B^0

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

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

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-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-$\overline{B}^0$ 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.

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
5279.4±0.5 OUR FIT					
5279.3±0.7 OUR AVERAGE					
5279.1±0.7 ±0.3	135	[1] CSORNA	00	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
5281.3±2.2 ±1.4	51	ABE	96B	CDF	$p\overline{p}$ 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		BORTOLETTO	92	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
5279.6±0.7 ±2.0	40	[2] 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	[3] ALBRECHT	87D	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
5280.6±0.8 ±2.0		BEBEK	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

[1] CSORNA 00 uses fully reconstructed 135 $B^0 \rightarrow J/\psi^{(\prime)} K^0_S$ events and invariant masses without beam constraint.
[2] ALBRECHT 90J assumes 10580 for $\Upsilon(4S)$ mass. Supersedes ALBRECHT 87C and ALBRECHT 87D.
[3] 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*
0.33±0.28 OUR FIT Error includes scale factor of 1.1.				
0.34±0.32 OUR AVERAGE Error includes scale factor of 1.2.				
0.41±0.25±0.19	ALAM	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
−0.4 ±0.6 ±0.5	BORTOLETTO	92	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	[4] BEBEK	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

[4] 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.

$m_{B^0_H} - m_{B^0_L}$

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

B^0 MEAN LIFE

See $B^{\pm}/B^0/B^0_s/b$-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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements and asymmetric lifetime errors.

VALUE (10^{-12} s)	EVTS	DOCUMENT ID		TECN	COMMENT
1.536±0.014 OUR EVALUATION					
$1.523^{+0.024}_{-0.023}\pm0.022$		[5] AUBERT	03C	BABR	$e^+e^- \to \Upsilon(4S)$
$1.533\pm0.034\pm0.038$		[6] AUBERT	03H	BABR	$e^+e^- \to \Upsilon(4S)$
$1.554\pm0.030\pm0.019$		[7] ABE	02H	BELL	$e^+e^- \to \Upsilon(4S)$
$1.497\pm0.073\pm0.032$		[8] ACOSTA	02C	CDF	$p\overline{p}$ at 1.8 TeV
$1.529\pm0.012\pm0.029$		[9] AUBERT	02H	BABR	$e^+e^- \to \Upsilon(4S)$
$1.546\pm0.032\pm0.022$		[7] AUBERT	01F	BABR	$e^+e^- \to \Upsilon(4S)$
$1.541\pm0.028\pm0.023$		[9] ABBIENDI,G	00B	OPAL	$e^+e^- \to Z$
$1.518\pm0.053\pm0.034$		[10] BARATE	00R	ALEP	$e^+e^- \to Z$
$1.523\pm0.057\pm0.053$		[11] ABBIENDI	99J	OPAL	$e^+e^- \to Z$
$1.474\pm0.039^{+0.052}_{-0.051}$		[10] ABE	98Q	CDF	$p\overline{p}$ at 1.8 TeV
$1.52\pm0.06\pm0.04$		[11] ACCIARRI	98S	L3	$e^+e^- \to Z$
$1.64\pm0.08\pm0.08$		[11] ABE	97J	SLD	$e^+e^- \to Z$
$1.532\pm0.041\pm0.040$		[12] ABREU	97F	DLPH	$e^+e^- \to Z$
$1.25^{+0.15}_{-0.13}\pm0.05$	121	[8] BUSKULIC	96J	ALEP	$e^+e^- \to Z$
$1.49^{+0.17}_{-0.15}{}^{+0.08}_{-0.06}$		[13] BUSKULIC	96J	ALEP	$e^+e^- \to Z$
$1.61^{+0.14}_{-0.13}\pm0.08$		[10,14] ABREU	95Q	DLPH	$e^+e^- \to Z$
$1.63\pm0.14\pm0.13$		[15] ADAM	95	DLPH	$e^+e^- \to Z$
$1.53\pm0.12\pm0.08$		[10,16] AKERS	95T	OPAL	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.58\pm0.09\pm0.02$		[8] ABE	98B	CDF	Repl. by ACOSTA 02C
$1.54\pm0.08\pm0.06$		[10] ABE	96C	CDF	Repl. by ABE 98Q
$1.55\pm0.06\pm0.03$		[17] BUSKULIC	96J	ALEP	$e^+e^- \to Z$
$1.61\pm0.07\pm0.04$		[10] BUSKULIC	96J	ALEP	Repl. by BARATE 00R
1.62 ± 0.12		[18] ADAM	95	DLPH	$e^+e^- \to Z$
$1.57\pm0.18\pm0.08$	121	[8] ABE	94D	CDF	Repl. by ABE 98B
$1.17^{+0.29}_{-0.23}\pm0.16$	96	[10] ABREU	93D	DLPH	Sup. by ABREU 95Q

$1.55 \pm 0.25 \pm 0.18$	76	[15] ABREU	93G	DLPH	Sup. by ADAM 95
$1.51 {}^{+0.24}_{-0.23} {}^{+0.12}_{-0.14}$	78	[10] ACTON	93C	OPAL	Sup. by AKERS 95T
$1.52 {}^{+0.20}_{-0.18} {}^{+0.07}_{-0.13}$	77	[10] BUSKULIC	93D	ALEP	Sup. by BUSKULIC 96J
$1.20 {}^{+0.52}_{-0.36} {}^{+0.16}_{-0.14}$	15	[19] WAGNER	90	MRK2	E^{ee}_{cm}= 29 GeV
$0.82 {}^{+0.57}_{-0.37} \pm 0.27$		[20] AVERILL	89	HRS	E^{ee}_{cm}= 29 GeV

[5] 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.
[6] Measurement performed with decays $B^0 \rightarrow D^{*-} \pi^+$ and $B^0 \rightarrow D^{*-} \rho^+$ using a partial reconstruction technique.
[7] Events are selected in which one B meson is fully reconstructed while the second B meson is reconstructed inclusively.
[8] Measured mean life using fully reconstructed decays.
[9] Data analyzed using partially reconstructed $\overline{B}^0 \rightarrow D^{*+} \ell^- \overline{\nu}$ decays.
[10] Data analyzed using $D/D^* \ell$X event vertices.
[11] Data analyzed using charge of secondary vertex.
[12] Data analyzed using inclusive $D/D^* \ell X$.
[13] Measured mean life using partially reconstructed $D^{*-} \pi^+$X vertices.
[14] ABREU 95Q assumes B($B^0 \rightarrow D^{**-} \ell^+ \nu_\ell$) = 3.2 ± 1.7%.
[15] Data analyzed using vertex-charge technique to tag B charge.
[16] AKERS 95T assumes B($B^0 \rightarrow D_s{}^{(*)} D^{0\,(*)}$) = 5.0 ± 0.9% to find B^+/B^0 yield.
[17] Combined result of $D/D^* \ell$x analysis, fully reconstructed B analysis, and partially reconstructed $D^{*-} \pi^+$X analysis.
[18] Combined ABREU 95Q and ADAM 95 result.
[19] 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 $\pi^- \overline{D}^0$.
[20] AVERILL 89 is an estimate of the B^0 mean lifetime assuming that $B^0 \rightarrow D^{*+} +$ X always.

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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements and asymmetric lifetime errors.

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.					
1.086±0.017 OUR EVALUATION					
$1.091 \pm 0.023 \pm 0.014$		[21] ABE	02H	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
$1.093 \pm 0.066 \pm 0.028$		[22] ACOSTA	02C	CDF	$p \overline{p}$ at 1.8 TeV
$1.082 \pm 0.026 \pm 0.012$		[21] AUBERT	01F	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
$1.085 \pm 0.059 \pm 0.018$		[23] BARATE	00R	ALEP	$e^+ e^- \rightarrow Z$
$1.079 \pm 0.064 \pm 0.041$		[24] ABBIENDI	99J	OPAL	$e^+ e^- \rightarrow Z$
$1.110 \pm 0.056 {}^{+0.033}_{-0.030}$		[23] ABE	98Q	CDF	$p \overline{p}$ at 1.8 TeV

$1.09 \pm 0.07 \pm 0.03$		[24] ACCIARRI	98S	L3	$e^+e^- \to Z$
$1.01 \pm 0.07 \pm 0.06$		[24] ABE	97J	SLD	$e^+e^- \to Z$
$1.27 {}^{+0.23}_{-0.19} {}^{+0.03}_{-0.02}$		[22] BUSKULIC	96J	ALEP	$e^+e^- \to Z$
$1.00 {}^{+0.17}_{-0.15} \pm 0.10$		[23,25] ABREU	95Q	DLPH	$e^+e^- \to Z$
$1.06 {}^{+0.13}_{-0.10} \pm 0.10$		[26] ADAM	95	DLPH	$e^+e^- \to Z$
$0.99 \pm 0.14 {}^{+0.05}_{-0.04}$		[23,27] AKERS	95T	OPAL	$e^+e^- \to Z$

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

$1.06 \pm 0.07 \pm 0.02$		[22] ABE	98B	CDF	Repl. by ACOSTA 02C
$1.01 \pm 0.11 \pm 0.02$		[23] ABE	96C	CDF	Repl. by ABE 98Q
$1.03 \pm 0.08 \pm 0.02$		[28] BUSKULIC	96J	ALEP	$e^+e^- \to Z$
$0.98 \pm 0.08 \pm 0.03$		[23] BUSKULIC	96J	ALEP	Repl. by BARATE 00R
$1.02 \pm 0.16 \pm 0.05$	269	[22] ABE	94D	CDF	Repl. by ABE 98B
$1.11 {}^{+0.51}_{-0.39} \pm 0.11$	188	[23] ABREU	93D	DLPH	Sup. by ABREU 95Q
$1.01 {}^{+0.29}_{-0.22} \pm 0.12$	253	[26] ABREU	93G	DLPH	Sup. by ADAM 95
$1.0 {}^{+0.33}_{-0.25} \pm 0.08$	130	ACTON	93C	OPAL	Sup. by AKERS 95T
$0.96 {}^{+0.19}_{-0.15} {}^{+0.18}_{-0.12}$	154	[23] BUSKULIC	93D	ALEP	Sup. by BUSKULIC 96J

[21] Events are selected in which one B meson is fully reconstructed while the second B meson is reconstructed inclusively.
[22] Measured using fully reconstructed decays.
[23] Data analyzed using $D\,/\,D^*\,\ell$X vertices.
[24] Data analyzed using charge of secondary vertex.
[25] ABREU 95Q assumes B($B^0 \to D^{**-}\ell^+\nu_\ell$) = 3.2 ± 1.7%.
[26] Data analyzed using vertex-charge technique to tag B charge.
[27] AKERS 95T assumes B($B^0 \to D_s^{(*)} D^{0\,(*)}$) = 5.0 ± 0.9% to find B^+/B^0 yield.
[28] 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.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT

The data in this block is included in the average printed for a previous datablock.

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

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$0.95 {}^{+0.117}_{-0.080} \pm 0.091$			[29] ARTUSO	97	CLE2	$e^+e^- \to \Upsilon(4S)$
$1.15 \pm 0.17 \pm 0.06$			[30] JESSOP	97	CLE2	$e^+e^- \to \Upsilon(4S)$
$0.93 \pm 0.18 \pm 0.12$			[31] ATHANAS	94	CLE2	Sup. by ARTUSO 97
$0.91 \pm 0.27 \pm 0.21$			[32] ALBRECHT	92C	ARG	$e^+e^- \to \Upsilon(4S)$
1.0 ± 0.4		29	[32,33] ALBRECHT	92G	ARG	$e^+e^- \to \Upsilon(4S)$
$0.89 \pm 0.19 \pm 0.13$			[32] FULTON	91	CLEO	$e^+e^- \to \Upsilon(4S)$
$1.00 \pm 0.23 \pm 0.14$			[32] ALBRECHT	89L	ARG	$e^+e^- \to \Upsilon(4S)$
0.49 to 2.3	90		[34] BEAN	87B	CLEO	$e^+e^- \to \Upsilon(4S)$

[29] ARTUSO 97 uses partial reconstruction of $B \rightarrow D^* \ell \nu_\ell$ and independent of B^0 and B^+ production fraction.
[30] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[31] ATHANAS 94 uses events tagged by fully reconstructed B^- decays and partially or fully reconstructed B^0 decays.
[32] Assumes equal production of B^0 and B^+.
[33] ALBRECHT 92G data analyzed using $B \rightarrow D_s \overline{D}$, $D_s \overline{D}^*$, $D_s^* \overline{D}$, $D_s^* \overline{D}^*$ events.
[34] BEAN 87B assume the fraction of $B^0 \overline{B}^0$ events at the $\Upsilon(4S)$ is 0.41.

$\left|\Delta\Gamma_{B_d^0}\right|/\Gamma_{B_d^0}$

$\Gamma_{B_d^0}$ and $\left|\Delta\Gamma_{B_d^0}\right|$ are the decay rate average and difference between two B_d^0 *CP* eigenstates.

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.18	95	[35] ABDALLAH	03B	DLPH	$e^+ e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.80	95	[36,37] BEHRENS	00B	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

[35] Using the measured τ_{B^0}=1.55 ± 0.03 ps.
[36] BEHRENS 00B uses high-momentum lepton tags and partially reconstructed $\overline{B}^0 \rightarrow D^{*+} \pi^-$, ρ^- decays to determine the flavor of the B meson.
[37] Assumes Δ_{md}=0.478 ± 0.018 ps^{-1} and τ_{B^0}=1.548 ± 0.032 ps.

B^0 DECAY MODES

$\overline{B}^0$ 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% $B^0 \overline{B}^0$ 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.*, $B \rightarrow D^{\pm}$anything, 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	$\ell^+ \nu_\ell$ anything	[a]	(10.5 ±0.8) %	
Γ_2	$D^- \ell^+ \nu_\ell$	[a]	(2.14±0.20) %	
Γ_3	$D^*(2010)^- \ell^+ \nu_\ell$	[a]	(5.44±0.23) %	
Γ_4	$\rho^- \ell^+ \nu_\ell$	[a]	(2.6 ±0.7) $\times 10^{-4}$	
Γ_5	$\pi^- \ell^+ \nu_\ell$	[a]	(1.33±0.22) $\times 10^{-4}$	
	Inclusive modes			
Γ_6	$\pi^- \mu^+ \nu_\mu$			
Γ_7	K^+ anything		(78 ±8) %	
	***D*, *D**, or *D*$_s$ modes**			
Γ_8	$D^- \pi^+$		(2.76±0.25) $\times 10^{-3}$	
Γ_9	$D^- \rho^+$		(7.7 ±1.3) $\times 10^{-3}$	
Γ_{10}	$D^- K^*(892)^+$		(3.7 ±1.8) $\times 10^{-4}$	
Γ_{11}	$D^- \omega \pi^+$		(2.8 ±0.6) $\times 10^{-3}$	
Γ_{12}	$D^- K^+$		(2.0 ±0.6) $\times 10^{-4}$	
Γ_{13}	$D^- K^+ \overline{K}^0$		$<$ 3.1 $\times 10^{-4}$	CL=90%
Γ_{14}	$D^- K^+ \overline{K}^*(892)^0$		(8.8 ±1.9) $\times 10^{-4}$	
Γ_{16}	$\overline{D}^0 \pi^+ \pi^-$		(8.0 ±1.6) $\times 10^{-4}$	
Γ_{17}	$D^*(2010)^- \pi^+$		(2.76±0.21) $\times 10^{-3}$	
Γ_{18}	$D^- \pi^+ \pi^+ \pi^-$		(8.0 ±2.5) $\times 10^{-3}$	
Γ_{19}	$(D^- \pi^+ \pi^+ \pi^-)$ nonresonant		(3.9 ±1.9) $\times 10^{-3}$	
Γ_{20}	$D^- \pi^+ \rho^0$		(1.1 ±1.0) $\times 10^{-3}$	
Γ_{21}	$D^- a_1(1260)^+$		(6.0 ±3.3) $\times 10^{-3}$	
Γ_{22}	$D^*(2010)^- \pi^+ \pi^0$		(1.5 ±0.5) %	
Γ_{23}	$D^*(2010)^- \rho^+$		(6.8 ±0.9) $\times 10^{-3}$	
Γ_{24}	$D^*(2010)^- K^+$		(2.0 ±0.5) $\times 10^{-4}$	
Γ_{25}	$D^*(2010)^- K^*(892)^+$		(3.8 ±1.5) $\times 10^{-4}$	
Γ_{26}	$D^*(2010)^- K^+ \overline{K}^0$		$<$ 4.7 $\times 10^{-4}$	CL=90%
Γ_{27}	$D^*(2010)^- K^+ \overline{K}^*(892)^0$		(1.29±0.33) $\times 10^{-3}$	
Γ_{28}	$D^*(2010)^- \pi^+ \pi^+ \pi^-$		(7.6 ±1.8) $\times 10^{-3}$	S=1.4
Γ_{29}	$(D^*(2010)^- \pi^+ \pi^+ \pi^-)$ non-resonant		(0.0 ±2.5) $\times 10^{-3}$	
Γ_{30}	$D^*(2010)^- \pi^+ \rho^0$		(5.7 ±3.2) $\times 10^{-3}$	
Γ_{31}	$D^*(2010)^- a_1(1260)^+$		(1.30±0.27) %	
Γ_{32}	$D^*(2010)^- \pi^+ \pi^+ \pi^- \pi^0$		(1.76±0.27) %	
Γ_{33}	$D^*(2010)^+ \pi^+ \pi^- \pi^- \pi^0$		(1.8 ±0.7) %	
Γ_{34}	$D^*(2010)^- p \overline{p} \pi^+$		(6.5 ±1.6) $\times 10^{-4}$	
Γ_{35}	$D^*(2010)^- p \overline{n}$		(1.5 ±0.4) $\times 10^{-3}$	
Γ_{36}	$\overline{D}^*(2010)^- \omega \pi^+$		(2.9 ±0.5) $\times 10^{-3}$	
Γ_{37}	$\overline{D}_2^*(2460)^- \pi^+$		$<$ 2.2 $\times 10^{-3}$	CL=90%

Γ_{38}	$\overline{D}{}_2^*(2460)^- \rho^+$	$< 4.9 \times 10^{-3}$	CL=90%
Γ_{39}	$D^- D^+$	$< 9.4 \times 10^{-4}$	CL=90%
Γ_{40}	$D^- D_s^+$	$(8.0 \pm 3.0) \times 10^{-3}$	
Γ_{41}	$D^*(2010)^- D_s^+$	(1.07 ± 0.29) %	
Γ_{42}	$D^- D_s^{*+}$	(1.0 ± 0.5) %	
Γ_{43}	$D^*(2010)^- D_s^{*+}$	(1.9 ± 0.5) %	
Γ_{44}	$D^- D_{sJ}(2317)^+$	seen	
Γ_{45}	$D^- D_{sJ}(2457)^+$	seen	
Γ_{46}	$D^- D_{sJ}(2536)^+$	not seen	
Γ_{47}	$D^*(2010)^- D_{sJ}(2536)^+$	not seen	
Γ_{48}	$D^- D_{sJ}(2573)^+$	not seen	
Γ_{49}	$D^*(2010)^- D_{sJ}(2573)^+$	not seen	
Γ_{50}	$D_s^+ \pi^-$	$(2.7 \pm 1.0) \times 10^{-5}$	
Γ_{51}	$D_s^{*+} \pi^-$	$< 4.1 \times 10^{-5}$	CL=90%
Γ_{52}	$D_s^+ \rho^-$	$< 7 \times 10^{-4}$	CL=90%
Γ_{53}	$D_s^{*+} \rho^-$	$< 8 \times 10^{-4}$	CL=90%
Γ_{54}	$D_s^+ a_1(1260)^-$	$< 2.6 \times 10^{-3}$	CL=90%
Γ_{55}	$D_s^{*+} a_1(1260)^-$	$< 2.2 \times 10^{-3}$	CL=90%
Γ_{56}	$D_s^- K^+$	$(3.8 \pm 1.3) \times 10^{-5}$	
Γ_{57}	$D_s^{*-} K^+$	$< 2.5 \times 10^{-5}$	CL=90%
Γ_{58}	$D_s^- K^*(892)^+$	$< 9.9 \times 10^{-4}$	CL=90%
Γ_{59}	$D_s^{*-} K^*(892)^+$	$< 1.1 \times 10^{-3}$	CL=90%
Γ_{60}	$D_s^- \pi^+ K^0$	$< 5 \times 10^{-3}$	CL=90%
Γ_{61}	$D_s^{*-} \pi^+ K^0$	$< 3.1 \times 10^{-3}$	CL=90%
Γ_{62}	$D_s^- \pi^+ K^*(892)^0$	$< 4 \times 10^{-3}$	CL=90%
Γ_{63}	$D_s^{*-} \pi^+ K^*(892)^0$	$< 2.0 \times 10^{-3}$	CL=90%
Γ_{64}	$\overline{D}{}^0 K^0$	$(5.0 \pm 1.4) \times 10^{-5}$	
Γ_{65}	$\overline{D}{}^0 K^*(892)^0$	$(4.8 \pm 1.2) \times 10^{-5}$	
Γ_{66}	$\overline{D}{}^0 \pi^0$	$(2.91 \pm 0.28) \times 10^{-4}$	
Γ_{67}	$\overline{D}{}^0 \rho^0$	$(2.9 \pm 1.1) \times 10^{-4}$	
Γ_{68}	$\overline{D}{}^0 \eta$	$(2.2 \pm 0.5) \times 10^{-4}$	S=1.6
Γ_{69}	$\overline{D}{}^0 \eta'$	$(1.7 \pm 0.4) \times 10^{-4}$	
Γ_{70}	$\overline{D}{}^0 \omega$	$(2.5 \pm 0.6) \times 10^{-4}$	S=1.5
Γ_{71}	$D^0 K^*(892)^0$	$< 1.8 \times 10^{-5}$	CL=90%
Γ_{72}	$\overline{D}{}^{*0} \gamma$	$< 5.0 \times 10^{-5}$	CL=90%
Γ_{73}	$\overline{D}{}^*(2007)^0 \pi^0$	$(2.7 \pm 0.5) \times 10^{-4}$	
Γ_{74}	$\overline{D}{}^*(2007)^0 \rho^0$	$< 5.1 \times 10^{-4}$	CL=90%
Γ_{75}	$\overline{D}{}^*(2007)^0 \eta$	$(2.6 \pm 0.6) \times 10^{-4}$	
Γ_{76}	$\overline{D}{}^*(2007)^0 \eta'$	$< 2.6 \times 10^{-4}$	CL=90%
Γ_{77}	$\overline{D}{}^*(2007)^0 \pi^+ \pi^-$	$(6.2 \pm 2.2) \times 10^{-4}$	
Γ_{78}	$\overline{D}{}^*(2007)^0 K^0$	$< 6.6 \times 10^{-5}$	CL=90%
Γ_{79}	$\overline{D}{}^*(2007)^0 K^*(892)^0$	$< 6.9 \times 10^{-5}$	CL=90%

Γ_{80}	$D^*(2007)^0 K^*(892)^0$	$< 4.0 \times 10^{-5}$	CL=90%
Γ_{81}	$D^*(2007)^0 \pi^+ \pi^+ \pi^- \pi^-$	$(3.0 \pm 0.9) \times 10^{-3}$	
Γ_{82}	$D^*(2010)^+ D^*(2010)^-$	$(8.7 \pm 1.8) \times 10^{-4}$	
Γ_{83}	$\overline{D}^*(2007)^0 \omega$	$(4.2 \pm 1.1) \times 10^{-4}$	
Γ_{84}	$D^*(2010)^+ D^-$	$< 6.3 \times 10^{-4}$	CL=90%
Γ_{85}	$D^*(2010)^- D^+ +$ $D^*(2010)^+ D^-$	$(9.3 \pm 1.5) \times 10^{-4}$	
Γ_{86}	$D^*(2007)^0 \overline{D}^*(2007)^0$	< 2.7 %	CL=90%
Γ_{87}	$D^- D^0 K^+$	$(1.7 \pm 0.4) \times 10^{-3}$	
Γ_{88}	$D^- D^*(2007)^0 K^+$	$(4.6 \pm 1.0) \times 10^{-3}$	
Γ_{89}	$D^*(2010)^- D^0 K^+$	$(3.1 ^{+0.6}_{-0.5}) \times 10^{-3}$	
Γ_{90}	$D^*(2010)^- D^*(2007)^0 K^+$	(1.18 ± 0.20) %	
Γ_{91}	$D^- D^+ K^0$	$< 1.7 \times 10^{-3}$	CL=90%
Γ_{92}	$D^*(2010)^- D^+ K^0 +$ $D^- D^*(2010)^+ K^0$	$(6.5 \pm 1.6) \times 10^{-3}$	
Γ_{93}	$D^*(2010)^- D^*(2010)^+ K^0$	$(8.8 \pm 1.9) \times 10^{-3}$	
Γ_{94}	$\overline{D}^0 D^0 K^0$	$< 1.4 \times 10^{-3}$	CL=90%
Γ_{95}	$\overline{D}^0 D^*(2007)^0 K^0 +$ $\overline{D}^*(2007)^0 D^0 K^0$	$< 3.7 \times 10^{-3}$	CL=90%
Γ_{96}	$\overline{D}^*(2007)^0 D^*(2007)^0 K^0$	$< 6.6 \times 10^{-3}$	CL=90%
Γ_{97}	$(\overline{D}+\overline{D}^*)(D+D^*)K$	(4.3 ± 0.7) %	
	Charmonium modes		
Γ_{98}	$\eta_c K^0$	$(1.2 \pm 0.4) \times 10^{-3}$	
Γ_{99}	$\eta_c K^*(892)^0$	$(1.6 \pm 0.7) \times 10^{-3}$	
Γ_{100}	$J/\psi(1S) K^0$	$(8.5 \pm 0.5) \times 10^{-4}$	
Γ_{101}	$J/\psi(1S) K^+ \pi^-$	$(1.2 \pm 0.6) \times 10^{-3}$	
Γ_{102}	$J/\psi(1S) K^*(892)^0$	$(1.31 \pm 0.07) \times 10^{-3}$	
Γ_{103}	$J/\psi(1S) \phi K^0$	$(9.4 \pm 2.6) \times 10^{-5}$	
Γ_{104}	$J/\psi(1S) K(1270)^0$	$(1.3 \pm 0.5) \times 10^{-3}$	
Γ_{105}	$J/\psi(1S) \pi^0$	$(2.2 \pm 0.4) \times 10^{-5}$	
Γ_{106}	$J/\psi(1S) \eta$	$< 2.7 \times 10^{-5}$	CL=90%
Γ_{107}	$J/\psi(1S) \pi^+ \pi^-$	$(4.6 \pm 0.9) \times 10^{-5}$	
Γ_{108}	$J/\psi(1S) \rho^0$	$(1.6 \pm 0.7) \times 10^{-5}$	
Γ_{109}	$J/\psi(1S) \omega$	$< 2.7 \times 10^{-4}$	CL=90%
Γ_{110}	$J/\psi(1S) \phi$	$< 9.2 \times 10^{-6}$	CL=90%
Γ_{111}	$J/\psi(1S) \eta'(958)$	$< 6.3 \times 10^{-5}$	CL=90%
Γ_{112}	$J/\psi(1S) K^0 \pi^+ \pi^-$	$(1.0 \pm 0.4) \times 10^{-3}$	
Γ_{113}	$J/\psi(1S) K^0 \rho^0$	$(5.4 \pm 3.0) \times 10^{-4}$	
Γ_{114}	$J/\psi(1S) K^*(892)^+ \pi^-$	$(8 \pm 4) \times 10^{-4}$	
Γ_{115}	$J/\psi(1S) K^*(892)^0 \pi^+ \pi^-$	$(6.6 \pm 2.2) \times 10^{-4}$	
Γ_{116}	$J/\psi(1S) p \overline{p}$	$< 1.9 \times 10^{-6}$	CL=90%
Γ_{117}	$\psi(2S) K^0$	$(6.2 \pm 0.7) \times 10^{-4}$	

Γ_{118}	$\psi(2S) K^+ \pi^-$		$<$ 1 $\times 10^{-3}$	CL=90%
Γ_{119}	$\psi(2S) K^*(892)^0$		$(\ 8.0\ \pm1.3\ ) \times 10^{-4}$	
Γ_{120}	$\chi_{c0}(1P) K^0$		$<$ 5.0 $\times 10^{-4}$	CL=90%
Γ_{121}	$\chi_{c1}(1P) K^0$		$(\ 4.0\ ^{+1.2}_{-1.0}\ ) \times 10^{-4}$	
Γ_{122}	$\chi_{c1}(1P) K^*(892)^0$		$(\ 4.1\ \pm1.5\ ) \times 10^{-4}$	

K or *K** modes

Γ_{123}	$K^+ \pi^-$		$(\ 1.85\pm0.11) \times 10^{-5}$	S=1.2
Γ_{124}	$K^0 \pi^0$		$(\ 9.5\ ^{+2.1}_{-1.9}\ ) \times 10^{-6}$	
Γ_{125}	$\eta' K^0$		$(\ 6.3\ \pm0.7\ ) \times 10^{-5}$	S=1.1
Γ_{126}	$\eta' K^*(892)^0$		$<$ 2.4 $\times 10^{-5}$	CL=90%
Γ_{127}	$\eta K^*(892)^0$		$(\ 1.4\ ^{+0.6}_{-0.5}\ ) \times 10^{-5}$	
Γ_{128}	ηK^0		$<$ 9.3 $\times 10^{-6}$	CL=90%
Γ_{129}	ωK^0		$<$ 1.3 $\times 10^{-5}$	CL=90%
Γ_{130}	$K^0_S X^0$ (Familon)		$<$ 5.3 $\times 10^{-5}$	CL=90%
Γ_{131}	$\omega K^*(892)^0$		$<$ 2.3 $\times 10^{-5}$	CL=90%
Γ_{132}	$K^+ K^-$			
Γ_{133}	$K^0 \overline{K}^0$		$<$ 3.3 $\times 10^{-6}$	CL=90%
Γ_{134}	$K^0_S K^0_S K^0_S$		$(\ 4.2\ ^{+1.8}_{-1.5}\ ) \times 10^{-6}$	
Γ_{135}	$K^+ \pi^- \pi^0$		$<$ 4.0 $\times 10^{-5}$	CL=90%
Γ_{136}	$K^+ \rho^-$		$(\ 7.3\ \pm1.8\ ) \times 10^{-6}$	
Γ_{137}	$K^0 \pi^+ \pi^-$		$(\ 4.7\ \pm0.7\ ) \times 10^{-5}$	
Γ_{138}	$K^0 \rho^0$		$<$ 3.9 $\times 10^{-5}$	CL=90%
Γ_{139}	$K^0 f_0(980)$		$<$ 3.6 $\times 10^{-4}$	CL=90%
Γ_{140}	$K^*(892)^+ \pi^-$		$(\ 1.6\ ^{+0.6}_{-0.5}\ ) \times 10^{-5}$	
Γ_{141}	$K^*(892)^0 \pi^0$		$<$ 3.6 $\times 10^{-6}$	CL=90%
Γ_{142}	$K^*_2(1430)^+ \pi^-$		$<$ 1.8 $\times 10^{-5}$	CL=90%
Γ_{143}	$K^0 K^- \pi^+$		$<$ 2.1 $\times 10^{-5}$	CL=90%
Γ_{144}	$K^+ K^- \pi^0$		$<$ 1.9 $\times 10^{-5}$	CL=90%
Γ_{145}	$K^0 K^+ K^-$		$(\ 2.8\ \pm0.5\ ) \times 10^{-5}$	
Γ_{146}	$K^0 \phi$		$(\ 8.6\ ^{+1.3}_{-1.1}\ ) \times 10^{-6}$	
Γ_{147}	$K^- \pi^+ \pi^+ \pi^-$	[b]	$<$ 2.3 $\times 10^{-4}$	CL=90%
Γ_{148}	$K^*(892)^0 \pi^+ \pi^-$		$<$ 1.4 $\times 10^{-3}$	CL=90%
Γ_{149}	$K^*(892)^0 \rho^0$		$<$ 3.4 $\times 10^{-5}$	CL=90%
Γ_{150}	$K^*(892)^0 f_0(980)$		$<$ 1.7 $\times 10^{-4}$	CL=90%
Γ_{151}	$K_1(1400)^+ \pi^-$		$<$ 1.1 $\times 10^{-3}$	CL=90%
Γ_{152}	$K^- a_1(1260)^+$	[b]	$<$ 2.3 $\times 10^{-4}$	CL=90%
Γ_{153}	$K^*(892)^0 K^+ K^-$		$<$ 6.1 $\times 10^{-4}$	CL=90%
Γ_{154}	$K^*(892)^0 \phi$		$(\ 1.07\pm0.11) \times 10^{-5}$	
Γ_{155}	$\overline{K}^*(892)^0 K^*(892)^0$		$<$ 2.2 $\times 10^{-5}$	CL=90%
Γ_{156}	$K^*(892)^0 K^*(892)^0$		$<$ 3.7 $\times 10^{-5}$	CL=90%

Γ_{157}	$K^*(892)^+ K^*(892)^-$		$<$ 1.41	$\times 10^{-4}$	CL=90%
Γ_{158}	$K_1(1400)^0 \rho^0$		$<$ 3.0	$\times 10^{-3}$	CL=90%
Γ_{159}	$K_1(1400)^0 \phi$		$<$ 5.0	$\times 10^{-3}$	CL=90%
Γ_{160}	$K_2^*(1430)^0 \rho^0$		$<$ 1.1	$\times 10^{-3}$	CL=90%
Γ_{161}	$K_2^*(1430)^0 \phi$		$<$ 1.4	$\times 10^{-3}$	CL=90%
Γ_{162}	$K^*(892)^0 \gamma$		(4.3 $\pm$0.4)	$\times 10^{-5}$	
Γ_{163}	$K^0 \phi \gamma$		$<$ 8.3	$\times 10^{-6}$	CL=90%
Γ_{164}	$K^+ \pi^- \gamma$		(4.6 $\pm$1.4)	$\times 10^{-6}$	
Γ_{165}	$K^*(1410) \gamma$		$<$ 1.3	$\times 10^{-4}$	CL=90%
Γ_{166}	$K^+ \pi^- \gamma$ nonresonant		$<$ 2.6	$\times 10^{-6}$	CL=90%
Γ_{167}	$K_1(1270)^0 \gamma$		$<$ 7.0	$\times 10^{-3}$	CL=90%
Γ_{168}	$K_1(1400)^0 \gamma$		$<$ 4.3	$\times 10^{-3}$	CL=90%
Γ_{169}	$K_2^*(1430)^0 \gamma$		(1.3 $\pm$0.5)	$\times 10^{-5}$	
Γ_{170}	$K^*(1680)^0 \gamma$		$<$ 2.0	$\times 10^{-3}$	CL=90%
Γ_{171}	$K_3^*(1780)^0 \gamma$		$<$ 1.0	%	CL=90%
Γ_{172}	$K_4^*(2045)^0 \gamma$		$<$ 4.3	$\times 10^{-3}$	CL=90%

