$B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE

NODE=S051

$B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE MEAN LIFE

NODE=S051T

NODE=S051T

Each measurement of the B mean life is an average over an admixture of various bottom mesons and baryons which decay weakly. Different techniques emphasize different admixtures of produced particles, which could result in a different B mean life.

"OUR EVALUATION" is an average using rescaled values of the data listed below. This is a weighted average of the lifetimes of the five main b-hadron species (B^+, B^0, B^0_{sH}, B^0_{sL}, and Λ_b) that assumes the production fractions in Z decays (given at the end of this section) and equal production fractions of B^0_{sH} and B^0_{sL} mesons.

NODE=S051T

VALUE (10^{-12} s)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.5673±0.0029 OUR EVALUATION		(Produced by HFLAV)			
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.570 ±0.005 ±0.008		[1] ABDALLAH	04E	DLPH	$e^+e^- \to Z$
1.533 ±0.015 $^{+0.035}_{-0.031}$		[2] ABE	98B	CDF	$p\overline{p}$ at 1.8 TeV
1.549 ±0.009 ±0.015		[3] ACCIARRI	98	L3	$e^+e^- \to Z$
1.611 ±0.010 ±0.027		[4] ACKERSTAFF	97F	OPAL	$e^+e^- \to Z$
1.582 ±0.011 ±0.027		[4] ABREU	96E	DLPH	$e^+e^- \to Z$
1.575 ±0.010 ±0.026		[5] ABREU	96E	DLPH	$e^+e^- \to Z$
1.533 ±0.013 ±0.022	29.8k	[6] BUSKULIC	96F	ALEP	$e^+e^- \to Z$
1.564 ±0.030 ±0.036		[7] ABE,K	95B	SLD	$e^+e^- \to Z$
1.542 ±0.021 ±0.045		[8] ABREU	94L	DLPH	$e^+e^- \to Z$
1.50 $^{+0.24}_{-0.21}$ ±0.03		[9] ABREU	94P	DLPH	$e^+e^- \to Z$
1.46 ±0.06 ±0.06	5344	[10] ABE	93J	CDF	Repl. by ABE 98B
1.23 $^{+0.14}_{-0.13}$ ±0.15	188	[11] ABREU	93D	DLPH	Sup. by ABREU 94L
1.49 ±0.11 ±0.12	253	[12] ABREU	93G	DLPH	Sup. by ABREU 94L
1.51 $^{+0.16}_{-0.14}$ ±0.11	130	[13] ACTON	93C	OPAL	$e^+e^- \to Z$
1.523 ±0.034 ±0.038	5372	[14] ACTON	93L	OPAL	$e^+e^- \to Z$
1.535 ±0.035 ±0.028	7357	[14] ADRIANI	93K	L3	Repl. by ACCIARRI 98
1.511 ±0.022 ±0.078		[15] BUSKULIC	93O	ALEP	$e^+e^- \to Z$
1.28 ±0.10		[16] ABREU	92	DLPH	Sup. by ABREU 94L
1.37 ±0.07 ±0.06	1354	[17] ACTON	92	OPAL	Sup. by ACTON 93L
1.49 ±0.03 ±0.06		[18] BUSKULIC	92F	ALEP	Sup. by BUSKULIC 96F
1.35 $^{+0.19}_{-0.17}$ ±0.05		[19] BUSKULIC	92G	ALEP	$e^+e^- \to Z$
1.32 ±0.08 ±0.09	1386	[20] ADEVA	91H	L3	Sup. by ADRIANI 93K
1.32 $^{+0.31}_{-0.25}$ ±0.15	37	[21] ALEXANDER	91G	OPAL	$e^+e^- \to Z$
1.29 ±0.06 ±0.10	2973	[22] DECAMP	91C	ALEP	Sup. by BUSKULIC 92F
1.36 $^{+0.25}_{-0.23}$		[23] HAGEMANN	90	JADE	E^{ee}_{cm}= 35 GeV
1.13 ±0.15		[24] LYONS	90	RVUE	
1.35 ±0.10 ±0.24		BRAUNSCH...	89B	TASS	E^{ee}_{cm}= 35 GeV
0.98 ±0.12 ±0.13		ONG	89	MRK2	E^{ee}_{cm}= 29 GeV
1.17 $^{+0.27}_{-0.22}$ $^{+0.17}_{-0.16}$		KLEM	88	DLCO	E^{ee}_{cm}= 29 GeV
1.29 ±0.20 ±0.21		[25] ASH	87	MAC	E^{ee}_{cm}= 29 GeV
1.02 $^{+0.42}_{-0.39}$	301	[26] BROM	87	HRS	E^{ee}_{cm}= 29 GeV

NODE=S051T

→ UNCHECKED ←

OCCUR=2

[1] Measurement performed using an inclusive reconstruction and B flavor identification technique. NODE=S051T;LINKAGE=AB

[2] Measured using inclusive $J/\psi(1S) \to \mu^+\mu^-$ vertex. NODE=S051T;LINKAGE=CD

[3] ACCIARRI 98 uses inclusively reconstructed secondary vertex and lepton impact parameter. NODE=S051T;LINKAGE=S

[4] ACKERSTAFF 97F uses inclusively reconstructed secondary vertices. NODE=S051T;LINKAGE=R1

[5] Combines ABREU 96E secondary vertex result with ABREU 94L impact parameter result. NODE=S051T;LINKAGE=R2

[6] BUSKULIC 96F analyzed using 3D impact parameter. NODE=S051T;LINKAGE=R

[7] ABE,K 95B uses an inclusive topological technique. NODE=S051T;LINKAGE=N

[8] ABREU 94L uses charged particle impact parameters. Their result from inclusively reconstructed secondary vertices is superseded by ABREU 96E. NODE=S051T;LINKAGE=FA

[9] From proper time distribution of $b \rightarrow J/\psi(1S)$ anything. NODE=S051T;LINKAGE=F
[10] ABE 93J analyzed using $J/\psi(1S) \rightarrow \mu\mu$ vertices. NODE=S051T;LINKAGE=P
[11] ABREU 93D data analyzed using $D\,/\,D^{*}\,\ell$ anything event vertices. NODE=S051T;LINKAGE=CC
[12] ABREU 93G data analyzed using charged and neutral vertices. NODE=S051T;LINKAGE=BC
[13] ACTON 93C analysed using $D\,/\,D^{*}\,\ell$ anything event vertices. NODE=S051T;LINKAGE=A
[14] ACTON 93L and ADRIANI 93K analyzed using lepton (e and μ) impact parameter at Z. NODE=S051T;LINKAGE=M
[15] BUSKULIC 93O analyzed using dipole method. NODE=S051T;LINKAGE=O
[16] ABREU 92 is combined result of muon and hadron impact parameter analyses. Hadron tracks gave $(12.7 \pm 0.4 \pm 1.2) \times 10^{-13}$ s for an admixture of B species weighted by production fraction and mean charge multiplicity, while muon tracks gave $(13.0 \pm 1.0 \pm 0.8) \times 10^{-13}$ s for an admixture weighted by production fraction and semileptonic branching fraction. NODE=S051T;LINKAGE=H
[17] ACTON 92 is combined result of muon and electron impact parameter analyses. NODE=S051T;LINKAGE=L
[18] BUSKULIC 92F uses the lepton impact parameter distribution for data from the 1991 run. NODE=S051T;LINKAGE=EE
[19] BUSKULIC 92G use $J/\psi(1S)$ tags to measure the average b lifetime. This is comparable to other methods only if the $J/\psi(1S)$ branching fractions of the different b-flavored hadrons are in the same ratio. NODE=S051T;LINKAGE=E
[20] Using $Z \rightarrow e^{+}X$ or $\mu^{+}X$, ADEVA 91H determined the average lifetime for an admixture of B hadrons from the impact parameter distribution of the lepton. NODE=S051T;LINKAGE=K
[21] Using $Z \rightarrow J/\psi(1S)X$, $J/\psi(1S) \rightarrow \ell^{+}\ell^{-}$, ALEXANDER 91G determined the average lifetime for an admixture of B hadrons from the decay point of the $J/\psi(1S)$. NODE=S051T;LINKAGE=J
[22] Using $Z \rightarrow eX$ or μX, DECAMP 91C determines the average lifetime for an admixture of B hadrons from the signed impact parameter distribution of the lepton. NODE=S051T;LINKAGE=D
[23] HAGEMANN 90 uses electrons and muons in an impact parameter analysis. NODE=S051T;LINKAGE=BQ
[24] LYONS 90 combine the results of the B lifetime measurements of ONG 89, BRAUNSCHWEIG 89B, KLEM 88, and ASH 87, and JADE data by private communication. They use statistical techniques which include variation of the error with the mean life, and possible correlations between the systematic errors. This result is not independent of the measured results used in our average. NODE=S051T;LINKAGE=C
[25] We have combined an overall scale error of 15% in quadrature with the systematic error of ± 0.7 to obtain ± 2.1 systematic error. NODE=S051T;LINKAGE=G
[26] Statistical and systematic errors were combined by BROM 87. NODE=S051T;LINKAGE=I

CHARGED *b*-HADRON ADMIXTURE MEAN LIFE

NODE=S051T1

NODE=S051T1

VALUE (10^{-12} s)	*DOCUMENT ID*		*TECN*	*COMMENT*
1.72±0.08±0.06	[1] ADAM	95	DLPH	$e^{+}e^{-} \rightarrow Z$

