73 3503 | M. Athanas <i>et al.</i> | (CLEO Collab.) |
| Also | | PRL 74 3090 (erratum) | M. Athanas <i>et al.</i> | (CLEO Collab.) |
| BUSKULIC | 94B | PL B322 441 | D. Buskulic <i>et al.</i> | (ALEPH Collab.) |
| PDG | 94 | PR D50 1173 | L. Montanet <i>et al.</i> | (CERN, LBL, BOST+) |
| PROCARIO | 94 | PRL 73 1472 | M. Procaro <i>et al.</i> | (CLEO Collab.) |
| STONE | 94 | HEPSY 93-11 | S. Stone | |
| Published in | B | Decays, 2nd Edition, World Scientific, Singapore | | |
| ABREU | 93D | ZPHY C57 181 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| ABREU | 93G | PL B312 253 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| ACTON | 93C | PL B307 247 | P.D. Acton <i>et al.</i> | (OPAL Collab.) |
| ALBRECHT | 93 | ZPHY C57 533 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 93E | ZPHY C60 11 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALEXANDER | 93B | PL B319 365 | J. Alexander <i>et al.</i> | (CLEO Collab.) |
| AMMAR | 93 | PRL 71 674 | R. Ammar <i>et al.</i> | (CLEO Collab.) |
| BARTELT | 93 | PRL 71 1680 | J.E. Bartelt <i>et al.</i> | (CLEO Collab.) |
| BATTLE | 93 | PRL 71 3922 | M. Battle <i>et al.</i> | (CLEO Collab.) |
| BEAN | 93B | PRL 70 2681 | A. Bean <i>et al.</i> | (CLEO Collab.) |
| BUSKULIC | 93D | PL B307 194 | D. Buskulic <i>et al.</i> | (ALEPH Collab.) |
| Also | | PL B325 537 (erratum) | D. Buskulic <i>et al.</i> | (ALEPH Collab.) |
| BUSKULIC | 93K | PL B313 498 | D. Buskulic <i>et al.</i> | (ALEPH Collab.) |
| SANGHERA | 93 | PR D47 791 | S. Sanghera <i>et al.</i> | (CLEO Collab.) |
| ALBRECHT | 92C | PL B275 195 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 92G | ZPHY C54 1 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 92L | ZPHY C55 357 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| BORTOLETTO | 92 | PR D45 21 | D. Bortoletto <i>et al.</i> | (CLEO Collab.) |
| HENDERSON | 92 | PR D45 2212 | S. Henderson <i>et al.</i> | (CLEO Collab.) |
| KRAMER | 92 | PL B279 181 | G. Kramer, W.F. Palmer | (HAMB, OSU) |
| ALBAJAR | 91E | PL B273 540 | C. Albajar <i>et al.</i> | (UA1 Collab.) |
| ALBRECHT | 91B | PL B254 288 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 91C | PL B255 297 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 91E | PL B262 148 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| BERKELMAN | 91 | ARNPS 41 1 | K. Berkelman, S. Stone | (CORN, SYRA) |
| "Decays of <i>B</i> Mesons" | | | | |
| FULTON | 91 | PR D43 651 | R. Fulton <i>et al.</i> | (CLEO Collab.) |
| ALBRECHT | 90B | PL B241 278 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 90J | ZPHY C48 543 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ANTREASYAN | 90B | ZPHY C48 553 | D. Antreasyan <i>et al.</i> | (Crystal Ball Collab.) |
| BORTOLETTO | 90 | PRL 64 2117 | D. Bortoletto <i>et al.</i> | (CLEO Collab.) |
| ELSEN | 90 | ZPHY C46 349 | E. Elsen <i>et al.</i> | (JADE Collab.) |
| ROSNER | 90 | PR D42 3732 | J.L. Rosner | |
| WAGNER | 90 | PRL 64 1095 | S.R. Wagner <i>et al.</i> | (Mark II Collab.) |
| ALBRECHT | 89C | PL B219 121 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 89G | PL B229 304 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 89J | PL B229 175 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 89L | PL B232 554 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ARTUSO | 89 | PRL 62 2233 | M. Artuso <i>et al.</i> | (CLEO Collab.) |
| AVERILL | 89 | PR D39 123 | D.A. Averill <i>et al.</i> | (HRS Collab.) |
| VERY | 89B | PL B223 470 | P. Avery <i>et al.</i> | (CLEO Collab.) |
| BEBEK | 89 | PRL 62 8 | C. Bebek <i>et al.</i> | (CLEO Collab.) |
| BORTOLETTO | 89 | PRL 62 2436 | D. Bortoletto <i>et al.</i> | (CLEO Collab.) |
| BORTOLETTO | 89B | PRL 63 1667 | D. Bortoletto <i>et al.</i> | (CLEO Collab.) |
| ALBRECHT | 88F | PL B209 119 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 88K | PL B215 424 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |

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| ALBRECHT | 87C | PL B185 218 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 87D | PL B199 451 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 87I | PL B192 245 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ALBRECHT | 87J | PL B197 452 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| AVERY | 87 | PL B183 429 | P. Avery <i>et al.</i> | (CLEO Collab.) |
| BEAN | 87B | PRL 58 183 | A. Bean <i>et al.</i> | (CLEO Collab.) |
| BEBEK | 87 | PR D36 1289 | C. Bebek <i>et al.</i> | (CLEO Collab.) |
| ALAM | 86 | PR D34 3279 | M.S. Alam <i>et al.</i> | (CLEO Collab.) |
| ALBRECHT | 86F | PL B182 95 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| PDG | 86 | PL 170B 1 | M. Aguilar-Benitez <i>et al.</i> | (CERN, CIT+) |
| CHEN | 85 | PR D31 2386 | A. Chen <i>et al.</i> | (CLEO Collab.) |
| HAAS | 85 | PRL 55 1248 | J. Haas <i>et al.</i> | (CLEO Collab.) |
| AVERY | 84 | PRL 53 1309 | P. Avery <i>et al.</i> | (CLEO Collab.) |
| GILES | 84 | PR D30 2279 | R. Giles <i>et al.</i> | (CLEO Collab.) |
| BEHRENDTS | 83 | PRL 50 881 | S. Behrends <i>et al.</i> | (CLEO Collab.) |