Light unflavored meson modes

Γ_{173}	$\rho^0 \gamma$		$<$ 1.2	$\times 10^{-6}$	CL=90%
Γ_{174}	$\omega \gamma$		$<$ 1.0	$\times 10^{-6}$	CL=90%
Γ_{175}	$\phi \gamma$		$<$ 3.3	$\times 10^{-6}$	CL=90%
Γ_{176}	$\pi^+ \pi^-$		(4.8 $\pm$0.5)	$\times 10^{-6}$	
Γ_{177}	$\pi^0 \pi^0$		(1.9 $\pm$0.5)	$\times 10^{-6}$	
Γ_{178}	$\eta \pi^0$		$<$ 2.9	$\times 10^{-6}$	CL=90%
Γ_{179}	$\eta \eta$		$<$ 1.8	$\times 10^{-5}$	CL=90%
Γ_{180}	$\eta' \pi^0$		$<$ 5.7	$\times 10^{-6}$	CL=90%
Γ_{181}	$\eta' \eta'$		$<$ 4.7	$\times 10^{-5}$	CL=90%
Γ_{182}	$\eta' \eta$		$<$ 2.7	$\times 10^{-5}$	CL=90%
Γ_{183}	$\eta' \rho^0$		$<$ 1.2	$\times 10^{-5}$	CL=90%
Γ_{184}	$\eta \rho^0$		$<$ 1.0	$\times 10^{-5}$	CL=90%
Γ_{185}	$\omega \eta$		$<$ 1.2	$\times 10^{-5}$	CL=90%
Γ_{186}	$\omega \eta'$		$<$ 6.0	$\times 10^{-5}$	CL=90%
Γ_{187}	$\omega \rho^0$		$<$ 1.1	$\times 10^{-5}$	CL=90%
Γ_{188}	$\omega \omega$		$<$ 1.9	$\times 10^{-5}$	CL=90%
Γ_{189}	$\phi \pi^0$		$<$ 5	$\times 10^{-6}$	CL=90%
Γ_{190}	$\phi \eta$		$<$ 9	$\times 10^{-6}$	CL=90%
Γ_{191}	$\phi \eta'$		$<$ 3.1	$\times 10^{-5}$	CL=90%
Γ_{192}	$\phi \rho^0$		$<$ 1.3	$\times 10^{-5}$	CL=90%
Γ_{193}	$\phi \omega$		$<$ 2.1	$\times 10^{-5}$	CL=90%
Γ_{194}	$\phi \phi$		$<$ 1.2	$\times 10^{-5}$	CL=90%
Γ_{195}	$\pi^+ \pi^- \pi^0$		$<$ 7.2	$\times 10^{-4}$	CL=90%
Γ_{196}	$\rho^0 \pi^0$		$<$ 5.3	$\times 10^{-6}$	CL=90%
Γ_{197}	$\rho^\mp \pi^\pm$	[*c*]	(2.28$\pm$0.25)	$\times 10^{-5}$	
Γ_{198}	$\pi^+ \pi^- \pi^+ \pi^-$		$<$ 2.3	$\times 10^{-4}$	CL=90%

Γ_{199}	$\rho^0 \rho^0$		$<$	2.1	$\times 10^{-6}$	CL=90%
Γ_{200}	$a_1(1260)^{\mp} \pi^{\pm}$	[c]	$<$	4.9	$\times 10^{-4}$	CL=90%
Γ_{201}	$a_2(1320)^{\mp} \pi^{\pm}$	[c]	$<$	3.0	$\times 10^{-4}$	CL=90%
Γ_{202}	$\pi^+ \pi^- \pi^0 \pi^0$		$<$	3.1	$\times 10^{-3}$	CL=90%
Γ_{203}	$\rho^+ \rho^-$		$<$	2.2	$\times 10^{-3}$	CL=90%
Γ_{204}	$a_1(1260)^0 \pi^0$		$<$	1.1	$\times 10^{-3}$	CL=90%
Γ_{205}	$\omega \pi^0$		$<$	3	$\times 10^{-6}$	CL=90%
Γ_{206}	$\pi^+ \pi^+ \pi^- \pi^- \pi^0$		$<$	9.0	$\times 10^{-3}$	CL=90%
Γ_{207}	$a_1(1260)^+ \rho^-$		$<$	3.4	$\times 10^{-3}$	CL=90%
Γ_{208}	$a_1(1260)^0 \rho^0$		$<$	2.4	$\times 10^{-3}$	CL=90%
Γ_{209}	$\pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^-$		$<$	3.0	$\times 10^{-3}$	CL=90%
Γ_{210}	$a_1(1260)^+ a_1(1260)^-$		$<$	2.8	$\times 10^{-3}$	CL=90%
Γ_{211}	$\pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^0$		$<$	1.1	%	CL=90%

Baryon modes

Γ_{212}	$p \overline{p}$		$<$	1.2	$\times 10^{-6}$	CL=90%
Γ_{213}	$p \overline{p} \pi^+ \pi^-$		$<$	2.5	$\times 10^{-4}$	CL=90%
Γ_{214}	$p \overline{p} K^0$		$<$	7.2	$\times 10^{-6}$	CL=90%
Γ_{215}	$p \overline{\Lambda} \pi^-$			(4.0 $^{+1.1}_{-1.0}$)	$\times 10^{-6}$	
Γ_{216}	$p \overline{\Lambda} K^-$		$<$	8.2	$\times 10^{-7}$	CL=90%
Γ_{217}	$p \overline{\Sigma}^0 \pi^-$		$<$	3.8	$\times 10^{-6}$	CL=90%
Γ_{218}	$\overline{\Lambda} \Lambda$		$<$	1.0	$\times 10^{-6}$	CL=90%
Γ_{219}	$\Delta^0 \overline{\Delta}^0$		$<$	1.5	$\times 10^{-3}$	CL=90%
Γ_{220}	$\Delta^{++} \overline{\Delta}^{--}$		$<$	1.1	$\times 10^{-4}$	CL=90%
Γ_{221}	$\overline{D}^0 p \overline{p}$			(1.18±0.22)	$\times 10^{-4}$	
Γ_{222}	$\overline{D}^*(2007)^0 p \overline{p}$			(1.2 ±0.4)	$\times 10^{-4}$	
Γ_{223}	$\overline{\Sigma}_c^{--} \Delta^{++}$		$<$	1.0	$\times 10^{-3}$	CL=90%
Γ_{224}	$\overline{\Lambda}_c^- p \pi^+ \pi^-$			(1.3 ±0.4)	$\times 10^{-3}$	
Γ_{225}	$\overline{\Lambda}_c^- p$			(2.2 ±0.8)	$\times 10^{-5}$	
Γ_{226}	$\overline{\Lambda}_c^- p \pi^0$		$<$	5.9	$\times 10^{-4}$	CL=90%
Γ_{227}	$\overline{\Lambda}_c^- p \pi^+ \pi^- \pi^0$		$<$	5.07	$\times 10^{-3}$	CL=90%
Γ_{228}	$\overline{\Lambda}_c^- p \pi^+ \pi^- \pi^+ \pi^-$		$<$	2.74	$\times 10^{-3}$	CL=90%
Γ_{229}	$\overline{\Sigma}_c(2520)^{--} p \pi^+$			(1.6 ±0.7)	$\times 10^{-4}$	
Γ_{230}	$\overline{\Sigma}_c(2520)^0 p \pi^-$		$<$	1.21	$\times 10^{-4}$	CL=90%
Γ_{231}	$\overline{\Sigma}_c(2455)^0 p \pi^-$			(10 ±8)	$\times 10^{-5}$	S=1.7
Γ_{232}	$\overline{\Sigma}_c(2455)^{--} p \pi^+$			(2.8 ±0.9)	$\times 10^{-4}$	
Γ_{233}	$\overline{\Lambda}_c(2593)^-$ / $\overline{\Lambda}_c(2625)^- p$		$<$	1.1	$\times 10^{-4}$	CL=90%

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

Γ_{234}	$\gamma \gamma$	*B1*	$<$	1.7	$\times 10^{-6}$	CL=90%
Γ_{235}	$e^+ e^-$	*B1*	$<$	1.9	$\times 10^{-7}$	CL=90%
Γ_{236}	$\mu^+ \mu^-$	*B1*	$<$	1.6	$\times 10^{-7}$	CL=90%
Γ_{237}	$K^0 e^+ e^-$	*B1*	$<$	5.4	$\times 10^{-7}$	CL=90%

Γ_{238}	$K^0\mu^+\mu^-$	B1		$(5.6\ ^{+2.9}_{-2.4})$	$\times 10^{-7}$	
Γ_{239}	$K^0\ell^+\ell^-$	B1	[a]	< 6.8	$\times 10^{-7}$	CL=90%
Γ_{240}	$K^*(892)^0 e^+e^-$	B1		< 2.4	$\times 10^{-6}$	CL=90%
Γ_{241}	$K^*(892)^0\mu^+\mu^-$	B1		$(1.3\ \pm0.4)$	$\times 10^{-6}$	
Γ_{242}	$K^*(892)^0\nu\overline{\nu}$	B1		< 1.0	$\times 10^{-3}$	CL=90%
Γ_{243}	$K^*(892)^0\ell^+\ell^-$	B1	[a]	(1.17 ± 0.30)	$\times 10^{-6}$	
Γ_{244}	$e^\pm\mu^\mp$	LF	[c]	< 1.7	$\times 10^{-7}$	CL=90%
Γ_{245}	$K^0 e^\pm\mu^\mp$	LF		< 4.0	$\times 10^{-6}$	CL=90%
Γ_{246}	$K^*(892)^0 e^\pm\mu^\mp$	LF		< 3.4	$\times 10^{-6}$	CL=90%
Γ_{247}	$e^\pm\tau^\mp$	LF	[c]	< 5.3	$\times 10^{-4}$	CL=90%
Γ_{248}	$\mu^\pm\tau^\mp$	LF	[c]	< 8.3	$\times 10^{-4}$	CL=90%

[a] An ℓ indicates an e or a μ mode, not a sum over these modes.

[b] B^0 and B_s^0 contributions not separated. Limit is on weighted average of the two decay rates.

[c] The value is for the sum of the charge states or particle/antiparticle states indicated.

B^0 BRANCHING RATIOS

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

$\Gamma(\ell^+\nu_\ell\,\text{anything})/\Gamma_{\text{total}}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.105 ±0.008 OUR AVERAGE				
0.1078±0.0060±0.0069	[38] ARTUSO	97	CLE2	$e^+e^-\to\Upsilon(4S)$
0.093 ±0.011 ±0.015	ALBRECHT	94	ARG	$e^+e^-\to\Upsilon(4S)$
0.099 ±0.030 ±0.009	HENDERSON	92	CLEO	$e^+e^-\to\Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.109 ±0.007 ±0.011	ATHANAS	94	CLE2	Sup. by ARTUSO 97

[38] ARTUSO 97 uses partial reconstruction of $B\to D^*\ell\nu_\ell$ and inclusive semileptonic branching ratio from BARISH 96B (0.1049 ± 0.0017 ± 0.0043).

$\Gamma(D^-\ell^+\nu_\ell)/\Gamma_{\text{total}}$ — Γ_2/Γ

ℓ denotes e or μ, not the sum.

"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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

VALUE	DOCUMENT ID		TECN	COMMENT
0.0214±0.0020 OUR EVALUATION				
0.0213±0.0018 OUR AVERAGE				
0.0213±0.0012±0.0039	ABE	02E	BELL	$e^+e^-\to\Upsilon(4S)$
0.0209±0.0013±0.0018	[39] BARTELT	99	CLE2	$e^+e^-\to\Upsilon(4S)$
0.0235±0.0020±0.0044	[40] BUSKULIC	97	ALEP	$e^+e^-\to Z$

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

$0.0187 \pm 0.0015 \pm 0.0032$	[41] ATHANAS	97	CLE2	Repl. by BARTELT 99
$0.018 \pm 0.006 \pm 0.003$	[42] FULTON	91	CLEO	$e^+e^- \to \Upsilon(4S)$
$0.020 \pm 0.007 \pm 0.006$	[43] ALBRECHT	89J	ARG	$e^+e^- \to \Upsilon(4S)$

[39] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[40] BUSKULIC 97 assumes fraction (B^+) = fraction (B^0) = (37.8 ± 2.2)% and PDG 96 values for B lifetime and branching ratio of D^* and D decays.
[41] ATHANAS 97 uses missing energy and missing momentum to reconstruct neutrino.
[42] FULTON 91 assumes assuming equal production of B^0 and B^+ at the $\Upsilon(4S)$ and uses Mark III D and D^* branching ratios.
[43] ALBRECHT 89J reports 0.018 ± 0.006 ± 0.005. We rescale using the method described in STONE 94 but with the updated PDG 94 B($D^0 \to K^- \pi^+$).

$\Gamma(D^*(2010)^- \ell^+ \nu_\ell)/\Gamma_{total}$ — Γ_3/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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0544±0.0023 OUR EVALUATION					
0.0519±0.0032 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.					
$0.0609 \pm 0.0019 \pm 0.0040$		[44] ADAM	03	CLE2	$e^+e^- \to \Upsilon(4S)$
$0.0459 \pm 0.0023 \pm 0.0040$		[45] ABE	02F	BELL	$e^+e^- \to \Upsilon(4S)$
$0.0470 \pm 0.0013 ^{+0.0036}_{-0.0031}$		[46] ABREU	01H	DLPH	$e^+e^- \to Z$
$0.0526 \pm 0.0020 \pm 0.0046$		[47] ABBIENDI	00Q	OPAL	$e^+e^- \to Z$
$0.0553 \pm 0.0026 \pm 0.0052$		[48] BUSKULIC	97	ALEP	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.0609 \pm 0.0019 \pm 0.0040$		[49] BRIERE	02	CLE2	$e^+e^- \to \Upsilon(4S)$
$0.0508 \pm 0.0021 \pm 0.0066$		[50] ACKERSTAFF	97G	OPAL	Repl. by ABBIENDI 00Q
$0.0552 \pm 0.0017 \pm 0.0068$		[51] ABREU	96P	DLPH	Repl. by ABREU 01H
$0.0449 \pm 0.0032 \pm 0.0039$	376	[52] BARISH	95	CLE2	Repl. by ADAM 03
$0.0518 \pm 0.0030 \pm 0.0062$	410	[53] BUSKULIC	95N	ALEP	Sup. by BUSKULIC 97
$0.045 \pm 0.003 \pm 0.004$		[54] ALBRECHT	94	ARG	$e^+e^- \to \Upsilon(4S)$
$0.047 \pm 0.005 \pm 0.005$	235	[55] ALBRECHT	93	ARG	$e^+e^- \to \Upsilon(4S)$
seen	398	[56] SANGHERA	93	CLE2	$e^+e^- \to \Upsilon(4S)$
$0.070 \pm 0.018 \pm 0.014$		[57] ANTREASYAN	90B	CBAL	$e^+e^- \to \Upsilon(4S)$
		[58] ALBRECHT	89C	ARG	$e^+e^- \to \Upsilon(4S)$
$0.060 \pm 0.010 \pm 0.014$		[59] ALBRECHT	89J	ARG	$e^+e^- \to \Upsilon(4S)$
$0.040 \pm 0.004 \pm 0.006$		[60] BORTOLETTO	89B	CLEO	$e^+e^- \to \Upsilon(4S)$
$0.070 \pm 0.012 \pm 0.019$	47	[61] ALBRECHT	87J	ARG	$e^+e^- \to \Upsilon(4S)$

[44] Uses the combined fit of both $B^0 \to D^*(2010)^- \ell \nu$ and $B^+ \to \overline{D}(2007)^0 \ell \nu$ samples.
[45] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[46] ABREU 01H measured using about 5000 partial reconstructed D^* sample.
[47] ABBIENDI 00Q assumes the fraction B($b \to B^0$)= $(39.7^{+1.8}_{-2.2})$%. This result is an average of two methods using exclusive and partial D^* reconstruction.

[48] BUSKULIC 97 assumes fraction (B^+) = fraction (B^0) = (37.8 ± 2.2)% and PDG 96 values for B lifetime and D^* and D branching fractions.

[49] The results are based on the same analysis and data sample reported in ADAM 03.

[50] ACKERSTAFF 97G assumes fraction (B^+) = fraction (B^0) = (37.8 ± 2.2)% and PDG 96 values for B lifetime and branching ratio of D^* and D decays.

[51] ABREU 96P result is the average of two methods using exclusive and partial D^* reconstruction.

[52] BARISH 95 use B($D^0 \to K^- \pi^+$) = (3.91 ± 0.08 ± 0.17)% and B($D^{*+} \to D^0 \pi^+$) = (68.1 ± 1.0 ± 1.3)%.

[53] BUSKULIC 95N assumes fraction (B^+) = fraction (B^0) = 38.2 ± 1.3 ± 2.2% and τ_{B^0} = 1.58 ± 0.06 ps. $\Gamma(D^{*-} \ell^+ \nu_\ell)$/total = [5.18 − 0.13(fraction(B^0)−38.2)−1.5(τ_{B^0} − 1.58)]%.

[54] ALBRECHT 94 assumes B($D^{*+} \to D^0 \pi^+$) = 68.1 ± 1.0 ± 1.3%. Uses partial reconstruction of D^{*+} and is independent of D^0 branching ratios.

[55] ALBRECHT 93 reports 0.052 ± 0.005 ± 0.006. We rescale using the method described in STONE 94 but with the updated PDG 94 B($D^0 \to K^- \pi^+$). We have taken their average e and μ value. They also obtain $\alpha = 2*\Gamma^0/(\Gamma^- + \Gamma^+) - 1$ = 1.1 ± 0.4 ± 0.2, $A_{AF} = 3/4*(\Gamma^- - \Gamma^+)/\Gamma$ = 0.2 ± 0.08 ± 0.06 and a value of $|V_{cb}|$ = 0.036–0.045 depending on model assumptions.

[56] Combining $\overline{D}^{*0} \ell^+ \nu_\ell$ and $\overline{D}^{*-} \ell^+ \nu_\ell$ SANGHERA 93 test $V-A$ structure and fit the decay angular distributions to obtain $A_{FB} = 3/4*(\Gamma^- - \Gamma^+)/\Gamma$ = 0.14 ± 0.06 ± 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.

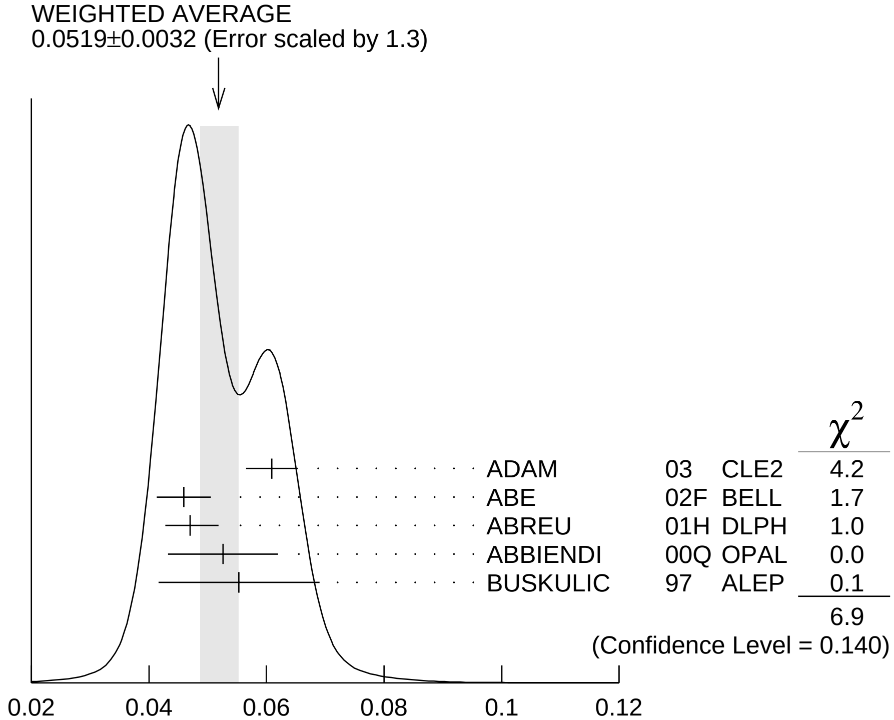
[57] ANTREASYAN 90B is average over B and $\overline{D}^*(2010)$ charge states.

[58] The measurement of ALBRECHT 89C suggests a D^* polarization γ_L/γ_T of 0.85 ± 0.45. or α = 0.7 ± 0.9.

[59] ALBRECHT 89J is ALBRECHT 87J value rescaled using B($D^*(2010)^- \to D^0 \pi^-$) = 0.57 ± 0.04 ± 0.04. Superseded by ALBRECHT 93.

[60] We have taken average of the the BORTOLETTO 89B values for electrons and muons, 0.046 ± 0.005 ± 0.007. We rescale using the method described in STONE 94 but with the updated PDG 94 B($D^0 \to K^- \pi^+$). The measurement suggests a D^* polarization parameter value α = 0.65 ± 0.66 ± 0.25.

[61] ALBRECHT 87J assume μ-e universality, the B($\Upsilon(4S) \to B^0 \overline{B}^0$) = 0.45, the B($D^0 \to K^- \pi^+$) = (0.042 ± 0.004 ± 0.004), and the B($D^*(2010)^- \to D^0 \pi^-$) = 0.49 ± 0.08. Superseded by ALBRECHT 89J.



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

$\Gamma(\rho^- \ell^+ \nu_\ell)/\Gamma_{\text{total}}$ Γ_4/Γ

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

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
2.6 ±0.7 OUR AVERAGE					
$2.17 \pm 0.34 ^{+0.62}_{-0.68}$		[62] ATHAR	03	CLE2	$e^+ e^- \to \Upsilon(4S)$
$3.29 \pm 0.42 \pm 0.72$		[63] AUBERT	03E	BABR	$e^+ e^- \to \Upsilon(4S)$
$2.57 \pm 0.29 ^{+0.53}_{-0.62}$		[64] BEHRENS	00	CLE2	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2.69 \pm 0.41 ^{+0.61}_{-0.64}$		[65] BEHRENS	00	CLE2	$e^+ e^- \to \Upsilon(4S)$
$2.5 \pm 0.4 ^{+0.7}_{-0.9}$		[66] ALEXANDER	96T	CLE2	Repl. by BEHRENS 00
<4.1	90	[67] BEAN	93B	CLE2	$e^+ e^- \to \Upsilon(4S)$

[62] ATHAR 03 reports systematic errors $^{+0.47}_{-0.5} \pm 0.41 \pm 0.01$, 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.

[63] 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.

[64] 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.

[65] 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: $\Gamma(B^0 \to \rho^- \ell^+ \nu)$=2$\Gamma(B^+ \to \rho^0 \ell^+ \nu)\approx$ 2$\Gamma(B^+ \to \omega \ell^+ \nu)$. No evidence for $\omega \ell \nu$ is reported.

[66] 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: $\Gamma(B^0 \to \rho^- \ell^+ \nu)$ =2$\Gamma(B^+ \to \rho^0 \ell^+ \nu) \approx$ 2$\Gamma(B^+ \to \omega \ell^+ \nu)$. No evidence for $\omega \ell \nu$ is reported.

[67] 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 $B^+ \to (\omega$ 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.

$\Gamma(\pi^- \ell^+ \nu_\ell)/\Gamma_{total}$ — Γ_5/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
1.33±0.18±0.13	[68] ATHAR	03	CLE2	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.8 ±0.4 ±0.4	[69] ALEXANDER	96T	CLE2	Repl. by ATHAR 03

[68] 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.

[69] 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: $\Gamma(B^0 \to \pi^- \ell^+ \nu) = 2 \times \Gamma(B^+ \to \pi^0 \ell^+ \nu)$.

$\Gamma(\pi^- \mu^+ \nu_\mu)/\Gamma_{total}$ — Γ_6/Γ

VALUE	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •			
seen	[70] ALBRECHT	91C	ARG

[70] In ALBRECHT 91C, one event is fully reconstructed providing evidence for the $b \to u$ transition.

$\Gamma(K^+ \text{anything})/\Gamma_{total}$ — Γ_7/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.78±0.08	[71] ALBRECHT	96D	ARG	$e^+ e^- \to \Upsilon(4S)$

[71] Average multiplicity.

$\Gamma(D^- \pi^+)/\Gamma_{total}$ — Γ_8/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.00276±0.00025 OUR AVERAGE					
0.00268±0.00012±0.00024		[72,73] AHMED	02B	CLE2	$e^+ e^- \to \Upsilon(4S)$
0.0027 ±0.0006 ±0.0005		[74] BORTOLETTO	92	CLEO	$e^+ e^- \to \Upsilon(4S)$
0.0048 ±0.0011 ±0.0011	22	[75] ALBRECHT	90J	ARG	$e^+ e^- \to \Upsilon(4S)$
0.0051 $^{+0.0028}_{-0.0025}$ $^{+0.0013}_{-0.0012}$	4	[76] BEBEK	87	CLEO	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0029 ±0.0004 ±0.0002	81	[77] ALAM	94	CLE2	Repl. by AHMED 02B
0.0031 ±0.0013 ±0.0010	7	[75] ALBRECHT	88K	ARG	$e^+ e^- \to \Upsilon(4S)$

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

[73] 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.

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

[75] ALBRECHT 88K assumes $B^0 \overline{B}^0$:$B^+ B^-$ production ratio is 45:55. Superseded by ALBRECHT 90J which assumes 50:50.

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

[77] ALAM 94 reports [B($B^0 \to D^- \pi^+$) × B($D^+ \to K^- \pi^+ \pi^+$)] = 0.000265 ± 0.000032 ± 0.000023. We divide by our best value B($D^+ \to K^- \pi^+ \pi^+$) = (9.2 ± 0.6) × 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 $\Upsilon(4S)$.

$\Gamma(D^- \rho^+)/\Gamma_{total}$ — Γ_9/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0077±0.0013 OUR AVERAGE					
0.0076±0.0013±0.0005	79	[78] ALAM	94	CLE2	$e^+ e^- \to \Upsilon(4S)$
0.009 ±0.005 ±0.003	9	[79] ALBRECHT	90J	ARG	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.022 ±0.012 ±0.009	6	[79] ALBRECHT	88K	ARG	$e^+ e^- \to \Upsilon(4S)$

[78] ALAM 94 reports [B($B^0 \to D^- \rho^+$) × B($D^+ \to K^- \pi^+ \pi^+$)] = 0.000704 ± 0.000096 ± 0.000070. We divide by our best value B($D^+ \to K^- \pi^+ \pi^+$) = (9.2 ± 0.6) × 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 $\Upsilon(4S)$.

[79] ALBRECHT 88K assumes $B^0 \overline{B}^0$:$B^+ B^-$ production ratio is 45:55. Superseded by ALBRECHT 90J which assumes 50:50.

$\Gamma(D^- K^*(892)^+)/\Gamma_{total}$ — Γ_{10}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
(3.7±1.5±1.0) × 10^{-4}	[80] MAHAPATRA	02	CLE2	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(D^- \omega \pi^+)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.0028±0.0005±0.0004	[81] ALEXANDER	01B	CLE2	$e^+ e^- \to \Upsilon(4S)$

[81] 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 $1349 \pm 25^{+10}_{-5}$ MeV and width $547 \pm 86^{+46}_{-45}$ MeV.

$\Gamma(D^- K^+)/\Gamma_{total}$ — Γ_{12}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
(2.04±0.50±0.27) × 10^{-4}	[82] ABE	01I	BELL	$e^+ e^- \to \Upsilon(4S)$

[82] ABE 01I reports B($B^0 \to D^- K^+$)/B($B^0 \to D^- \pi^+$)= 0.068 ± 0.015 ± 0.007. We multiply by our best value B($B^0 \to D^- \pi^+$)= (3.0 ± 0.4) × 10^{-3}. Our first error is their experiment's error and the second error is systematic error from using our best value.

$\Gamma(D^- K^+ \overline{K}^0)/\Gamma_{total}$ Γ_{13}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<3.1	90	[83] DRUTSKOY	02	BELL	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(D^- K^+ \overline{K}^*(892)^0)/\Gamma_{total}$ Γ_{14}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
8.8±1.1±1.5	[84] DRUTSKOY	02	BELL	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(\overline{D}^0 \pi^+ \pi^-)/\Gamma_{total}$ Γ_{16}/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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
8.0± 0.6±1.5			[85,86] SATPATHY	03	BELL	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 16	90		[85] ALAM	94	CLE2	$e^+ e^- \to \Upsilon(4S)$
< 70	90		[87] BORTOLETTO	92	CLEO	$e^+ e^- \to \Upsilon(4S)$
<340	90		[88] BEBEK	87	CLEO	$e^+ e^- \to \Upsilon(4S)$
700 ±500		5	[89] BEHRENDS	83	CLEO	$e^+ e^- \to \Upsilon(4S)$

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

[86] No assumption about the intermediate mechanism is made in the analysis.

[87] 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 $D_0^*(2340) \to D^0\pi$ is < 0.0001 at 90% CL and into $D_2^*(2460)$ followed by $D_2^*(2460) \to D^0\pi$ is < 0.0004 at 90% CL.

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

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

$\Gamma(D^*(2010)^- \pi^+)/\Gamma_{total}$ Γ_{17}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.00276±0.00021 OUR AVERAGE					
0.00281±0.00024±0.00005		[90] BRANDENB...	98	CLE2	$e^+ e^- \to \Upsilon(4S)$
0.0026 ±0.0003 ±0.0004	82	[91] ALAM	94	CLE2	$e^+ e^- \to \Upsilon(4S)$
0.00337±0.00096±0.00002		[92] BORTOLETTO	92	CLEO	$e^+ e^- \to \Upsilon(4S)$
0.00236±0.00088±0.00002	12	[93] ALBRECHT	90J	ARG	$e^+ e^- \to \Upsilon(4S)$
$0.00236^{+0.00150}_{-0.00110}$±0.00002	5	[94] BEBEK	87	CLEO	$e^+ e^- \to \Upsilon(4S)$

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

0.010	±0.004	±0.001	8	[95] AKERS	94J	OPAL	$e^+ e^- \to Z$
0.0027	±0.0014	±0.0010	5	[96] ALBRECHT	87C	ARG	$e^+ e^- \to \Upsilon(4S)$
0.0035	±0.002	±0.002		[97] ALBRECHT	86F	ARG	$e^+ e^- \to \Upsilon(4S)$
0.017	±0.005	±0.005	41	[98] GILES	84	CLEO	$e^+ e^- \to \Upsilon(4S)$

[90] 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($D^* \to D\pi$).

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

[92] BORTOLETTO 92 reports $0.0040 \pm 0.0010 \pm 0.0007$ for B($D^*(2010)^+ \to D^0\pi^+$) = 0.57 ± 0.06. We rescale to our best value B($D^*(2010)^+ \to D^0\pi^+$) = $(67.7 \pm 0.5) \times 10^{-2}$. 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.

[93] ALBRECHT 90J reports $0.0028 \pm 0.0009 \pm 0.0006$ for B($D^*(2010)^+ \to D^0\pi^+$) = 0.57 ± 0.06. We rescale to our best value B($D^*(2010)^+ \to D^0\pi^+$) = $(67.7 \pm 0.5) \times 10^{-2}$. 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.

[94] BEBEK 87 reports $0.0028^{+0.0015}_{-0.0012}{}^{+0.0010}_{-0.0006}$ for B($D^*(2010)^+ \to D^0\pi^+$) = 0.57 ± 0.06. We rescale to our best value B($D^*(2010)^+ \to D^0\pi^+$) = $(67.7 \pm 0.5) \times 10^{-2}$. 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.

[95] Assumes B($Z \to b\overline{b}$) = 0.217 and 38% B_d production fraction.

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

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

[98] Assumes B($D^*(2010)^+ \to D^0\pi^+$) = $0.60^{+0.08}_{-0.15}$. Assumes B($\Upsilon(4S) \to B^0\overline{B}^0$) = 0.40 ± 0.02 Does not depend on D branching ratios.

$\Gamma(D^-\pi^+\pi^+\pi^-)/\Gamma_{total}$ — Γ_{18}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0080±0.0021±0.0014	[99] BORTOLETTO92	CLEO	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma((D^-\pi^+\pi^+\pi^-)\text{ nonresonant})/\Gamma_{total}$ — Γ_{19}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0039±0.0014±0.0013	[100] BORTOLETTO92	CLEO	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(D^-\pi^+\rho^0)/\Gamma_{total}$ — Γ_{20}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0011±0.0009±0.0004	[101] BORTOLETTO92	CLEO	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(D^- a_1(1260)^+)/\Gamma_{total}$ Γ_{21}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0060±0.0022±0.0024	[102] BORTOLETTO 92	CLEO	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(D^*(2010)^- \pi^+ \pi^0)/\Gamma_{total}$ Γ_{22}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0152±0.0052±0.0001	51	[103] ALBRECHT 90J	ARG	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.015 ±0.008 ±0.008	8	[104] ALBRECHT 87C	ARG	$e^+e^- \to \Upsilon(4S)$

[103] ALBRECHT 90J reports $0.018 \pm 0.004 \pm 0.005$ for $B(D^*(2010)^+ \to D^0\pi^+) = 0.57 \pm 0.06$. We rescale to our best value $B(D^*(2010)^+ \to D^0\pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. 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.

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

$\Gamma(D^*(2010)^- \rho^+)/\Gamma_{total}$ Γ_{23}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0068 ±0.0009 OUR AVERAGE				
0.0068 ±0.0003 ±0.0009		[105] CSORNA 03	CLE2	$e^+e^- \to \Upsilon(4S)$
0.0160 ±0.0113 ±0.0001		[106] BORTOLETTO 92	CLEO	$e^+e^- \to \Upsilon(4S)$
0.00589±0.00352±0.00004	19	[107] ALBRECHT 90J	ARG	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0074 ±0.0010 ±0.0014	76	[108,109] ALAM 94	CLE2	$e^+e^- \to \Upsilon(4S)$
0.081 ±0.029 $^{+0.059}_{-0.024}$	19	[110] CHEN 85	CLEO	$e^+e^- \to \Upsilon(4S)$

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

[106] BORTOLETTO 92 reports $0.019 \pm 0.008 \pm 0.011$ for $B(D^*(2010)^+ \to D^0\pi^+) = 0.57 \pm 0.06$. We rescale to our best value $B(D^*(2010)^+ \to D^0\pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. 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.