[1] ADAM 95 data analyzed using vertex-charge technique to tag b-hadron charge. NODE=S051T1;LINKAGE=F

NEUTRAL *b*-HADRON ADMIXTURE MEAN LIFE

NODE=S051T2

NODE=S051T2

VALUE (10^{-12} s)	*DOCUMENT ID*		*TECN*	*COMMENT*
1.58±0.11±0.09	[1] ADAM	95	DLPH	$e^{+}e^{-} \rightarrow Z$

[1] ADAM 95 data analyzed using vertex-charge technique to tag b-hadron charge. NODE=S051T2;LINKAGE=F

MEAN LIFE RATIO $\tau_{\text{charged } b-\text{hadron}}/\tau_{\text{neutral } b-\text{hadron}}$

NODE=S051DT

NODE=S051DT

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
$\mathbf{1.09^{+0.11}_{-0.10}\pm 0.08}$	[1] ADAM	95	DLPH	$e^{+}e^{-} \rightarrow Z$

[1] ADAM 95 data analyzed using vertex-charge technique to tag b-hadron charge. NODE=S051DT;LINKAGE=F

$\left|\Delta\tau_{b}\right|/\tau_{b,\overline{b}}$

NODE=S051DTB

$\tau_{b,\overline{b}}$ and $\left|\Delta\tau_{b}\right|$ are the mean life average and difference between b and $\overline{b}$ hadrons.

NODE=S051DTB

NODE=S051DTB

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
−0.001±0.012±0.008	[1] ABBIENDI	99J	OPAL	$e^{+}e^{-} \rightarrow Z$

[1] Data analyzed using both the jet charge and the charge of secondary vertex in the opposite hemisphere. NODE=S051DTB;LINKAGE=A

$\overline{b}$ PRODUCTION FRACTIONS AND DECAY MODES

NODE=S051210;NODE=S051

The branching fraction measurements are for an admixture of B mesons and baryons at energies above the $\Upsilon(4S)$. Only the highest energy results (LHC, LEP, Tevatron, $Sp\overline{p}S$) are used in the branching fraction averages. In the following, the production fractions are provided separately at three different colliders (LEP, $p\overline{p}$ Tevatron, and pp LHC) and are used for the subsequent measurements accordingly.

NODE=S051

For inclusive branching fractions, *e.g.*, $B \to D^{\pm}$ anything, the values usually are multiplicities, not branching fractions. They can be greater than one.

The modes below are listed for a $\overline{b}$ initial state. b modes are their charge conjugates. Reactions indicate the weak decay vertex and do not include mixing.

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level

PRODUCTION FRACTIONS

NODE=S051;CLUMP=P

The production fractions for weakly decaying b-hadrons at high energy have been calculated from the best values of mean lives, mixing parameters, and branching fractions in this edition by the Heavy Flavor Averaging Group (HFLAV) as described in the note "B^0-$\overline{B}^0$ Mixing" in the B^0 Particle Listings. We no longer provide world averages of the b-hadron production fractions, where results from LEP, Tevatron and LHC are averaged together; indeed the available data (from CDF and LHCb) shows that the fractions depend on the kinematics (in particular the p_T) of the produced b hadron. Hence, we would like to list the fractions at LEP Z decays, at $p\overline{p}$ collision at the Tevatron, and at pp collision at LHC, separately, when they are available.

NODE=S051

Values assume:

$\mathrm{B}(\overline{b} \to B^+) = \mathrm{B}(\overline{b} \to B^0)$

$\mathrm{B}(\overline{b} \to B^+) + \mathrm{B}(\overline{b} \to B^0) + \mathrm{B}(\overline{b} \to B^0_s) + \mathrm{B}(b \to b\text{-baryon}) = 100\%$.

The notation for production fractions varies in the literature (f_d, d_{B^0}, $f(b \to \overline{B}^0)$, $\mathrm{Br}(b \to \overline{B}^0)$). We use our own branching fraction notation here, $\mathrm{B}(\overline{b} \to B^0\,\text{at}\,Z)$ at LEP, $\mathrm{B}(\overline{b} \to B^0\,\text{at}\,p\overline{p})$ at Tevatron, $\mathrm{B}(\overline{b} \to B^0\,\text{at}\,pp)$ at LHC. The $\mathrm{B}(\overline{b} \to B^+_c)$ is a placeholder for the future measurements, and is negligible in the b-production fractions.

Note these production fractions are b-hadronization fractions, not the conventional branching fractions of b-quark to a B-hadron, which may have considerable dependence on the initial and final state kinematic and production environment.

Production fractions at Z

The correlation coefficients between the reported production fractions are:

$cor(B^0_s$ at Z, b-baryon at $Z) = 0.064$

$cor(B^0_s$ at Z, $B^{\pm}{=}B^0$ at $Z) = -0.633$

$cor(b$-baryon at Z, $B^{\pm}{=}B^0$ at $Z) = -0.813$.

	Mode	Fraction (Γ_i/Γ)		
Γ_1	B^+ at Z	$(40.8 \pm 0.7)\,\%$		DESIG=1;OUR EVAL;→ UNCHECKED ←
Γ_2	B^0 at Z	$(40.8 \pm 0.7)\,\%$		DESIG=2;OUR EVAL;→ UNCHECKED ←
Γ_3	B^0_s at Z	$(10.0 \pm 0.8)\,\%$		DESIG=3;OUR EVAL;→ UNCHECKED ←
Γ_4	b-baryon at Z	$(8.4 \pm 1.1)\,\%$		DESIG=4;OUR EVAL;→ UNCHECKED ←
Γ_5	B^+_c at Z			DESIG=235

Production fractions at $p\overline{p}$

NODE=S051;CLUMP=Q

The correlation coefficients between the reported production fractions are:

NODE=S051

$cor(B^0_s$ at $p\overline{p}$, b-baryon at $p\overline{p}) = -0.429$

$cor(B^0_s$ at $p\overline{p}$, $B^{\pm}{=}B^0$ at $p\overline{p}) = +0.159$

$cor(b$-baryon at $p\overline{p}$, $B^{\pm}{=}B^0$ at $p\overline{p}) = -0.960$.

as obtained with the Tevatron average of time-integrated mixing parameter $\overline{\chi} = 0.147 \pm 0.011$.

Γ_6	B^+ at $p\overline{p}$		(34.4 ± 2.1) %		DESIG=70;OUR EVAL;→ UNCHECKED ←
Γ_7	B^0 at $p\overline{p}$		(34.4 ± 2.1) %		DESIG=71;OUR EVAL;→ UNCHECKED ←
Γ_8	B^0_s at $p\overline{p}$		(11.5 ± 1.3) %		DESIG=72;OUR EVAL;→ UNCHECKED ←
Γ_9	b-baryon at $p\overline{p}$		(19.8 ± 4.6) %		DESIG=74;OUR EVAL;→ UNCHECKED ←
Γ_{10}	B^+_c at $p\overline{p}$				DESIG=73

Production fractions at pp

NODE=S051;CLUMP=U

Γ_{11}	B^+ at pp		(36.0 ± 0.5) %		DESIG=80
Γ_{12}	B^0 at pp		(36.0 ± 0.5) %		DESIG=81
Γ_{13}	B^0_s at pp		(9.04 ± 0.25) %		DESIG=82
Γ_{14}	b-baryon at pp		(18.7 ± 1.1) %		DESIG=84
Γ_{15}	B^+_c at pp		$(2.7 \pm 0.5) \times 10^{-3}$		DESIG=83