[107] ALBRECHT 90J reports $0.007 \pm 0.003 \pm 0.003$ for $B(D^*(2010)^+ \to D^0\pi^+) = 0.57 \pm 0.06$. We rescale to our best value $B(D^*(2010)^+ \to D^0\pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. 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.

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

[109] 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.

[110] Uses $B(D^* \to D^0\pi^+) = 0.6 \pm 0.15$ and $B(\Upsilon(4S) \to B^0\overline{B}^0) = 0.4$. Does not depend on D branching ratios.

$\Gamma(D^*(2010)^- K^+)/\Gamma_{total}$ — Γ_{24}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$(2.04\pm0.44\pm0.16) \times 10^{-4}$	[111] ABE	01I	BELL	$e^+e^- \to \Upsilon(4S)$

[111] ABE 01I reports $B(B^0 \to D^*(2010)^- K^+)/B(B^0 \to D^*(2010)^- \pi^+) = 0.074 \pm 0.015 \pm 0.006$. We multiply by our best value $B(B^0 \to D^*(2010)^- \pi^+) = (2.76 \pm 0.21) \times 10^{-3}$. Our first error is their experiment's error and the second error is systematic error from using our best value.

$\Gamma(D^*(2010)^- K^*(892)^+)/\Gamma_{total}$ — Γ_{25}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$(3.8\pm1.3\pm0.8) \times 10^{-4}$	[112] MAHAPATRA	02	CLE2	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(D^*(2010)^- K^+ \overline{K}^0)/\Gamma_{total}$ — Γ_{26}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<4.7	90	[113] DRUTSKOY	02	BELL	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(D^*(2010)^- K^+ \overline{K}^*(892)^0)/\Gamma_{total}$ — Γ_{27}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$12.9\pm2.2\pm2.5$	[114] DRUTSKOY	02	BELL	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(D^*(2010)^- \pi^+\pi^+\pi^-)/\Gamma_{total}$ — Γ_{28}/Γ

0.0076±0.0018 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$0.0063\pm0.0010\pm0.0011$		49	[115,116] ALAM	94	CLE2	$e^+e^- \to \Upsilon(4S)$
$0.0134\pm0.0036\pm0.0001$			[117] BORTOLETTO	92	CLEO	$e^+e^- \to \Upsilon(4S)$
$0.0101\pm0.0041\pm0.0001$		26	[118] ALBRECHT	90J	ARG	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$0.033\pm0.009\pm0.016$		27	[119] ALBRECHT	87C	ARG	$e^+e^- \to \Upsilon(4S)$
<0.042	90		[120] BEBEK	87	CLEO	$e^+e^- \to \Upsilon(4S)$

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

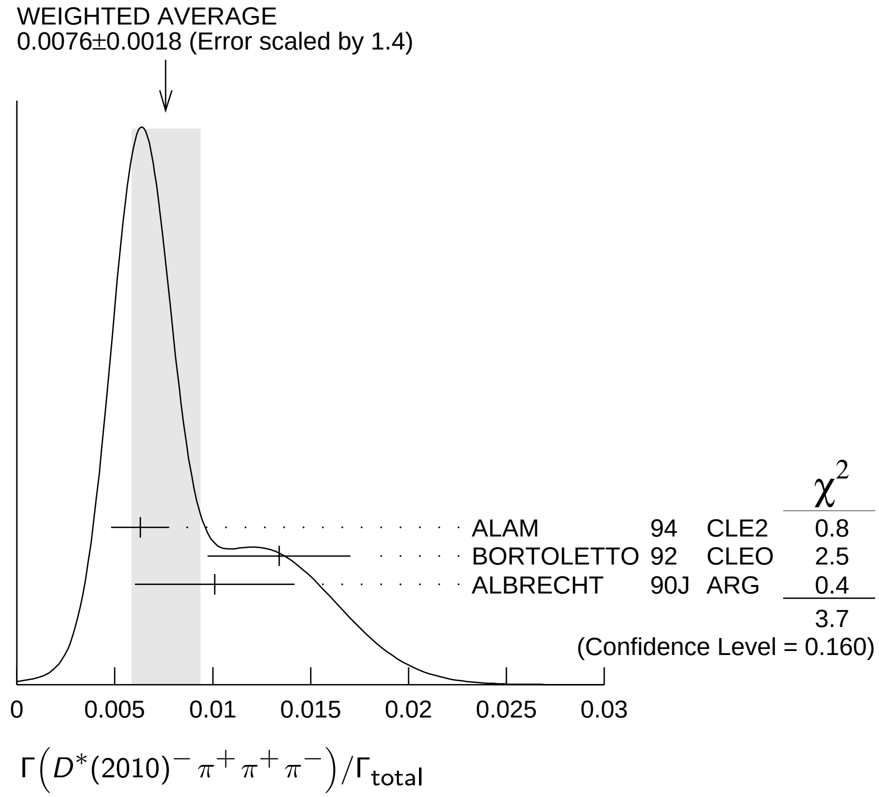
[116] The three pion mass is required to be between 1.0 and 1.6 GeV consistent with an a_1 meson. (If this channel is dominated by a_1^+, the branching ratio for $\overline{D}^{*-} a_1^+$ is twice that for $\overline{D}^{*-}\pi^+\pi^+\pi^-$.)

[117] BORTOLETTO 92 reports $0.0159 \pm 0.0028 \pm 0.0037$ for $B(D^*(2010)^+ \to D^0\pi^+) = 0.57 \pm 0.06$. We rescale to our best value $B(D^*(2010)^+ \to D^0\pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. 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.

[118] ALBRECHT 90J reports $0.012 \pm 0.003 \pm 0.004$ for B($D^*(2010)^+ \rightarrow D^0 \pi^+$) = 0.57 ± 0.06. 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.

[119] 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.

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



$\Gamma((D^*(2010)^- \pi^+ \pi^+ \pi^-)\text{ nonresonant})/\Gamma_{total}$ Γ_{29}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
$0.0000 \pm 0.0019 \pm 0.0016$	[121] BORTOLETTO92	CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(D^*(2010)^- \pi^+ \rho^0)/\Gamma_{total}$ Γ_{30}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
$0.00573 \pm 0.00317 \pm 0.00004$	[122] BORTOLETTO92	CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$

[122] BORTOLETTO 92 reports $0.0068 \pm 0.0032 \pm 0.0021$ for B($D^*(2010)^+ \rightarrow D^0 \pi^+$) = 0.57 ± 0.06. 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.

$\Gamma(D^*(2010)^- a_1(1260)^+)/\Gamma_{total}$ Γ_{31}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.0130±0.0027 OUR AVERAGE				
0.0126±0.0020±0.0022	[123,124] ALAM	94	CLE2	$e^+e^- \to \Upsilon(4S)$
0.0152±0.0070±0.0001	[125] BORTOLETTO	92	CLEO	$e^+e^- \to \Upsilon(4S)$

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

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

[125] BORTOLETTO 92 reports $0.018 \pm 0.006 \pm 0.006$ for B($D^*(2010)^+ \to D^0\pi^+$) = 0.57 ± 0.06. We rescale to our best value B($D^*(2010)^+ \to D^0\pi^+$) = $(67.7 \pm 0.5) \times 10^{-2}$. 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.

$\Gamma(D^*(2010)^- \pi^+\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{32}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0176±0.0027 OUR AVERAGE					
0.0172±0.0014±0.0024		[126] ALEXANDER	01B	CLE2	$e^+e^- \to \Upsilon(4S)$
0.0345±0.0181±0.0003	28	[127] ALBRECHT	90J	ARG	$e^+e^- \to \Upsilon(4S)$

[126] 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 $1349 \pm 25^{+10}_{-5}$ MeV and width $547 \pm 86^{+46}_{-45}$ MeV.

[127] ALBRECHT 90J reports $0.041 \pm 0.015 \pm 0.016$ for B($D^*(2010)^+ \to D^0\pi^+$) = 0.57 ± 0.06. We rescale to our best value B($D^*(2010)^+ \to D^0\pi^+$) = $(67.7 \pm 0.5) \times 10^{-2}$. 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.

$\Gamma(D^*(2010)^- p\overline{p}\pi^+)/\Gamma_{total}$ Γ_{34}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{6.5^{+1.3}_{-1.2}\pm1.0}$	[128] ANDERSON	01	CLE2	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(D^*(2010)^- p\overline{n})/\Gamma_{total}$ Γ_{35}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$\mathbf{14.5^{+3.4}_{-3.0}\pm2.7}$	[129] ANDERSON	01	CLE2	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(\overline{D}^*(2010)^- \omega\pi^+)/\Gamma_{total}$ Γ_{36}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.0029±0.0003±0.0004	[130] ALEXANDER	01B	CLE2	$e^+e^- \to \Upsilon(4S)$

[130] 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 $1349 \pm 25^{+10}_{-5}$ MeV and width $547 \pm 86^{+46}_{-45}$ MeV.

$\Gamma(\overline{D}_2^*(2460)^- \pi^+)/\Gamma_{total}$ Γ_{37}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0022	90	[131] ALAM	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

[131] 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%.

$\Gamma(\overline{D}_2^*(2460)^- \rho^+)/\Gamma_{total}$ Γ_{38}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0049	90	[132] ALAM	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

[132] 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%.

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<9.4 \times 10^{-4}$	90	[133] LIPELES	00	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5.9 \times 10^{-3}$	90	BARATE	98Q	ALEP	$e^+e^- \rightarrow Z$
$<1.2 \times 10^{-3}$	90	ASNER	97	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(D^- D_s^+)/\Gamma_{total}$ Γ_{40}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0080±0.0030 OUR AVERAGE					
$0.0084 \pm 0.0030 ^{+0.0020}_{-0.0021}$		[134] GIBAUT	96	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$0.013 \pm 0.011 \pm 0.003$		[135] ALBRECHT	92G	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
$0.007 \pm 0.004 \pm 0.002$		[136] BORTOLETTO	92	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.012 ± 0.007	3	[137] BORTOLETTO	90	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

[134] GIBAUT 96 reports $0.0087 \pm 0.0024 \pm 0.0020$ for B($D_s^+ \rightarrow \phi\pi^+$) = 0.035. We rescale to our best value B($D_s^+ \rightarrow \phi\pi^+$) = $(3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[135] ALBRECHT 92G reports $0.017 \pm 0.013 \pm 0.006$ for B($D_s^+ \rightarrow \phi\pi^+$) = 0.027. We rescale to our best value B($D_s^+ \rightarrow \phi\pi^+$) = $(3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes PDG 1990 D^+ branching ratios, e.g., B($D^+ \rightarrow K^-\pi^+\pi^+$) = 7.7 ± 1.0%.

[136] BORTOLETTO 92 reports $0.0080 \pm 0.0045 \pm 0.0030$ for B($D_s^+ \rightarrow \phi\pi^+$) = 0.030 ± 0.011. We rescale to our best value B($D_s^+ \rightarrow \phi\pi^+$) = $(3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D.

[137] BORTOLETTO 90 assume B($D_s \rightarrow \phi\pi^+$) = 2%. Superseded by BORTOLETTO 92.

$\Gamma(D^*(2010)^- D_s^+)/\Gamma_{total}$ — Γ_{41}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0107±0.0029 OUR AVERAGE					
0.0103±0.0019±0.0025		[138] AUBERT	03I	BABR	$e^+ e^- \to \Upsilon(4S)$
$0.0110\pm0.0021^{+0.0026}_{-0.0027}$		[139] AHMED	00B	CLE2	$e^+ e^- \to \Upsilon(4S)$
0.010 ±0.008 ±0.003		[140] ALBRECHT	92G	ARG	$e^+ e^- \to \Upsilon(4S)$
0.013 ±0.008 ±0.003		[141] BORTOLETTO	92	CLEO	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0090±0.0027±0.0022		[142] GIBAUT	96	CLE2	Repl. by AHMED 00B
0.024 ±0.014	3	[143] BORTOLETTO	90	CLEO	$e^+ e^- \to \Upsilon(4S)$

[138] AUBERT 03I reports 0.0103 ± 0.0014 ± 0.0013 for $B(D_s^+ \to \phi\pi^+) = 0.036$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[139] AHMED 00B reports 0.0110 ± 0.0018 ± 0.0011 for $B(D_s^+ \to \phi\pi^+) = 0.036$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[140] ALBRECHT 92G reports 0.014 ± 0.010 ± 0.003 for $B(D_s^+ \to \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes PDG 1990 D^+ and $D^*(2010)^+$ branching ratios, e.g., $B(D^0 \to K^-\pi^+) = 3.71 \pm 0.25\%$, $B(D^+ \to K^-\pi^+\pi^+) = 7.1 \pm 1.0\%$, and $B(D^*(2010)^+ \to D^0\pi^+) = 55 \pm 4\%$.

[141] BORTOLETTO 92 reports $0.016 \pm 0.009 \pm 0.006$ for $B(D_s^+ \to \phi\pi^+) = 0.030 \pm 0.011$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses Mark III branching fractions for the D and $D^*(2010)$.

[142] GIBAUT 96 reports $0.0093 \pm 0.0023 \pm 0.0016$ for $B(D_s^+ \to \phi\pi^+) = 0.035$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[143] BORTOLETTO 90 assume $B(D_s \to \phi\pi^+) = 2\%$. Superseded by BORTOLETTO 92.

$\Gamma(D^- D_s^{*+})/\Gamma_{total}$ — Γ_{42}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.010±0.005 OUR AVERAGE				
0.010±0.004±0.002	[144] GIBAUT	96	CLE2	$e^+ e^- \to \Upsilon(4S)$
0.020±0.014±0.005	[145] ALBRECHT	92G	ARG	$e^+ e^- \to \Upsilon(4S)$

[144] GIBAUT 96 reports $0.0100 \pm 0.0035 \pm 0.0022$ for $B(D_s^+ \to \phi\pi^+) = 0.035$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[145] ALBRECHT 92G reports 0.027 ± 0.017 ± 0.009 for $B(D_s^+ \to \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes PDG 1990 D^+ branching ratios, e.g., $B(D^+ \to K^-\pi^+\pi^+) = 7.7 \pm 1.0\%$.

$\left[\Gamma\left(D^{*}(2010)^{-} D_s^{+}\right)+\Gamma\left(D^{*}(2010)^{-} D_s^{*+}\right)\right]/\Gamma_{\text{total}}$ $(\Gamma_{41}+\Gamma_{43})/\Gamma$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.030±0.008 OUR AVERAGE					
0.030±0.004±0.007		[146] AUBERT	03I	BABR	$e^+e^- \to \Upsilon(4S)$
4.1 ±1.1 ±1.0	22	[147] BORTOLETTO	90	CLEO	$e^+e^- \to \Upsilon(4S)$

[146] AUBERT 03I reports 0.0300 ± 0.0019 ± 0.0039 for B($D_s^+ \to \phi\pi^+$) = 0.036. We rescale to our best value B($D_s^+ \to \phi\pi^+$) = (3.6 ± 0.9) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[147] BORTOLETTO 90 reports 7.5 ± 2.0 for B($D_s^+ \to \phi\pi^+$) = 0.02. We rescale to our best value B($D_s^+ \to \phi\pi^+$) = (3.6 ± 0.9) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma\left(D^{*}(2010)^{-} D_s^{*+}\right)/\Gamma_{\text{total}}$ Γ_{43}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.019±0.005 OUR AVERAGE				
0.020±0.003±0.005	[148] AUBERT	03I	BABR	$e^+e^- \to \Upsilon(4S)$
0.018±0.004±0.004	[149] AHMED	00B	CLE2	$e^+e^- \to \Upsilon(4S)$
0.019±0.011±0.005	[150] ALBRECHT	92G	ARG	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.020±0.006±0.005	[151] GIBAUT	96	CLE2	Repl. by AHMED 00B

[148] AUBERT 03I reports 0.0197 ± 0.0015 ± 0.0030 for B($D_s^+ \to \phi\pi^+$) = 0.036. We rescale to our best value B($D_s^+ \to \phi\pi^+$) = (3.6 ± 0.9) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[149] AHMED 00B reports 0.0182 ± 0.0037 ± 0.0025 for B($D_s^+ \to \phi\pi^+$) = 0.036. We rescale to our best value B($D_s^+ \to \phi\pi^+$) = (3.6 ± 0.9) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[150] ALBRECHT 92G reports 0.026 ± 0.014 ± 0.006 for B($D_s^+ \to \phi\pi^+$) = 0.027. We rescale to our best value B($D_s^+ \to \phi\pi^+$) = (3.6 ± 0.9) × 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($D^0 \to K^-\pi^+$) = 3.71 ± 0.25%, B($D^+ \to K^-\pi^+\pi^+$) = 7.1 ± 1.0%, and B($D^*(2010)^+ \to D^0\pi^+$) = 55 ± 4%.

[151] GIBAUT 96 reports 0.0203 ± 0.0050 ± 0.0036 for B($D_s^+ \to \phi\pi^+$) = 0.035. We rescale to our best value B($D_s^+ \to \phi\pi^+$) = (3.6 ± 0.9) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma\left(D^{-} D_{sJ}(2317)^{+}\right)/\Gamma_{\text{total}}$ Γ_{44}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	[152] KROKOVNY	03B	BELL	$e^+e^- \to \Upsilon(4S)$

[152] The product branching ratio for B($B^0 \to D^- D_{sJ}(2317)^+$)×B($D_{sJ}(2317)^+ \to D_s\pi^0$) is measured to be $(8.6^{+3.3}_{-2.6} \pm 2.6) \times 10^{-4}$.

$\Gamma(D^- D_{sJ}(2457)^+)/\Gamma_{total}$ — Γ_{45}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	[153] KROKOVNY 03B	BELL	$e^+e^- \to \Upsilon(4S)$

[153] The product branching ratio for B($B^0 \to D^- D_{sJ}(2457)^+$)×B($D_{sJ}(2457)^+ \to D_s^{*+}\pi^0, D_s^+\gamma$) are measured to be $(22.7^{+7.3}_{-6.2} \pm 6.8) \times 10^{-4}$ and $(8.2^{+2.2}_{-1.9} \pm 2.5) \times 10^{-4}$, respectively.

$\Gamma(D^- D_{sJ}(2536)^+)/\Gamma_{total}$ — Γ_{46}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	[154] AUBERT 03X	BABR	$e^+e^- \to \Upsilon(4S)$

[154] No evidence is found for such decay and set a limit on B($B^0 \to D^- D_{sJ}(2536)^+$)×B($D_{sJ}(2536)^+ \to D^*(2007)^0 K^+$) $< 5 \times 10^{-4}$ at 90%CL.

$\Gamma(D^*(2010)^- D_{sJ}(2536)^+)/\Gamma_{total}$ — Γ_{47}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	[155] AUBERT 03X	BABR	$e^+e^- \to \Upsilon(4S)$

[155] No evidence is found for such decay and set a limit on B($B^0 \to D^*(2010)^- D_{sJ}(2536)^+$)×B($D_{sJ}(2536)^+ \to D^*(2007)^0 K^+$) $< 7 \times 10^{-4}$ at 90%CL.

$\Gamma(D^- D_{sJ}(2573)^+)/\Gamma_{total}$ — Γ_{48}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	[156] AUBERT 03X	BABR	$e^+e^- \to \Upsilon(4S)$

[156] No evidence is found for such decay and set a limit on B($B^0 \to D^- D_{sJ}(2573)^+$)×B($D_{sJ}(2573)^+ \to D^0 K^+$) $< 1 \times 10^{-4}$ at 90%CL.

$\Gamma(D^*(2010)^- D_{sJ}(2573)^+)/\Gamma_{total}$ — Γ_{49}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	[157] AUBERT 03X	BABR	$e^+e^- \to \Upsilon(4S)$

[157] No evidence is found for such decay and set a limit on B($B^0 \to D^*(2010)^- D_{sJ}(2573)^+$)×B($D_{sJ}(2573)^+ \to D^0 K^+$) $< 2 \times 10^{-4}$ at 90%CL.

$\Gamma(D_s^+ \pi^-)/\Gamma_{total}$ — Γ_{50}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
27±10 OUR AVERAGE				
$31.\pm 11.^{+7.}_{-8.}$		[158] AUBERT 03D	BABR	$e^+e^- \to \Upsilon(4S)$
$24.^{+11.}_{-\ 9.}\pm 6.$		[159] KROKOVNY 02	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<$ 280	90	[160] ALEXANDER 93B	CLE2	$e^+e^- \to \Upsilon(4S)$
$<$1300	90	[161] BORTOLETTO90	CLEO	$e^+e^- \to \Upsilon(4S)$

[158] AUBERT 03D reports $[B(B^0 \to D_s^+ \pi^-) \times B(D_s^+ \to \phi\pi^+)] = 1.13 \pm 0.33 \pm 0.21$. We divide by our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[159] KROKOVNY 02 reports $[B(B^0 \to D_s^+ \pi^-) \times B(D_s^+ \to \phi\pi^+)] = 0.86^{+0.37}_{-0.30} \pm 0.11$. We divide by our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[160] ALEXANDER 93B reports < 270 for $B(D_s^+ \to \phi\pi^+) = 0.037$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

[161] BORTOLETTO 90 assume $B(D_s \to \phi\pi^+) = 2\%$.

$[\Gamma(D_s^+ \pi^-) + \Gamma(D_s^- K^+)]/\Gamma_{total}$ — $(\Gamma_{50}+\Gamma_{56})/\Gamma$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0013	90	[162] ALBRECHT	93E	ARG	$e^+e^- \to \Upsilon(4S)$

[162] ALBRECHT 93E reports $< 1.7 \times 10^{-3}$ for $B(D_s^+ \to \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

$\Gamma(D_s^{*+} \pi^-)/\Gamma_{total}$ — Γ_{51}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
< 4.1	90	AUBERT	03D	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<50	90	[163] ALEXANDER	93B	CLE2	$e^+e^- \to \Upsilon(4S)$

[163] ALEXANDER 93B reports < 44 for $B(D_s^+ \to \phi\pi^+) = 0.037$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

$[\Gamma(D_s^{*+} \pi^-) + \Gamma(D_s^{*-} K^+)]/\Gamma_{total}$ — $(\Gamma_{51}+\Gamma_{57})/\Gamma$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0009	90	[164] ALBRECHT	93E	ARG	$e^+e^- \to \Upsilon(4S)$

[164] ALBRECHT 93E reports $< 1.2 \times 10^{-3}$ for $B(D_s^+ \to \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

$\Gamma(D_s^+ \rho^-)/\Gamma_{total}$ — Γ_{52}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0007	90	[165] ALEXANDER	93B	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.0016	90	[166] ALBRECHT	93E	ARG	$e^+e^- \to \Upsilon(4S)$

[165] ALEXANDER 93B reports $< 6.6 \times 10^{-4}$ for $B(D_s^+ \to \phi\pi^+) = 0.037$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

[166] ALBRECHT 93E reports $< 2.2 \times 10^{-3}$ for $B(D_s^+ \to \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

$\Gamma(D_s^{*+}\rho^-)/\Gamma_{total}$ Γ_{53}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0008	90	[167] ALEXANDER 93B	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.0019	90	[168] ALBRECHT 93E	ARG	$e^+e^- \to \Upsilon(4S)$

[167] ALEXANDER 93B reports $< 7.4 \times 10^{-4}$ for $B(D_s^+ \to \phi\pi^+) = 0.037$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

[168] ALBRECHT 93E reports $< 2.5 \times 10^{-3}$ for $B(D_s^+ \to \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

$\Gamma(D_s^+ a_1(1260)^-)/\Gamma_{total}$ Γ_{54}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0026	90	[169] ALBRECHT 93E	ARG	$e^+e^- \to \Upsilon(4S)$

[169] ALBRECHT 93E reports $< 3.5 \times 10^{-3}$ for $B(D_s^+ \to \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

$\Gamma(D_s^{*+} a_1(1260)^-)/\Gamma_{total}$ Γ_{55}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0022	90	[170] ALBRECHT 93E	ARG	$e^+e^- \to \Upsilon(4S)$

[170] ALBRECHT 93E reports $< 2.9 \times 10^{-3}$ for $B(D_s^+ \to \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

$\Gamma(D_s^- K^+)/\Gamma_{total}$ Γ_{56}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
38±13 OUR AVERAGE				
$32.\pm12.\pm\ 8.$		[171] AUBERT 03D	BABR	$e^+e^- \to \Upsilon(4S)$
$45.^{+14.}_{-12.}\pm11.$		[172] KROKOVNY 02	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 240	90	[173] ALEXANDER 93B	CLE2	$e^+e^- \to \Upsilon(4S)$
<1300	90	[174] BORTOLETTO90	CLEO	$e^+e^- \to \Upsilon(4S)$

[171] AUBERT 03D reports $[B(B^0 \to D_s^- K^+) \times B(D_s^+ \to \phi\pi^+)] = 1.16 \pm 0.36 \pm 0.24$. We divide by our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[172] KROKOVNY 02 reports $[B(B^0 \to D_s^- K^+) \times B(D_s^+ \to \phi\pi^+)] = 1.61^{+0.45}_{-0.38} \pm 0.21$. We divide by our best value $B(D_s^+ \to \phi\pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[173] ALEXANDER 93B reports < 230 for $B(D_s^+ \to \phi\pi^+) = 0.037$. We rescale to our best value $B(D_s^+ \to \phi\pi^+) = 0.036$.

[174] BORTOLETTO 90 assume $B(D_s \to \phi\pi^+) = 2\%$.

$\Gamma(D_s^{*-} K^+)/\Gamma_{total}$ — Γ_{57}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
< 2.5	90	AUBERT	03D	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<17	90	[175] ALEXANDER	93B	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

[175] ALEXANDER 93B reports < 17 for $B(D_s^+ \rightarrow \phi\pi^+) = 0.037$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(D_s^- K^*(892)^+)/\Gamma_{total}$ — Γ_{58}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0010	90	[176] ALEXANDER	93B	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.0034	90	[177] ALBRECHT	93E	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

[176] ALEXANDER 93B reports $< 9.7 \times 10^{-4}$ for $B(D_s^+ \rightarrow \phi\pi^+) = 0.037$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

[177] ALBRECHT 93E reports $< 4.6 \times 10^{-3}$ for $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(D_s^{*-} K^*(892)^+)/\Gamma_{total}$ — Γ_{59}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0011	90	[178] ALEXANDER	93B	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.004	90	[179] ALBRECHT	93E	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

[178] ALEXANDER 93B reports $< 11.0 \times 10^{-4}$ for $B(D_s^+ \rightarrow \phi\pi^+) = 0.037$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

[179] ALBRECHT 93E reports $< 5.8 \times 10^{-3}$ for $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(D_s^- \pi^+ K^0)/\Gamma_{total}$ — Γ_{60}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.005	90	[180] ALBRECHT	93E	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

[180] ALBRECHT 93E reports $< 7.3 \times 10^{-3}$ for $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(D_s^{*-} \pi^+ K^0)/\Gamma_{total}$ — Γ_{61}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0031	90	[181] ALBRECHT	93E	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

[181] ALBRECHT 93E reports $< 4.2 \times 10^{-3}$ for $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(D_s^- \pi^+ K^*(892)^0)/\Gamma_{total}$ — Γ_{62}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.004	90	[182] ALBRECHT 93E	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[182] ALBRECHT 93E reports $< 5.0 \times 10^{-3}$ for $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(D_s^{*-} \pi^+ K^*(892)^0)/\Gamma_{total}$ — Γ_{63}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0020	90	[183] ALBRECHT 93E	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[183] ALBRECHT 93E reports $< 2.7 \times 10^{-3}$ for $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(\overline{D}^0 K^0)/\Gamma_{total}$ — Γ_{64}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{(5.0^{+1.3}_{-1.2} \pm 0.6) \times 10^{-5}}$	[184] KROKOVNY 03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(\overline{D}^0 K^*(892)^0)/\Gamma_{total}$ — Γ_{65}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{(4.8^{+1.1}_{-1.0} \pm 0.5) \times 10^{-5}}$	[185] KROKOVNY 03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(\overline{D}^0 \pi^0)/\Gamma_{total}$ — Γ_{66}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
2.91±0.28 OUR AVERAGE				
2.9 ±0.2 ±0.3		[186] AUBERT 04B	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
3.1 ±0.4 ±0.5		[186] ABE 02J	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
$2.74^{+0.36}_{-0.32} \pm 0.55$		[186] COAN 02	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1.2	90	[187] NEMATI 98	CLE2	Repl. by COAN 02
<4.8	90	[188] ALAM 94	CLE2	Repl. by NEMATI 98

[186] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[187] 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.
[188] 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 $B(D^0 \rightarrow K^-\pi^+\pi^+\pi^-)/B(D^0 \rightarrow K^-\pi^+)$.

$\Gamma(\overline{D}^0 \rho^0)/\Gamma_{total}$ — Γ_{67}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
2.9±1.0±0.4			[189] SATPATHY 03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

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

< 3.9	90		[190] NEMATI	98	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
< 5.5	90		[191] ALAM	94	CLE2	Repl. by NEMATI 98
< 6.0	90		[192] BORTOLETTO	92	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
< 27.0	90	4	[193] ALBRECHT	88K	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

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

[190] 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.

[191] 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($D^0 \rightarrow K^-\pi^+\pi^+\pi^-$)/B($D^0 \rightarrow K^-\pi^+$).

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

[193] ALBRECHT 88K reports < 0.003 assuming $B^0\overline{B}^0$:B^+B^- production ratio is 45:55. We rescale to 50%.

$\Gamma(\overline{D}^0\eta)/\Gamma_{total}$ — Γ_{68}/Γ

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
2.2±0.5 OUR AVERAGE	Error includes scale factor of 1.6.				
$2.5\pm0.2\pm0.3$		[194] AUBERT	04B	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
$1.4^{+0.5}_{-0.4}\pm0.3$		[194] ABE	02J	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.3	90	[195] NEMATI	98	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
<6.8	90	[196] ALAM	94	CLE2	Repl. by NEMATI 98

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

[195] 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.

[196] 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($D^0 \rightarrow K^-\pi^+\pi^+\pi^-$)/B($D^0 \rightarrow K^-\pi^+$).

$\Gamma(\overline{D}^0\eta')/\Gamma_{total}$ — Γ_{69}/Γ

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.7±0.4±0.2		[197] AUBERT	04B	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
9.4	90	[198] NEMATI	98	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
8.6	90	[199] ALAM	94	CLE2	Repl. by NEMATI 98

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

[198] 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.

[199] 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($D^0 \rightarrow K^-\pi^+\pi^+\pi^-$)/B($D^0 \rightarrow K^-\pi^+$).

$\Gamma(\overline{D}^0\eta')/\Gamma(\overline{D}^0\eta)$ — Γ_{69}/Γ_{68}

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.7 ±0.2 ±0.1	AUBERT	04B	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(\overline{D}^0 \omega)/\Gamma_{total}$ Γ_{70}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
2.5±0.6 OUR AVERAGE Error includes scale factor of 1.5.					
$3.0 \pm 0.3 \pm 0.4$		[200] AUBERT	04B	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
$1.8 \pm 0.5 ^{+0.4}_{-0.3}$		[200] ABE	02J	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<5.1	90	[201] NEMATI	98	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
<6.3	90	[202] ALAM	94	CLE2	Repl. by NEMATI 98

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

[201] 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.

[202] 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($D^0 \rightarrow K^- \pi^+ \pi^+ \pi^-$)/B($D^0 \rightarrow K^- \pi^+$).

$\Gamma(D^0 K^*(892)^0)/\Gamma_{total}$ Γ_{71}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.8 \times 10^{-5}}$	90	[203] KROKOVNY	03	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(\overline{D}^{*0} \gamma)/\Gamma_{total}$ Γ_{72}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<5.0 \times 10^{-5}}$	90	[204] ARTUSO	00	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(\overline{D}^*(2007)^0 \pi^0)/\Gamma_{total}$ Γ_{73}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
2.7 ±0.5 OUR AVERAGE					
$2.9 \pm 0.4 \pm 0.5$		[205] AUBERT	04B	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
$2.7 ^{+0.8}_{-0.7} {}^{+0.5}_{-0.6}$		[205] ABE	02J	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
$2.20 ^{+0.59}_{-0.52} \pm 0.79$		[205] COAN	02	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<4.4	90	[206] NEMATI	98	CLE2	Repl. by COAN 02
<9.7	90	[207] ALAM	94	CLE2	Repl. by NEMATI 98

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

[206] 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.

[207] 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($D^0 \rightarrow K^- \pi^+ \pi^+ \pi^-$)/B($D^0 \rightarrow K^- \pi^+$).

$\Gamma(\overline{D}^0 \pi^0)/\Gamma(\overline{D}^*(2007)^0 \pi^0)$ Γ_{15}/Γ_{73}

VALUE	DOCUMENT ID		TECN	COMMENT
1.0 ±0.1 ±0.2	AUBERT	04B	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$

$\Gamma(\overline{D}^*(2007)^0 \rho^0)/\Gamma_{total}$ — Γ_{74}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.1 \times 10^{-4}$	90	[208] SATPATHY	03	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.00056	90	[209] NEMATI	98	CLE2	$e^+e^- \to \Upsilon(4S)$
<0.00117	90	[210] ALAM	94	CLE2	Repl. by NEMATI 98

[208] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[209] 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.
[210] ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2007)^0 \to D^0\pi^0)$ and absolute $B(D^0 \to K^-\pi^+)$ and the PDG 1992 $B(D^0 \to K^-\pi^+\pi^0)/B(D^0 \to K^-\pi^+)$ and $B(D^0 \to K^-\pi^+\pi^+\pi^-)/B(D^0 \to K^-\pi^+)$.

$\Gamma(\overline{D}^*(2007)^0 \eta)/\Gamma_{total}$ — Γ_{75}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
$2.6 \pm 0.4 \pm 0.4$		[211] AUBERT	04B	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<4.6	90	[211] ABE	02J	BELL	$e^+e^- \to \Upsilon(4S)$
<2.6	90	[212] NEMATI	98	CLE2	$e^+e^- \to \Upsilon(4S)$
<6.9	90	[213] ALAM	94	CLE2	Repl. by NEMATI 98

[211] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[212] 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.
[213] ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2007)^0 \to D^0\pi^0)$ and absolute $B(D^0 \to K^-\pi^+)$ and the PDG 1992 $B(D^0 \to K^-\pi^+\pi^0)/B(D^0 \to K^-\pi^+)$ and $B(D^0 \to K^-\pi^+\pi^+\pi^-)/B(D^0 \to K^-\pi^+)$.

$\Gamma(\overline{D}^0 \eta)/\Gamma(\overline{D}^*(2007)^0 \eta)$ — Γ_{68}/Γ_{75}

VALUE	DOCUMENT ID		TECN	COMMENT
$0.9 \pm 0.2 \pm 0.1$	AUBERT	04B	BABR	$e^+e^- \to \Upsilon(4S)$

$\Gamma(\overline{D}^*(2007)^0 \eta')/\Gamma(\overline{D}^*(2007)^0 \eta)$ — Γ_{76}/Γ_{75}

VALUE	DOCUMENT ID		TECN	COMMENT
$0.5 \pm 0.3 \pm 0.1$	AUBERT	04B	BABR	$e^+e^- \to \Upsilon(4S)$

$\Gamma(\overline{D}^*(2007)^0 \eta')/\Gamma_{total}$ — Γ_{76}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.00026	90	[214] AUBERT	04B	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.0014	90	BRANDENB...	98	CLE2	$e^+e^- \to \Upsilon(4S)$
<0.0019	90	[215] NEMATI	98	CLE2	$e^+e^- \to \Upsilon(4S)$
<0.0027	90	[216] ALAM	94	CLE2	Repl. by NEMATI 98

[214] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[215] 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.
[216] ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II $B(D^*(2007)^0 \to D^0\pi^0)$ and absolute $B(D^0 \to K^-\pi^+)$ and the PDG 1992 $B(D^0 \to K^-\pi^+\pi^0)/B(D^0 \to K^-\pi^+)$ and $B(D^0 \to K^-\pi^+\pi^+\pi^-)/B(D^0 \to K^-\pi^+)$.

$\Gamma(\overline{D}^0 \eta')/\Gamma(\overline{D}^*(2007)^0 \eta')$ — Γ_{69}/Γ_{76}

VALUE	DOCUMENT ID		TECN	COMMENT
1.3±0.8±0.2	AUBERT	04B	BABR	$e^+ e^- \to \Upsilon(4S)$

$\Gamma(\overline{D}^*(2007)^0 \omega)/\Gamma_{total}$ — Γ_{83}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
4.2±0.7±0.9	90	[217] AUBERT	04B	BABR	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<$ 7.9	90	[217] ABE	02J	BELL	$e^+ e^- \to \Upsilon(4S)$
$<$ 7.4	90	[218] NEMATI	98	CLE2	$e^+ e^- \to \Upsilon(4S)$
$<$21	90	[219] ALAM	94	CLE2	Repl. by NEMATI 98

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

[218] 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.

[219] ALAM 94 assume equal production of B^+ and B^0 at the $\Upsilon(4S)$ and use the CLEO II B($D^*(2007)^0 \to D^0 \pi^0$) and absolute B($D^0 \to K^- \pi^+$) and the PDG 1992 B($D^0 \to K^- \pi^+ \pi^0$)/B($D^0 \to K^- \pi^+$) and B($D^0 \to K^- \pi^+ \pi^+ \pi^-$)/B($D^0 \to K^- \pi^+$).

$\Gamma(\overline{D}^0 \omega)/\Gamma(\overline{D}^*(2007)^0 \omega)$ — Γ_{70}/Γ_{83}

VALUE	DOCUMENT ID		TECN	COMMENT
0.7 ±0.1 ±0.1	AUBERT	04B	BABR	$e^+ e^- \to \Upsilon(4S)$

$\Gamma(\overline{D}^*(2007)^0 \pi^+ \pi^-)/\Gamma_{total}$ — Γ_{77}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
(6.2±1.2±1.8) × 10^{-4}	[220,221] SATPATHY	03	BELL	$e^+ e^- \to \Upsilon(4S)$

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

[221] No assumption about the intermediate mechanism is made in the analysis.

$\Gamma(\overline{D}^*(2007)^0 K^0)/\Gamma_{total}$ — Γ_{78}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<6.6 × 10^{-5}	90	[222] KROKOVNY	03	BELL	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(\overline{D}^*(2007)^0 K^*(892)^0)/\Gamma_{total}$ — Γ_{79}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<6.9 × 10^{-5}	90	[223] KROKOVNY	03	BELL	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(D^*(2007)^0 K^*(892)^0)/\Gamma_{total}$ — Γ_{80}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<4.0 × 10^{-5}	90	[224] KROKOVNY	03	BELL	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(D^*(2007)^0 \pi^+ \pi^+ \pi^- \pi^-)/\Gamma_{total}$ — Γ_{81}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
3.0±0.7±0.6	[225] EDWARDS	02	CLE2	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(D^*(2007)^0\pi^+\pi^+\pi^-\pi^-)/\Gamma(D^*(2010)^+\pi^+\pi^-\pi^-\pi^0)$ — Γ_{81}/Γ_{33}

VALUE	DOCUMENT ID		TECN	COMMENT
0.17±0.04±0.02	[226] EDWARDS	02	CLE2	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(D^*(2010)^+ D^*(2010)^-)/\Gamma_{\text{total}}$ — Γ_{82}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
(8.7±1.8) × 10⁻⁴ OUR AVERAGE					
$(8.3\pm1.6\pm1.2)\times10^{-4}$		[227,228] AUBERT	02M	BABR	$e^+e^- \to \Upsilon(4S)$
$(9.9^{+4.2}_{-3.3}\pm1.2)\times10^{-4}$		[227] LIPELES	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$(6.2^{+4.0}_{-2.9}\pm1.0)\times10^{-4}$		[229] ARTUSO	99	CLE2	Repl. by LIPELES 00
$<6.1\times10^{-3}$	90	[230] BARATE	98Q	ALEP	$e^+e^- \to Z$
$<2.2\times10^{-3}$	90	[231] ASNER	97	CLE2	Repl. by ARTUSO 99

[227] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[228] AUBERT 02M also assumes the measured CP-odd fraction of the final states is 0.22 ± 0.18 ± 0.03.
[229] ARTUSO 99 uses B($\Upsilon(4S) \to B^0\overline{B}^0$)=(48 ± 4)%.
[230] BARATE 98Q (ALEPH) observes 2 events with an expected background of 0.10 ± 0.03 which corresponds to a branching ratio of $(2.3^{+1.9}_{-1.2}\pm0.4)\times10^{-3}$.
[231] ASNER 97 at CLEO observes 1 event with an expected background of 0.022 ± 0.011. This corresponds to a branching ratio of $(5.3^{+7.1}_{-3.7}\pm1.0)\times10^{-4}$.

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<6.3 × 10⁻⁴	90	[232] LIPELES	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5.6\times10^{-3}$	90	BARATE	98Q	ALEP	$e^+e^- \to Z$
$<1.8\times10^{-3}$	90	ASNER	97	CLE2	$e^+e^- \to \Upsilon(4S)$

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

$[\Gamma(D^*(2010)^- D^+)+\Gamma(D^*(2010)^+ D^-)]/\Gamma_{\text{total}}$ — Γ_{85}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
0.93±0.15 OUR AVERAGE				
$0.88\pm0.10\pm0.13$	[233] AUBERT	03J	BABR	$e^+e^- \to \Upsilon(4S)$
$1.17\pm0.26^{+0.22}_{-0.25}$	[233,234] ABE	02Q	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.48\pm0.38^{+0.28}_{-0.31}$	[233,235] ABE	02Q	BELL	$e^+e^- \to \Upsilon(4S)$

[233] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[234] The measurement is performed using fully reconstructed D^* and D^+ decays.
[235] The measurement is performed using a partial reconstruction technique for the D^* and fully reconstructed D^+ decays as a cross check.

$\Gamma(D^*(2007)^0 \overline{D}^*(2007)^0)/\Gamma_{total}$ — Γ_{86}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.027	90	BARATE	98Q	ALEP	$e^+ e^- \rightarrow Z$

$\Gamma(D^- D^0 K^+)/\Gamma_{total}$ — Γ_{87}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
1.7±0.3±0.3	[236] AUBERT	03X	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(D^- D^*(2007)^0 K^+)/\Gamma_{total}$ — Γ_{88}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
4.6±0.7±0.7	[237] AUBERT	03X	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(D^*(2010)^- D^0 K^+)/\Gamma_{total}$ — Γ_{89}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
$3.1^{+0.4}_{-0.3}\pm0.4$	[238] AUBERT	03X	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(D^*(2010)^- D^*(2007)^0 K^+)/\Gamma_{total}$ — Γ_{90}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
11.8±1.0±1.7	[239] AUBERT	03X	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(D^- D^+ K^0)/\Gamma_{total}$ — Γ_{91}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<1.7	90	[240] AUBERT	03X	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$[\Gamma(D^*(2010)^- D^+ K^0) + \Gamma(D^- D^*(2010)^+ K^0)]/\Gamma_{total}$ — Γ_{92}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
6.5±1.2±1.0	[241] AUBERT	03X	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(D^*(2010)^- D^*(2010)^+ K^0)/\Gamma_{total}$ — Γ_{93}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
$8.8^{+1.5}_{-1.4}\pm1.3$	[242] AUBERT	03X	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(\overline{D}^0 D^0 K^0)/\Gamma_{total}$ — Γ_{94}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<1.4	90	[243] AUBERT	03X	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\left[\Gamma\left(\overline{D}^0 D^*(2007)^0 K^0\right) + \Gamma\left(\overline{D}^*(2007)^0 D^0 K^0\right)\right]/\Gamma_{total}$ — Γ_{95}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<3.7	90	[244] AUBERT	03X	BABR	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma\left(\overline{D}^*(2007)^0 D^*(2007)^0 K^0\right)/\Gamma_{total}$ — Γ_{96}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<6.6	90	[245] AUBERT	03X	BABR	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma\left((\overline{D}+\overline{D}^*)(D+D^*)K\right)/\Gamma_{total}$ — Γ_{97}/Γ

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
4.3±0.3±0.6	[246] AUBERT	03X	BABR	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma\left(\eta_c K^0\right)/\Gamma_{total}$ — Γ_{98}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
1.2 ±0.4 OUR AVERAGE				
$1.23 \pm 0.23^{+0.40}_{-0.41}$	[247] FANG	03	BELL	$e^+e^- \to \Upsilon(4S)$
$1.09^{+0.55}_{-0.42} \pm 0.33$	[248] EDWARDS	01	CLE2	$e^+e^- \to \Upsilon(4S)$

[247] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[248] EDWARDS 01 assumes equal production of B^0 and B^+ at the $\Upsilon(4S)$. The correlated uncertainties (28.3)% from $B(J/\psi(1S) \to \gamma\eta_c)$ in those modes have been accounted for.

$\Gamma\left(\eta_c K^*(892)^0\right)/\Gamma_{total}$ — Γ_{99}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.62 \pm 0.32^{+0.55}_{-0.60}}$	[249] FANG	03	BELL	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma\left(\eta_c K^*(892)^0\right)/\Gamma\left(\eta_c K^0\right)$ — Γ_{99}/Γ_{98}

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.33 \pm 0.36^{+0.24}_{-0.33}}$	FANG	03	BELL	$e^+e^- \to \Upsilon(4S)$

$\Gamma\left(J/\psi(1S) K^0\right)/\Gamma_{total}$ — Γ_{100}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
8.5±0.5 OUR AVERAGE						
7.9±0.4±0.9			[250] ABE	03B	BELL	$e^+e^- \to \Upsilon(4S)$
8.3±0.4±0.5			[250] AUBERT	02	BABR	$e^+e^- \to \Upsilon(4S)$
9.5±0.8±0.6			[250] AVERY	00	CLE2	$e^+e^- \to \Upsilon(4S)$
11.5±2.3±1.7			[251] ABE	96H	CDF	$p\overline{p}$ at 1.8 TeV
7.0±4.1±0.1			[252] BORTOLETTO	92	CLEO	$e^+e^- \to \Upsilon(4S)$
9.3±7.3±0.2		2	[253] ALBRECHT	90J	ARG	$e^+e^- \to \Upsilon(4S)$

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

$8.5^{+1.4}_{-1.2}\pm0.6$			[250] JESSOP	97	CLE2	Repl. by AVERY 00
$7.5\pm2.4\pm0.8$		10	[252] ALAM	94	CLE2	Sup. by JESSOP 97
<50	90		ALAM	86	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

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

[251] ABE 96H assumes that $B(B^+ \rightarrow J/\psi K^+) = (1.02 \pm 0.14) \times 10^{-3}$.

[252] BORTOLETTO 92 reports $6 \pm 3 \pm 2$ for $B(J/\psi(1S) \rightarrow e^+e^-) = 0.069 \pm 0.009$. We rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.93 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

[253] ALBRECHT 90J reports $8 \pm 6 \pm 2$ for $B(J/\psi(1S) \rightarrow e^+e^-) = 0.069 \pm 0.009$. We rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.93 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)K^+\pi^-)/\Gamma_{total}$ — Γ_{101}/Γ

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.16±0.56±0.02			[254] BORTOLETTO	92	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<1.3	90		[255] ALBRECHT	87D	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
<6.3	90	2	GILES	84	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

[254] BORTOLETTO 92 reports $1.0 \pm 0.4 \pm 0.3$ for $B(J/\psi(1S) \rightarrow e^+e^-) = 0.069 \pm 0.009$. We rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.93 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

[255] ALBRECHT 87D assume $B^+B^-/B^0\overline{B}^0$ ratio is 55/45. $K\pi$ system is specifically selected as nonresonant.

$\Gamma(J/\psi(1S)K^*(892)^0)/\Gamma_{total}$ — Γ_{102}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.31±0.07 OUR AVERAGE					
$1.29\pm0.05\pm0.13$		[256] ABE	02N	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
$1.24\pm0.05\pm0.09$		[256] AUBERT	02	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
$1.74\pm0.20\pm0.18$		[257] ABE	98O	CDF	$p\overline{p}$ 1.8 TeV
$1.32\pm0.17\pm0.17$		[258] JESSOP	97	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$1.28\pm0.66\pm0.02$		[259] BORTOLETTO	92	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
$1.28\pm0.60\pm0.02$	6	[260] ALBRECHT	90J	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
$4.1\ \pm1.8\ \pm0.1$	5	[261] BEBEK	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.36\pm0.27\pm0.22$		[262] ABE	96H	CDF	Sup. by ABE 98O
$1.69\pm0.31\pm0.18$	29	[263] ALAM	94	CLE2	Sup. by JESSOP 97
		[264] ALBRECHT	94G	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
$4.0\ \pm0.30$		[265] ALBAJAR	91E	UA1	$E^{p\overline{p}}_{cm} = 630$ GeV
$3.3\ \pm0.18$	5	[266] ALBRECHT	87D	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
$4.1\ \pm0.18$	5	[267] ALAM	86	CLEO	Repl. by BEBEK 87

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

[257] ABE 98O reports $[B(B^0 \to J/\psi(1S) K^*(892)^0)]/[B(B^+ \to J/\psi(1S) K^+)] = 1.76 \pm 0.14 \pm 0.15$. We multiply by our best value $B(B^+ \to J/\psi(1S) K^+) = (9.9 \pm 1.0) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

[259] BORTOLETTO 92 reports $1.1 \pm 0.5 \pm 0.3$ for $B(J/\psi(1S) \to e^+ e^-) = 0.069 \pm 0.009$. We rescale to our best value $B(J/\psi(1S) \to e^+ e^-) = (5.93 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

[260] ALBRECHT 90J reports $1.1 \pm 0.5 \pm 0.2$ for $B(J/\psi(1S) \to e^+ e^-) = 0.069 \pm 0.009$. We rescale to our best value $B(J/\psi(1S) \to e^+ e^-) = (5.93 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

[261] BEBEK 87 reports $3.5 \pm 1.6 \pm 0.3$ for $B(J/\psi(1S) \to e^+ e^-) = 0.069 \pm 0.009$. We rescale to our best value $B(J/\psi(1S) \to e^+ e^-) = (5.93 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Updated in BORTOLETTO 92 to use the same assumptions.

[262] ABE 96H assumes that $B(B^+ \to J/\psi K^+) = (1.02 \pm 0.14) \times 10^{-3}$.

[263] 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 $B \to \psi K^*$ decay is dominated by the $CP = -1$ CP eigenstate. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

[264] 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 $K^0_S \pi^0$.

[265] ALBAJAR 91E assumes B^0_d production fraction of 36%.

[266] ALBRECHT 87D assume $B^+ B^- / B^0 \overline{B}^0$ ratio is 55/45. Superseded by ALBRECHT 90J.

[267] ALAM 86 assumes $B^\pm/B^0$ ratio is 60/40. The observation of the decay $B^+ \to J/\psi K^*(892)^+$ (HAAS 85) has been retracted in this paper.

$\Gamma(J/\psi(1S) K^*(892)^0)/\Gamma(J/\psi(1S) K^0)$ — $\Gamma_{102}/\Gamma_{100}$

VALUE	DOCUMENT ID		TECN	COMMENT
1.48±0.12 OUR AVERAGE				
$1.49 \pm 0.10 \pm 0.08$	[268] AUBERT	02	BABR	$e^+ e^- \to \Upsilon(4S)$
$1.39 \pm 0.36 \pm 0.10$	ABE	96Q	CDF	$p\overline{p}$

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

$\Gamma(J/\psi(1S) \phi K^0)/\Gamma_{total}$ — Γ_{103}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$(9.4 \pm 2.6) \times 10^{-5}$ OUR AVERAGE				
$(10.2 \pm 3.8 \pm 1.0) \times 10^{-5}$	[269] AUBERT	03O	BABR	$e^+ e^- \to \Upsilon(4S)$
$(8.8^{+3.5}_{-3.0} \pm 1.3) \times 10^{-5}$	[270] ANASTASSOV	00	CLE2	$e^+ e^- \to \Upsilon(4S)$

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

[270] 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 $B(B^+ \to J/\psi(1S) \phi K^+) = B(B^0 \to J/\psi(1S) \phi K^0)$.

$\Gamma(J/\psi(1S)K(1270)^0)/\Gamma_{total}$ — Γ_{104}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
1.30±0.34±0.32	[271] ABE	01L	BELL	$e^+e^- \to \Upsilon(4S)$

[271] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$ and uses the PDG value of $B(B^+ \to J/\psi(1S)K^+) = (1.00 \pm 0.10) \times 10^{-3}$.

$\Gamma(J/\psi(1S)\pi^0)/\Gamma_{total}$ — Γ_{105}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
2.2±0.4 OUR AVERAGE						
2.3±0.5±0.2			[272] ABE	03B	BELL	$e^+e^- \to \Upsilon(4S)$
2.0±0.6±0.2			[272] AUBERT	02	BABR	$e^+e^- \to \Upsilon(4S)$
$2.5^{+1.1}_{-0.9}\pm0.2$			[272] AVERY	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 32	90		[273] ACCIARRI	97C	L3	
< 5.8	90		BISHAI	96	CLE2	$e^+e^- \to \Upsilon(4S)$
<690	90	1	[274] ALEXANDER	95	CLE2	Sup. by BISHAI 96

[272] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[273] ACCIARRI 97C assumes B^0 production fraction (39.5 ± 4.0%) and B_s (12.0 ± 3.0%).
[274] Assumes equal production of B^+B^- and $B^0\overline{B}^0$ on $\Upsilon(4S)$.

$\Gamma(J/\psi(1S)\eta)/\Gamma_{total}$ — Γ_{106}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.7 \times 10^{-5}$	90	[275] AUBERT	03O	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.2 \times 10^{-3}$	90	[276] ACCIARRI	97C	L3	

[275] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[276] ACCIARRI 97C assumes B^0 production fraction (39.5 ± 4.0%) and B_s (12.0 ± 3.0%).

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma_{total}$ — Γ_{107}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$(4.6\pm0.7\pm0.6) \times 10^{-5}$	[277] AUBERT	03B	BABR	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(J/\psi(1S)\rho^0)/\Gamma_{total}$ — Γ_{108}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
1.6±0.6±0.4		[278] AUBERT	03B	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<25	90	BISHAI	96	CLE2	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(J/\psi(1S)\omega)/\Gamma_{total}$ — Γ_{109}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.7 \times 10^{-4}$	90	BISHAI	96	CLE2	$e^+e^- \to \Upsilon(4S)$

$\Gamma(J/\psi(1S)\phi)/\Gamma_{total}$ — Γ_{110}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
<9.2	90	[279] AUBERT	03O	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(J/\psi(1S)\eta'(958))/\Gamma_{total}$ — Γ_{111}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<6.3	90	[280] AUBERT	03O	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(J/\psi(1S)K^0\pi^+\pi^-)/\Gamma_{total}$ — Γ_{112}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
10.3±3.3±1.5	[281] AFFOLDER	02B	CDF	$p\overline{p}$ 1.8 TeV

[281] Uses $B^0 \rightarrow J/\psi(1S)K^0_S$ decay as a reference and B($B^0 \rightarrow J/\psi(1S)K^0$)= 8.3×10^{-4}.

$\Gamma(J/\psi(1S)K^0\rho^0)/\Gamma_{total}$ — Γ_{113}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
5.4±2.9±0.9	[282] AFFOLDER	02B	CDF	$p\overline{p}$ 1.8 TeV

[282] Uses $B^0 \rightarrow J/\psi(1S)K^0_S$ decay as a reference and B($B^0 \rightarrow J/\psi(1S)K^0$)= 8.3×10^{-4}.

$\Gamma(J/\psi(1S)K^*(892)^+\pi^-)/\Gamma_{total}$ — Γ_{114}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
7.7±4.1±1.3	[283] AFFOLDER	02B	CDF	$p\overline{p}$ 1.8 TeV

[283] Uses $B^0 \rightarrow J/\psi(1S)K^0_S$ decay as a reference and B($B^0 \rightarrow J/\psi(1S)K^0$)= 8.3×10^{-4}.

$\Gamma(J/\psi(1S)K^*(892)^0\pi^+\pi^-)/\Gamma_{total}$ — Γ_{115}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
6.6±1.9±1.1	[284] AFFOLDER	02B	CDF	$p\overline{p}$ 1.8 TeV

[284] Uses $B^0 \rightarrow J/\psi(1S)K^*(892)^0$ decay as a reference and B($B^0 \rightarrow J/\psi(1S)K^0$)= 12.4×10^{-4}.

$\Gamma(J/\psi(1S)p\overline{p})/\Gamma_{total}$ — Γ_{116}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.9 × 10⁻⁶	90	[285] AUBERT	03K	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(\psi(2S)K^0)/\Gamma_{total}$ — Γ_{117}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
6.2±0.7 OUR AVERAGE					
6.7±1.1		[286] ABE	03B	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
6.9±1.1±1.1		[286] AUBERT	02	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
5.0±1.1±0.6		[286] RICHICHI	01	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 8	90	[286] ALAM	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
<15	90	[286] BORTOLETTO	92	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
<28	90	[286] ALBRECHT	90J	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(\psi(2S)K^0)/\Gamma(J/\psi(1S)K^0)$ — $\Gamma_{117}/\Gamma_{100}$

VALUE	DOCUMENT ID		TECN	COMMENT
0.82±0.13±0.12	[287] AUBERT	02	BABR	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(\psi(2S)K^+\pi^-)/\Gamma_{total}$ — Γ_{118}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.001	90	[288] ALBRECHT	90J	ARG	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(\psi(2S)K^*(892)^0)/\Gamma_{total}$ — Γ_{119}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
8.0±1.3 OUR AVERAGE					
7.6±1.1±1.0		[289] RICHICHI	01	CLE2	$e^+e^- \to \Upsilon(4S)$
9.0±2.2±0.9		[290] ABE	98O	CDF	$p\overline{p}$ 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<19	90	[291] ALAM	94	CLE2	Repl. by RICHICHI 01
14 ±8 ±4		[291] BORTOLETTO	92	CLEO	$e^+e^- \to \Upsilon(4S)$
<23	90	[291] ALBRECHT	90J	ARG	$e^+e^- \to \Upsilon(4S)$

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

[290] ABE 98O reports $[B(B^0 \to \psi(2S)K^*(892)^0)]/[B(B^+ \to J/\psi(1S)K^+)] = 0.908 \pm 0.194 \pm 0.10$. We multiply by our best value $B(B^+ \to J/\psi(1S)K^+) = (9.9 \pm 1.0) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

$\Gamma(\chi_{c0}(1P)K^0)/\Gamma_{total}$ — Γ_{120}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.0 \times 10^{-4}$	90	[292] EDWARDS	01	CLE2	$e^+e^- \to \Upsilon(4S)$

[292] EDWARDS 01 assumes equal production of B^0 and B^+ at the $\Upsilon(4S)$. The correlated uncertainties (28.3)% from $B(J/\psi(1S) \to \gamma\eta_c)$ in those modes have been accounted for.

$\Gamma(\chi_{c1}(1P)K^0)/\Gamma_{total}$ — Γ_{121}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
$4.0^{+1.2}_{-1.0}$ OUR AVERAGE					
4.7±1.5±0.5		[293] AUBERT	02	BABR	$e^+e^- \to \Upsilon(4S)$
$3.4^{+1.7}_{-1.2}\pm0.4$		[294] AVERY	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<27	90	[295] ALAM	94	CLE2	$e^+e^- \to \Upsilon(4S)$

[293] AUBERT 02 reports $5.4 \pm 1.4 \pm 1.1$ for $B(\chi_{c1}(1P) \to \gamma J/\psi(1S)) = 0.273 \pm 0.016$. We rescale to our best value $B(\chi_{c1}(1P) \to \gamma J/\psi(1S)) = (31.6 \pm 3.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

[294] AVERY 00 reports $3.9^{+1.9}_{-1.3} \pm 0.4$ for $B(\chi_{c1}(1P) \to \gamma J/\psi(1S)) = 0.273 \pm 0.016$. We rescale to our best value $B(\chi_{c1}(1P) \to \gamma J/\psi(1S)) = (31.6 \pm 3.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

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

$\Gamma(\chi_{c1}(1P) K^*(892)^0)/\Gamma_{total}$ — Γ_{122}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
4.1±1.4±0.4		[296] AUBERT	02	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<21	90	[297] ALAM	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

[296] AUBERT 02 reports 4.8 ± 1.4 ± 0.9 for B($\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)$) = 0.273 ± 0.016. We rescale to our best value B($\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)$) = (31.6 ± 3.3) × 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 $\Upsilon(4S)$.

[297] BORTOLETTO 92 assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\chi_{c1}(1P) K^0)/\Gamma(J/\psi(1S) K^0)$ — $\Gamma_{121}/\Gamma_{100}$

VALUE	DOCUMENT ID		TECN	COMMENT
0.57±0.17±0.06	[298] AUBERT	02	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

[298] AUBERT 02 reports 0.66 ± 0.11 ± 0.17 for B($\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)$) = 0.273 ± 0.016. We rescale to our best value B($\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)$) = (31.6 ± 3.3) × 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 $\Upsilon(4S)$.

$\Gamma(\chi_{c1}(1P) K^*(892)^0)/\Gamma(\chi_{c1}(1P) K^0)$ — $\Gamma_{122}/\Gamma_{121}$

VALUE	DOCUMENT ID		TECN	COMMENT
0.89±0.34±0.17	[299] AUBERT	02	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(K^+\pi^-)/\Gamma_{total}$ — Γ_{123}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
1.85±0.11 OUR AVERAGE		Error includes scale factor of 1.2.			
$1.80^{+0.23}_{-0.21}{}^{+0.12}_{-0.09}$		[300] BORNHEIM	03	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
1.79±0.09±0.07		[300] AUBERT	02Q	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
2.25±0.19±0.18		[300] CASEY	02	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.93^{+0.34}_{-0.32}{}^{+0.15}_{-0.06}$		[300] ABE	01H	BELL	Repl. by CASEY 02
1.67±0.16±0.13		[300] AUBERT	01E	BABR	Repl. by AUBERT 02Q
< 6.6	90	[301] ABE	00C	SLD	$e^+e^- \rightarrow Z$
$1.72^{+0.25}_{-0.24}$±0.12		[300] CRONIN-HEN...	00	CLE2	Repl. by BORNHEIM 03
$1.5\ ^{+0.5}_{-0.4}$ ±0.14		GODANG	98	CLE2	Repl. by CRONIN-HENNESSY 00
$2.4\ ^{+1.7}_{-1.1}$ ±0.2		[302] ADAM	96D	DLPH	$e^+e^- \rightarrow Z$
< 1.7	90	ASNER	96	CLE2	Sup. by ADAM 96D
< 3.0	90	[303] BUSKULIC	96V	ALEP	$e^+e^- \rightarrow Z$
< 9	90	[304] ABREU	95N	DLPH	Sup. by ADAM 96D
< 8.1	90	[305] AKERS	94L	OPAL	$e^+e^- \rightarrow Z$
< 2.6	90	[306] BATTLE	93	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
<18	90	ALBRECHT	91B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
< 9	90	[307] AVERY	89B	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
<32	90	AVERY	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

[300] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[301] ABE 00C assumes B($Z \to b\overline{b}$)=(21.7 ± 0.1)% and the B fractions f_{B^0}=f_{B^+}=$(39.7^{+1.8}_{-2.2})$% and f_{B_s}=$(10.5^{+1.8}_{-2.2})$%.
[302] 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.
[303] BUSKULIC 96V assumes PDG 96 production fractions for B^0, B^+, B_s, b baryons.
[304] 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^0_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.
[305] Assumes B($Z \to b\overline{b}$) = 0.217 and B^0_d (B^0_s) fraction 39.5% (12%).
[306] BATTLE 93 assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.
[307] Assumes the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$.

$\Gamma(K^+\pi^-)/\Gamma(K^0\pi^0)$ $\quad\quad\Gamma_{123}/\Gamma_{124}$

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.20^{+0.50+0.22}_{-0.58-0.32}}$	[308] ABE	01H	BELL	$e^+e^- \to \Upsilon(4S)$

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

$[\Gamma(K^+\pi^-)+\Gamma(\pi^+\pi^-)]/\Gamma_{total}$ $\quad\quad(\Gamma_{123}+\Gamma_{176})/\Gamma$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
1.9±0.6 OUR AVERAGE					
$2.8^{+1.5}_{-1.0}\pm2.0$		[309] ADAM	96D	DLPH	$e^+e^- \to Z$
$1.8^{+0.6+0.3}_{-0.5-0.4}$	17.2	ASNER	96	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2.4^{+0.8}_{-0.7}\pm0.2$		[310] BATTLE	93	CLE2	$e^+e^- \to \Upsilon(4S)$

[309] 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.
[310] BATTLE 93 assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(K^0\pi^0)/\Gamma_{total}$ $\quad\quad\Gamma_{124}/\Gamma$

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.95^{+0.21}_{-0.19}}$ **OUR AVERAGE**					
$1.28^{+0.40+0.17}_{-0.33-0.14}$		[311] BORNHEIM	03	CLE2	$e^+e^- \to \Upsilon(4S)$
$0.80^{+0.33}_{-0.31}\pm0.16$		[311] CASEY	02	BELL	$e^+e^- \to \Upsilon(4S)$
$0.82^{+0.31}_{-0.27}\pm0.12$		[311] AUBERT	01E	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.60^{+0.72+0.25}_{-0.59-0.27}$		[311] ABE	01H	BELL	Repl. by CASEY 02
$1.46^{+0.59+0.24}_{-0.51-0.33}$		[311] CRONIN-HEN...	00	CLE2	Repl. by BORNHEIM 03
<4.1	90	GODANG	98	CLE2	Repl. by CRONIN-HENNESSY 00
<4.0	90	ASNER	96	CLE2	Rep. by GODANG 98

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

$\Gamma(\eta' K^0)/\Gamma_{total}$ — Γ_{125}/Γ

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
6.3 ±0.7 OUR AVERAGE Error includes scale factor of 1.1.			
$6.06\pm0.56\pm0.46$	[312] AUBERT 03W	BABR	$e^+e^- \to \Upsilon(4S)$
$5.5\ ^{+1.9}_{-1.6}\ \pm0.8$	[312] ABE 01M	BELL	$e^+e^- \to \Upsilon(4S)$
$8.9\ ^{+1.8}_{-1.6}\ \pm0.9$	[312] RICHICHI 00	CLE2	$e^+e^- \to \Upsilon(4S)$

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

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
$4.2\ ^{+1.3}_{-1.1}\ \pm0.4$	[312] AUBERT 01G	BABR	Repl. by AUBERT 03W
$4.7\ ^{+2.7}_{-2.0}\ \pm0.9$	BEHRENS 98	CLE2	Repl. by RICHICHI 00

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

$\Gamma(\eta' K^*(892)^0)/\Gamma_{total}$ — Γ_{126}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<2.4	90	[313] RICHICHI 00	CLE2	$e^+e^- \to \Upsilon(4S)$

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

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<3.9	90	BEHRENS 98	CLE2	Repl. by RICHICHI 00

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

$\Gamma(\eta K^*(892)^0)/\Gamma_{total}$ — Γ_{127}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{1.38^{+0.55}_{-0.46}\pm0.16}$		[314] RICHICHI 00	CLE2	$e^+e^- \to \Upsilon(4S)$

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

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<3.0	90	BEHRENS 98	CLE2	Repl. by RICHICHI 00

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

$\Gamma(\eta K^0)/\Gamma_{total}$ — Γ_{128}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
< 9.3	90	[315] RICHICHI 00	CLE2	$e^+e^- \to \Upsilon(4S)$

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

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<33	90	BEHRENS 98	CLE2	Repl. by RICHICHI 00

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

$\Gamma(\omega K^0)/\Gamma_{total}$ — Γ_{129}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<1.3	90	[316] AUBERT 01G	BABR	$e^+e^- \to \Upsilon(4S)$

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

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<2.1	90	[316] JESSOP 00	CLE2	$e^+e^- \to \Upsilon(4S)$
<5.7	90	[316] BERGFELD 98	CLE2	Repl. by JESSOP 00

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

$\Gamma(K^0_S X^0 (\text{Familon}))/\Gamma_{\text{total}}$ — Γ_{130}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<5.3	90	[317] AMMAR	01B	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

[317] 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_{131}/Γ

VALUE	CL%	DOCUMENT ID		TECN
$<2.3 \times 10^{-5}$	90	[318] BERGFELD	98	CLE2

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

$\Gamma(K^+ K^-)/\Gamma_{\text{total}}$ — Γ_{132}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
< 0.6	90	[319] AUBERT	02Q	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 0.8	90	[319] BORNHEIM	03	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
< 0.9	90	[319] CASEY	02	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
< 2.7	90	[319] ABE	01H	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
< 2.5	90	[319] AUBERT	01E	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
< 66	90	[320] ABE	00C	SLD	$e^+ e^- \rightarrow Z$
< 1.9	90	[319] CRONIN-HEN...	00	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
< 4.3	90	GODANG	98	CLE2	Repl. by CRONIN-HENNESSY 00
< 46		[321] ADAM	96D	DLPH	$e^+ e^- \rightarrow Z$
< 4	90	ASNER	96	CLE2	Repl. by GODANG 98
< 18	90	[322] BUSKULIC	96V	ALEP	$e^+ e^- \rightarrow Z$
<120	90	[323] ABREU	95N	DLPH	Sup. by ADAM 96D
< 7	90	[324] BATTLE	93	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