DECAY MODES

NODE=S051;CLUMP=L

Semileptonic and leptonic modes

Γ_{16}	ν anything		(23.1 ± 1.5) %		DESIG=23
Γ_{17}	$\ell^+ \nu_\ell$ anything	[a]	(10.69 ± 0.22) %		DESIG=131
Γ_{18}	$e^+ \nu_e$ anything		(10.86 ± 0.35) %		DESIG=100
Γ_{19}	$\mu^+ \nu_\mu$ anything		$(10.95 {}^{+0.29}_{-0.25})$ %		DESIG=102
Γ_{20}	$D^- \ell^+ \nu_\ell$ anything	[a]	(2.2 ± 0.4) %	S=1.8	DESIG=15
Γ_{21}	$D^- \pi^+ \ell^+ \nu_\ell$ anything		$(4.9 \pm 1.9) \times 10^{-3}$		DESIG=58
Γ_{22}	$D^- \pi^- \ell^+ \nu_\ell$ anything		$(2.6 \pm 1.6) \times 10^{-3}$		DESIG=61
Γ_{23}	$\overline{D}^0 \ell^+ \nu_\ell$ anything	[a]	(6.80 ± 0.34) %		DESIG=16
Γ_{24}	$\overline{D}^0 \pi^- \ell^+ \nu_\ell$ anything		(1.07 ± 0.27) %		DESIG=57
Γ_{25}	$\overline{D}^0 \pi^+ \ell^+ \nu_\ell$ anything		$(2.3 \pm 1.6) \times 10^{-3}$		DESIG=60
Γ_{26}	$D^{*-} \ell^+ \nu_\ell$ anything	[a]	(2.75 ± 0.19) %		DESIG=17
Γ_{27}	$D^{*-} \pi^- \ell^+ \nu_\ell$ anything		$(6 \pm 7) \times 10^{-4}$		DESIG=62
Γ_{28}	$D^{*-} \pi^+ \ell^+ \nu_\ell$ anything		$(4.8 \pm 1.0) \times 10^{-3}$		DESIG=59
Γ_{29}	$\overline{D}^0_j \ell^+ \nu_\ell$ anything $\times$ B($\overline{D}^0_j \rightarrow D^{*+} \pi^-$)	[a,b]	$(2.6 \pm 0.9) \times 10^{-3}$		DESIG=18
Γ_{30}	$D^-_j \ell^+ \nu_\ell$ anything $\times$ B($D^-_j \rightarrow D^0 \pi^-$)	[a,b]	$(7.0 \pm 2.3) \times 10^{-3}$		DESIG=19
Γ_{31}	$\overline{D}^*_2(2460)^0 \ell^+ \nu_\ell$ anything $\times$ B($\overline{D}^*_2(2460)^0 \rightarrow D^{*-} \pi^+$)		$< 1.4 \times 10^{-3}$	CL=90%	DESIG=21
Γ_{32}	$D^*_2(2460)^- \ell^+ \nu_\ell$ anything $\times$ B($D^*_2(2460)^- \rightarrow D^0 \pi^-$)		$(4.2 {}^{+1.5}_{-1.8}) \times 10^{-3}$		DESIG=22
Γ_{33}	$\overline{D}^*_2(2460)^0 \ell^+ \nu_\ell$ anything $\times$ B($\overline{D}^*_2(2460)^0 \rightarrow D^- \pi^+$)		$(1.6 \pm 0.8) \times 10^{-3}$		DESIG=220
Γ_{34}	charmless $\ell \overline{\nu}_\ell$	[a]	$(1.7 \pm 0.5) \times 10^{-3}$		DESIG=31
Γ_{35}	$\tau^+ \nu_\tau$ anything		(2.41 ± 0.23) %		DESIG=172
Γ_{36}	$D^{*-} \tau \nu_\tau$ anything		$(9 \pm 4) \times 10^{-3}$		DESIG=64
Γ_{37}	$\overline{c} \rightarrow \ell^- \overline{\nu}_\ell$ anything	[a]	(8.02 ± 0.19) %		DESIG=219
Γ_{38}	$c \rightarrow \ell^+ \nu$ anything		$(1.6 {}^{+0.4}_{-0.5})$ %		DESIG=66

	Charmed meson and baryon modes				NODE=S051;CLUMP=M
Γ_{39}	$\overline{D}^0$ anything		(58.9 ± 2.8) %		DESIG=24
Γ_{40}	$D^0 D_s^{\pm}$ anything	[c]	$(9.1 \, {}^{+4.0}_{-2.8})$ %		DESIG=50
Γ_{41}	$D^{\mp} D_s^{\pm}$ anything	[c]	$(4.0 \, {}^{+2.3}_{-1.8})$ %		DESIG=51
Γ_{42}	$\overline{D}^0 D^0$ anything	[c]	$(5.1 \, {}^{+2.0}_{-1.8})$ %		DESIG=47
Γ_{43}	$D^0 D^{\pm}$ anything	[c]	$(2.7 \, {}^{+1.8}_{-1.6})$ %		DESIG=48
Γ_{44}	$D^{\pm} D^{\mp}$ anything	[c]	$< 9 \times 10^{-3}$	CL=90%	DESIG=49
Γ_{45}	D^0 anything				DESIG=32
Γ_{46}	D^+ anything				DESIG=33
Γ_{47}	D^- anything		(22.9 ± 1.6) %		DESIG=25
Γ_{48}	$D^*(2010)^+$ anything		(17.3 ± 2.0) %		DESIG=46
Γ_{49}	$D_1(2420)^0$ anything		(5.0 ± 1.5) %		DESIG=42
Γ_{50}	$D^*(2010)^{\mp} D_s^{\pm}$ anything	[c]	$(3.3 \, {}^{+1.6}_{-1.3})$ %		DESIG=52
Γ_{51}	$D^0 D^*(2010)^{\pm}$ anything	[c]	$(3.0 \, {}^{+1.1}_{-0.9})$ %		DESIG=53
Γ_{52}	$D^*(2010)^{\pm} D^{\mp}$ anything	[c]	$(2.5 \, {}^{+1.2}_{-1.0})$ %		DESIG=54
Γ_{53}	$D^*(2010)^{\pm} D^*(2010)^{\mp}$ anything	[c]	(1.2 ± 0.4) %		DESIG=55
Γ_{54}	$\overline{D} D$ anything		$(10 \, {}^{+11}_{-10})$ %		DESIG=68
Γ_{55}	$D_2^*(2460)^0$ anything		(4.7 ± 2.7) %		DESIG=43
Γ_{56}	D_s^- anything		(14.7 ± 2.1) %		DESIG=26
Γ_{57}	D_s^+ anything		(10.1 ± 3.1) %		DESIG=34
Γ_{58}	Λ_c^+ anything		(7.6 ± 1.1) %		DESIG=27
Γ_{59}	$\overline{c} / c$ anything	[d]	(116.2 ± 3.2) %		DESIG=28
	Charmonium modes				NODE=S051;CLUMP=N
Γ_{60}	$J/\psi(1S)$ anything		(1.16 ± 0.10) %		DESIG=106
Γ_{61}	$\psi(2S)$ anything		$(3.06 \pm 0.30) \times 10^{-3}$		DESIG=124
Γ_{62}	$\chi_{c0}(1P)$ anything		$(2.9 \pm 0.6) \times 10^{-3}$		DESIG=221
Γ_{63}	$\chi_{c1}(1P)$ anything		$(5.6 \pm 1.5) \times 10^{-3}$	S=1.3	DESIG=170
Γ_{64}	$\chi_{c2}(1P)$ anything		$(1.4 \pm 1.0) \times 10^{-3}$		DESIG=222
Γ_{65}	$\chi_c(2P)$ anything, $\chi_c \to \phi\phi$		$< 2.8 \times 10^{-7}$	CL=95%	DESIG=231
Γ_{66}	$\eta_c(1S)$ anything		$(5.7 \pm 0.7) \times 10^{-3}$		DESIG=223
Γ_{67}	$\eta_c(2S)$ anything, $\eta_c \to \phi\phi$		$(3.3 \pm 1.4) \times 10^{-7}$		DESIG=228
Γ_{68}	$\chi_{c1}(3872)$ anything, $\chi_{c1} \to \phi\phi$		$< 4.5 \times 10^{-7}$	CL=95%	DESIG=229
Γ_{69}	$\chi_{c0}(3915)$ anything, $\chi_{c0} \to \phi\phi$		$< 3.1 \times 10^{-7}$	CL=95%	DESIG=230
	***K* or *K** modes**				NODE=S051;CLUMP=O
Γ_{70}	$\overline{s}\gamma$		$(3.1 \pm 1.1) \times 10^{-4}$		DESIG=185
Γ_{71}	$\overline{s}\overline{\nu}\nu$	B1	$< 6.4 \times 10^{-4}$	CL=90%	DESIG=65
Γ_{72}	$K^{\pm}$ anything		(74 ± 6) %		DESIG=10
Γ_{73}	K_S^0 anything		(29.0 ± 2.9) %		DESIG=11
	Pion modes				NODE=S051;CLUMP=C
Γ_{74}	$\pi^{\pm}$ anything		(397 ± 21) %		DESIG=44
Γ_{75}	π^0 anything	[d]	(280 ± 60) %		DESIG=5
Γ_{76}	ϕ anything		(2.82 ± 0.23) %		DESIG=56
	Baryon modes				NODE=S051;CLUMP=A
Γ_{77}	$p / \overline{p}$ anything		(13.1 ± 1.1) %		DESIG=12
Γ_{78}	$\Lambda / \overline{\Lambda}$ anything		(5.9 ± 0.6) %		DESIG=13
Γ_{79}	b-baryon anything		(10.2 ± 2.8) %		DESIG=45
Γ_{80}	$\overline{\Lambda}_b^0$ anything				DESIG=232
Γ_{81}	Ξ_b^+ anything				DESIG=233
	Other modes				NODE=S051;CLUMP=B
Γ_{82}	charged anything	[d]	(497 ± 7) %		DESIG=14
Γ_{83}	hadron$^+$ hadron$^-$		$(1.7 \, {}^{+1.0}_{-0.7}) \times 10^{-5}$		DESIG=29
Γ_{84}	charmless		$(7 \pm 21) \times 10^{-3}$		DESIG=7

$\Delta B = 1$ weak neutral current ($B1$) modes NODE=S051;CLUMP=R

Γ_{85}	$e^+ e^-$ anything					DESIG=103
Γ_{86}	$\mu^+ \mu^-$ anything	$B1$	$<$ 3.2	$\times 10^{-4}$	CL=90%	DESIG=104
Γ_{87}	$\nu \overline{\nu}$ anything					DESIG=20

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

[b] D_j represents an unresolved mixture of pseudoscalar and tensor D^{**} (P-wave) states. LINKAGE=DJ

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

[d] Inclusive branching fractions have a multiplicity definition and can be greater than 100%. LINKAGE=M

$B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE BRANCHING RATIOS

NODE=S051215

$\Gamma(B^+ \text{ at } Z)/\Gamma_{\text{total}}$ — Γ_1/Γ

NODE=S051R9

"OUR EVALUATION" is an average from Z decay. NODE=S051R9

VALUE	DOCUMENT ID		TECN	COMMENT
0.408 ±0.007 OUR EVALUATION	(Produced by HFLAV)			
0.4099±0.0082±0.0111	[1] ABDALLAH	03K	DLPH	$e^+ e^- \rightarrow Z$