[319] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[320] ABE 00C assumes B($Z \rightarrow b\overline{b}$)=(21.7 ± 0.1)% and the B fractions $f_{B^0}=f_{B^+}=(39.7^{+1.8}_{-2.2})$% and $f_{B_s}=(10.5^{+1.8}_{-2.2})$%.
[321] 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.
[322] BUSKULIC 96V assumes PDG 96 production fractions for B^0, B^+, B_s, b baryons.
[323] 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^0_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.
[324] BATTLE 93 assumes equal production of $B^0 \overline{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.3 \times 10^{-6}$	90	[325] BORNHEIM	03	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<4.1 \times 10^{-6}$	90	[325] CASEY	02	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
$<1.7 \times 10^{-5}$	90	GODANG	98	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(K^0_S K^0_S K^0_S)/\Gamma_{total}$ Γ_{134}/Γ

VALUE (units 10^{-6})	DOCUMENT ID	TECN	COMMENT
$\mathbf{4.2^{+1.6}_{-1.3}\pm0.8}$	[326] GARMASH 04	BELL	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(K^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{135}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{<40\times10^{-6}}$	90	[327] ECKHART 02	CLE2	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(K^+\rho^-)/\Gamma_{total}$ Γ_{136}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{7.3^{+1.3}_{-1.2}\pm1.3}$		[328] AUBERT 03T	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<32	90	[328] JESSOP 00	CLE2	$e^+e^- \to \Upsilon(4S)$
<35	90	ASNER 96	CLE2	Repl. by JESSOP 00

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

$\Gamma(K^0\pi^+\pi^-)/\Gamma_{total}$ Γ_{137}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
47 ± 7 OUR AVERAGE				
$45.4\pm5.2\pm5.9$		[329] GARMASH 04	BELL	$e^+e^- \to \Upsilon(4S)$
$50\ ^{+10}_{-\ 9}\ \pm7$		[329] ECKHART 02	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<440	90	ALBRECHT 91E	ARG	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(K^0\rho^0)/\Gamma_{total}$ Γ_{138}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{<3.9\times10^{-5}}$	90	ASNER 96	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<3.2\times10^{-4}$	90	ALBRECHT 91B	ARG	$e^+e^- \to \Upsilon(4S)$
$<5.0\times10^{-4}$	90	[330] AVERY 89B	CLEO	$e^+e^- \to \Upsilon(4S)$
<0.064	90	[331] AVERY 87	CLEO	$e^+e^- \to \Upsilon(4S)$

[330] AVERY 89B reports $< 5.8\times10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.
[331] AVERY 87 reports < 0.08 assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K^0 f_0(980))/\Gamma_{total}$ Γ_{139}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{<3.6\times10^{-4}}$	90	[332] AVERY 89B	CLEO	$e^+e^- \to \Upsilon(4S)$

[332] AVERY 89B reports $< 4.2\times10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K^*(892)^+\pi^-)/\Gamma_{total}$ Γ_{140}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{16^{+6}_{-5}\pm2}$		[333] ECKHART	02	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<$ 72	90	ASNER	96	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$<$620	90	ALBRECHT	91B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
$<$380	90	[334] AVERY	89B	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
$<$560	90	[335] AVERY	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

[333] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[334] AVERY 89B reports $< 4.4 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.
[335] AVERY 87 reports $< 7 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K^*(892)^0\pi^0)/\Gamma_{total}$ Γ_{141}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<3.6\times10^{-6}}$	90	[232] JESSOP	00	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.8\times10^{-5}$	90	ASNER	96	CLE2	Repl. by JESSOP 00

$\Gamma(K_2^*(1430)^+\pi^-)/\Gamma_{total}$ Γ_{142}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.8\times10^{-5}}$	90	[336] GARMASH	04	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.6\times10^{-3}$	90	ALBRECHT	91B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(K^0K^-\pi^+)/\Gamma_{total}$ Γ_{143}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<21\times10^{-6}}$	90	[337] ECKHART	02	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(K^+K^-\pi^0)/\Gamma_{total}$ Γ_{144}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<19\times10^{-6}}$	90	[338] ECKHART	02	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(K^0K^+K^-)/\Gamma_{total}$ Γ_{145}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{28.3\pm3.3\pm4.0}$		[339] GARMASH	04	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<$1300	90	ALBRECHT	91E	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(K^0\phi)/\Gamma_{total}$ — Γ_{146}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
$8.6^{+1.3}_{-1.1}$ OUR AVERAGE					
$8.4^{+1.5}_{-1.3}\pm0.5$		[340] AUBERT	04A	BABR	$e^+e^- \to \Upsilon(4S)$
$9.0^{+2.2}_{-1.8}\pm0.7$		[341] CHEN	03B	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$8.1^{+3.1}_{-2.5}\pm0.8$		[341] AUBERT	01D	BABR	$e^+e^- \to \Upsilon(4S)$
$<$ 12.3	90	[341] BRIERE	01	CLE2	$e^+e^- \to \Upsilon(4S)$
$<$ 31	90	[341] BERGFELD	98	CLE2	
$<$ 88	90	ASNER	96	CLE2	$e^+e^- \to \Upsilon(4S)$
$<$ 720	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$
$<$ 420	90	[342] AVERY	89B	CLEO	$e^+e^- \to \Upsilon(4S)$
$<$1000	90	[343] AVERY	87	CLEO	$e^+e^- \to \Upsilon(4S)$

[340] Assumes equal production of B^+ and B^0 at $\Upsilon(4S)$.
[341] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[342] AVERY 89B reports $< 4.9 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.
[343] AVERY 87 reports $< 1.3 \times 10^{-3}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K^-\pi^+\pi^+\pi^-)/\Gamma_{total}$ — Γ_{147}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.3 \times 10^{-4}$	90	[344] ADAM	96D	DLPH	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.1 \times 10^{-4}$	90	[345] ABREU	95N	DLPH	Sup. by ADAM 96D

[344] 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.
[345] 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^0_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

$\Gamma(K^*(892)^0\pi^+\pi^-)/\Gamma_{total}$ — Γ_{148}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.4 \times 10^{-3}$	90	ALBRECHT	91E	ARG	$e^+e^- \to \Upsilon(4S)$

$\Gamma(K^*(892)^0\rho^0)/\Gamma_{total}$ — Γ_{149}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.4 \times 10^{-5}$	90	[346] GODANG	02	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.86 \times 10^{-4}$	90	[347] ABE	00C	SLD	$e^+e^- \to Z$
$<4.6 \times 10^{-4}$	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$
$<5.8 \times 10^{-4}$	90	[348] AVERY	89B	CLEO	$e^+e^- \to \Upsilon(4S)$
$<9.6 \times 10^{-4}$	90	[349] AVERY	87	CLEO	$e^+e^- \to \Upsilon(4S)$

[346] Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 2.4×10^{-5}.
[347] ABE 00C assumes B($Z \to b\overline{b}$)=(21.7 ± 0.1)% and the B fractions $f_{B^0}=f_{B^+}=(39.7^{+1.8}_{-2.2})$% and $f_{B_s}=(10.5^{+1.8}_{-2.2})$%.
[348] AVERY 89B reports $< 6.7 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.
[349] AVERY 87 reports $< 1.2 \times 10^{-3}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K^*(892)^0 f_0(980))/\Gamma_{total}$ — Γ_{150}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.7 \times 10^{-4}$	90	[350] AVERY	89B	CLEO	$e^+e^- \to \Upsilon(4S)$

[350] AVERY 89B reports $< 2.0 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K_1(1400)^+\pi^-)/\Gamma_{total}$ — Γ_{151}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.1 \times 10^{-3}$	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$

$\Gamma(K^- a_1(1260)^+)/\Gamma_{total}$ — Γ_{152}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.3 \times 10^{-4}$	90	[351] ADAM	96D	DLPH	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<3.9 \times 10^{-4}$	90	[352] ABREU	95N	DLPH	Sup. by ADAM 96D

[351] 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.
[352] 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^0_s decays cannot be separated. Limits are given for the weighted average of the decay rates for the two neutral B mesons.

$\Gamma(K^*(892)^0 K^+ K^-)/\Gamma_{total}$ — Γ_{153}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.1 \times 10^{-4}$	90	ALBRECHT	91E	ARG	$e^+e^- \to \Upsilon(4S)$

$\Gamma(K^*(892)^0\phi)/\Gamma_{total}$ — Γ_{154}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
10.7±1.1 OUR AVERAGE					
$11.2 \pm 1.3 \pm 0.8$		[353] AUBERT	03V	BABR	$e^+e^- \to \Upsilon(4S)$
$10.0^{+1.6}_{-1.5}{}^{+0.7}_{-0.8}$		[353] CHEN	03B	BELL	$e^+e^- \to \Upsilon(4S)$
$11.5^{+4.5}_{-3.7}{}^{+1.8}_{-1.7}$		[353] BRIERE	01	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$8.7^{+2.5}_{-2.1} \pm 1.1$		[353] AUBERT	01D	BABR	Repl. by AUBERT 03V
<384	90	[354] ABE	00C	SLD	$e^+e^- \to Z$
< 21	90	[353] BERGFELD	98	CLE2	
< 43	90	ASNER	96	CLE2	$e^+e^- \to \Upsilon(4S)$
<320	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$
<380	90	[355] AVERY	89B	CLEO	$e^+e^- \to \Upsilon(4S)$
<380	90	[356] AVERY	87	CLEO	$e^+e^- \to \Upsilon(4S)$

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

[354] ABE 00C assumes B($Z \to b\overline{b}$)=(21.7 ± 0.1)% and the B fractions $f_{B^0}=f_{B^+}=(39.7^{+1.8}_{-2.2})$% and $f_{B_s}=(10.5^{+1.8}_{-2.2})$%.

[355] AVERY 89B reports $< 4.4 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

[356] AVERY 87 reports $< 4.7 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(\overline{K}^*(892)^0 K^*(892)^0)/\Gamma_{total}$ — Γ_{155}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<2.2 × 10⁻⁵	90	[357] GODANG	02	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<4.69 \times 10^{-4}$	90	[358] ABE	00C	SLD	$e^+e^- \to Z$

[357] Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 1.9×10^{-5}.

[358] ABE 00C assumes B($Z \to b\overline{b}$)=(21.7 ± 0.1)% and the B fractions $f_{B^0}=f_{B^+}=(39.7^{+1.8}_{-2.2})$% and $f_{B_s}=(10.5^{+1.8}_{-2.2})$%.

$\Gamma(K^*(892)^0 K^*(892)^0)/\Gamma_{total}$ — Γ_{156}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.7 \times 10^{-5}$	90	[359] GODANG	02	CLE2	$e^+e^- \to \Upsilon(4S)$

[359] Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 2.9×10^{-5}.

$\Gamma(K^*(892)^+ K^*(892)^-)/\Gamma_{total}$ — Γ_{157}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.41 \times 10^{-4}$	90	[360] GODANG	02	CLE2	$e^+e^- \to \Upsilon(4S)$

[360] Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 8.9×10^{-5}.

$\Gamma(K_1(1400)^0 \rho^0)/\Gamma_{total}$ — Γ_{158}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.0 \times 10^{-3}$	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$

$\Gamma(K_1(1400)^0 \phi)/\Gamma_{total}$ — Γ_{159}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.0 \times 10^{-3}$	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$

$\Gamma(K_2^*(1430)^0 \rho^0)/\Gamma_{total}$ — Γ_{160}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.1 \times 10^{-3}$	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$

$\Gamma(K_2^*(1430)^0 \phi)/\Gamma_{total}$ — Γ_{161}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.4 \times 10^{-3}$	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$

$\Gamma(K^*(892)^0\gamma)/\Gamma_{total}$ — Γ_{162}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
4.3 ±0.4 OUR AVERAGE						
$4.23\pm0.40\pm0.22$			[361] AUBERT	02C	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
$4.55^{+0.72}_{-0.68}\pm0.34$			[362] COAN	00	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<11	90		ACOSTA	02G	CDF	$p\overline{p}$ at 1.8 TeV
<21	90		[363] ADAM	96D	DLPH	$e^+e^- \rightarrow Z$
$4.0\pm1.7\pm0.8$		8	[364] AMMAR	93	CLE2	Repl. by COAN 00
<42	90		ALBRECHT	89G	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
<24	90		[365] AVERY	89B	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
<210	90		AVERY	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

[361] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[362] 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.
[363] ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.
[364] AMMAR 93 observed 6.6 ± 2.8 events above background.
[365] AVERY 89B reports $< 2.8 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K^0\phi\gamma)/\Gamma_{total}$ — Γ_{163}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
<8.3	90	[366] DRUTSKOY	04	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

[366] Assumes equal production of B^+ and B^0 at $\Upsilon(4S)$.

$\Gamma(K^+\pi^-\gamma)/\Gamma_{total}$ — Γ_{164}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{(4.6^{+1.3+0.5}_{-1.2-0.7}) \times 10^{-6}}$	[367,368] NISHIDA	02	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

[367] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[368] $1.25\ \text{GeV}/c^2 < M_{K\pi} < 1.6\ \text{GeV}/c^2$

$\Gamma(K^*(1410)\gamma)/\Gamma_{total}$ — Γ_{165}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.3 \times 10^{-4}}$	90	[369] NISHIDA	02	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(K^+\pi^-\gamma \text{ nonresonant})/\Gamma_{total}$ — Γ_{166}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<2.6 \times 10^{-6}}$	90	[370,371] NISHIDA	02	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

[370] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[371] $1.25\ \text{GeV}/c^2 < M_{K\pi} < 1.6\ \text{GeV}/c^2$

$\Gamma(K_1(1270)^0\gamma)/\Gamma_{total}$ — Γ_{167}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0070	90	[372] ALBRECHT	89G	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[372] ALBRECHT 89G reports < 0.0078 assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K_1(1400)^0\gamma)/\Gamma_{total}$ — Γ_{168}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0043	90	[373] ALBRECHT	89G	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[373] ALBRECHT 89G reports < 0.0048 assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K_2^*(1430)^0\gamma)/\Gamma_{total}$ — Γ_{169}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
1.3±0.5±0.1		[374] NISHIDA	02	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<40	90	[375] ALBRECHT	89G	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[374] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[375] ALBRECHT 89G reports $< 4.4 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K^*(1680)^0\gamma)/\Gamma_{total}$ — Γ_{170}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0020	90	[376] ALBRECHT	89G	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[376] ALBRECHT 89G reports < 0.0022 assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K_3^*(1780)^0\gamma)/\Gamma_{total}$ — Γ_{171}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.010	90	[377] ALBRECHT	89G	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[377] ALBRECHT 89G reports < 0.011 assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K_4^*(2045)^0\gamma)/\Gamma_{total}$ — Γ_{172}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0043	90	[378] ALBRECHT	89G	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[378] ALBRECHT 89G reports < 0.0048 assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(\rho^0\gamma)/\Gamma_{total}$ — Γ_{173}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.2 \times 10^{-6}$	90	[379] AUBERT	04C	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.7 \times 10^{-5}$	90	[380] COAN	00	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

[379] Assumes equal production of B^+ and B^0 at $\Upsilon(4S)$.
[380] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\omega\gamma)/\Gamma_{total}$ — Γ_{174}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.0 \times 10^{-6}$	90	[381] AUBERT	04C	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<0.92 \times 10^{-5}$	90	[382] COAN	00	CLE2	$e^+e^- \to \Upsilon(4S)$

[381] Assumes equal production of B^+ and B^0 at $\Upsilon(4S)$.
[382] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\phi\gamma)/\Gamma_{total}$ — Γ_{175}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<0.33 \times 10^{-5}$	90	[383] COAN	00	CLE2	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ — Γ_{176}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
4.8±0.5 OUR AVERAGE						
$4.5^{+1.4}_{-1.2}{}^{+0.5}_{-0.4}$			[384] BORNHEIM	03	CLE2	$e^+e^- \to \Upsilon(4S)$
4.7±0.6±0.2			[384] AUBERT	02Q	BABR	$e^+e^- \to \Upsilon(4S)$
5.4±1.2±0.5			[384] CASEY	02	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$5.6^{+2.3}_{-2.0}{}^{+0.4}_{-0.5}$			[384] ABE	01H	BELL	Repl. by CASEY 02
4.1±1.0±0.7			[384] AUBERT	01E	BABR	Repl. by AUBERT 02Q
< 67	90		[385] ABE	00C	SLD	$e^+e^- \to Z$
$4.3^{+1.6}_{-1.4}$±0.5			[384] CRONIN-HEN...	00	CLE2	Repl. by BORNHEIM 03
< 15	90		GODANG	98	CLE2	Repl. by CRONIN-HENNESSY 00
< 45	90		[386] ADAM	96D	DLPH	$e^+e^- \to Z$
< 20	90		ASNER	96	CLE2	Repl. by GODANG 98
< 41	90		[387] BUSKULIC	96V	ALEP	$e^+e^- \to Z$
< 55	90		[388] ABREU	95N	DLPH	Sup. by ADAM 96D
< 47	90		[389] AKERS	94L	OPAL	$e^+e^- \to Z$
< 29	90		[390] BATTLE	93	CLE2	$e^+e^- \to \Upsilon(4S)$
<130	90		[390] ALBRECHT	90B	ARG	$e^+e^- \to \Upsilon(4S)$
< 77	90		[391] BORTOLETTO	89	CLEO	$e^+e^- \to \Upsilon(4S)$
<260	90		[391] BEBEK	87	CLEO	$e^+e^- \to \Upsilon(4S)$
<500	90	4	GILES	84	CLEO	$e^+e^- \to \Upsilon(4S)$

[384] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[385] ABE 00C assumes B($Z \to b\overline{b}$)=(21.7 ± 0.1)% and the B fractions $f_{B^0}=f_{B^+}=(39.7^{+1.8}_{-2.2})$% and $f_{B_s}=(10.5^{+1.8}_{-2.2})$%.
[386] ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.
[387] BUSKULIC 96V assumes PDG 96 production fractions for B^0, B^+, B_s, b baryons.
[388] Assumes a B^0, B^- production fraction of 0.39 and a B_s production fraction of 0.12.
[389] Assumes B($Z \to b\overline{b}$) = 0.217 and B^0_d (B^0_s) fraction 39.5% (12%).
[390] Assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.
[391] Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(\pi^+\pi^-)/\Gamma(K^+\pi^-)$ — $\Gamma_{176}/\Gamma_{123}$

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.29^{+0.13}_{-0.12}{}^{+0.01}_{-0.02}}$	[392] ABE	01H	BELL	$e^+e^- \to \Upsilon(4S)$

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

$\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$ — Γ_{177}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
1.9±0.5 OUR AVERAGE					
2.1±0.6±0.3		[393] AUBERT	03S	BABR	$e^+e^- \to \Upsilon(4S)$
1.7±0.6±0.2		[393] LEE	03	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 3.6	90	[393] AUBERT	03L	BABR	$e^+e^- \to \Upsilon(4S)$
< 4.4	90	[393] BORNHEIM	03	CLE2	$e^+e^- \to \Upsilon(4S)$
< 5.7	90	[393] ASNER	02	CLE2	$e^+e^- \to \Upsilon(4S)$
< 6.4	90	[393] CASEY	02	BELL	$e^+e^- \to \Upsilon(4S)$
< 9.3	90	GODANG	98	CLE2	Repl. by ASNER 02
< 9.1	90	ASNER	96	CLE2	Repl. by GODANG 98
<60	90	[394] ACCIARRI	95H	L3	$e^+e^- \to Z$

[393] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[394] 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_{178}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<2.9 \times 10^{-6}}$	90	[395] RICHICHI	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<8 \times 10^{-6}$	90	BEHRENS	98	CLE2	Repl. by RICHICHI 00
$<2.5 \times 10^{-4}$	90	[396] ACCIARRI	95H	L3	$e^+e^- \to Z$
$<1.8 \times 10^{-3}$	90	[397] ALBRECHT	90B	ARG	$e^+e^- \to \Upsilon(4S)$

[395] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[396] ACCIARRI 95H assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.
[397] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(\eta\eta)/\Gamma_{\text{total}}$ — Γ_{179}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.8 \times 10^{-5}}$	90	BEHRENS	98	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<4.1 \times 10^{-4}$	90	[398] ACCIARRI	95H	L3	$e^+e^- \to Z$

[398] 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_{180}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<5.7 \times 10^{-6}}$	90	[399] RICHICHI	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.1 \times 10^{-5}$	90	BEHRENS	98	CLE2	Repl. by RICHICHI 00

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

$\Gamma(\eta'\eta')/\Gamma_{total}$ Γ_{181}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<4.7 × 10^{-5}	90	BEHRENS	98	CLE2	$e^+e^- \to \Upsilon(4S)$

$\Gamma(\eta'\eta)/\Gamma_{total}$ Γ_{182}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<2.7 × 10^{-5}	90	BEHRENS	98	CLE2	$e^+e^- \to \Upsilon(4S)$

$\Gamma(\eta'\rho^0)/\Gamma_{total}$ Γ_{183}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.2 × 10^{-5}	90	[400] RICHICHI	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<2.3 × 10^{-5}	90	BEHRENS	98	CLE2	Repl. by RICHICHI 00

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

$\Gamma(\eta\rho^0)/\Gamma_{total}$ Γ_{184}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.0 × 10^{-5}	90	[401] RICHICHI	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.3 × 10^{-5}	90	BEHRENS	98	CLE2	Repl. by RICHICHI 00

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

$\Gamma(\omega\eta)/\Gamma_{total}$ Γ_{185}/Γ

VALUE	CL%	DOCUMENT ID		TECN
<1.2 × 10^{-5}	90	[402] BERGFELD	98	CLE2

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

$\Gamma(\omega\eta')/\Gamma_{total}$ Γ_{186}/Γ

VALUE	CL%	DOCUMENT ID		TECN
<6.0 × 10^{-5}	90	[403] BERGFELD	98	CLE2

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

$\Gamma(\omega\rho^0)/\Gamma_{total}$ Γ_{187}/Γ

VALUE	CL%	DOCUMENT ID		TECN
<1.1 × 10^{-5}	90	[404] BERGFELD	98	CLE2

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

$\Gamma(\omega\omega)/\Gamma_{total}$ Γ_{188}/Γ

VALUE	CL%	DOCUMENT ID		TECN
<1.9 × 10^{-5}	90	[405] BERGFELD	98	CLE2

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

$\Gamma(\phi\pi^0)/\Gamma_{total}$ Γ_{189}/Γ

VALUE	CL%	DOCUMENT ID		TECN
<0.5 × 10^{-5}	90	[406] BERGFELD	98	CLE2

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

$\Gamma(\phi\eta)/\Gamma_{total}$ — Γ_{190}/Γ

VALUE	CL%	DOCUMENT ID		TECN
$<0.9 \times 10^{-5}$	90	[407] BERGFELD	98	CLE2

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

$\Gamma(\phi\eta')/\Gamma_{total}$ — Γ_{191}/Γ

VALUE	CL%	DOCUMENT ID		TECN
$<3.1 \times 10^{-5}$	90	[408] BERGFELD	98	CLE2

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

$\Gamma(\phi\rho^0)/\Gamma_{total}$ — Γ_{192}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.3 \times 10^{-5}$	90	[409] BERGFELD	98	CLE2	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.56 \times 10^{-4}$	90	[410] ABE	00C	SLD	$e^+e^- \to Z$

[409] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[410] ABE 00C assumes B($Z \to b\overline{b}$)=(21.7 ± 0.1)% and the B fractions $f_{B^0}=f_{B^+}=(39.7^{+1.8}_{-2.2})$% and $f_{B_s}=(10.5^{+1.8}_{-2.2})$%.

$\Gamma(\phi\omega)/\Gamma_{total}$ — Γ_{193}/Γ

VALUE	CL%	DOCUMENT ID		TECN
$<2.1 \times 10^{-5}$	90	[411] BERGFELD	98	CLE2

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

$\Gamma(\phi\phi)/\Gamma_{total}$ — Γ_{194}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.2 \times 10^{-5}$	90	[412] BERGFELD	98	CLE2	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<3.21 \times 10^{-4}$	90	[413] ABE	00C	SLD	$e^+e^- \to Z$
$<3.9 \times 10^{-5}$	90	ASNER	96	CLE2	$e^+e^- \to \Upsilon(4S)$

[412] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[413] ABE 00C assumes B($Z \to b\overline{b}$)=(21.7 ± 0.1)% and the B fractions $f_{B^0}=f_{B^+}=(39.7^{+1.8}_{-2.2})$% and $f_{B_s}=(10.5^{+1.8}_{-2.2})$%.

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{195}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<7.2 \times 10^{-4}$	90	[414] ALBRECHT	90B	ARG	$e^+e^- \to \Upsilon(4S)$

[414] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(\rho^0\pi^0)/\Gamma_{total}$ — Γ_{196}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.3 \times 10^{-6}$	90	[415] GORDON	02	BELL	$e^+e^- \to \Upsilon$(rS)
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5.5 \times 10^{-6}$	90	[227] JESSOP	00	CLE2	$e^+e^- \to \Upsilon(4S)$
$<2.4 \times 10^{-5}$	90	ASNER	96	CLE2	Repl. by JESSOP 00
$<4.0 \times 10^{-4}$	90	[416] ALBRECHT	90B	ARG	$e^+e^- \to \Upsilon(4S)$

[415] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[416] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(\rho^\mp\pi^\pm)/\Gamma_{total}$ — Γ_{197}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
2.28±0.25 OUR AVERAGE				
$2.26\pm0.18\pm0.22$		[417] AUBERT 03T	BABR	$e^+e^- \to \Upsilon(4S)$
$2.08^{+0.60}_{-0.63}{}^{+0.28}_{-0.31}$		[417] GORDON 02	BELL	$e^+e^- \to \Upsilon(\mathrm{rS})$
$2.76^{+0.84}_{-0.74}\pm0.42$		[417] JESSOP 00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<8.8	90	ASNER 96	CLE2	Repl. by JESSOP 00
<52	90	[418] ALBRECHT 90B	ARG	$e^+e^- \to \Upsilon(4S)$
<520	90	[419] BEBEK 87	CLEO	$e^+e^- \to \Upsilon(4S)$

[417] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[418] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.
[419] BEBEK 87 reports $< 6.1\times10^{-3}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma_{total}$ — Γ_{198}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.3\times10^{-4}$	90	[420] ADAM 96D	DLPH	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<2.8\times10^{-4}$	90	[421] ABREU 95N	DLPH	Sup. by ADAM 96D
$<6.7\times10^{-4}$	90	[422] ALBRECHT 90B	ARG	$e^+e^- \to \Upsilon(4S)$

[420] ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.
[421] Assumes a B^0, B^- production fraction of 0.39 and a B_s production fraction of 0.12.
[422] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(\rho^0\rho^0)/\Gamma_{total}$ — Γ_{199}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.1\times10^{-6}$	90	[423] AUBERT 03V	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<1.8\times10^{-5}$	90	[424] GODANG 02	CLE2	$e^+e^- \to \Upsilon(4S)$
$<1.36\times10^{-4}$	90	[425] ABE 00C	SLD	$e^+e^- \to Z$
$<2.8\times10^{-4}$	90	[426] ALBRECHT 90B	ARG	$e^+e^- \to \Upsilon(4S)$
$<2.9\times10^{-4}$	90	[427] BORTOLETTO 89	CLEO	$e^+e^- \to \Upsilon(4S)$
$<4.3\times10^{-4}$	90	[427] BEBEK 87	CLEO	$e^+e^- \to \Upsilon(4S)$

[423] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[424] Assumes a helicity 00 configuration. For a helicity 11 configuration, the limit decreases to 1.4×10^{-5}.
[425] ABE 00C assumes $B(Z \to b\overline{b})=(21.7\pm0.1)\%$ and the B fractions $f_{B^0}=f_{B^+}=(39.7^{+1.8}_{-2.2})\%$ and $f_{B_s}=(10.5^{+1.8}_{-2.2})\%$.
[426] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.
[427] Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(a_1(1260)^{\mp}\pi^{\pm})/\Gamma_{total}$ Γ_{200}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<4.9 \times 10^{-4}$	90	[428] BORTOLETTO	89	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<6.3 \times 10^{-4}$	90	[429] ALBRECHT	90B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
$<1.0 \times 10^{-3}$	90	[428] BEBEK	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

[428] Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.
[429] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(a_2(1320)^{\mp}\pi^{\pm})/\Gamma_{total}$ Γ_{201}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.0 \times 10^{-4}$	90	[430] BORTOLETTO	89	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.4 \times 10^{-3}$	90	[430] BEBEK	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

[430] Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{total}$ Γ_{202}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.1 \times 10^{-3}$	90	[431] ALBRECHT	90B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[431] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(\rho^+\rho^-)/\Gamma_{total}$ Γ_{203}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.2 \times 10^{-3}$	90	[432] ALBRECHT	90B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[432] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(a_1(1260)^0\pi^0)/\Gamma_{total}$ Γ_{204}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.1 \times 10^{-3}$	90	[433] ALBRECHT	90B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[433] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(\omega\pi^0)/\Gamma_{total}$ Γ_{205}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3 \times 10^{-6}$	90	[434] AUBERT	01G	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5.5 \times 10^{-6}$	90	[434] JESSOP	00	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$<1.4 \times 10^{-5}$	90	[434] BERGFELD	98	CLE2	Repl. by JESSOP 00
$<4.6 \times 10^{-4}$	90	[435] ALBRECHT	90B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[434] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[435] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(\pi^+\pi^+\pi^-\pi^-\pi^0)/\Gamma_{total}$ Γ_{206}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<9.0 \times 10^{-3}$	90	[436] ALBRECHT	90B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[436] ALBRECHT 90B limit assumes equal production of $B^0\overline{B}^0$ and B^+B^- at $\Upsilon(4S)$.

$\Gamma(a_1(1260)^+ \rho^-)/\Gamma_{total}$ Γ_{207}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.4 \times 10^{-3}$	90	[437] ALBRECHT	90B	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

[437] ALBRECHT 90B limit assumes equal production of $B^0 \overline{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

$\Gamma(a_1(1260)^0 \rho^0)/\Gamma_{total}$ Γ_{208}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.4 \times 10^{-3}$	90	[438] ALBRECHT	90B	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

[438] ALBRECHT 90B limit assumes equal production of $B^0 \overline{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

$\Gamma(\pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^-)/\Gamma_{total}$ Γ_{209}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.0 \times 10^{-3}$	90	[439] ALBRECHT	90B	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

[439] ALBRECHT 90B limit assumes equal production of $B^0 \overline{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

$\Gamma(a_1(1260)^+ a_1(1260)^-)/\Gamma_{total}$ Γ_{210}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.8 \times 10^{-3}$	90	[440] BORTOLETTO	89	CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<6.0 \times 10^{-3}$	90	[441] ALBRECHT	90B	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

[440] BORTOLETTO 89 reports $< 3.2 \times 10^{-3}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0 \overline{B}^0$. We rescale to 50%.
[441] ALBRECHT 90B limit assumes equal production of $B^0 \overline{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

$\Gamma(\pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^0)/\Gamma_{total}$ Γ_{211}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.1 \times 10^{-2}$	90	[442] ALBRECHT	90B	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

[442] ALBRECHT 90B limit assumes equal production of $B^0 \overline{B}^0$ and $B^+ B^-$ at $\Upsilon(4S)$.

$\Gamma(p \overline{p})/\Gamma_{total}$ Γ_{212}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.2 \times 10^{-6}$	90	[443] ABE	02O	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.4 \times 10^{-6}$	90	[443] BORNHEIM	03	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
$<7.0 \times 10^{-6}$	90	[444] COAN	99	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
$<1.8 \times 10^{-5}$	90	[445] BUSKULIC	96V	ALEP	$e^+ e^- \rightarrow Z$
$<3.5 \times 10^{-4}$	90	[446] ABREU	95N	DLPH	Sup. by ADAM 96D
$<3.4 \times 10^{-5}$	90	[447] BORTOLETTO	89	CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
$<1.2 \times 10^{-4}$	90	[448] ALBRECHT	88F	ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
$<1.7 \times 10^{-4}$	90	[447] BEBEK	87	CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$

[443] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[444] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[445] BUSKULIC 96V assumes PDG 96 production fractions for B^0, B^+, B_s, b baryons.
[446] Assumes a B^0, B^- production fraction of 0.39 and a B_s production fraction of 0.12.
[447] Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0 \overline{B}^0$. We rescale to 50%.
[448] ALBRECHT 88F reports $< 1.3 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0 \overline{B}^0$. We rescale to 50%.

$\Gamma(p\overline{p}\pi^+\pi^-)/\Gamma_{total}$ Γ_{213}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<2.5	90	[449] BEBEK	89	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<9.5	90	[450] ABREU	95N	DLPH	Sup. by ADAM 96D
$5.4\pm1.8\pm2.0$		[451] ALBRECHT	88F	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[449] BEBEK 89 reports $< 2.9 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.
[450] Assumes a B^0, B^- production fraction of 0.39 and a B_s production fraction of 0.12.
[451] ALBRECHT 88F reports $6.0 \pm 2.0 \pm 2.2$ assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(p\overline{p}K^0)/\Gamma_{total}$ Γ_{214}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<7.2\times10^{-6}$	90	[452,453] ABE	02K	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

[452] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[453] Explicitly vetoes resonant production of $p\overline{p}$ from Charmonium states.

$\Gamma(p\overline{\Lambda}\pi^-)/\Gamma_{total}$ Γ_{215}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
$3.97^{+1.00}_{-0.80}\pm0.56$		[454] WANG	03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 13	90	[454] COAN	99	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
<180	90	[455] ALBRECHT	88F	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

[454] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[455] ALBRECHT 88F reports $< 2.0 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(p\overline{\Lambda}K^-)/\Gamma_{total}$ Γ_{216}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<8.2\times10^{-7}$	90	[456] WANG	03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(p\overline{\Sigma}^0\pi^-)/\Gamma_{total}$ Γ_{217}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.8\times10^{-6}$	90	[457] WANG	03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(\overline{\Lambda}\Lambda)/\Gamma_{total}$ Γ_{218}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.0\times10^{-6}$	90	[458] ABE	02O	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.2\times10^{-6}$	90	[458] BORNHEIM	03	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$<3.9\times10^{-6}$	90	[459] COAN	99	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

[458] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[459] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

$\Gamma(\Delta^0 \overline{\Delta}^0)/\Gamma_{total}$ — Γ_{219}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0015	90	[460] BORTOLETTO	89	CLEO	$e^+ e^- \to \Upsilon(4S)$

[460] BORTOLETTO 89 reports < 0.0018 assuming $\Upsilon(4S)$ decays 43% to $B^0 \overline{B}^0$. We rescale to 50%.

$\Gamma(\Delta^{++} \overline{\Delta}^{--})/\Gamma_{total}$ — Γ_{220}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.1 \times 10^{-4}$	90	[461] BORTOLETTO	89	CLEO	$e^+ e^- \to \Upsilon(4S)$

[461] BORTOLETTO 89 reports $< 1.3 \times 10^{-4}$ assuming $\Upsilon(4S)$ decays 43% to $B^0 \overline{B}^0$. We rescale to 50%.

$\Gamma(\overline{D}^0 p \overline{p})/\Gamma_{total}$ — Γ_{221}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$(1.18 \pm 0.15 \pm 0.16) \times 10^{-4}$	[462] ABE	02W	BELL	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(\overline{D}^*(2007)^0 p \overline{p})/\Gamma_{total}$ — Γ_{222}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$(1.20^{+0.33}_{-0.29} \pm 0.21) \times 10^{-4}$	[463] ABE	02W	BELL	$e^+ e^- \to \Upsilon(4S)$

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

$\Gamma(\overline{\Sigma}_c^{--} \Delta^{++})/\Gamma_{total}$ — Γ_{223}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0010	90	[464] PROCARIO	94	CLE2	$e^+ e^- \to \Upsilon(4S)$

[464] PROCARIO 94 reports < 0.0012 for B($\Lambda_c^+ \to p K^- \pi^+$) = 0.043. We rescale to our best value B($\Lambda_c^+ \to p K^- \pi^+$) = 0.050.

$\Gamma(\overline{\Lambda}_c^- p \pi^+ \pi^-)/\Gamma_{total}$ — Γ_{224}/Γ

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
1.3 ±0.4 OUR AVERAGE				
1.7 ±0.3 ±0.4	[465] DYTMAN	02	CLE2	$e^+ e^- \to \Upsilon(4S)$
1.10±0.20±0.29	[466] GABYSHEV	02	BELL	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.33^{+0.46}_{-0.42} \pm 0.37$	[467] FU	97	CLE2	Repl. by DYTMAN 02

[465] DYTMAN 02 reports $1.67^{+0.27}_{-0.25}$ for B($\Lambda_c^+ \to p K^- \pi^+$) = 0.05. We rescale to our best value B($\Lambda_c^+ \to p K^- \pi^+$) = $(5.0 \pm 1.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[466] GABYSHEV 02 reports 1.1 ± 0.2 for B($\Lambda_c^+ \to p K^- \pi^+$) = 0.05. We rescale to our best value B($\Lambda_c^+ \to p K^- \pi^+$) = $(5.0 \pm 1.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[467] FU 97 uses PDG 96 values of Λ_c branching fraction.

$\Gamma(\overline{\Lambda}_c^- p)/\Gamma_{total}$ Γ_{225}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{2.19^{+0.56}_{-0.49}\pm0.65}$		[468,469] GABYSHEV	03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<9	90	[468,470] DYTMAN	02	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
<3.1	90	[468,471] GABYSHEV	02	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
<21	90	[472] FU	97	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

[468] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[469] The second error for GABYSHEV 03 includes the systematic and the error of $\Lambda_c \rightarrow \overline{p}K^+\pi^-$ decay branching fraction.
[470] DYTMAN 02 measurement uses B($\Lambda_c^- \rightarrow \overline{p}K^+\pi^-$) = 5.0 ± 1.3%. The second error includes the systematic and the uncertainty of the branching ratio.
[471] Uses the value for $\Lambda_c \rightarrow pK^-\pi^+$ branching ratio (5.0 ± 1.3)%.
[472] FU 97 uses PDG 96 values of Λ_c branching ratio.

$\Gamma(\overline{\Lambda}_c^- p\pi^0)/\Gamma_{total}$ Γ_{226}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<5.9\times10^{-4}}$	90	[473] FU	97	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

[473] FU 97 uses PDG 96 values of Λ_c branching ratio.

$\Gamma(\overline{\Lambda}_c^- p\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{227}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<5.07\times10^{-3}}$	90	[474] FU	97	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

[474] FU 97 uses PDG 96 values of Λ_c branching ratio.

$\Gamma(\overline{\Lambda}_c^- p\pi^+\pi^-\pi^+\pi^-)/\Gamma_{total}$ Γ_{228}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<2.74\times10^{-3}}$	90	[475] FU	97	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

[475] FU 97 uses PDG 96 values of Λ_c branching ratio.

$\Gamma(\overline{\Sigma}_c(2520)^{--} p\pi^+)/\Gamma_{total}$ Γ_{229}/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
1.6±0.6±0.4	[476] GABYSHEV	02	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

[476] GABYSHEV 02 reports $1.63^{+0.64}_{-0.58}$ for B($\Lambda_c^+ \rightarrow pK^-\pi^+$) = 0.05. We rescale to our best value B($\Lambda_c^+ \rightarrow pK^-\pi^+$) = $(5.0\pm1.3)\times10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\overline{\Sigma}_c(2520)^0 p\pi^-)/\Gamma_{total}$ Γ_{230}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{<1.21\times10^{-4}}$	90	[477,478] GABYSHEV	02	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

[477] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[478] Uses the value for $\Lambda_c \rightarrow pK^-\pi^+$ branching ratio (5.0 ± 1.3)%.

$\Gamma(\overline{\Sigma}_c(2455)^0 p \pi^-)/\Gamma_{total}$ — Γ_{231}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
1.0±0.8 OUR AVERAGE	Error includes scale factor of 1.7.			
$2.2 \pm 0.7 \pm 0.6$		[479] DYTMAN	02 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$0.5^{+0.5}_{-0.4} \pm 0.1$	90	[480] GABYSHEV	02 BELL	$e^+e^- \rightarrow \Upsilon(4S)$

[479] DYTMAN 02 reports 2.2 ± 0.7 for $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = 0.05$. We rescale to our best value $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[480] GABYSHEV 02 reports $0.48^{+0.46}_{-0.41}$ for $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = 0.05$. We rescale to our best value $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\overline{\Sigma}_c(2455)^{--} p \pi^+)/\Gamma_{total}$ — Γ_{232}/Γ

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
2.8±0.9 OUR AVERAGE			
$3.7 \pm 1.1 \pm 1.0$	[481] DYTMAN	02 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$2.4 \pm 0.7 \pm 0.6$	[482] GABYSHEV	02 BELL	$e^+e^- \rightarrow \Upsilon(4S)$

[481] DYTMAN 02 reports 3.7 ± 1.1 for $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = 0.05$. We rescale to our best value $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[482] GABYSHEV 02 reports $2.38^{+0.75}_{-0.69}$ for $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = 0.05$. We rescale to our best value $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\overline{\Lambda}_c(2593)^- / \overline{\Lambda}_c(2625)^- p)/\Gamma_{total}$ — Γ_{233}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{<1.1 \times 10^{-4}}$	90	[483,484] DYTMAN	02 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

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

[484] DYTMAN 02 measurement uses $B(\Lambda_c^- \rightarrow \overline{p}K^+\pi^-) = 5.0 \pm 1.3\%$. The second error includes the systematic and the uncertainty of the branching ratio.

$\Gamma(\gamma\gamma)/\Gamma_{total}$ — Γ_{234}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{<1.7 \times 10^{-6}}$	90	[485] AUBERT	01I BABR	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<3.9 \times 10^{-5}$	90	[486] ACCIARRI	95I L3	$e^+e^- \rightarrow Z$

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

[486] ACCIARRI 95I assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.

$\Gamma(e^+e^-)/\Gamma_{total}$ Γ_{235}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.9 \times 10^{-7}$	90	[487] CHANG	03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<8.3 \times 10^{-7}$	90	[487] BERGFELD	00B	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$<1.4 \times 10^{-5}$	90	[488] 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	[489] AVERY	89B	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
$<7.6 \times 10^{-5}$	90	[490] ALBRECHT	87D	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
$<6.4 \times 10^{-5}$	90	[491] AVERY	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
$<3 \times 10^{-4}$	90	GILES	84	CLEO	Repl. by AVERY 87

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

[488] ACCIARRI 97B assume PDG 96 production fractions for B^+, B^0, B_s, and Λ_b.

[489] AVERY 89B reports $< 3 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

[490] ALBRECHT 87D reports $< 8.5 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

[491] AVERY 87 reports $< 8 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(\mu^+\mu^-)/\Gamma_{total}$ Γ_{236}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.6 \times 10^{-7}$	90	[492] CHANG	03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<6.1 \times 10^{-7}$	90	[492] BERGFELD	00B	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$<4.0 \times 10^{-5}$	90	ABBOTT	98B	D0	$p\overline{p}$ 1.8 TeV
$<6.8 \times 10^{-7}$	90	[493] ABE	98	CDF	$p\overline{p}$ at 1.8 TeV
$<1.0 \times 10^{-5}$	90	[494] ACCIARRI	97B	L3	$e^+e^- \rightarrow Z$
$<1.6 \times 10^{-6}$	90	[495] ABE	96L	CDF	Repl. by ABE 98
$<5.9 \times 10^{-6}$	90	AMMAR	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$<8.3 \times 10^{-6}$	90	[496] ALBAJAR	91C	UA1	$E_{cm}^{p\overline{p}}$= 630 GeV
$<1.2 \times 10^{-5}$	90	[497] ALBAJAR	91C	UA1	$E_{cm}^{p\overline{p}}$= 630 GeV
$<4.3 \times 10^{-5}$	90	[498] AVERY	89B	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
$<4.5 \times 10^{-5}$	90	[499] ALBRECHT	87D	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
$<7.7 \times 10^{-5}$	90	[500] AVERY	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
$<2 \times 10^{-4}$	90	GILES	84	CLEO	Repl. by AVERY 87

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

[493] ABE 98 assumes production of $\sigma(B^0) = \sigma(B^+)$ and $\sigma(B_s)/\sigma(B^0) = 1/3$. They normalize to their measured $\sigma(B^0, p_T(B) > 6, |y| < 1.0) = 2.39 \pm 0.32 \pm 0.44\ \mu$b.

[494] ACCIARRI 97B assume PDG 96 production fractions for B^+, B^0, B_s, and Λ_b.

[495] ABE 96L assumes equal B^0 and B^+ production. They normalize to their measured $\sigma(B^+, p_T(B) > 6\ \text{GeV}/c, |y| < 1) = 2.39 \pm 0.54\ \mu$b.

[496] B^0 and B_s^0 are not separated.

[497] Obtained from unseparated B^0 and B_s^0 measurement by assuming a B^0:B_s^0 ratio 2:1.

[498] AVERY 89B reports $< 5 \times 10^{-3}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0 \overline{B}^0$. We rescale to 50%.
[499] ALBRECHT 87D reports $< 5 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0 \overline{B}^0$. We rescale to 50%.
[500] AVERY 87 reports $< 9 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0 \overline{B}^0$. We rescale to 50%.

$\Gamma(K^0 e^+ e^-)/\Gamma_{total}$ — Γ_{237}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.4 \times 10^{-7}$	90	[501] ISHIKAWA	03	BELL	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.7 \times 10^{-6}$	90	[502] ABE	02	BELL	Repl. by ISHIKAWA 03
$<3.8 \times 10^{-6}$	90	[502] AUBERT	02L	BABR	$e^+ e^- \to \Upsilon(4S)$
$<8.45 \times 10^{-6}$	90	[503] ANDERSON	01B	CLE2	$e^+ e^- \to \Upsilon(4S)$
$<3.0 \times 10^{-4}$	90	ALBRECHT	91E	ARG	$e^+ e^- \to \Upsilon(4S)$
$<5.2 \times 10^{-4}$	90	[504] AVERY	87	CLEO	$e^+ e^- \to \Upsilon(4S)$

[501] Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. The second error is a total of systematic uncertainties including model dependence.
[502] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[503] The result is for di-lepton masses above 0.5 GeV.
[504] AVERY 87 reports $< 6.5 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0 \overline{B}^0$. We rescale to 50%.

$\Gamma(K^0 \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{238}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE (units 10^{-7})	CL%	DOCUMENT ID		TECN	COMMENT
$5.6^{+2.9}_{-2.3} \pm 0.5$		[505] ISHIKAWA	03	BELL	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<$ 33	90	[506] ABE	02	BELL	Repl. by ISHIKAWA 03
$<$ 36	90	AUBERT	02L	BABR	$e^+ e^- \to \Upsilon(4S)$
$<$ 66.4	90	[507] ANDERSON	01B	CLE2	$e^+ e^- \to \Upsilon(4S)$
$<$5200	90	ALBRECHT	91E	ARG	$e^+ e^- \to \Upsilon(4S)$
$<$3600	90	[508] AVERY	87	CLEO	$e^+ e^- \to \Upsilon(4S)$

[505] Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. The second error is a total of systematic uncertainties including model dependence.
[506] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.
[507] The result is for di-lepton masses above 0.5 GeV.
[508] AVERY 87 reports $< 4.5 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0 \overline{B}^0$. We rescale to 50%.

$\Gamma(K^0 \ell^+ \ell^-)/\Gamma_{total}$ — Γ_{239}/Γ

VALUE (units 10^{-7})	CL%	DOCUMENT ID		TECN	COMMENT
<6.8	90	[509] ISHIKAWA	03	BELL	$e^+ e^- \to \Upsilon(4S)$

[509] Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$.

$\Gamma(K^*(892)^0 e^+ e^-)/\Gamma_{total}$ — Γ_{240}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.4 \times 10^{-6}$	90	[510] ISHIKAWA 03	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<6.4 \times 10^{-6}$	90	[511] ABE 02	BELL	Repl. by ISHIKAWA 03
$<6.7 \times 10^{-6}$	90	[511] AUBERT 02L	BABR	$e^+e^- \to \Upsilon(4S)$
$<2.9 \times 10^{-4}$	90	ALBRECHT 91E	ARG	$e^+e^- \to \Upsilon(4S)$

[510] Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. The second error is a total of systematic uncertainties including model dependence.

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

$\Gamma(K^*(892)^0 \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{241}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
$1.33^{+0.42}_{-0.37} \pm 0.11$		[512] ISHIKAWA 03	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<$ 4.2	90	[513] ABE 02	BELL	$e^+e^- \to \Upsilon(4S)$
$<$ 3.3	90	AUBERT 02L	BABR	$e^+e^- \to \Upsilon(4S)$
$<$ 4.0	90	[514] AFFOLDER 99B	CDF	$p\overline{p}$ at 1.8 TeV
$<$ 25	90	[515] ABE 96L	CDF	Repl. by AFFOLDER 99B
$<$ 23	90	[516] ALBAJAR 91C	UA1	$E_{cm}^{p\overline{p}} = 630$ GeV
$<$340	90	ALBRECHT 91E	ARG	$e^+e^- \to \Upsilon(4S)$

[512] Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$. The second error is a total of systematic uncertainties including model dependence.

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

[514] AFFOLDER 99B measured relative to $B^0 \to J/\psi(1S) K^*(892)^0$.

[515] ABE 96L measured relative to $B^0 \to J/\psi(1S) K^*(892)^0$ using PDG 94 branching ratios.

[516] ALBAJAR 91C assumes 36% of $\overline{b}$ quarks give B^0 mesons.

$\Gamma(K^*(892)^0 \ell^+ \ell^-)/\Gamma_{total}$ — Γ_{243}/Γ

VALUE (units 10^{-7})	DOCUMENT ID	TECN	COMMENT
$11.7^{+3.0}_{-2.7} \pm 0.9$	[517] ISHIKAWA 03	BELL	$e^+e^- \to \Upsilon(4S)$

[517] Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$.

$\Gamma(K^*(892)^0 \nu\overline{\nu})/\Gamma_{total}$ — Γ_{242}/Γ

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.0 \times 10^{-3}$	90	[518] ADAM 96D	DLPH	$e^+e^- \to Z$

[518] ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.

$\Gamma(e^{\pm}\mu^{\mp})/\Gamma_{total}$ — Γ_{244}/Γ

Test of lepton family number conservation. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 1.7 \times 10^{-7}$	90	[519] CHANG	03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<15 \times 10^{-7}$	90	[519] BERGFELD	00B	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$< 3.5 \times 10^{-6}$	90	ABE	98V	CDF	$p\overline{p}$ at 1.8 TeV
$< 1.6 \times 10^{-5}$	90	[520] ACCIARRI	97B	L3	$e^+e^- \rightarrow Z$
$< 5.9 \times 10^{-6}$	90	AMMAR	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
$< 3.4 \times 10^{-5}$	90	[521] AVERY	89B	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
$< 4.5 \times 10^{-5}$	90	[522] ALBRECHT	87D	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
$< 7.7 \times 10^{-5}$	90	[523] AVERY	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
$< 3 \times 10^{-4}$	90	GILES	84	CLEO	Repl. by AVERY 87

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

[520] ACCIARRI 97B assume PDG 96 production fractions for B^+, B^0, B_s, and Λ_b.

[521] Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

[522] ALBRECHT 87D reports $< 5 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%.

[523] AVERY 87 reports $< 9 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%.

$\Gamma(K^0 e^{\pm}\mu^{\mp})/\Gamma_{total}$ — Γ_{245}/Γ

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<4.0 \times 10^{-6}$	90	[524] AUBERT	02L	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(K^*(892)^0 e^{\pm}\mu^{\mp})/\Gamma_{total}$ — Γ_{246}/Γ

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.4 \times 10^{-6}$	90	[525] AUBERT	02L	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

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

$\Gamma(e^{\pm}\tau^{\mp})/\Gamma_{total}$ — Γ_{247}/Γ

Test of lepton family number conservation. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.3 \times 10^{-4}$	90	AMMAR	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(\mu^{\pm}\tau^{\mp})/\Gamma_{total}$ — Γ_{248}/Γ

Test of lepton family number conservation. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<8.3 \times 10^{-4}$	90	AMMAR	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

POLARIZATION IN B^0 DECAY

In decays involving two vector mesons, one can distinguish among the states in which meson palarizations are both longitudinal (L) or both are transverse and parallel ($\parallel$) or perpendicular ($\perp$) to one another.

Γ_L/Γ in $B^0 \to J/\psi(1S) K^*(892)^0$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.605±0.022 OUR AVERAGE					
0.62 ±0.02 ±0.03		[526] ABE	02N	BELL	$e^+e^- \to \Upsilon(4S)$
0.597±0.028±0.024		[527] AUBERT	01H	BABR	$e^+e^- \to \Upsilon(4S)$
0.59 ±0.06 ±0.01		[528] AFFOLDER	00N	CDF	$p\overline{p}$ at 1.8 TeV
0.52 ±0.07 ±0.04		[529] JESSOP	97	CLE2	$e^+e^- \to \Upsilon(4S)$
0.65 ±0.10 ±0.04	65	ABE	95Z	CDF	$p\overline{p}$ at 1.8 TeV
0.97 ±0.16 ±0.15	13	[530] ALBRECHT	94G	ARG	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.80 ±0.08 ±0.05	42	[530] ALAM	94	CLE2	Sup. by JESSOP 97

[526] Averaged over an admixture of B^0 and B^+ decays and the P wave fraction is $(19 \pm 2 \pm 3)\%$.

[527] Averaged over an admixture of B^0 and B^- decays and the P wave fraction is $(16.0 \pm 3.2 \pm 1.4) \times 10^{-2}$.

[528] 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 $0.13^{+0.12}_{-0.09} \pm 0.06$.

[529] JESSOP 97 is the average over a mixture of B^0 and B^+ decays. The P-wave fraction is found to be $0.16 \pm 0.08 \pm 0.04$.

[530] Averaged over an admixture of B^0 and B^+ decays.

Γ_L/Γ in $B^0 \to \psi(2S) K^*(892)^0$

VALUE	DOCUMENT ID		TECN	COMMENT
0.45±0.11±0.04	[531] RICHICHI	01	CLE2	$e^+e^- \to \Upsilon(4S)$

[531] Averages between charged and neutral B mesons.

Γ_L/Γ in $B^0 \to D_s^{*+} D^{*-}$

VALUE	DOCUMENT ID		TECN	COMMENT
0.52 ±0.05 OUR AVERAGE				
0.519±0.050±0.028	[532] AUBERT	03I	BABR	$e^+e^- \to \Upsilon(4S)$
0.506±0.139±0.036	AHMED	00B	CLE2	$e^+e^- \to \Upsilon(4S)$

[532] Measurement performed using partial reconstruction of D^{*-} decay.

Γ_L/Γ in $B^0 \to D^{*-} \rho^+$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.885±0.016±0.012		CSORNA	03	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.93 ±0.05 ±0.05	76	ALAM	94	CLE2	$e^+e^- \to \Upsilon(4S)$

$\Gamma_\perp/\Gamma$ in $B^0 \to D^{*+} D^{*-}$

VALUE	DOCUMENT ID		TECN	COMMENT
0.063±0.055±0.009	AUBERT	03Q	BABR	$e^+e^- \to \Upsilon(4S)$

Γ_L/Γ in $B^0 \to \phi K^*(892)^0$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.57±0.11 OUR AVERAGE	Error includes scale factor of 1.8.			
0.65±0.07±0.02	AUBERT	03V	BABR	$e^+ e^- \to \Upsilon(4S)$
0.41±0.10±0.04	CHEN	03B	BELL	$e^+ e^- \to \Upsilon(4S)$

B^0–$\overline{B}^0$ MIXING

Updated December 2003 by O. Schneider (Federal Institute of Technology, Lausanne).

There are two neutral B^0–$\overline{B}^0$ meson systems, B^0_d–$\overline{B}^0_d$ and B^0_s–$\overline{B}^0_s$ (generically denoted B^0_q–$\overline{B}^0_q$, $q = s, d$), which exhibit particle-antiparticle mixing [1]. This mixing phenomenon is described in Ref. 2. In the following, we adopt the notation introduced in Ref. 2, and assume CPT conservation throughout. In each system, the light (L) and heavy (H) mass eigenstates,

$$|B_{\rm L,H}\rangle = p|B^0_q\rangle \pm q|\overline{B}^0_q\rangle \,, \tag{1}$$

have a mass difference $\Delta m_q = m_{\rm H} - m_{\rm L} > 0$, and a total decay width difference $\Delta\Gamma_q = \Gamma_{\rm H} - \Gamma_{\rm L}$. In the absence of CP violation in the mixing, $|q/p| = 1$, these differences are given by $\Delta m_q = 2|M_{12}|$ and $|\Delta\Gamma_q| = 2|\Gamma_{12}|$, where M_{12} and Γ_{12} are the off-diagonal elements of the mass and decay matrices [2]. The evolution of a pure $|B^0_q\rangle$ or $|\overline{B}^0_q\rangle$ state at $t = 0$ is given by

$$|B^0_q(t)\rangle = g_+(t)\,|B^0_q\rangle + \frac{q}{p}\,g_-(t)\,|\overline{B}^0_q\rangle \,, \tag{2}$$

$$|\overline{B}^0_q(t)\rangle = g_+(t)\,|\overline{B}^0_q\rangle + \frac{p}{q}g_-(t)\,|B^0_q\rangle \,, \tag{3}$$

which means that the flavor states remain unchanged (+) or oscillate into each other (−) with time-dependent probabilities proportional to

$$|g_\pm(t)|^2 = \frac{e^{-\Gamma_q t}}{2}\left[\cosh\!\left(\frac{\Delta\Gamma_q}{2}\,t\right) \pm \cos(\Delta m_q\, t)\right] \,, \tag{4}$$

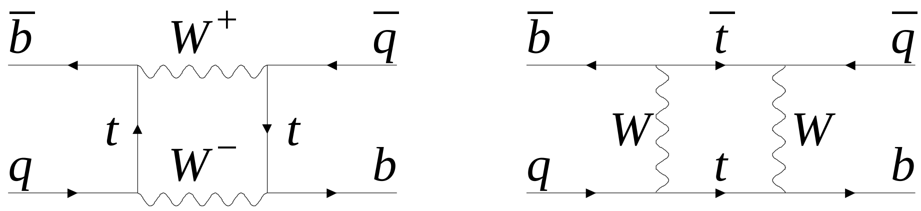


Figure 1: Dominant box diagrams for the $B_q^0 \rightarrow \overline{B}_q^0$ transitions ($q = d$ or s). Similar diagrams exist where one or both t quarks are replaced with c or u quarks.

where $\Gamma_q = (\Gamma_{\rm H} + \Gamma_{\rm L})/2$. In the absence of CP violation, the time-integrated mixing probability $\int |g_-(t)|^2\, dt/(\int |g_-(t)|^2\, dt + \int |g_+(t)|^2\, dt)$ is given by

$$\chi_q = \frac{x_q^2 + y_q^2}{2(x_q^2+1)}\,, \qquad \text{where} \qquad x_q = \frac{\Delta m_q}{\Gamma_q}\,, \qquad y_q = \frac{\Delta\Gamma_q}{2\Gamma_q}\,. \quad (5)$$

Standard Model predictions and phenomenology

In the Standard Model, the transitions $B_q^0 \rightarrow \overline{B}_q^0$ and $\overline{B}_q^0 \rightarrow B_q^0$ are due to the weak interaction. They are described, at the lowest order, by box diagrams involving two W bosons and two up-type quarks (see Fig. 1), as is the case for K^0–$\overline{K}^0$ mixing. However, the long range interactions arising from intermediate virtual states are negligible for the neutral B meson systems, because the large B mass is off the region of hadronic resonances. The calculation of the dispersive and absorptive parts of the box diagrams yields the following predictions for the off-diagonal element of the mass and decay matrices [3],

$$M_{12} = -\frac{G_F^2 m_W^2 \eta_B m_{B_q} B_{B_q} f_{B_q}^2}{12\pi^2}\, S_0(m_t^2/m_W^2)\,(V_{tq}^* V_{tb})^2\,, \qquad (6)$$

$$\Gamma_{12} = \frac{G_F^2 m_b^2 \eta'_B m_{B_q} B_{B_q} f_{B_q}^2}{8\pi}$$

$$\times \left[(V_{tq}^* V_{tb})^2 + V_{tq}^* V_{tb} V_{cq}^* V_{cb} \; \mathcal{O}\left(\frac{m_c^2}{m_b^2}\right) + (V_{cq}^* V_{cb})^2 \; \mathcal{O}\left(\frac{m_c^4}{m_b^4}\right) \right] , \tag{7}$$

where G_F is the Fermi constant, m_W the W boson mass, and m_i the mass of quark i; m_{B_q}, f_{B_q} and B_{B_q} are the B_q^0 mass, weak decay constant and bag parameter, respectively. The known function $S_0(x_t)$ can be approximated very well by $0.784\, x_t^{0.76}$ [4], and V_{ij} are the elements of the CKM matrix [5]. The QCD corrections η_B and η'_B are of order unity. The only non-negligible contributions to M_{12} are from box diagrams involving two top quarks. The phases of M_{12} and Γ_{12} satisfy

$$\phi_M - \phi_\Gamma = \pi + \mathcal{O}\left(\frac{m_c^2}{m_b^2}\right) , \tag{8}$$

implying that the mass eigenstates have mass and width differences of opposite signs. This means that, like in the K^0–$\overline{K}^0$ system, the heavy state has a smaller decay width than that of the light state. Hence, $\Delta\Gamma$ is expected to be negative in the Standard Model.

Furthermore, the quantity

$$\left|\frac{\Gamma_{12}}{M_{12}}\right| \simeq \frac{3\pi}{2} \frac{m_b^2}{m_W^2} \frac{1}{S_0(m_t^2/m_W^2)} \sim \mathcal{O}\left(\frac{m_b^2}{m_t^2}\right) \tag{9}$$

is small, and a power expansion of $|q/p|^2$ yields

$$\left|\frac{q}{p}\right|^2 = 1 + \left|\frac{\Gamma_{12}}{M_{12}}\right| \sin(\phi_M - \phi_\Gamma) + \mathcal{O}\left(\left|\frac{\Gamma_{12}}{M_{12}}\right|^2\right) . \tag{10}$$

Therefore, considering both Eqs. (8) and (9), the CP-violating parameter

$$1 - \left|\frac{q}{p}\right|^2 \simeq \mathrm{Im}\left(\frac{\Gamma_{12}}{M_{12}}\right) \tag{11}$$

is expected to be very small: $\sim \mathcal{O}(10^{-3})$ for the B^0_d–$\overline{B}^0_d$ system and $\lesssim \mathcal{O}(10^{-4})$ for the B^0_s–$\overline{B}^0_s$ system [6].

In the approximation of negligible CP violation in mixing, the ratio $\Delta\Gamma_q/\Delta m_q$ is equal to the small quantity $|\Gamma_{12}/M_{12}|$ of Eq. (9); it is hence independent of CKM matrix elements, *i.e.*, the same for the B^0_d–$\overline{B}^0_d$ and B^0_s–$\overline{B}^0_s$ systems. It can be calculated with lattice QCD techniques; typical results are $\sim 5 \times 10^{-3}$ with quoted uncertainties of $\sim 30\%$. Given the current experimental knowledge (discussed below) on the mixing parameter x_q,

$$\begin{cases} x_d = 0.771 \pm 0.012 & (B^0_d\text{–}\overline{B}^0_d \text{ system}) \\ x_s > 20.6 \text{ at } 95\% \text{ CL} & (B^0_s\text{–}\overline{B}^0_s \text{ system}) \end{cases} , \qquad (12)$$

the Standard Model thus predicts that $\Delta\Gamma_d/\Gamma_d$ is very small (below 1%), but $\Delta\Gamma_s/\Gamma_s$ considerably larger ($\sim 10\%$). These width differences are caused by the existence of final states to which both the B^0_q and $\overline{B}^0_q$ mesons can decay. Such decays involve $b \to c\bar{c}q$ quark-level transitions, which are Cabibbo-suppressed if $q = d$ and Cabibbo-allowed if $q = s$.

Experimental issues and methods for oscillation analyses

Time-integrated measurements of B^0–$\overline{B}^0$ mixing were published for the first time in 1987 by UA1 [7] and ARGUS [8], and since then by many other experiments. These measurements are typically based on counting same-sign and opposite-sign lepton pairs from the semileptonic decay of the produced $b\overline{b}$ pairs. Such analyses cannot easily separate the contributions from the different b-hadron species, therefore, the clean environment of $\Upsilon(4S)$ machines (where only B^0_d and charged B_u mesons are produced) is in principle best suited to measure χ_d.

However, better sensitivity is obtained from time-dependent analyses aimed at the direct measurement of the oscillation frequencies Δm_d and Δm_s, from the proper time distributions of B_d^0 or B_s^0 candidates identified through their decay in (mostly) flavor-specific modes, and suitably tagged as mixed or unmixed. (This is particularly true for the B_s^0–$\overline{B}_s^0$ system, where the large value of x_s implies maximal mixing, *i.e.*, $\chi_s \simeq 1/2$.) In such analyses, the B_d^0 or B_s^0 mesons are either fully reconstructed, partially reconstructed from a charm meson, selected from a lepton with the characteristics of a $b \to \ell^-$ decay, or selected from a reconstructed displaced vertex. At high-energy colliders (LEP, SLC, Tevatron), the proper time $t = \dfrac{m_B}{p} L$ is measured from the distance L between the production vertex and the B decay vertex, and from an estimate of the B momentum p. At asymmetric B factories (KEKB, PEP-II), producing $e^+e^- \to \Upsilon(4S) \to B_d^0 \overline{B}_d^0$ events with a boost $\beta\gamma$ (= 0.425, 0.55), the proper time difference between the two B candidates is estimated as $\Delta t \simeq \dfrac{\Delta z}{\beta\gamma c}$, where Δz is the spatial separation between the two B decay vertices along the boost direction. In all cases, the good resolution needed on the vertex positions is obtained with silicon detectors.

The average statistical significance $\mathcal{S}$ of a B_d^0 or B_s^0 oscillation signal can be approximated as [9]

$$\mathcal{S} \approx \sqrt{N/2}\, f_{\rm sig}\, (1 - 2\eta)\, e^{-(\Delta m\, \sigma_t)^2/2} \,, \qquad (13)$$

where N and $f_{\rm sig}$ are the number of candidates and the fraction of signal in the selected sample, η is the total mistag probability, and σ_t is the resolution on proper time (or proper time difference). The quantity $\mathcal{S}$ decreases very quickly as Δm increases; this dependence is controlled by σ_t, which is therefore a critical parameter for Δm_s analyses. At high-energy colliders, the proper time resolution $\sigma_t \sim \frac{m_B}{\langle p \rangle}\sigma_L \oplus t\frac{\sigma_p}{p}$ includes a constant contribution due to the decay length resolution σ_L (typically 0.05–0.3 ps), and a term due to the relative momentum resolution σ_p/p (typically 10–20% for partially reconstructed decays), which increases with proper time. At B factories, the boost of the B mesons is estimated from the known beam energies, and the term due to the spatial resolution dominates (typically 1–1.5 ps because of the much smaller B boost).

In order to tag a B candidate as mixed or unmixed, it is necessary to determine its flavor both in the initial state and in the final state. The initial and final state mistag probabilities, η_i and η_f, degrade $\mathcal{S}$ by a total factor $(1-2\eta) = (1-2\eta_i)(1-2\eta_f)$. In lepton-based analyses, the final state is tagged by the charge of the lepton from $b \to \ell^-$ decays; the biggest contribution to η_f is then due to $\overline{b} \to \overline{c} \to \ell^-$ decays. Alternatively, the charge of a reconstructed charm meson (D^{*-} from B^0_d or D^-_s from B^0_s), or that of a kaon thought to come from a $b \to c \to s$ decay [10], can be used. For fully inclusive analyses based on topological vertexing, final state tagging techniques include jet charge [11] and charge dipole [12,13] methods.

At high-energy colliders, the methods to tag the initial state (*i.e.*, the state at production), can be divided in two groups: the ones that tag the initial charge of the $\overline{b}$ quark contained in the B candidate itself (same-side tag), and the ones that tag the initial charge of the other b quark produced in the event (opposite-side tag). On the same side, the charge of a track from the primary vertex is correlated with the production state of the B if that track is a decay product of a B^{**} state or the first particle in the fragmentation chain [14,15]. Jet- and vertex-charge techniques work on both sides and on the opposite side, respectively. Finally, the charge of a lepton from $b \to \ell^-$

or of a kaon from $b \to c \to s$ can be used as opposite side tags, keeping in mind that their performance is degraded due to integrated mixing. At SLC, the beam polarization produced a sizeable forward-backward asymmetry in the $Z \to b\overline{b}$ decays, and provided another very interesting and effective initial state tag based on the polar angle of the B candidate [12]. Initial state tags have also been combined to reach $\eta_i \sim 26\%$ at LEP [15,16], or even 22% at SLD [12] with full efficiency. In the case $\eta_f = 0$, this corresponds to an effective tagging efficiency (defined as $Q = \epsilon(1-2\eta)^2$, where ϵ is the tagging efficiency) in the range $23-31\%$. The equivalent figure at CDF is $\sim 3.5\%$ for Tevatron Run I [17] (expected to reach $\sim 5\%$ for Run II [18]), reflecting the fact that tagging is very challenging at hadron colliders.