NODE=S051R9 → UNCHECKED ←

[1] The analysis is based on a neural network, to estimate the charge of the weakly-decaying b hadron by distinguishing its decay products from particles produced at the primary vertex. NODE=S051R9;LINKAGE=A

$\Gamma(B^0_s \text{ at } Z)/\left[\Gamma(B^+ \text{ at } Z) + \Gamma(B^0 \text{ at } Z)\right]$ — $\Gamma_3/(\Gamma_1+\Gamma_2)$

NODE=S051R2

"OUR EVALUATION" is an average from Z decay. NODE=S051R2

VALUE	DOCUMENT ID
0.1230±0.0115 OUR EVALUATION	(Produced by HFLAV)

NODE=S051R2 → UNCHECKED ←

$\Gamma(b\text{-baryon at } Z)/\left[\Gamma(B^+ \text{ at } Z) + \Gamma(B^0 \text{ at } Z)\right]$ — $\Gamma_4/(\Gamma_1+\Gamma_2)$

NODE=S051R75 NODE=S051R75

VALUE	DOCUMENT ID
0.103±0.015 OUR EVALUATION	

→ UNCHECKED ←

$\Gamma(B^+ \text{ at } p\overline{p})/\Gamma(B^0 \text{ at } p\overline{p})$ — Γ_6/Γ_7

NODE=S051R69 NODE=S051R69

VALUE	DOCUMENT ID		TECN	COMMENT
$1.054 \pm 0.018^{+0.062}_{-0.074}$	AALTONEN	08N	CDF	$p\overline{p}$ at 1.96 TeV

$\Gamma(B^0_s \text{ at } p\overline{p})/\left[\Gamma(B^+ \text{ at } p\overline{p}) + \Gamma(B^0 \text{ at } p\overline{p})\right]$ — $\Gamma_8/(\Gamma_6+\Gamma_7)$

NODE=S051R45 NODE=S051R45

VALUE	DOCUMENT ID		TECN	COMMENT
0.17 ±0.02 OUR EVALUATION				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.128^{+0.011}_{-0.010} \pm 0.011$	[1] AALTONEN	08N	CDF	$p\overline{p}$ at 1.96 TeV
0.213 ± 0.068	[2] AFFOLDER	00E	CDF	$p\overline{p}$ at 1.8 TeV
$0.21 \pm 0.036^{+0.038}_{-0.030}$	[3] ABE	99P	CDF	$\overline{p}p$ at 1.8 TeV

→ UNCHECKED ←

[1] AALTONEN 08N reports $[\Gamma(\overline{b} \rightarrow B^0_s \text{ at } Z)/[\Gamma(\overline{b} \rightarrow B^+ \text{ at } Z) + \Gamma(\overline{b} \rightarrow B^0 \text{ at } Z)]] \times [B(D^+_s \rightarrow \phi\pi^+)] = (5.76 \pm 0.18^{+0.45}_{-0.42}) \times 10^{-3}$ which we divide by our best (shown rounded) value $B(D^+_s \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. NODE=S051R45;LINKAGE=AA

[2] AFFOLDER 00E uses several electron-charm final states in $b \rightarrow c e^- X$. NODE=S051R45;LINKAGE=A

[3] ABE 99P uses the numbers of $K^*(892)^0$, $K^*(892)^+$, and $\phi(1020)$ events produced in association with the double semileptonic decays $b \rightarrow c\mu^- X$ with $c \rightarrow s\mu^+ X$. NODE=S051R45;LINKAGE=B

$\Gamma(b\text{-baryon at } p\overline{p})/\left[\Gamma(B^+ \text{ at } p\overline{p}) + \Gamma(B^0 \text{ at } p\overline{p})\right]$ — $\Gamma_9/(\Gamma_6+\Gamma_7)$

NODE=S051R74 NODE=S051R74

VALUE	DOCUMENT ID		TECN	COMMENT
0.29 ±0.08 OUR EVALUATION				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.31 \pm 0.11\ ^{+0.12}_{-0.08}$	[1] AALTONEN	09E	CDF	$p\overline{p}$ at 1.8 TeV
$0.22\ ^{+0.08}_{-0.07} \pm 0.01$	[2] AALTONEN	08N	CDF	$p\overline{p}$ at 1.96 TeV
0.118 ± 0.042	[1,3] AFFOLDER	00E	CDF	$p\overline{p}$ at 1.8 TeV

→ UNCHECKED ←

[1] AALTONEN 09E errata to the measurement reported in AFFOLDER 00E using the p_T spectra from fully reconstructed B^0 and Λ_b decays. NODE=S051R74;LINKAGE=AL

[2] AALTONEN 08N reports $[\Gamma(\overline{b} \to b\text{-baryon at } p\overline{p})/\big[\Gamma(\overline{b} \to B^+ \text{at } p\overline{p}) + \Gamma(\overline{b} \to B^0 \text{at } p\overline{p})\big]] \times [B(\Lambda_c^+ \to pK^-\pi^+)] = (14.1 \pm 0.6^{+5.3}_{-4.4}) \times 10^{-3}$ which we divide by our best (shown rounded) value $B(\Lambda_c^+ \to pK^-\pi^+) = (6.37 \pm 0.21) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. NODE=S051R74;LINKAGE=AA

[3] AFFOLDER 00E uses several electron-charm final states in $b \to c e^- X$. NODE=S051R74;LINKAGE=A

$\Gamma(B_s^0 \text{at } p\overline{p})/\big[\Gamma(B^+ \text{at } p\overline{p}) + \Gamma(B^0 \text{at } p\overline{p})\big]$ $\Gamma_{13}/(\Gamma_{11}+\Gamma_{12})$

NODE=S051R73

VALUE	DOCUMENT ID		TECN	COMMENT	
0.1254±0.0033 OUR FIT					
0.127 ±0.004 OUR AVERAGE					
0.124 ±0.002 ±0.005	[1,2] AAIJ	20V	LHCB	pp at 7 TeV	
0.128 ±0.002 ±0.005	[1,3] AAIJ	20V	LHCB	pp at 8 TeV	OCCUR=2
0.133 ±0.002 ±0.005	[1,4,5] AAIJ	20V	LHCB	pp at 13 TeV	OCCUR=3
0.122 ±0.006	[6] AAIJ	19AD	LHCB	pp at 13 TeV	
0.134 ±0.004 $^{+0.011}_{-0.010}$	[7] AAIJ	12J	LHCB	pp at 7 TeV	
0.1265±0.0085±0.0131	[8] AAIJ	11F	LHCB	pp at 7 TeV	

[1] AAIJ 20V measures the average value using the observed $B_s^0 \to J/\psi\phi$ and $B^+ \to J/\psi K^+$ yields, over the ranges b-hadron p_T of 0.5 and 40 GeV and η of 2.0 and 6.5. The value is not used in averages as BR-related systematic uncertainties are not evaluated. NODE=S051R73;LINKAGE=AR

[2] AAIJ 20V reports $[\Gamma(\overline{b} \to B_s^0 \text{at } pp)/\Gamma(\overline{b} \to B^+ \text{at } pp)] \times [B(B_s^0 \to J/\psi(1S)\phi)] / [B(B^+ \to J/\psi(1S)K^+)] = 0.1238 \pm 0.0010 \pm 0.0022$ which we multiply or divide by our best (shown rounded) values $B(B_s^0 \to J/\psi(1S)\phi) = (1.01 \pm 0.04) \times 10^{-3}$, $B(B^+ \to J/\psi(1S)K^+) = (1.019 \pm 0.019) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values. NODE=S051R73;LINKAGE=CR

[3] AAIJ 20V reports $[\Gamma(\overline{b} \to B_s^0 \text{at } pp)/\Gamma(\overline{b} \to B^+ \text{at } pp)] \times [B(B_s^0 \to J/\psi(1S)\phi)] / [B(B^+ \to J/\psi(1S)K^+)] = 0.1270 \pm 0.0007 \pm 0.0022$ which we multiply or divide by our best (shown rounded) values $B(B_s^0 \to J/\psi(1S)\phi) = (1.01 \pm 0.04) \times 10^{-3}$, $B(B^+ \to J/\psi(1S)K^+) = (1.019 \pm 0.019) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values. NODE=S051R73;LINKAGE=DR

[4] AAIJ 20V reports the results in two different data sets, and we quote here the weighted average. NODE=S051R73;LINKAGE=BR

[5] AAIJ 20V reports $[\Gamma(\overline{b} \to B_s^0 \text{at } pp)/\Gamma(\overline{b} \to B^+ \text{at } pp)] \times [B(B_s^0 \to J/\psi(1S)\phi)] / [B(B^+ \to J/\psi(1S)K^+)] = 0.1326 \pm 0.0007 \pm 0.0023$ which we multiply or divide by our best (shown rounded) values $B(B_s^0 \to J/\psi(1S)\phi) = (1.01 \pm 0.04) \times 10^{-3}$, $B(B^+ \to J/\psi(1S)K^+) = (1.019 \pm 0.019) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values. NODE=S051R73;LINKAGE=ER

[6] AAIJ 19AD measured the average value using b-hadron semileptonic decays and assuming isospin symmetry for b-hadron p_T of 4 and 25 GeV and η of 2 and 5. NODE=S051R73;LINKAGE=CA

[7] AAIJ 12J measured this value using b-hadron semileptonic decays and assuming isospin symmetry. NODE=S051R73;LINKAGE=AJ

[8] AAIJ 11F measured $f_s/f_d = 0.253 \pm 0.017 \pm 0.017 \pm 0.020$, where the errors are statistical, systematic, and theoretical. We divide their value by 2. Our second error combines systematic and theoretical uncertainties. NODE=S051R73;LINKAGE=AI

$\Gamma(B_s^0 \text{at } pp)/\Gamma(B^0 \text{at } pp)$ Γ_{13}/Γ_{12}

NODE=S051R01

VALUE	DOCUMENT ID		TECN	COMMENT	
0.251 ±0.007 OUR FIT					
0.239 ±0.016 OUR AVERAGE					
0.240 ±0.004 ±0.020	[1] AAD	15CM	ATLS	pp at 7 TeV	
0.238 ±0.004 ±0.026	[2] AAIJ	13P	LHCB	pp at 7 TeV	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.2385±0.0075	[3] AAIJ	21Y	LHCB	pp at 8 TeV	OCCUR=2
0.2539±0.0079	[3] AAIJ	21Y	LHCB	pp at 13 TeV	OCCUR=3
0.2390±0.0076	[3] AAIJ	21Y	LHCB	pp at 7 TeV	OCCUR=4

[1] AAD 15CM measurement is derived from the observed $B^0_s \to J/\psi\phi$ and $B^0_d \to J/\psi K^{*0}$ yields and a recent theory prediction of B($B^0_s \to J/\psi\phi$)/B($B^0_d \to J/\psi K^{*0}$). The second uncertainty combines in quadrature systematic and theoretical uncertainties. NODE=S051R01;LINKAGE=A

[2] AAIJ 13P studies also separately the $p_T(B)$ and $\eta(B)$ dependency of $\Gamma(\overline{b} \to B^0_s \,\mathrm{at}\, pp)$/ $\Gamma(\overline{b} \to B^0 \,\mathrm{at}\, pp)$, finding $f_s/f_d(p_T)$= (0.256 ± 0.020) + (−2.0 ± 0.6) 10^{-3} /GeV/c ($p_T - \langle p_T \rangle$) and $f_s/f_d(\eta)$= (0.256 ± 0.020) + (0.005 ± 0.006) ($\eta - \langle\eta\rangle$), where $\langle p_T \rangle$ = 10.4 GeV/c and $\langle\eta\rangle$ = 3.28. AAIJ 13P reports the measurement as 0.238 ± 0.004 ± 0.015 ± 0.021 where the last uncertainly is theoretical. NODE=S051R01;LINKAGE=AA

[3] AAIJ 21Y uses hadronic decays $B^0 \to D^- \pi^+$, $B^0 \to D^- K^+$, $B^0_s \to D^-_s \pi^+$ and $B^0_s \to J/\psi\phi$ as well as semileptonic B^0 and B^0_s decays. Measured within the p_T range [0.5,40] GeV/c, η range [2, 6.4]. NODE=S051R01;LINKAGE=B

$\Gamma(B^+_c \,\mathrm{at}\, pp)/[\Gamma(B^+ \,\mathrm{at}\, pp) + \Gamma(B^0 \,\mathrm{at}\, pp)]$ $\Gamma_{15}/(\Gamma_{11}+\Gamma_{12})$

NODE=S051R39
NODE=S051R39

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
3.7 ±0.6 OUR FIT				
3.7 ±0.6 OUR AVERAGE				
3.63±0.08±0.87	[1] AAIJ	19AI	LHCB	pp at 7 TeV
3.78±0.04±0.90	[1] AAIJ	19AI	LHCB	pp at 13 TeV

OCCUR=2

[1] Measured using B^+_c semileptonic decays. NODE=S051R39;LINKAGE=A

$\Gamma(b\text{-baryon} \,\mathrm{at}\, pp)/[\Gamma(B^+ \,\mathrm{at}\, pp) + \Gamma(B^0 \,\mathrm{at}\, pp)]$ $\Gamma_{14}/(\Gamma_{11}+\Gamma_{12})$

NODE=S051R3
NODE=S051R3

VALUE	DOCUMENT ID		TECN	COMMENT
0.259±0.018 OUR FIT				
0.259±0.018 OUR AVERAGE [$0.27^{+0.06}_{-0.05}$ OUR 2019 AVERAGE]				
0.259±0.018	[1] AAIJ	19AD	LHCB	pp at 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.305±0.010±0.081	[2] AAIJ	12J	LHCB	pp at 7 TeV

NEW

[1] AAIJ 19AD measured the average value for Λ^0_b using semileptonic decays and assuming isospin symmetry for b-hadron p_T of 4 and 25 GeV and η of 2 and 5. NODE=S051R3;LINKAGE=B

[2] AAIJ 12J measured the ratio to be (0.404 ± 0.017 ± 0.027 ± 0.105) × [1 − (0.031 ± 0.004 ± 0.003)×P_T]using b-hadron semileptonic decays where the P_T is the momentum of charmed hadron-muon pair in GeV/c.We quote their weighted average value where the second error combines systematic and the error on B($\Lambda^+_c \to pK^-\pi^+$). NODE=S051R3;LINKAGE=AJ

$\Gamma(\nu\,\mathrm{anything})/\Gamma_{\mathrm{total}}$ Γ_{16}/Γ

NODE=S051R6
NODE=S051R6

VALUE	DOCUMENT ID		TECN	COMMENT
0.2308±0.0077±0.0124	[1,2] ACCIARRI	96C	L3	$e^+e^- \to Z$

[1] ACCIARRI 96C assumes relative b semileptonic decay rates e:μ:τ of 1:1:0.25. Based on missing-energy spectrum. NODE=S051R6;LINKAGE=MS

[2] Assumes Standard Model value for R_B. NODE=S051R6;LINKAGE=SM

$\Gamma(\ell^+\nu_\ell\,\mathrm{anything})/\Gamma_{\mathrm{total}}$ Γ_{17}/Γ

NODE=S051S45

"OUR EVALUATION" is an average of the data listed below, excluding all asymmetry measurements, performed by the LEP Electroweak Working Group as described in the "Note on the Z boson" in the Z Particle Listings. NODE=S051S45

NODE=S051S45
→ UNCHECKED ←

VALUE	DOCUMENT ID		TECN	COMMENT
0.1069±0.0022 OUR EVALUATION				
0.1064±0.0016 OUR AVERAGE				
0.1070±0.0010±0.0035	[1] HEISTER	02G	ALEP	$e^+e^- \to Z$
0.1070±0.0008$^{+0.0037}_{-0.0049}$	[2] ABREU	01L	DLPH	$e^+e^- \to Z$
0.1083±0.0010$^{+0.0028}_{-0.0024}$	[3] ABBIENDI	00E	OPAL	$e^+e^- \to Z$
0.1016±0.0013±0.0030	[4] ACCIARRI	00	L3	$e^+e^- \to Z$
0.1085±0.0012±0.0047	[5,6] ACCIARRI	96C	L3	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.1106±0.0039±0.0022	[7] ABREU	95D	DLPH	$e^+e^- \to Z$
0.114 ±0.003 ±0.004	[8] BUSKULIC	94G	ALEP	$e^+e^- \to Z$
0.100 ±0.007 ±0.007	[9] ABREU	93C	DLPH	$e^+e^- \to Z$
0.105 ±0.006 ±0.005	[10] AKERS	93B	OPAL	Repl. by ABBIENDI 00E

[1] Uses the combination of lepton transverse momentum spectrum and the correlation between the charge of the lepton and opposite jet charge. The first error is statistic and the second error is the total systematic error including the modeling. NODE=S051S45;LINKAGE=HG
[2] The experimental systematic and model uncertainties are combined in quadrature. NODE=S051S45;LINKAGE=L1
[3] ABBIENDI 00E result is determined by comparing the distribution of several kinematic variables of leptonic events in a lifetime tagged $Z \rightarrow b\overline{b}$ sample using artificial neural network techniques. The first error is statistic; the second error is the total systematic error. NODE=S051S45;LINKAGE=ES
[4] ACCIARRI 00 result obtained from a combined fit of $R_b = \Gamma(Z \rightarrow b\overline{b})/\Gamma(Z \rightarrow \text{hadrons})$ and $B(b \rightarrow \ell\nu X)$, using double-tagging method. NODE=S051S45;LINKAGE=N
[5] ACCIARRI 96C result obtained by a fit to the single lepton spectrum. NODE=S051S45;LINKAGE=MS
[6] Assumes Standard Model value for R_B. NODE=S051S45;LINKAGE=SM
[7] ABREU 95D give systematic errors ±0.0019 (model) and 0.0012 (R_c). We combine these in quadrature. NODE=S051S45;LINKAGE=B
[8] BUSKULIC 94G uses e and μ events. This value is from a global fit to the lepton p and p_T (relative to jet) spectra which also determines the b and c production fractions, the fragmentation functions, and the forward-backward asymmetries. This branching ratio depends primarily on the ratio of dileptons to single leptons at high p_T, but the lower p_T portion of the lepton spectrum is included in the global fit to reduce the model dependence. The model dependence is ±0.0026 and is included in the systematic error. NODE=S051S45;LINKAGE=A
[9] ABREU 93C event count includes ee events. Combining ee, $\mu\mu$, and $e\mu$ events, they obtain $0.100 \pm 0.007 \pm 0.007$. NODE=S051S45;LINKAGE=G
[10] AKERS 93B analysis performed using single and dilepton events. NODE=S051S45;LINKAGE=SB