At B factories, the flavor of a B^0_d meson at production cannot be determined, since the two neutral B mesons produced in a $\Upsilon(4S)$ decay evolve in a coherent P-wave state where they keep opposite flavors at any time. However, as soon as one of them decays, the other follows a time-evolution given by Eqs. (2) or (3), where t is replaced with Δt (which will take negative values half of the time). Hence, the "initial state" tag of a B can be taken as the final state tag of the other B. Effective tagging efficiencies $Q = 28 - 29\%$ are achieved by BABAR and Belle [19], using different techniques including $b \to \ell^-$ and $b \to c \to s$ tags. It is interesting to note that, in this case, mixing of this other B (*i.e.*, the coherent mixing occurring before the first B decay) does not contribute to the mistag probability.

In the absence of experimental evidence for a decay-width difference, oscillation analyses typically neglect $\Delta\Gamma$ in Eq. (4), and describe the data with the physics functions

$\Gamma e^{-\Gamma t}(1 \pm \cos(\Delta m t))/2$ (high-energy colliders) or $\Gamma e^{-\Gamma|\Delta t|}(1 \pm \cos(\Delta m \Delta t))/4$ (asymmetric $\Upsilon(4S)$ machines). As can be seen from Eq. (4), a non-zero value of $\Delta\Gamma$ would effectively reduce the oscillation amplitude with a small time-dependent factor that would be very difficult to distinguish from time resolution effects. Measurements of Δm_d are usually extracted from the data using a maximum likelihood fit. No significant B^0_s–$\overline{B}^0_s$ oscillations have been seen so far. To extract information useful to set lower limits on Δm_s, B^0_s analyses follow a method [9] in which a B^0_s oscillation amplitude $\mathcal{A}$ is measured as a function of a fixed test value of Δm_s, using a maximum likelihood fit based on the functions $\Gamma_s e^{-\Gamma_s t}(1 \pm \mathcal{A}\cos(\Delta m_s t))/2$. To a very good approximation, the statistical uncertainty on $\mathcal{A}$ is Gaussian and equal to $1/\mathcal{S}$ from Eq. (13). If $\Delta m_s = \Delta m_s^{\rm true}$, one expects $\mathcal{A} = 1$ within the total uncertainty $\sigma_{\mathcal{A}}$; however, if Δm_s is (far) below its true value, a measurement consistent with $\mathcal{A} = 0$ is expected. A value of Δm_s can be excluded at 95% CL if $\mathcal{A} + 1.645\,\sigma_{\mathcal{A}} \leq 1$. If $\Delta m_s^{\rm true}$ is very large, one expects $\mathcal{A} = 0$, and all values of Δm_s such that $1.645\,\sigma_{\mathcal{A}}(\Delta m_s) < 1$ are expected to be excluded at 95% CL. Because of the proper time resolution, the quantity $\sigma_{\mathcal{A}}(\Delta m_s)$ is an increasing function of Δm_s, and one therefore expects to be able to exclude individual Δm_s values up to $\Delta m_s^{\rm sens}$, where $\Delta m_s^{\rm sens}$, called here the sensitivity of the analysis, is defined by $1.645\,\sigma_{\mathcal{A}}(\Delta m_s^{\rm sens}) = 1$.

B^0_d *mixing studies*

Many B^0_d–$\overline{B}^0_d$ oscillations analyses have been published by the ALEPH [20], BABAR [21], Belle [22], CDF [14], DELPHI [13,23], L3 [24], and OPAL [25] collaborations. Although a variety of different techniques have been used, the individual Δm_d results obtained at high-energy colliders have remarkably similar precision. Their average is compatible with the recent and more precise measurements from asymmetric B factories. The systematic uncertainties are not negligible; they are often dominated by sample composition, mistag probability, or b-hadron lifetime contributions. Before being combined, the measurements are adjusted on the basis of a common set of input values, including the b-hadron lifetimes and fractions published in this *Review*. Some measurements are statistically correlated. Systematic correlations arise both from common physics sources (fragmentation fractions, lifetimes, branching ratios of b hadrons), and from purely experimental or algorithmic effects (efficiency, resolution, tagging, background description). Combining all published measurements [13,14,20–25] and accounting for all identified correlations as described in Ref. 26, yields $\Delta m_d = 0.502 \pm 0.004(\text{stat}) \pm 0.005(\text{syst})\ \text{ps}^{-1}$.

On the other hand, ARGUS and CLEO have published time-integrated measurements [27–29], which average to $\chi_d = 0.182 \pm 0.015$. Following Ref. 29, the width difference $\Delta\Gamma_d$ could in principle be extracted from the measured value of Γ_d and the above averages for Δm_d and χ_d (see Eq. (5)), provided that $\Delta\Gamma_d$ has a negligible impact on the Δm_d measurements. However, direct time-dependent studies yield stronger constraints: DELPHI published the result $|\Delta\Gamma_d|/\Gamma_d < 18\%$ at 95% CL [13], while BABAR recently obtained $-8.4\% < \text{sign}(\text{Re}\lambda_{\text{CP}})\Delta\Gamma_{\text{d}}/\Gamma_{\text{d}} < 6.8\%$ at 90% CL [30].

Assuming $\Delta\Gamma_d = 0$ and no CP violation in mixing, and using the measured B^0_d lifetime, the Δm_d and χ_d results are combined to yield the world average

$$\Delta m_d = 0.502 \pm 0.007\ \text{ps}^{-1} \tag{14}$$

or, equivalently,

$$\chi_d = 0.186 \pm 0.004\,. \tag{15}$$

Evidence for CP violation in B_d^0 mixing has been searched for, both with flavor-specific and inclusive B_d^0 decays, in samples where the initial flavor state is tagged. In the case of semileptonic (or other flavor-specific) decays, where the final state tag is also available, the following asymmetry [2]

$$\mathcal{A}_{\rm SL} = \frac{N(\overline{B}_d^0(t) \to \ell^+ \nu_\ell X) - N(B_d^0(t) \to \ell^- \overline{\nu}_\ell X)}{N(\overline{B}_d^0(t) \to \ell^+ \nu_\ell X) + N(B_d^0(t) \to \ell^- \overline{\nu}_\ell X)} \simeq 1 - |q/p|_d^2 \tag{16}$$

has been measured, either in time-integrated analyses at CLEO [28,29,31] and CDF [32], or in time-dependent analyses at LEP [33–35] and BABAR [30,36]. In the inclusive case, also investigated at LEP [34,35,37], no final state tag is used, and the asymmetry [38]

$$\begin{aligned} &\frac{N(B_d^0(t) \to {\rm all}) - N(\overline{B}_d^0(t) \to {\rm all})}{N(B_d^0(t) \to {\rm all}) + N(\overline{B}_d^0(t) \to {\rm all})} \\ &\simeq \mathcal{A}_{\rm SL}\left[\frac{x_d}{2}\sin(\Delta m_d\, t) - \sin^2\left(\frac{\Delta m_d\, t}{2}\right)\right] \end{aligned} \tag{17}$$

must be measured as a function of the proper time to extract information on CP violation. In all cases, asymmetries compatible with zero have been found, with a precision limited by the available statistics. A simple average of all published results for the B_d^0 meson [29,31,33,35–37] yields $\mathcal{A}_{\rm SL} = +0.002 \pm 0.013$, or $|q/p|_d = 0.999 \pm 0.006$, a result which does not yet constrain the Standard Model.

The Δm_d result of Eq. (14) provides an estimate of $2|M_{12}|$, and can be used, together with Eq. (6), to extract the magnitude of the CKM matrix element V_{td} within the Standard Model [39]. The main experimental uncertainties on the resulting estimate of $|V_{td}|$ come from m_t and Δm_d; however, the extraction is at present completely dominated by the uncertainty on the hadronic matrix element $f_{B_d}\sqrt{B_{B_d}} = 221 \pm 28^{+0}_{-22}$ MeV obtained from lattice QCD calculations [40].

B^0_s *mixing studies*

B^0_s–$\overline{B}^0_s$ oscillations have been the subject of many studies from ALEPH [15,41], CDF [42], DELPHI [13,16,43,44], OPAL [45], and SLD [12,46,47]. No oscillation signal has been found so far. The most sensitive analyses appear to be the ones based on inclusive lepton samples at LEP. Because of their better proper time resolution, the small data samples analyzed inclusively at SLD, as well as the few fully reconstructed B_s decays at LEP, turn out to be also very useful to explore the high Δm_s region.

All results are limited by the available statistics. They can easily be combined, since all experiments provide measurements of the B^0_s oscillation amplitude. All published results [12,13,16,41,42,43,45,46] are averaged using the procedure of Ref. 26 to yield the combined amplitudes $\mathcal{A}$ shown in Fig. 2 as a function of Δm_s. The individual results have been adjusted to common physics inputs, and all known correlations have been accounted for; the sensitivities of the inclusive analyses, which depend directly through Eq. (13) on the assumed fraction f_s of B^0_s mesons in an unbiased sample of weakly-decaying b hadrons, have also been rescaled to a common average of $f_s = 0.107 \pm 0.011$. The combined sensitivity for 95% CL exclusion of Δm_s values is found to be 17.8 ps^{-1}. All values of Δm_s below 14.4 ps^{-1} are excluded at 95% CL, which we express as

$$\Delta m_s > 14.4 \ \text{ps}^{-1} \quad \text{at } 95\% \text{ CL}. \tag{18}$$

The values between 14.4 and 21.8 ps^{-1} cannot be excluded, because the data is compatible with a signal in this region.

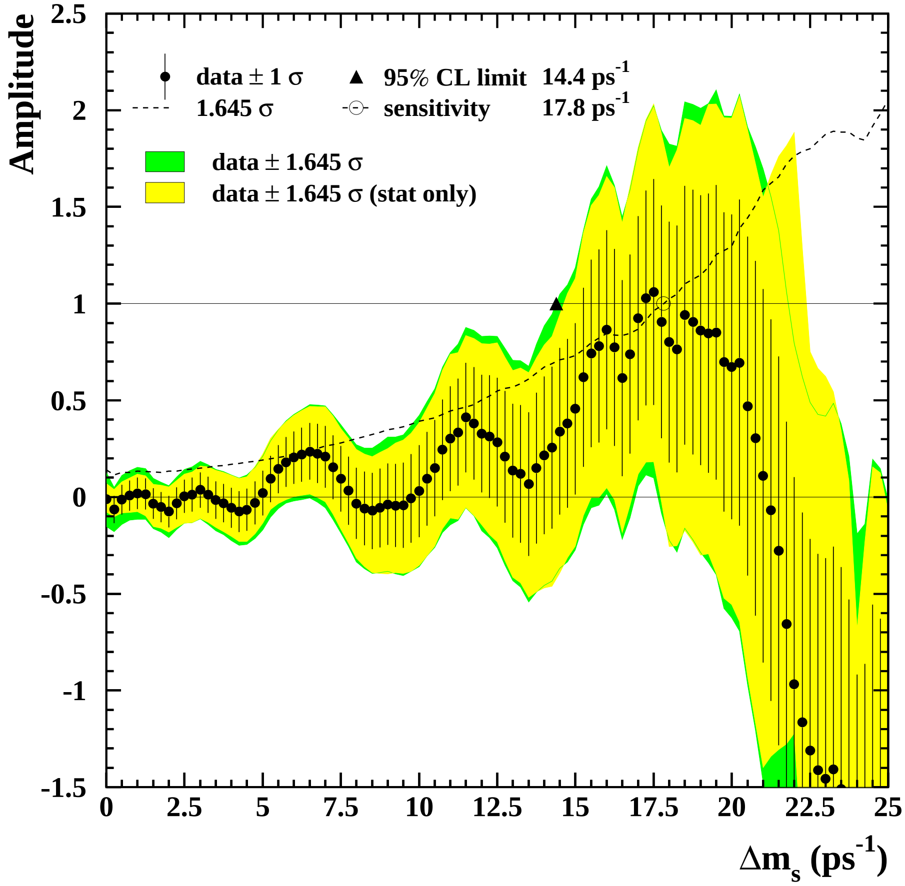


Figure 2: Combined measurements of the B_s^0 oscillation amplitude as a function of Δm_s, including all results published by November 2003. The measurements are dominated by statistical uncertainties. Neighboring points are statistically correlated. See full-color version on color pages at end of book.

However, no deviation from $\mathcal{A} = 0$ is seen in Fig. 2 that would indicate the observation of a signal.

Some Δm_s analyses are still unpublished [44,47]. Including these in the above combination would yield $\Delta m_s > 14.6$ ps^{-1} at 95% CL with a sensitivity of 19.3 ps^{-1}.

The information on $|V_{ts}|$ obtained, in the framework of the Standard Model, from the combined amplitude spectrum, is hampered by the hadronic uncertainty, as in the B_d^0 case. However, several uncertainties cancel in the frequency ratio

$$\frac{\Delta m_s}{\Delta m_d} = \frac{m_{B_s}}{m_{B_d}} \, \xi^2 \left| \frac{V_{ts}}{V_{td}} \right|^2 , \tag{19}$$

where $\xi = (f_{B_s}\sqrt{B_{B_s}})/(f_{B_d}\sqrt{B_{B_d}}) = 1.15 \pm 0.05^{+0.12}_{-0.00}$ is an SU(3) flavor-symmetry breaking factor obtained from lattice QCD calculations [40]. The CKM matrix can be constrained using the experimental results on Δm_d, Δm_s, $|V_{ub}/V_{cb}|$, ϵ_K, and $\sin(2\beta)$ together with theoretical inputs and unitarity conditions [39,48]. Given all measurements other than Δm_d and Δm_s, the constraint from our knowledge on the ratio $\Delta m_s/\Delta m_d$ is presently more effective in limiting the position of the apex of the CKM unitarity triangle than the one obtained from the Δm_d measurements alone, due to the reduced hadronic uncertainty in Eq. (19). We note also that it would be difficult for the Standard Model to accommodate values of Δm_s above $\sim 25\ \text{ps}^{-1}$ [48].

Information on $\Delta\Gamma_s$ can be obtained by studying the proper time distribution of untagged data samples enriched in B_s^0 mesons [49]. In the case of an inclusive B_s^0 selection [50], or a semileptonic B_s^0 decay selection [16,51], both the short- and long-lived components are present, and the proper time distribution is a superposition of two exponentials with decay constants $\Gamma_s \pm \Delta\Gamma_s/2$. In principle, this provides sensitivity to both Γ_s and $(\Delta\Gamma_s/\Gamma_s)^2$. Ignoring $\Delta\Gamma_s$ and fitting for a single exponential leads to an estimate of Γ_s with a relative bias proportional to $(\Delta\Gamma_s/\Gamma_s)^2$. An alternative approach, which is directly sensitive to first order in $\Delta\Gamma_s/\Gamma_s$, is to determine the lifetime of B_s^0 candidates decaying to CP eigenstates; measurements exist for $B_s^0 \to J/\psi\phi$ [52] and $B_s^0 \to D_s^{(*)+}D_s^{(*)-}$ [53], which are mostly CP-even states [54]. An estimate of $\Delta\Gamma_s/\Gamma_s$

has also been obtained directly from a measurement of the $B_s^0 \to D_s^{(*)+} D_s^{(*)-}$ branching ratio [53], under the assumption that these decays account for all the CP-even final states (however, no systematic uncertainty due to this assumption is given, so the average quoted below will not include this estimate).

Present data is not precise enough to efficiently constrain both Γ_s and $\Delta\Gamma_s/\Gamma_s$; since the B_s^0 and B_d^0 lifetimes are predicted to be equal within less than a percent [55], an expectation compatible with the current experimental data [56], the constraint $\Gamma_s = \Gamma_d$ can also be used to improve the extraction of $\Delta\Gamma_s/\Gamma_s$. Applying the combination procedure of Ref. 26 on the published results [16,51–53,57], yields

$$|\Delta\Gamma_s|/\Gamma_s < 0.54 \quad \text{at } 95\% \text{ CL} \tag{20}$$

without external constraint, or

$$|\Delta\Gamma_s|/\Gamma_s < 0.29 \quad \text{at } 95\% \text{ CL} \tag{21}$$

when constraining $1/\Gamma_s$ to the measured B_d^0 lifetime. These results are not yet precise enough to test Standard Model predictions.

Average b-hadron mixing and b-hadron production fractions at high energy

Let f_u, f_d, f_s and $f_{\rm baryon}$ be the fractions of B_u, B_d^0, B_s^0 and b-baryon composing an unbiased sample of weakly decaying b hadrons produced in high-energy colliders. LEP experiments have measured $f_s \times {\rm BR}(B_s^0 \to D_s^- \ell^+ \nu_\ell X)$ [58], ${\rm BR}(b \to \Lambda_b^0) \times {\rm BR}(\Lambda_b^0 \to \Lambda_c^+ \ell^- \overline{\nu}_\ell X)$ [59], and ${\rm BR}(b \to \Xi_b^-) \times {\rm BR}(\Xi_b^- \to \Xi^- \ell^- \overline{\nu}_\ell X)$ [60] from partially reconstructed final states, including a lepton, $f_{\rm baryon}$ from protons identified in b events [61], and the production rate of charged b hadrons [62]. The various b-hadron fractions have also been measured at CDF from electron-charm final states [63]. All these published results have been combined following the procedure and assumptions described in Ref. 26, to yield $f_u = f_d = (40.3 \pm 1.1)\%$, $f_s = (8.8 \pm 2.1)\%$, and $f_{\rm baryon} = (10.7 \pm 1.8)\%$ under the constraints

$$f_u = f_d \qquad \text{and} \qquad f_u + f_d + f_s + f_{\rm baryon} = 1\,. \tag{22}$$

Time-integrated mixing analyses performed with lepton pairs from $b\overline{b}$ events produced at high-energy colliders measure the quantity

$$\overline{\chi} = f'_d\,\chi_d + f'_s\,\chi_s\,, \tag{23}$$

where f'_d and f'_s are the fractions of B^0_d and B^0_s hadrons in a sample of semileptonic b-hadron decays. Assuming that all b hadrons have the same semileptonic decay width implies $f'_q = f_q/(\Gamma_q \tau_b)$ $(q = s, d)$, where τ_b is the average b-hadron lifetime. Hence $\overline{\chi}$ measurements can be used to improve our knowledge on the fractions f_u, f_d, f_s and $f_{\rm baryon}$.

Combining the above estimates of these fractions with the average $\overline{\chi} = 0.1257 \pm 0.0042$ (published in this *Review*), χ_d from Eq. (15), and $\chi_s = 1/2$ yields, under the constraints of Eq. (22),

$$f_u = f_d = (39.7 \pm 1.0)\%\,, \tag{24}$$

$$f_s = (10.7 \pm 1.1)\%\,, \tag{25}$$

$$f_{\rm baryon} = (9.9 \pm 1.7)\%\,, \tag{26}$$

showing that mixing information substantially reduces the uncertainty on f_s. These results and the averages quoted in Eqs. (14) and (15) for χ_d and Δm_d have been obtained in a consistent way by the B oscillations working group [26], taking into account the fact that many individual measurements of Δm_d depend on the assumed values for the b-hadron fractions.

Summary and prospects

B^0–$\overline{B}^0$ mixing has been and still is a field of intense study. The mass difference in the B_d^0–$\overline{B}_d^0$ system is very well measured (with an accuracy of 1.3%) but, despite an impressive theoretical effort, the hadronic uncertainty still limits the precision of the extracted estimate of $|V_{td}|$. The mass difference in the B_s^0–$\overline{B}_s^0$ system is much larger and still unmeasured. However, the current experimental lower limit on Δm_s already provides, together with Δm_d, a significant constraint on the CKM matrix within the Standard Model. No strong experimental evidence exists yet for the rather large decay width difference expected in the B_s^0–$\overline{B}_s^0$ system. It is interesting to recall that the ratio $\Delta\Gamma_s/\Delta m_s$ does not depend on CKM matrix elements in the Standard Model (see Eq. (9)), and that a measurement of either Δm_s or $\Delta\Gamma_s$ could be turned into a Standard Model prediction of the other one.

In the near future, the most promising prospects for B_s^0 mixing are from Run II at the Tevatron, where both Δm_s and $\Delta\Gamma_s$ are expected to be measured with fully reconstructed B_s^0 decays. The CDF and D0 collaborations expect to be able to observe B_s^0 oscillations with $2-3$ fb^{-1} of data, if Δm_s is consistent with the current Standard Model prediction [18]. Should this not be the case, then the discovery of B_s^0 oscillations will most likely be made at CERN's Large Hadron Collider scheduled to come into operation in 2007, where the LHC collaboration claims to have the potential to cover a Δm_s range up to ~ 68 ps^{-1} after 2 fb^{-1} of data (10^7 s) have been analyzed [64]. The BTeV experiment at Fermilab should have a comparable sensitivity to Δm_s and is expected to turn on in 2009 [65].

CP violation in B mixing, which has not been seen yet, as well as the phases involved in B mixing, will be further investigated with the large statistics that will become available at the B factories, the Tevatron, and the LHC.

B mixing may not have delivered all its secrets yet, because it is one of the phenomena where new physics might very well reveal itself (for example, new particles involved in the box diagrams). Theoretical calculations in lattice QCD are becoming more reliable, and further progress in reducing hadronic uncertainties is expected. In the long term, a stringent check of the consistency, within the Standard Model, of the B_d^0 and B_s^0 mixing measurements, with all other measured observables in B physics (including CP asymmetries in B decays), will be possible, allowing to place limits on new physics or, better, discover new physics.

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B^0-$\overline{B}^0$ MIXING PARAMETERS

For a discussion of B^0-$\overline{B}^0$ mixing see the note on "B^0-$\overline{B}^0$ Mixing" in the B^0 Particle Listings above.

χ_d is a measure of the time-integrated B^0-$\overline{B}^0$ mixing probability that a produced $B^0(\overline{B}^0)$ decays as a $\overline{B}^0(B^0)$. Mixing violates $\Delta B \neq 2$ rule.

$$\chi_d = \frac{x_d^2}{2(1+x_d^2)}$$

$$x_d = \frac{\Delta m_{B^0}}{\Gamma_{B^0}} = (m_{B^0_H} - m_{B^0_L})\,\tau_{B^0} \ ,$$

where H, L stand for heavy and light states of two B^0 CP eigenstates and $\tau_{B^0} = \frac{1}{0.5(\Gamma_{B^0_H}+\Gamma_{B^0_L})}$.

χ_d

This B^0-$\overline{B}^0$ mixing parameter is the probability (integrated over time) that a produced B^0 (or $\overline{B}^0$) decays as a $\overline{B}^0$ (or B^0), e.g. for inclusive lepton decays

$$\chi_d = \Gamma(B^0 \to \ell^- X \text{ (via } \overline{B}^0))/\Gamma(B^0 \to \ell^\pm X)$$
$$= \Gamma(\overline{B}^0 \to \ell^+ X \text{ (via } B^0))/\Gamma(\overline{B}^0 \to \ell^\pm X)$$

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 $B^0(\overline{b}d)$ or $B^0_s(\overline{b}s)$. They are listed in the $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE section.

The experiments at $\Upsilon(4S)$ make an assumption about the $B^0\overline{B}^0$ 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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements, includes χ_d calculated from Δm_{B^0} and τ_{B^0}.

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.186±0.004 OUR EVALUATION					
0.182±0.015 OUR AVERAGE					
$0.198\pm0.013\pm0.014$		[533] BEHRENS	00B	CLE2	$e^+e^- \to \Upsilon(4S)$
$0.16\pm0.04\pm0.04$		[534] ALBRECHT	94	ARG	$e^+e^- \to \Upsilon(4S)$
$0.149\pm0.023\pm0.022$		[535] BARTELT	93	CLE2	$e^+e^- \to \Upsilon(4S)$
0.171 ± 0.048		[536] ALBRECHT	92L	ARG	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.20\pm0.13\pm0.12$		[537] ALBRECHT	96D	ARG	$e^+e^- \to \Upsilon(4S)$
$0.19\pm0.07\pm0.09$		[538] ALBRECHT	96D	ARG	$e^+e^- \to \Upsilon(4S)$
0.24 ± 0.12		[539] ELSEN	90	JADE	e^+e^- 35–44 GeV
$0.158^{+0.052}_{-0.059}$		ARTUSO	89	CLEO	$e^+e^- \to \Upsilon(4S)$
0.17 ± 0.05		[540] ALBRECHT	87I	ARG	$e^+e^- \to \Upsilon(4S)$
<0.19	90	[541] BEAN	87B	CLEO	$e^+e^- \to \Upsilon(4S)$
<0.27	90	[542] AVERY	84	CLEO	$e^+e^- \to \Upsilon(4S)$

[533] BEHRENS 00B uses high-momentum lepton tags and partially reconstructed $\overline{B}^0 \to D^{*+}\pi^-$, ρ^- decays to determine the flavor of the B meson.

[534] 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^*).

[535] BARTELT 93 analysis performed using tagged events (lepton+pion from D^*). Using dilepton events they obtain $0.157 \pm 0.016^{+0.033}_{-0.028}$.

[536] 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 $\tau_{B^\pm}/\tau_{B^0} = (0.95 \pm 0.14)\ (f_{+-}/f_0)$.

[537] Uses $D^{*+} K^{\pm}$ correlations.

[538] Uses $(D^{*+} \ell^-)\ K^{\pm}$ correlations.

[539] These experiments see a combination of B_s and B_d mesons.

[540] ALBRECHT 87I is inclusive measurement with like-sign dileptons, with tagged B decays plus leptons, and one fully reconstructed event. Measures r=0.21 ± 0.08. We convert to χ for comparison. Superseded by ALBRECHT 92L.

[541] BEAN 87B measured $r <$ 0.24; we converted to χ.

[542] 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.

$\Delta m_{B^0} = m_{B^0_H} - m_{B^0_L}$

$\Delta m_{B^0_s}$ is a measure of 2π times the B^0-$\overline{B}^0$ oscillation frequency in time-dependent mixing experiments.

The second "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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

The first "OUR EVALUATION" (0.502 ± 0.007), also provided by the HFAG, includes Δm_d calculated from χ_d measured at $\Upsilon(4S)$.

VALUE ($10^{12}\ \hbar\ s^{-1}$)	EVTS	DOCUMENT ID		TECN	COMMENT
0.502±0.007 OUR EVALUATION		First			
0.502±0.007 OUR EVALUATION		Second			
0.531±0.025±0.007		[543] ABDALLAH	03B	DLPH	$e^+ e^- \to Z$
0.492±0.018±0.013		[544] AUBERT	03C	BABR	$e^+ e^- \to \Upsilon(4S)$
0.503±0.008±0.010		[545] HASTINGS	03	BELL	$e^+ e^- \to \Upsilon(4S)$
0.509±0.017±0.020		[546] ZHENG	03	BELL	$e^+ e^- \to \Upsilon(4S)$
0.516±0.016±0.010		[547] AUBERT	02I	BABR	$e^+ e^- \to \Upsilon(4S)$
0.493±0.012±0.009		[548] AUBERT	02J	BABR	$e^+ e^- \to \Upsilon(4S)$
0.494±0.012±0.015		[549] HARA	02	BELL	$e^+ e^- \to \Upsilon(4S)$
0.528±0.017±0.011		[550] TOMURA	02	BELL	$e^+ e^- \to \Upsilon(4S)$
0.497±0.024±0.025		[551] ABBIENDI,G	00B	OPAL	$e^+ e^- \to Z$
0.503±0.064±0.071		[552] ABE	99K	CDF	$p\overline{p}$ at 1.8 TeV
0.500±0.052±0.043		[553] ABE	99Q	CDF	$p\overline{p}$ at 1.8 TeV
$0.516 \pm 0.099 ^{+0.029}_{-0.035}$		[554] AFFOLDER	99C	CDF	$p\overline{p}$ at 1.8 TeV
$0.471 ^{+0.078}_{-0.068} {}^{+0.033}_{-0.034}$		[555] ABE	98C	CDF	$p\overline{p}$ at 1.8 TeV
0.458±0.046±0.032		[556] ACCIARRI	98D	L3	$e^+ e^- \to Z$
0.437±0.043±0.044		[557] ACCIARRI	98D	L3	$e^+ e^- \to Z$
0.472±0.049±0.053		[558] ACCIARRI	98D	L3	$e^+ e^- \to Z$

$0.523 \pm 0.072 \pm 0.043$		[559] ABREU	97N	DLPH	$e^+e^- \rightarrow Z$
$0.493 \pm 0.042 \pm 0.027$		[557] ABREU	97N	DLPH	$e^+e^- \rightarrow Z$
$0.499 \pm 0.053 \pm 0.015$		[560] ABREU	97N	DLPH	$e^+e^- \rightarrow Z$
$0.480 \pm 0.040 \pm 0.051$		[556] ABREU	97N	DLPH	$e^+e^- \rightarrow Z$
$0.444 \pm 0.029 {}^{+0.020}_{-0.017}$		[557] ACKERSTAFF	97U	OPAL	$e^+e^- \rightarrow Z$
$0.430 \pm 0.043 {}^{+0.028}_{-0.030}$		[556] ACKERSTAFF	97V	OPAL	$e^+e^- \rightarrow Z$
$0.482 \pm 0.044 \pm 0.024$		[561] BUSKULIC	97D	ALEP	$e^+e^- \rightarrow Z$
$0.404 \pm 0.045 \pm 0.027$		[557] BUSKULIC	97D	ALEP	$e^+e^- \rightarrow Z$
$0.452 \pm 0.039 \pm 0.044$		[556] BUSKULIC	97D	ALEP	$e^+e^- \rightarrow Z$
$0.539 \pm 0.060 \pm 0.024$		[562] ALEXANDER	96V	OPAL	$e^+e^- \rightarrow Z$
$0.567 \pm 0.089 {}^{+0.029}_{-0.023}$		[563] ALEXANDER	96V	OPAL	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.516 \pm 0.016 \pm 0.010$		[564] AUBERT	02N	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
$0.463 \pm 0.008 \pm 0.016$		[548] ABE	01D	BELL	Repl. by HASTINGS 03
$0.444 \pm 0.028 \pm 0.028$		[565] ACCIARRI	98D	L3	$e^+e^- \rightarrow Z$
0.497 ± 0.035		[566] ABREU	97N	DLPH	$e^+e^- \rightarrow Z$
$0.467 \pm 0.022 {}^{+0.017}_{-0.015}$		[567] ACKERSTAFF	97V	OPAL	$e^+e^- \rightarrow Z$
0.446 ± 0.032		[568] BUSKULIC	97D	ALEP	$e^+e^- \rightarrow Z$
$0.531 {}^{+0.050}_{-0.046} \pm 0.078$		[569] ABREU	96Q	DLPH	Sup. by ABREU 97N
$0.496 {}^{+0.055}_{-0.051} \pm 0.043$		[556] ACCIARRI	96E	L3	Repl. by ACCIARRI 98D
$0.548 \pm 0.050 {}^{+0.023}_{-0.019}$		[570] ALEXANDER	96V	OPAL	$e^+e^- \rightarrow Z$
0.496 ± 0.046		[571] AKERS	95J	OPAL	Repl. by ACKERSTAFF 97V
$0.462 {}^{+0.040}_{-0.053} {}^{+0.052}_{-0.035}$		[556] AKERS	95J	OPAL	Repl. by ACKERSTAFF 97V
$0.50 \pm 0.12 \pm 0.06$		[559] ABREU	94M	DLPH	Sup. by ABREU 97N
$0.508 \pm 0.075 \pm 0.025$		[562] AKERS	94C	OPAL	Repl. by ALEXANDER 96V
$0.57 \pm 0.11 \pm 0.02$	153	[563] AKERS	94H	OPAL	Repl. by ALEXANDER 96V
$0.50 {}^{+0.07}_{-0.06} {}^{+0.11}_{-0.10}$		[556] BUSKULIC	94B	ALEP	Sup. by BUSKULIC 97D
$0.52 {}^{+0.10}_{-0.11} {}^{+0.04}_{-0.03}$		[563] BUSKULIC	93K	ALEP	Sup. by BUSKULIC 97D

[543] Events with a high transverse momentum lepton were removed and an inclusively reconstructed vertex was required.

[544] 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.

[545] 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-$\overline{B}^0$ mixing.

[546] ZHENG 03 data analyzed using partially reconstructed $\overline{B}^0 \rightarrow D^{*-}\pi^+$ decay and a flavor tag based on the charge of the lepton from the accompanying B decay.

[547] Uses a tagged sample of fully-reconstructed neutral B decays at $\Upsilon(4S)$.

[548] Measured based on the time evolution of dilepton events in $\Upsilon(4S)$ decays.

[549] Uses a tagged sample of B^0 decays reconstructed in the mode $B^0 \rightarrow D^*\ell\nu$.

[550] Uses a tagged sample of fully-reconstructed hadronic B^0 decays at $\Upsilon(4S)$.

[551] Data analyzed using partially reconstructed $\overline{B}^0 \rightarrow D^{*+} \ell^- \overline{\nu}$ decay and a combination of flavor tags from the rest of the event.
[552] Uses di-muon events.
[553] Uses jet-charge and lepton-flavor tagging.
[554] Uses $\ell^- D^{*+} - \ell$ events.
[555] Uses π-B in the same side.
[556] Uses ℓ-ℓ.
[557] Uses ℓ-Q_{hem}.
[558] Uses ℓ-ℓ with impact parameters.
[559] Uses $D^{*\pm}$-Q_{hem}.
[560] Uses $\pi_s^{\pm} \ell$-Q_{hem}.
[561] Uses $D^{*\pm}$-ℓ/Q_{hem}.
[562] Uses $D^{*\pm} \ell$-Q_{hem}.
[563] Uses $D^{*\pm}$-ℓ.
[564] AUBERT 02N result based on the same analysis and data sample reported in AUBERT 02I.
[565] ACCIARRI 98D combines results from ℓ-ℓ, ℓ-Q_{hem}, and ℓ-ℓ with impact parameters.
[566] ABREU 97N combines results from $D^{*\pm}$-Q_{hem}, ℓ-Q_{hem}, $\pi_s^{\pm} \ell$-Q_{hem}, and ℓ-ℓ.
[567] ACKERSTAFF 97V combines results from ℓ-ℓ, ℓ-Q_{hem}, D^*-ℓ, and $D^{*\pm}$-Q_{hem}.
[568] BUSKULIC 97D combines results from $D^{*\pm}$-ℓ/Q_{hem}, ℓ-Q_{hem}, and ℓ-ℓ.
[569] ABREU 96Q analysis performed using lepton, kaon, and jet-charge tags.
[570] ALEXANDER 96V combines results from $D^{*\pm}$-ℓ and $D^{*\pm} \ell$-Q_{hem}.
[571] AKERS 95J combines results from charge measurement, $D^{*\pm} \ell$-Q_{hem} and ℓ-ℓ.