$\Gamma(e^+\nu_e \text{anything})/\Gamma_{\text{total}}$ Γ_{18}/Γ

NODE=S051S1
NODE=S051S1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT	
0.1086±0.0035 OUR AVERAGE						
$0.1078\pm0.0008^{+0.0050}_{-0.0046}$		[1] ABBIENDI	00E	OPAL	$e^+e^- \rightarrow Z$	
$0.1089\pm0.0020\pm0.0051$		[2,3] ACCIARRI	96C	L3	$e^+e^- \rightarrow Z$	
$0.107 \pm0.015 \pm0.007$	260	[4] ABREU	93C	DLPH	$e^+e^- \rightarrow Z$	
$0.138 \pm0.032 \pm0.008$		[5] ADEVA	91C	L3	$e^+e^- \rightarrow Z$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$0.086 \pm0.027 \pm0.008$		[6] ABE	93E	VNS	E^{ee}_{cm}= 58 GeV	
$0.109 ^{+0.014}_{-0.013} \pm0.0055$	2719	[7] AKERS	93B	OPAL	Repl. by ABBIENDI 00E	
$0.111 \pm0.028 \pm0.026$		BEHREND	90D	CELL	E^{ee}_{cm}= 43 GeV	
$0.150 \pm0.011 \pm0.022$		BEHREND	90D	CELL	E^{ee}_{cm}= 35 GeV	OCCUR=2
$0.112 \pm0.009 \pm0.011$		ONG	88	MRK2	E^{ee}_{cm}= 29 GeV	
$0.149 ^{+0.022}_{-0.019}$		PAL	86	DLCO	E^{ee}_{cm}= 29 GeV	
$0.110 \pm0.018 \pm0.010$		AIHARA	85	TPC	E^{ee}_{cm}= 29 GeV	
$0.111 \pm0.034 \pm0.040$		ALTHOFF	84J	TASS	E^{ee}_{cm}= 34.6 GeV	
0.146 ± 0.028		KOOP	84	DLCO	Repl. by PAL 86	
$0.116 \pm0.021 \pm0.017$		NELSON	83	MRK2	E^{ee}_{cm}= 29 GeV	

[1] ABBIENDI 00E result is determined by comparing the distribution of several kinematic variables of leptonic events in a lifetime tagged $Z \rightarrow b\overline{b}$ sample using artificial neural network techniques. The first error is statistic; the second error is the total systematic error. NODE=S051S1;LINKAGE=ES
[2] ACCIARRI 96C result obtained by a fit to the single lepton spectrum. NODE=S051S1;LINKAGE=MS
[3] Assumes Standard Model value for R_B. NODE=S051S1;LINKAGE=SM
[4] ABREU 93C event count includes ee events. Combining ee, $\mu\mu$, and $e\mu$ events, they obtain $0.100 \pm 0.007 \pm 0.007$. NODE=S051S1;LINKAGE=G
[5] ADEVA 91C measure the average $B(b \rightarrow eX)$ branching ratio using single and double tagged b enhanced Z events. Combining e and μ results, they obtain $0.113 \pm 0.010 \pm 0.006$. Constraining the initial number of b quarks by the Standard Model prediction (378 ± 3 MeV) for the decay of the Z into $b\overline{b}$, the electron result gives $0.112 \pm 0.004 \pm 0.008$. They obtain $0.119 \pm 0.003 \pm 0.006$ when e and μ results are combined. Used to measure the $b\overline{b}$ width itself, this electron result gives $370 \pm 12 \pm 24$ MeV and combined with the muon result gives $385 \pm 7 \pm 22$ MeV. NODE=S051S1;LINKAGE=E
[6] ABE 93E experiment also measures forward-backward asymmetries and fragmentation functions for b and c. NODE=S051S1;LINKAGE=F
[7] AKERS 93B analysis performed using single and dilepton events. NODE=S051S1;LINKAGE=H

$\Gamma(\mu^+\nu_\mu \text{anything})/\Gamma_{\text{total}}$ Γ_{19}/Γ

NODE=S051S2
NODE=S051S2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.1095^{+0.0029}_{-0.0025}$ OUR AVERAGE					
$0.1096\pm0.0008^{+0.0034}_{-0.0027}$		[1] ABBIENDI	00E	OPAL	$e^+e^- \rightarrow Z$
$0.1082\pm0.0015\pm0.0059$		[2,3] ACCIARRI	96C	L3	$e^+e^- \rightarrow Z$
$0.110 \pm0.012 \pm0.007$	656	[4] ABREU	93C	DLPH	$e^+e^- \rightarrow Z$
$0.113 \pm0.012 \pm0.006$		[5] ADEVA	91C	L3	$e^+e^- \rightarrow Z$

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

0.122	±0.006	±0.007		[3] UENO	96	AMY	e^+e^- at 57.9 GeV
0.101	$^{+0.010}_{-0.009}$	±0.0055	4248	[6] AKERS	93B	OPAL	Repl. by ABBIENDI 00E
0.104	±0.023	±0.016		BEHREND	90D	CELL	E^{ee}_{cm}= 43 GeV
0.148	±0.010	±0.016		BEHREND	90D	CELL	E^{ee}_{cm}= 35 GeV
0.118	±0.012	±0.010		ONG	88	MRK2	E^{ee}_{cm}= 29 GeV
0.117	±0.016	±0.015		BARTEL	87	JADE	E^{ee}_{cm}= 34.6 GeV
0.114	±0.018	±0.025		BARTEL	85J	JADE	Repl. by BARTEL 87
0.117	±0.028	±0.010		ALTHOFF	84G	TASS	E^{ee}_{cm}= 34.5 GeV
0.105	±0.015	±0.013		ADEVA	83B	MRKJ	E^{ee}_{cm}= 33–38.5 GeV
0.155	$^{+0.054}_{-0.029}$			FERNANDEZ	83D	MAC	E^{ee}_{cm}= 29 GeV

OCCUR=2

[1] ABBIENDI 00E result is determined by comparing the distribution of several kinematic variables of leptonic events in a lifetime tagged $Z \to b\bar{b}$ sample using artificial neural network techniques. The first error is statistic; the second error is the total systematic error.

[2] ACCIARRI 96C result obtained by a fit to the single lepton spectrum.

[3] Assumes Standard Model value for R_B.

[4] ABREU 93C event count includes $\mu\mu$ events. Combining ee, $\mu\mu$, and $e\mu$ events, they obtain 0.100 ± 0.007 ± 0.007.

[5] ADEVA 91C measure the average B($b \to eX$) branching ratio using single and double tagged b enhanced Z events. Combining e and μ results, they obtain 0.113 ± 0.010 ± 0.006. Constraining the initial number of b quarks by the Standard Model prediction (378±3 MeV) for the decay of the Z into $b\bar{b}$, the muon result gives 0.123±0.003±0.006. They obtain 0.119 ± 0.003 ± 0.006 when e and μ results are combined. Used to measure the $b\bar{b}$ width itself, this muon result gives 394 ± 9 ± 22 MeV and combined with the electron result gives 385 ± 7 ± 22 MeV.

[6] AKERS 93B analysis performed using single and dilepton events.

NODE=S051S2;LINKAGE=ES
NODE=S051S2;LINKAGE=MS
NODE=S051S2;LINKAGE=SM
NODE=S051S2;LINKAGE=G
NODE=S051S2;LINKAGE=E
NODE=S051S2;LINKAGE=B

$\Gamma(D^- \ell^+ \nu_\ell \text{anything})/\Gamma_{\text{total}}$ Γ_{20}/Γ

NODE=S051R15
NODE=S051R15

VALUE	DOCUMENT ID		TECN	COMMENT
0.022 ±0.004 OUR AVERAGE Error includes scale factor of 1.8. [0.022 ± 0.004 OUR 2025 AVERAGE Scale factor = 1.9]				
0.0272±0.0028±0.0018	[1] ABREU	00R	DLPH	$e^+e^- \to Z$
0.0195±0.0025±0.0003	[2] AKERS	95Q	OPAL	$e^+e^- \to Z$

NEW

[1] ABREU 00R reports their experiment's uncertainties ±0.0019 ± 0.0016 ± 0.0018, where the first error is statistical, the second is systematic, and the third is the uncertainty due to the D branching fraction. We combine first two in quadrature.

[2] AKERS 95Q reports $[\Gamma(\bar{b} \to D^- \ell^+ \nu_\ell \text{anything})/\Gamma_{\text{total}}] \times [B(D^+ \to K^- 2\pi^+)] = (1.82 \pm 0.20 \pm 0.12) \times 10^{-3}$ which we divide by our best (shown rounded) value $B(D^+ \to K^- 2\pi^+) = (9.31 \pm 0.14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=S051R15;LINKAGE=B3
NODE=S051R15;LINKAGE=A

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

NODE=S051R60
NODE=S051R60

VALUE	DOCUMENT ID		TECN	COMMENT
0.0049±0.0018±0.0007	ABREU	00R	DLPH	$e^+e^- \to Z$

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

NODE=S051R63
NODE=S051R63

VALUE	DOCUMENT ID		TECN	COMMENT
0.0026±0.0015±0.0004	ABREU	00R	DLPH	$e^+e^- \to Z$

$\Gamma(\overline{D}^0 \ell^+ \nu_\ell \text{anything})/\Gamma_{\text{total}}$ Γ_{23}/Γ

NODE=S051R16
NODE=S051R16

VALUE	DOCUMENT ID		TECN	COMMENT
0.0680±0.0034 OUR AVERAGE [0.0679 ± 0.0034 OUR 2025 AVERAGE]				
0.0704±0.0040±0.0017	[1] ABREU	00R	DLPH	$e^+e^- \to Z$
0.0640±0.0056±0.0005	[2] AKERS	95Q	OPAL	$e^+e^- \to Z$

NEW

[1] ABREU 00R reports their experiment's uncertainties ±0.0034 ± 0.0036 ± 0.0017, where the first error is statistical, the second is systematic, and the third is the uncertainty due to the D branching fraction. We combine first two in quadrature.

[2] AKERS 95Q reports $[\Gamma(\bar{b} \to \overline{D}^0 \ell^+ \nu_\ell \text{anything})/\Gamma_{\text{total}}] \times [B(D^0 \to K^- \pi^+)] = (2.52 \pm 0.14 \pm 0.17) \times 10^{-3}$ which we divide by our best (shown rounded) value $B(D^0 \to K^- \pi^+) = (3.936 \pm 0.030) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=S051R16;LINKAGE=B3
NODE=S051R16;LINKAGE=A

$\Gamma(\overline{D}^0 \pi^- \ell^+ \nu_\ell \text{anything})/\Gamma_{\text{total}}$ Γ_{24}/Γ

NODE=S051R59
NODE=S051R59

VALUE	DOCUMENT ID		TECN	COMMENT
0.0107±0.0025±0.0011	ABREU	00R	DLPH	$e^+e^- \to Z$

$\Gamma(\overline{D}^0\pi^+\ell^+\nu_\ell \text{anything})/\Gamma_{total}$ Γ_{25}/Γ

NODE=S051R62
NODE=S051R62

VALUE	DOCUMENT ID		TECN	COMMENT
0.0023±0.0015±0.0004	ABREU	00R	DLPH	$e^+e^- \to Z$

$\Gamma(D^{*-}\ell^+\nu_\ell \text{anything})/\Gamma_{total}$ Γ_{26}/Γ

NODE=S051R17
NODE=S051R17

VALUE	DOCUMENT ID		TECN	COMMENT
0.0275±0.0019 OUR AVERAGE				
0.0275±0.0021±0.0009	[1] ABREU	00R	DLPH	$e^+e^- \to Z$
0.0276±0.0027±0.0011	[2] AKERS	95Q	OPAL	$e^+e^- \to Z$

SYCLP=A
SYCLP=A

[1] ABREU 00R reports their experiment's uncertainties $\pm0.0017 \pm 0.0013 \pm 0.0009$, where the first error is statistical, the second is systematic, and the third is the uncertainty due to the D branching fraction. We combine first two in quadrature.

NODE=S051R17;LINKAGE=B3

[2] AKERS 95Q reports $[B(\overline{b} \to D^*\ell^+\nu_\ell X) \times B(D^{*+} \to D^0\pi^+) \times B(D^0 \to K^-\pi^+)] = ((7.53 \pm 0.47 \pm 0.56) \times 10^{-4})$ and uses $B(D^{*+} \to D^0\pi^+) = 0.681 \pm 0.013$ and $B(D^0 \to K^-\pi^+) = 0.0401 \pm 0.0014$ to obtain the above result. The first error is the experiments error and the second error is the systematic error from the D^{*+} and D^0 branching ratios.

NODE=S051R17;LINKAGE=A

$\Gamma(D^{*-}\pi^-\ell^+\nu_\ell \text{anything})/\Gamma_{total}$ Γ_{27}/Γ

NODE=S051R64
NODE=S051R64

VALUE	DOCUMENT ID		TECN	COMMENT
0.0006±0.0007±0.0002	ABREU	00R	DLPH	$e^+e^- \to Z$

$\Gamma(D^{*-}\pi^+\ell^+\nu_\ell \text{anything})/\Gamma_{total}$ Γ_{28}/Γ

NODE=S051R61
NODE=S051R61

VALUE	DOCUMENT ID		TECN	COMMENT
0.0048±0.0009±0.0005	ABREU	00R	DLPH	$e^+e^- \to Z$

$\Gamma(\overline{D}_j^0\ell^+\nu_\ell \text{anything} \times B(\overline{D}_j^0 \to D^{*+}\pi^-))/\Gamma_{total}$ Γ_{29}/Γ

NODE=S051R18

D_j represents an unresolved mixture of pseudoscalar and tensor D^{**} (P-wave) states.

NODE=S051R18
NODE=S051R18

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
2.64±0.79±0.39	ABBIENDI	03M	OPAL	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6.1 ±1.3 ±1.3	AKERS	95Q	OPAL	Repl. by ABBIENDI 03M

$\Gamma(D_j^-\ell^+\nu_\ell \text{anything} \times B(D_j^- \to D^0\pi^-))/\Gamma_{total}$ Γ_{30}/Γ

NODE=S051R19

D_j represents an unresolved mixture of pseudoscalar and tensor D^{**} (P-wave) states.

NODE=S051R19
NODE=S051R19

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
$7.0\pm1.9^{+1.2}_{-1.3}$	AKERS	95Q	OPAL	$e^+e^- \to Z$

$\Gamma(\overline{D}_2^*(2460)^0\ell^+\nu_\ell \text{anything} \times B(\overline{D}_2^*(2460)^0 \to D^{*-}\pi^+))/\Gamma_{total}$ Γ_{31}/Γ

NODE=S051R21
NODE=S051R21

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<1.4	90	ABBIENDI	03M	OPAL	$e^+e^- \to Z$

$\Gamma(D_2^*(2460)^-\ell^+\nu_\ell \text{anything} \times B(D_2^*(2460)^- \to D^0\pi^-))/\Gamma_{total}$ Γ_{32}/Γ

NODE=S051R22
NODE=S051R22

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
$4.2\pm1.3^{+0.7}_{-1.2}$	AKERS	95Q	OPAL	$e^+e^- \to Z$

$\Gamma(\overline{D}_2^*(2460)^0\ell^+\nu_\ell \text{anything} \times B(\overline{D}_2^*(2460)^0 \to D^-\pi^+))/\Gamma_{total}$ Γ_{33}/Γ

NODE=S051R68
NODE=S051R68

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
1.6±0.7±0.3	AKERS	95Q	OPAL	$e^+e^- \to Z$

$\Gamma(\text{charmless } \ell\overline{\nu}_\ell)/\Gamma_{total}$ Γ_{34}/Γ

NODE=S051R31

"OUR EVALUATION" is an average of the data listed below performed by the LEP Heavy Flavour Steering Group. The averaging procedure takes into account correlations between the measurements.

NODE=S051R31

VALUE	DOCUMENT ID		TECN	COMMENT
0.00171±0.00052 OUR EVALUATION				
0.0017 ±0.0004 OUR AVERAGE				
$0.00163\pm0.00053^{+0.00055}_{-0.00062}$	[1] ABBIENDI	01R	OPAL	$e^+e^- \to Z$
0.00157±0.00035±0.00055	[2] ABREU	00D	DLPH	$e^+e^- \to Z$
0.00173±0.00055±0.00055	[3] BARATE	99G	ALEP	$e^+e^- \to Z$
0.0033 ±0.0010 ±0.0017	[4] ACCIARRI	98K	L3	$e^+e^- \to Z$

NODE=S051R31
→ UNCHECKED ←

[1] Obtained from the best fit of the MC simulated events to the data based on the $b \to X_u \ell \nu$ neutral network output distributions. NODE=S051R31;LINKAGE=AR
[2] ABREU 00D result obtained from a fit to the numbers of decays in $b \to u$ enriched and depleted samples and their lepton spectra, and assuming $|V_{cb}|$= 0.0384 ± 0.0033 and τ_b= 1.564 ± 0.014 ps. NODE=S051R31;LINKAGE=D
[3] Uses lifetime tagged $b\overline{b}$ sample. NODE=S051R31;LINKAGE=B
[4] ACCIARRI 98K assumes R_b= 0.2174 ± 0.0009 at Z decay. NODE=S051R31;LINKAGE=A

$\Gamma(\tau^+ \nu_\tau \text{anything})/\Gamma_{total}$ Γ_{35}/Γ

NODE=S051S46
NODE=S051S46

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.41±0.23 OUR AVERAGE					
2.78±0.18±0.51		[1] ABBIENDI	01Q	OPAL	$e^+ e^- \to Z$
2.43±0.20±0.25		[2] BARATE	01E	ALEP	$e^+ e^- \to Z$
2.19±0.24±0.39		[3] ABREU	00C	DLPH	$e^+ e^- \to Z$
1.7 ±0.5 ±1.1		[4,5] ACCIARRI	96C	L3	$e^+ e^- \to Z$
2.4 ±0.7 ±0.8	1032	[6] ACCIARRI	94C	L3	$e^+ e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.75±0.30±0.37	405	[7] BUSKULIC	95	ALEP	Repl. by BARATE 01E
4.08±0.76±0.62		BUSKULIC	93B	ALEP	Repl. by BUSKULIC 95