$x_d = \Delta m_{B^0}/\Gamma_{B^0}$

The second "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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

The first "OUR EVALUATION" (0.771 ± 0.012), also provided by the HFAG, includes χ_d measured at $\Upsilon(4S)$.

VALUE	DOCUMENT ID
0.771±0.012 OUR EVALUATION	First
0.771±0.012 OUR EVALUATION	Second

CP VIOLATION PARAMETERS

$\text{Re}(\epsilon_{B^0})/(1+|\epsilon_{B^0}|^2)$

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 $\overline{B}^0$ decays.

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
0.5± 3.1 OUR AVERAGE				
1.2± 2.9±3.6	[572] AUBERT	02K	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
−3.2± 6.5	[573] BARATE	01D	ALEP	$e^+ e^- \rightarrow Z$
3.5±10.3±1.5	[574] JAFFE	01	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
1.2±13.8±3.2	[575] ABBIENDI	99J	OPAL	$e^+ e^- \rightarrow Z$
2 ± 7 ±3	[576] ACKERSTAFF	97U	OPAL	$e^+ e^- \rightarrow Z$

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

4 ±18 ±3	[577] BEHRENS	00B	CLE2	Repl. by JAFFE 01
< 45	[578] BARTELT	93	CLE2	$e^+e^- \to \Upsilon(4S)$

[572] AUBERT 02K uses the charge asymmetry in like-sign dilepton events.
[573] BARATE 01D measured by investigating time-dependent asymmetries in semileptonic and fully inclusive B^0_d decays.
[574] JAFFE 01 finds $a_{\ell\ell} = 0.013 \pm 0.050 \pm 0.005$ and combines with the previous BEHRENS 00B independent measurement.
[575] 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.
[576] 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 $\text{Im}(\delta B) = -0.020 \pm 0.016 \pm 0.006$.
[577] BEHRENS 00B uses high-momentum lepton tags and partially reconstructed $\overline{B}^0 \to D^{*+}\pi^-$, ρ^- decays to determine the flavor of the B meson.
[578] 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

$$\frac{P(\overline{B}^0 \to B^0) - P(B^0 \to \overline{B}^0)}{P(\overline{B}^0 \to B^0) + P(B^0 \to \overline{B}^0)},$$

the *CPT* invariant asymmetry between the oscillation probabilities $P(\overline{B}^0 \to B^0)$ and $P(B^0 \to \overline{B}^0)$.

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.005±0.012±0.014	[579] AUBERT	02K	BABR	$e^+e^- \to \Upsilon(4S)$

[579] AUBERT 02K uses the charge asymmetry in like-sign dilepton events.

$A_{CP}\ (B^0 \to K^+\pi^-)$

A_{CP} is defined as

$$\frac{B(\overline{B}^0 \to \overline{f}) - B(B^0 \to f)}{B(\overline{B}^0 \to \overline{f}) + B(B^0 \to f)},$$

the *CP*-violation charge asymmetry of exclusive B^0 and $\overline{B}^0$ decay.

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
−0.09 ±0.04 OUR AVERAGE				
−0.102±0.050±0.016	[580] AUBERT	02Q	BABR	$e^+e^- \to \Upsilon(4S)$
$-0.06 \pm 0.09 ^{+0.01}_{-0.02}$	[581] CASEY	02	BELL	$e^+e^- \to \Upsilon(4S)$
−0.04 ±0.16	[582] CHEN	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.07 ±0.08 ±0.02	[583] AUBERT	02D	BABR	Repl. by AUBERT 02Q
$0.044 ^{+0.186}_{-0.167} {}^{+0.018}_{-0.021}$	[584] ABE	01K	BELL	Repl. by CASEY 02
−0.19 ±0.10 ±0.03	[585] AUBERT	01E	BABR	Repl. by AUBERT 02Q

[580] Corresponds to 90% confidence range $-0.188 < A_{CP} < -0.016$.
[581] Corresponds to 90% confidence range $-0.21 < A_{CP} < +0.09$.
[582] Corresponds to 90% confidence range $-0.30 < A_{CP} < 0.22$.
[583] Corresponds to 90% confidence range $-0.21 < A_{CP} < 0.07$.
[584] Corresponds to 90% confidence range $-0.25 < A_{CP} < 0.37$.
[585] Corresponds to 90% confidence range $-0.35 < A_{CP} < -0.03$.

$A_{CP}(B^0 \to \rho^+ \pi^-)$

VALUE	DOCUMENT ID		TECN	COMMENT
$-0.18 \pm 0.08 \pm 0.03$	AUBERT	03T	BABR	$e^+ e^- \to \Upsilon(4S)$

$A_{CP}(B^0 \to \rho^+ K^-)$

VALUE	DOCUMENT ID		TECN	COMMENT
$0.28 \pm 0.17 \pm 0.08$	AUBERT	03T	BABR	$e^+ e^- \to \Upsilon(4S)$

$A_{CP}(B^0 \to K^*(892)^+ \pi^-)$

VALUE	DOCUMENT ID		TECN	COMMENT
$0.26^{+0.33}_{-0.34}{}^{+0.10}_{-0.08}$	[586] EISENSTEIN	03	CLE2	$e^+ e^- \to \Upsilon(4S)$

[586] Corresponds to 90% confidence range $-0.31 < A_{CP} < 0.78$.

$A_{CP}(B^0 \to K^*(892)^0 \phi)$

VALUE	DOCUMENT ID		TECN	COMMENT
0.05 ± 0.10 OUR AVERAGE				
$0.04 \pm 0.12 \pm 0.02$	AUBERT	03V	BABR	$e^+ e^- \to \Upsilon(4S)$
$0.07 \pm 0.15^{+0.05}_{-0.03}$	[587] CHEN	03B	BELL	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.00 \pm 0.27 \pm 0.03$	[588] AUBERT	02E	BABR	Repl. by AUBERT 03V

[587] Corresponds to 90% confidence range $-0.18 < A_{CP} < 0.33$.
[588] Corresponds to 90% confidence range $-0.44 < A_{CP} < 0.44$.

$A_{CP}(B^0 \to D^*(2010)^+ D^-)$

VALUE	DOCUMENT ID		TECN	COMMENT
$-0.03 \pm 0.11 \pm 0.05$	AUBERT	03J	BABR	$e^+ e^- \to \Upsilon(4S)$

$C_{\pi\pi}$ $(B^0 \to \pi^+ \pi^-)$

$C_{\pi\pi}$ is defined as $(1-|\lambda|^2)/(1+|\lambda|^2)$, where the quantity $\lambda = q/p\, \overline{A}_f/A_f$ is a phase convention independent observable quantity for the final state f. For details, see the note on "CP Violation in B Decay Standard Model Predictions" in the B^0 Particle Listings above.

VALUE	DOCUMENT ID		TECN	COMMENT
-0.51 ± 0.23 OUR AVERAGE	Error includes scale factor of 1.2.			
$-0.77 \pm 0.27 \pm 0.08$	[589] ABE	03G	BELL	$e^+ e^- \to \Upsilon(4S)$
$-0.30 \pm 0.25 \pm 0.04$	[590] AUBERT	02Q	BABR	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$-0.94^{+0.31}_{-0.25} \pm 0.09$	[589] ABE	02M	BELL	Repl. by ABE 03G
$-0.25^{+0.45}_{-0.47} \pm 0.14$	[591] AUBERT	02D	BABR	Repl. by AUBERT 02Q

[589] Papers report $A_{\pi\pi}$ which has opposite sign to the convention used in this quantity ($C_{\pi\pi}$). We have done the conversion here.
[590] Corresponds to 90% confidence range $-0.72 < C_{\pi\pi} < 0.12$.
[591] Corresponds to 90% confidence range $-1.0 < C_{\pi\pi} < 0.47$.

$S_{\pi\pi}$ ($B^0 \to \pi^+\pi^-$)

$S_{\pi\pi} = 2\text{Im}\lambda/(1+|\lambda|^2)$, see the note in the $C_{\pi\pi}$ datablock above.

VALUE	DOCUMENT ID		TECN	COMMENT
-0.5 ± 0.6 OUR AVERAGE	Error includes scale factor of 2.3.			
$-1.23\pm0.41^{+0.08}_{-0.07}$	ABE	03G	BELL	$e^+e^- \to \Upsilon(4S)$
$0.02\pm0.34\pm0.05$	[592] AUBERT	02Q	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$-1.21^{+0.38}_{-0.27}{}^{+0.16}_{-0.13}$	ABE	02M	BELL	Repl. by ABE 03G
$0.03^{+0.52}_{-0.56}\pm0.11$	[593] AUBERT	02D	BABR	Repl. by AUBERT 02Q

[592] Corresponds to 90% confidence range $-0.54 < S_{\pi\pi} < 0.58$.
[593] Corresponds to 90% confidence range $-0.89 < S_{\pi\pi} < 0.85$.

$C_{\rho\pi}$ ($B^0 \to \rho^+\pi^-$)

VALUE	DOCUMENT ID		TECN	COMMENT
$0.36\pm0.18\pm0.04$	AUBERT	03T	BABR	$e^+e^- \to \Upsilon(4S)$

$S_{\rho\pi}$ ($B^0 \to \rho^+\pi^-$)

VALUE	DOCUMENT ID		TECN	COMMENT
$0.19\pm0.24\pm0.03$	AUBERT	03T	BABR	$e^+e^- \to \Upsilon(4S)$

$C_{\eta'(958)K}$ ($B^0 \to \eta'(958)K^0_S$)

VALUE	DOCUMENT ID		TECN	COMMENT
0.04 ± 0.13 OUR AVERAGE				
$0.01\pm0.16\pm0.04$	[594] ABE	03H	BELL	$e^+e^- \to \Upsilon(4S)$
$0.10\pm0.22\pm0.04$	AUBERT	03W	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$-0.26\pm0.22\pm0.03$	[594] ABE	03C	BELL	Repl. by ABE 03H
$-0.13\pm0.32^{+0.06}_{-0.09}$	[594] CHEN	02B	BELL	Repl. by ABE 03C

[594] BELLE Collab. quotes $A_{\eta'(958)K^0_S}$ which is equal to $-C_{\eta'(958)K^0_S}$.

$S_{\eta'(958)K}$ ($B^0 \to \eta'(958)K^0_S$)

VALUE	DOCUMENT ID		TECN	COMMENT
0.27 ± 0.21 OUR AVERAGE				
$0.43\pm0.27\pm0.05$	ABE	03H	BELL	$e^+e^- \to \Upsilon(4S)$
$0.02\pm0.34\pm0.03$	AUBERT	03W	BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.71\pm0.37^{+0.05}_{-0.06}$	ABE	03C	BELL	Repl. by ABE 03H
$0.28\pm0.55^{+0.07}_{-0.08}$	CHEN	02B	BELL	Repl. by ABE 03C

$C_{\phi K^0_S}$ ($B^0 \to \phi K^0_S$)

VALUE	DOCUMENT ID		TECN	COMMENT
0.15±0.29±0.07	[595] ABE	03H	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.56±0.41±0.16	[595] ABE	03C	BELL	Repl. by ABE 03H

[595] BELLE Collab. quotes $A_{\phi K^0_S}$ which is equal to $-C_{\phi K^0_S}$.

$S_{\phi K^0_S}$ ($B^0 \to \phi K^0_S$)

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{-0.96\pm0.50^{+0.09}_{-0.11}}$	ABE	03H	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.73±0.64±0.22	ABE	03C	BELL	Repl. by ABE 03H

$C_{K^+K^-K^0_S}$ ($B^0 \to K^+K^-K^0_S$)

VALUE	DOCUMENT ID		TECN	COMMENT
0.17±0.16±0.04	[596] ABE	03H	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.40\pm0.33^{+0.28}_{-0.10}$	[596] ABE	03C	BELL	Repl. by ABE 03H

[596] BELLE Collab. quotes $A_{K^+K^-K^0_S}$ which is equal to $-C_{K^+K^-K^0_S}$.

$S_{K^+K^-K^0_S}$ ($B^0 \to K^+K^-K^0_S$)

VALUE	DOCUMENT ID		TECN	COMMENT
−0.51±0.26±0.05	ABE	03H	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.49±0.43±0.11	ABE	03C	BELL	Repl. by ABE 03H

$C_{D^*(2010)^-D^+}$ ($B^0 \to D^*(2010)^-D^+$)

VALUE	DOCUMENT ID		TECN	COMMENT
−0.22±0.37±0.10	AUBERT	03J	BABR	$e^+e^- \to \Upsilon(4S)$

$S_{D^*(2010)^-D^+}$ ($B^0 \to D^*(2010)^-D^+$)

VALUE	DOCUMENT ID		TECN	COMMENT
−0.24±0.69±0.12	AUBERT	03J	BABR	$e^+e^- \to \Upsilon(4S)$

$C_{D^*(2010)^+D^-}$ ($B^0 \to D^*(2010)^+D^-$)

VALUE	DOCUMENT ID		TECN	COMMENT
−0.47±0.40±0.12	AUBERT	03J	BABR	$e^+e^- \to \Upsilon(4S)$

$S_{D^*(2010)^+D^-}$ ($B^0 \to D^*(2010)^+D^-$)

VALUE	DOCUMENT ID		TECN	COMMENT
−0.82±0.75±0.14	AUBERT	03J	BABR	$e^+e^- \to \Upsilon(4S)$

$C_{J/\psi(1S)\pi^0}$ ($B^0 \rightarrow J/\psi(1S)\pi^0$)

VALUE	DOCUMENT ID		TECN	COMMENT
0.38±0.41±0.09	AUBERT	03N	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

$S_{J/\psi(1S)\pi^0}$ ($B^0 \rightarrow J/\psi(1S)\pi^0$)

VALUE	DOCUMENT ID		TECN	COMMENT
0.05±0.49±0.16	AUBERT	03N	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

$\Delta C_{\rho\pi}$ ($B^0 \rightarrow \rho^+\pi^-$)

$\Delta C_{\rho\pi}$ describes the asymmetry between the rates $\Gamma(B^0 \rightarrow \rho^+\pi^-) + \Gamma(\overline{B}^0\rho^-\pi^+)$ and $\Gamma(B^0 \rightarrow \rho^-\pi^+) + \Gamma(\overline{B}^0 \rightarrow \rho^+\pi^-)$.

VALUE	DOCUMENT ID		TECN	COMMENT
$0.28^{+0.18}_{-0.19}\pm0.04$	AUBERT	03T	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

$\Delta S_{\rho\pi}$ ($B^0 \rightarrow \rho^+\pi^-$)

$\Delta S_{\rho\pi}$ is related to the strong phase difference between the amplitudes contributing to $B^0 \rightarrow \rho^+\pi^-$.

VALUE	DOCUMENT ID		TECN	COMMENT
0.15±0.25±0.03	AUBERT	03T	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

$|\lambda|$ ($B^0 \rightarrow c\overline{c}K^0$)

The same λ quantity, defined in the $C_{\pi\pi}$ datablock above.

"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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

VALUE	DOCUMENT ID		TECN	COMMENT
0.949±0.045 OUR EVALUATION				
0.95 ±0.04 OUR AVERAGE				
0.950±0.049±0.025	[597] ABE	02Z	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
0.948±0.051±0.030	[598] AUBERT	02P	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

[597] Measured with both $\eta_f = \pm1$ samples.

[598] Measured with the high purity of $\eta_f = -1$ samples.

$|\lambda|$ ($B^0 \rightarrow D^{*+}D^{*-}$)

The same λ quantity, defined in the $C_{\pi\pi}$ datablock above, but in C-even final state.

VALUE	DOCUMENT ID		TECN	COMMENT
0.75±0.19±0.02	AUBERT	03Q	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

Im(λ) ($B^0 \rightarrow D^{*+}D^{*-}$)

The same λ quantity, defined in the $C_{\pi\pi}$ datablock above, but in C-even final state.

VALUE	DOCUMENT ID		TECN	COMMENT
0.05±0.29±0.10	AUBERT	03Q	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

sin(2β)

For a discussion of CP violation, see the note on "CP Violation in B Decay Standard Model Predictions" in the B^0 Particle Listings above. sin(2β) is a measure of the CP-violating amplitude in the $B^0_d \to J/\psi(1S) K^0_S$.

"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 (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

VALUE	DOCUMENT ID		TECN	COMMENT
0.731±0.056 OUR EVALUATION				
0.73 ±0.05 OUR AVERAGE				
0.719±0.074±0.035	[599] ABE	02Z	BELL	$e^+ e^- \to \Upsilon(4S)$
0.741±0.067±0.034	[600] AUBERT	02P	BABR	$e^+ e^- \to \Upsilon(4S)$
0.79 $^{+0.41}_{-0.44}$	[601] AFFOLDER	00C	CDF	$p\overline{p}$ at 1.8 TeV
0.84 $^{+0.82}_{-1.04}$ ±0.16	[602] BARATE	00Q	ALEP	$e^+ e^- \to Z$
3.2 $^{+1.8}_{-2.0}$ ±0.5	[603] ACKERSTAFF	98Z	OPAL	$e^+ e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.99 ±0.14 ±0.06	[604] ABE	02U	BELL	$e^+ e^- \to \Upsilon(4S)$
0.59 ±0.14 ±0.05	[605] AUBERT	02N	BABR	$e^+ e^- \to \Upsilon(4S)$
0.58 $^{+0.32}_{-0.34}$ $^{+0.09}_{-0.10}$	ABASHIAN	01	BELL	Repl. by ABE 01G
0.99 ±0.14 ±0.06	[606] ABE	01G	BELL	Repl by ABE 02Z
0.34 ±0.20 ±0.05	AUBERT	01	BABR	Repl. by AUBERT 01B
0.59 ±0.14 ±0.05	[606] AUBERT	01B	BABR	Repl. by AUBERT 02P
1.8 ±1.1 ±0.3	[607] ABE	98U	CDF	Repl. by AFFOLDER 00C

[599] ABE 02Z result is based on 85 × 10^6 $B\overline{B}$ pairs.
[600] AUBERT 02P result is based on 88 × 10^6 $B\overline{B}$ pairs.
[601] AFFOLDER 00C uses about 400 $B^0 \to J/\psi(1S) K^0_S$ 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.
[602] BARATE 00Q uses 23 candidates for $B^0 \to J/\psi(1S) K^0_S$ decays. A combination of jet-charge, vertex-charge, and same-side tagging techniques were used to determine the B^0 production flavor.
[603] ACKERSTAFF 98Z uses 24 candidates for $B^0_d \to J/\psi(1S) K^0_S$ decay. A combination of jet-charge and vertex-charge techniques were used to tag the B^0_d production flavor.
[604] ABE 02U result is based on the same analysis and data sample reported in ABE 01G.
[605] AUBERT 02N result based on the same analysis and data sample reported in AUBERT 01B.
[606] First observation of CP violation in B^0 meson system.
[607] ABE 98U uses 198 ± 17 $B^0_d \to J/\psi(1S) K^0$ events. The production flavor of B^0 was determined using the same side tagging technique.

$B^0 \to D^{*-} \ell^+ \nu_\ell$ FORM FACTORS

R_1 (form factor ratio $\sim V/A_1$)

VALUE	DOCUMENT ID		TECN	COMMENT
1.18±0.30±0.12	DUBOSCQ	96	CLE2	$e^+ e^- \to \Upsilon(4S)$

R_2 (form factor ratio $\sim A_2/A_1$)

VALUE	DOCUMENT ID		TECN	COMMENT
0.71±0.22±0.07	DUBOSCQ	96	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

$\rho^2_{A_1}$ (form factor slope)

VALUE	DOCUMENT ID		TECN	COMMENT
0.91±0.15±0.06	DUBOSCQ	96	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

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ANASTASSOV	00	PRL 84 1393	A. Anastassov *et al.*	(CLEO Collab.)
ARTUSO	00	PRL 84 4292	M. Artuso *et al.*	(CLEO Collab.)

AVERY	00	PR D62 051101	P. Avery *et al.*	(CLEO Collab.)
BARATE	00Q	PL B492 259	R. Barate *et al.*	(ALEPH Collab.)
BARATE	00R	PL B492 275	R. Barate *et al.*	(ALEPH Collab.)
BEHRENS	00	PR D61 052001	B.H. Behrens *et al.*	(CLEO Collab.)
BEHRENS	00B	PL B490 36	B.H. Behrens *et al.*	(CLEO Collab.)
BERGFELD	00B	PR D62 091102R	T. Bergfeld *et al.*	(CLEO Collab.)
CHEN	00	PRL 85 525	S. Chen *et al.*	(CLEO Collab.)
COAN	00	PRL 84 5283	T.E. Coan *et al.*	(CLEO Collab.)
CRONIN-HEN...	00	PRL 85 515	D. Cronin-Hennessy *et al.*	(CLEO Collab.)
CSORNA	00	PR D61 111101	S.E. Csorna *et al.*	(CLEO Collab.)
JESSOP	00	PRL 85 2881	C.P. Jessop *et al.*	(CLEO Collab.)
LIPELES	00	PR D62 032005	E. Lipeles *et al.*	(CLEO Collab.)
RICHICHI	00	PRL 85 520	S.J. Richichi *et al.*	(CLEO Collab.)
ABBIENDI	99J	EPJ C12 609	G. Abbiendi *et al.*	(OPAL Collab.)
ABE	99K	PR D60 051101	F. Abe *et al.*	(CDF Collab.)
ABE	99Q	PR D60 072003	F. Abe *et al.*	(CDF Collab.)
AFFOLDER	99B	PRL 83 3378	T. Affolder *et al.*	(CDF Collab.)
AFFOLDER	99C	PR D60 112004	T. Affolder *et al.*	(CDF Collab.)
ARTUSO	99	PRL 82 3020	M. Artuso *et al.*	(CLEO Collab.)
BARTELT	99	PRL 82 3746	J. Bartelt *et al.*	(CLEO Collab.)
COAN	99	PR D59 111101	T.E. Coan *et al.*	(CLEO Collab.)
ABBOTT	98B	PL B423 419	B. Abbott *et al.*	(D0 Collab.)
ABE	98	PR D57 R3811	F. Abe *et al.*	(CDF Collab.)
ABE	98B	PR D57 5382	F. Abe *et al.*	(CDF Collab.)
ABE	98C	PRL 80 2057	F. Abe *et al.*	(CDF Collab.)
Also	99C	PR D59 032001	F. Abe *et al.*	(CDF Collab.)
ABE	98O	PR D58 072001	F. Abe *et al.*	(CDF Collab.)
ABE	98Q	PR D58 092002	F. Abe *et al.*	(CDF Collab.)
ABE	98U	PRL 81 5513	F. Abe *et al.*	(CDF Collab.)
ABE	98V	PRL 81 5742	F. Abe *et al.*	(CDF Collab.)
ACCIARRI	98D	EPJ C5 195	M. Acciarri *et al.*	(L3 Collab.)
ACCIARRI	98S	PL B438 417	M. Acciarri *et al.*	(L3 Collab.)
ACKERSTAFF	98Z	EPJ C5 379	K. Ackerstaff *et al.*	(OPAL Collab.)
BARATE	98Q	EPJ C4 387	R. Barate *et al.*	(ALEPH Collab.)
BEHRENS	98	PRL 80 3710	B.H. Behrens *et al.*	(CLEO Collab.)
BERGFELD	98	PRL 81 272	T. Bergfeld *et al.*	(CLEO Collab.)
BRANDENB...	98	PRL 80 2762	G. Brandenbrug *et al.*	(CLEO Collab.)
GODANG	98	PRL 80 3456	R. Godang *et al.*	(CLEO Collab.)
NEMATI	98	PR D57 5363	B. Nemati *et al.*	(CLEO Collab.)
ABE	97J	PRL 79 590	K. Abe *et al.*	(SLD Collab.)
ABREU	97F	ZPHY C74 19	P. Abreu *et al.*	(DELPHI Collab.)
Also	97K	ZPHY C75 579 erratum	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	97N	ZPHY C76 579	P. Abreu *et al.*	(DELPHI Collab.)
ACCIARRI	97B	PL B391 474	M. Acciarri *et al.*	(L3 Collab.)
ACCIARRI	97C	PL B391 481	M. Acciarri *et al.*	(L3 Collab.)
ACKERSTAFF	97G	PL B395 128	K. Ackerstaff *et al.*	(OPAL Collab.)
ACKERSTAFF	97U	ZPHY C76 401	K. Ackerstaff *et al.*	(OPAL Collab.)
ACKERSTAFF	97V	ZPHY C76 417	K. Ackerstaff *et al.*	(OPAL Collab.)
ARTUSO	97	PL B399 321	M. Artuso *et al.*	(CLEO Collab.)
ASNER	97	PRL 79 799	D. Asner *et al.*	(CLEO Collab.)
ATHANAS	97	PRL 79 2208	M. Athanas *et al.*	(CLEO Collab.)
BUSKULIC	97	PL B395 373	D. Buskulic *et al.*	(ALEPH Collab.)
BUSKULIC	97D	ZPHY C75 397	D. Buskulic *et al.*	(ALEPH Collab.)
FU	97	PRL 79 3125	X. Fu *et al.*	(CLEO Collab.)
JESSOP	97	PRL 79 4533	C.P. Jessop *et al.*	(CLEO Collab.)
ABE	96B	PR D53 3496	F. Abe *et al.*	(CDF Collab.)
ABE	96C	PRL 76 4462	F. Abe *et al.*	(CDF Collab.)
ABE	96H	PRL 76 2015	F. Abe *et al.*	(CDF Collab.)
ABE	96L	PRL 76 4675	F. Abe *et al.*	(CDF Collab.)
ABE	96Q	PR D54 6596	F. Abe *et al.*	(CDF Collab.)
ABREU	96P	ZPHY C71 539	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	96Q	ZPHY C72 17	P. Abreu *et al.*	(DELPHI Collab.)
ACCIARRI	96E	PL B383 487	M. Acciarri *et al.*	(L3 Collab.)
ADAM	96D	ZPHY C72 207	W. Adam *et al.*	(DELPHI Collab.)
ALBRECHT	96D	PL B374 256	H. Albrecht *et al.*	(ARGUS Collab.)
ALEXANDER	96T	PRL 77 5000	J.P. Alexander *et al.*	(CLEO Collab.)
ALEXANDER	96V	ZPHY C72 377	G. Alexander *et al.*	(OPAL Collab.)
ASNER	96	PR D53 1039	D.M. Asner *et al.*	(CLEO Collab.)
BARISH	96B	PRL 76 1570	B.C. Barish *et al.*	(CLEO Collab.)
BISHAI	96	PL B369 186	M. Bishai *et al.*	(CLEO Collab.)
BUSKULIC	96J	ZPHY C71 31	D. Buskulic *et al.*	(ALEPH Collab.)

BUSKULIC	96V	PL B384 471	D. Buskulic *et al.*	(ALEPH Collab.)
DUBOSCQ	96	PRL 76 3898	J.E. Duboscq *et al.*	(CLEO Collab.)
GIBAUT	96	PR D53 4734	D. Gibaut *et al.*	(CLEO Collab.)
PDG	96	PR D54 1	R. M. Barnett *et al.*	
ABE	95Z	PRL 75 3068	F. Abe *et al.*	(CDF Collab.)
ABREU	95N	PL B357 255	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	95Q	ZPHY C68 13	P. Abreu *et al.*	(DELPHI Collab.)
ACCIARRI	95H	PL B363 127	M. Acciarri *et al.*	(L3 Collab.)
ACCIARRI	95I	PL B363 137	M. Acciarri *et al.*	(L3 Collab.)
ADAM	95	ZPHY C68 363	W. Adam *et al.*	(DELPHI Collab.)
AKERS	95J	ZPHY C66 555	R. Akers *et al.*	(OPAL Collab.)
AKERS	95T	ZPHY C67 379	R. Akers *et al.*	(OPAL Collab.)
ALEXANDER	95	PL B341 435	J. Alexander *et al.*	(CLEO Collab.)
Also	95C	PL B347 469 (erratum)	J. Alexander *et al.*	(CLEO Collab.)
BARISH	95	PR D51 1014	B.C. Barish *et al.*	(CLEO Collab.)
BUSKULIC	95N	PL B359 236	D. Buskulic *et al.*	(ALEPH Collab.)
ABE	94D	PRL 72 3456	F. Abe *et al.*	(CDF Collab.)
ABREU	94M	PL B338 409	P. Abreu *et al.*	(DELPHI Collab.)
AKERS	94C	PL B327 411	R. Akers *et al.*	(OPAL Collab.)
AKERS	94H	PL B336 585	R. Akers *et al.*	(OPAL Collab.)
AKERS	94J	PL B337 196	R. Akers *et al.*	(OPAL Collab.)
AKERS	94L	PL B337 393	R. Akers *et al.*	(OPAL Collab.)
ALAM	94	PR D50 43	M.S. Alam *et al.*	(CLEO Collab.)
ALBRECHT	94	PL B324 249	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	94G	PL B340 217	H. Albrecht *et al.*	(ARGUS Collab.)
AMMAR	94	PR D49 5701	R. Ammar *et al.*	(CLEO Collab.)
ATHANAS	94	PRL 73 3503	M. Athanas *et al.*	(CLEO Collab.)
Also	95	PRL 74 3090 (erratum)	M. Athanas *et al.*	(CLEO Collab.)
BUSKULIC	94B	PL B322 441	D. Buskulic *et al.*	(ALEPH Collab.)
PDG	94	PR D50 1173	L. Montanet *et al.*	(CERN, LBL, BOST+)
PROCARIO	94	PRL 73 1472	M. Procario *et al.*	(CLEO Collab.)
STONE	94	HEPSY 93-11	S. Stone	
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ABREU	93D	ZPHY C57 181	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	93G	PL B312 253	P. Abreu *et al.*	(DELPHI Collab.)
ACTON	93C	PL B307 247	P.D. Acton *et al.*	(OPAL Collab.)
ALBRECHT	93	ZPHY C57 533	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	93E	ZPHY C60 11	H. Albrecht *et al.*	(ARGUS Collab.)
ALEXANDER	93B	PL B319 365	J. Alexander *et al.*	(CLEO Collab.)
AMMAR	93	PRL 71 674	R. Ammar *et al.*	(CLEO Collab.)
BARTELT	93	PRL 71 1680	J.E. Bartelt *et al.*	(CLEO Collab.)
BATTLE	93	PRL 71 3922	M. Battle *et al.*	(CLEO Collab.)
BEAN	93B	PRL 70 2681	A. Bean *et al.*	(CLEO Collab.)
BUSKULIC	93D	PL B307 194	D. Buskulic *et al.*	(ALEPH Collab.)
Also	94H	PL B325 537 (errata)	D. Buskulic *et al.*	(ALEPH Collab.)
BUSKULIC	93K	PL B313 498	D. Buskulic *et al.*	(ALEPH Collab.)
SANGHERA	93	PR D47 791	S. Sanghera *et al.*	(CLEO Collab.)
ALBRECHT	92C	PL B275 195	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	92G	ZPHY C54 1	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	92L	ZPHY C55 357	H. Albrecht *et al.*	(ARGUS Collab.)
BORTOLETTO	92	PR D45 21	D. Bortoletto *et al.*	(CLEO Collab.)
HENDERSON	92	PR D45 2212	S. Henderson *et al.*	(CLEO Collab.)
KRAMER	92	PL B279 181	G. Kramer, W.F. Palmer	(HAMB, OSU)
ALBAJAR	91C	PL B262 163	C. Albajar *et al.*	(UA1 Collab.)
ALBAJAR	91E	PL B273 540	C. Albajar *et al.*	(UA1 Collab.)
ALBRECHT	91B	PL B254 288	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	91C	PL B255 297	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	91E	PL B262 148	H. Albrecht *et al.*	(ARGUS Collab.)
BERKELMAN	91	ARNPS 41 1	K. Berkelman, S. Stone	(CORN, SYRA)
"Decays of B Mesons"				
FULTON	91	PR D43 651	R. Fulton *et al.*	(CLEO Collab.)
ALBRECHT	90B	PL B241 278	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	90J	ZPHY C48 543	H. Albrecht *et al.*	(ARGUS Collab.)
ANTREASYAN	90B	ZPHY C48 553	D. Antreasyan *et al.*	(Crystal Ball Collab.)
BORTOLETTO	90	PRL 64 2117	D. Bortoletto *et al.*	(CLEO Collab.)
ELSEN	90	ZPHY C46 349	E. Elsen *et al.*	(JADE Collab.)
ROSNER	90	PR D42 3732	J.L. Rosner	
WAGNER	90	PRL 64 1095	S.R. Wagner *et al.*	(Mark II Collab.)
ALBRECHT	89C	PL B219 121	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	89G	PL B229 304	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	89J	PL B229 175	H. Albrecht *et al.*	(ARGUS Collab.)

ALBRECHT	89L	PL B232 554	H. Albrecht *et al.*	(ARGUS Collab.)
ARTUSO	89	PRL 62 2233	M. Artuso *et al.*	(CLEO Collab.)
AVERILL	89	PR D39 123	D.A. Averill *et al.*	(HRS Collab.)
AVERY	89B	PL B223 470	P. Avery *et al.*	(CLEO Collab.)
BEBEK	89	PRL 62 8	C. Bebek *et al.*	(CLEO Collab.)
BORTOLETTO	89	PRL 62 2436	D. Bortoletto *et al.*	(CLEO Collab.)
BORTOLETTO	89B	PRL 63 1667	D. Bortoletto *et al.*	(CLEO Collab.)
ALBRECHT	88F	PL B209 119	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	88K	PL B215 424	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	87C	PL B185 218	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	87D	PL B199 451	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	87I	PL B192 245	H. Albrecht *et al.*	(ARGUS Collab.)
ALBRECHT	87J	PL B197 452	H. Albrecht *et al.*	(ARGUS Collab.)
AVERY	87	PL B183 429	P. Avery *et al.*	(CLEO Collab.)
BEAN	87B	PRL 58 183	A. Bean *et al.*	(CLEO Collab.)
BEBEK	87	PR D36 1289	C. Bebek *et al.*	(CLEO Collab.)
ALAM	86	PR D34 3279	M.S. Alam *et al.*	(CLEO Collab.)
ALBRECHT	86F	PL B182 95	H. Albrecht *et al.*	(ARGUS Collab.)
PDG	86	PL 170B	M. Aguilar-Benitez *et al.*	(CERN, CIT+)
CHEN	85	PR D31 2386	A. Chen *et al.*	(CLEO Collab.)
HAAS	85	PRL 55 1248	J. Haas *et al.*	(CLEO Collab.)
AVERY	84	PRL 53 1309	P. Avery *et al.*	(CLEO Collab.)
GILES	84	PR D30 2279	R. Giles *et al.*	(CLEO Collab.)
BEHRENDS	83	PRL 50 881	S. Behrends *et al.*	(CLEO Collab.)