[1] ABBIENDI 01Q uses a missing energy technique. NODE=S051S46;LINKAGE=AK
[2] The energy-flow and b-tagging algorithms were used. NODE=S051S46;LINKAGE=QK
[3] Uses the missing energy in $Z \to b\overline{b}$ decays without identifying leptons. NODE=S051S46;LINKAGE=N2
[4] ACCIARRI 96C result obtained from missing energy spectrum. NODE=S051S46;LINKAGE=MS
[5] Assumes Standard Model value for R_B. NODE=S051S46;LINKAGE=SM
[6] This is a direct result using tagged $b\overline{b}$ events at the Z, but species are not separated. NODE=S051S46;LINKAGE=A
[7] BUSKULIC 95 uses missing-energy technique. NODE=S051S46;LINKAGE=B

$\Gamma(D^{*-} \tau \nu_\tau \text{anything})/\Gamma_{total}$ Γ_{36}/Γ

NODE=S051R66
NODE=S051R66

VALUE	DOCUMENT ID		TECN	COMMENT
(0.88±0.31±0.28) × 10^{-2}	[1] BARATE	01E	ALEP	$e^+ e^- \to Z$

[1] The energy-flow and b-tagging algorithms were used. NODE=S051R66;LINKAGE=QK

$\Gamma(\overline{b} \to \overline{c} \to \ell^- \overline{\nu}_\ell \text{anything})/\Gamma_{total}$ Γ_{37}/Γ

NODE=S051S94
NODE=S051S94

"OUR EVALUATION" is an average of the data listed below, excluding all asymmetry measurements, performed by the LEP Electroweak Working Group as described in the "Note on the Z boson" in the Z Particle Listings.

NODE=S051S94
→ UNCHECKED ←

VALUE	DOCUMENT ID		TECN	COMMENT
0.0802±0.0019 OUR EVALUATION				
0.0817±0.0020 OUR AVERAGE				
$0.0818 \pm 0.0015 ^{+0.0024}_{-0.0026}$	[1] HEISTER	02G	ALEP	$e^+ e^- \to Z$
$0.0798 \pm 0.0022 ^{+0.0025}_{-0.0029}$	[2] ABREU	01L	DLPH	$e^+ e^- \to Z$
$0.0840 \pm 0.0016 ^{+0.0039}_{-0.0036}$	[3] ABBIENDI	00E	OPAL	$e^+ e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0770±0.0097±0.0046	[4] ABREU	95D	DLPH	$e^+ e^- \to Z$
0.082 ±0.003 ±0.012	[5] BUSKULIC	94G	ALEP	$e^+ e^- \to Z$
0.077 ±0.004 ±0.007	[6] AKERS	93B	OPAL	Repl. by ABBIENDI 00E

[1] Uses the combination of lepton transverse momentum spectrum and the correlation between the charge of the lepton and opposite jet charge. The first error is statistic and the second error is the total systematic error including the modeling. NODE=S051S94;LINKAGE=HG
[2] The experimental systematic and model uncertainties are combined in quadrature. NODE=S051S94;LINKAGE=L1
[3] ABBIENDI 00E result is determined by comparing the distribution of several kinematic variables of leptonic events in a lifetime tagged $Z \to b\overline{b}$ sample using artificial neural network techniques. The first error is statistic; the second error is the total systematic error. NODE=S051S94;LINKAGE=ES
[4] ABREU 95D give systematic errors ±0.0033 (model) and 0.0032 (R_c). We combine these in quadrature. This result is from the same global fit as their $\Gamma(\overline{b} \to \ell^+ \nu_\ell X)$ data. NODE=S051S94;LINKAGE=B
[5] BUSKULIC 94G uses e and μ events. This value is from the same global fit as their $\Gamma(\overline{b} \to \ell^+ \nu_\ell \text{anything})/\Gamma_{total}$ data. NODE=S051S94;LINKAGE=A
[6] AKERS 93B analysis performed using single and dilepton events. NODE=S051S94;LINKAGE=SB

$\Gamma(c \to \ell^+ \nu \text{anything})/\Gamma_{total}$ Γ_{38}/Γ

NODE=S051R8
NODE=S051R8

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.0161 \pm 0.0020 ^{+0.0034}_{-0.0047}}$	[1] ABREU	01L	DLPH	$e^+ e^- \to Z$

[1] The experimental systematic and model uncertainties are combined in quadrature. NODE=S051R8;LINKAGE=L1

$\Gamma(\overline{D}^0 \text{anything})/\Gamma_{total}$ Γ_{39}/Γ

NODE=S051R24
NODE=S051R24

VALUE	DOCUMENT ID	TECN	COMMENT
0.589±0.028 OUR AVERAGE [0.587 ± 0.028 OUR 2025 AVERAGE]			
0.589±0.028±0.004	[1] BUSKULIC 96Y	ALEP	$e^+e^- \to Z$

NEW

[1] BUSKULIC 96Y reports 0.605 ± 0.024 ± 0.016 from a measurement of $[\Gamma(\overline{b} \to \overline{D}^0 \text{anything})/\Gamma_{total}] \times [B(D^0 \to K^- \pi^+)]$ assuming $B(D^0 \to K^- \pi^+) = 0.0383$, which we rescale to our best (shown rounded) value $B(D^0 \to K^- \pi^+) = (3.936 \pm 0.030) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=S051R24;LINKAGE=A

$\Gamma(D^0 D_s^\pm \text{anything})/\Gamma_{total}$ Γ_{40}/Γ

NODE=S051R51
NODE=S051R51

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{0.091^{+0.020}_{-0.018}{}^{+0.034}_{-0.022}}$	[1] BARATE 98Q	ALEP	$e^+e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R51;LINKAGE=A

$\Gamma(D^\mp D_s^\pm \text{anything})/\Gamma_{total}$ Γ_{41}/Γ

NODE=S051R52
NODE=S051R52

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{0.040^{+0.017}_{-0.014}{}^{+0.016}_{-0.011}}$	[1] BARATE 98Q	ALEP	$e^+e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R52;LINKAGE=A

$[\Gamma(D^0 D_s^\pm \text{anything}) + \Gamma(D^\mp D_s^\pm \text{anything})]/\Gamma_{total}$ $(\Gamma_{40}+\Gamma_{41})/\Gamma$

NODE=S051R53
NODE=S051R53

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{0.131^{+0.026}_{-0.022}{}^{+0.048}_{-0.031}}$	[1] BARATE 98Q	ALEP	$e^+e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R53;LINKAGE=A

$\Gamma(\overline{D}^0 D^0 \text{anything})/\Gamma_{total}$ Γ_{42}/Γ

NODE=S051R47
NODE=S051R47

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{0.051^{+0.016}_{-0.014}{}^{+0.012}_{-0.011}}$	[1] BARATE 98Q	ALEP	$e^+e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R47;LINKAGE=A

$\Gamma(D^0 D^\pm \text{anything})/\Gamma_{total}$ Γ_{43}/Γ

NODE=S051R48
NODE=S051R48

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{0.027^{+0.015}_{-0.013}{}^{+0.010}_{-0.009}}$	[1] BARATE 98Q	ALEP	$e^+e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R48;LINKAGE=A

$[\Gamma(\overline{D}^0 D^0 \text{anything}) + \Gamma(D^0 D^\pm \text{anything})]/\Gamma_{total}$ $(\Gamma_{42}+\Gamma_{43})/\Gamma$

NODE=S051R50
NODE=S051R50

VALUE	DOCUMENT ID	TECN	COMMENT
$\mathbf{0.078^{+0.020}_{-0.018}{}^{+0.018}_{-0.016}}$	[1] BARATE 98Q	ALEP	$e^+e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R50;LINKAGE=A

$\Gamma(D^\pm D^\mp \text{anything})/\Gamma_{total}$ Γ_{44}/Γ

NODE=S051R49
NODE=S051R49

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.009	90	BARATE 98Q	ALEP	$e^+e^- \to Z$

$[\Gamma(D^0 \text{anything}) + \Gamma(D^+ \text{anything})]/\Gamma_{total}$ $(\Gamma_{45}+\Gamma_{46})/\Gamma$

NODE=S051R70
NODE=S051R70

VALUE	DOCUMENT ID	TECN	COMMENT
0.093±0.017±0.014	[1] ABDALLAH 03E	DLPH	$e^+e^- \to Z$

[1] The second error is the total of systematic uncertainties including the branching fractions used in the measurement.

NODE=S051R70;LINKAGE=SE

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

NODE=S051R25
NODE=S051R25

VALUE	DOCUMENT ID	TECN	COMMENT
0.229±0.016 OUR AVERAGE [0.227 ± 0.016 OUR 2025 AVERAGE]			
0.229±0.016±0.003	[1] BUSKULIC 96Y	ALEP	$e^+e^- \to Z$

NEW

[1] BUSKULIC 96Y reports 0.234 ± 0.013 ± 0.010 from a measurement of $[\Gamma(\overline{b} \to D^- \text{anything})/\Gamma_{total}] \times [B(D^+ \to K^- 2\pi^+)]$ assuming $B(D^+ \to K^- 2\pi^+) = 0.091$, which we rescale to our best (shown rounded) value $B(D^+ \to K^- 2\pi^+) = (9.31 \pm 0.14) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=S051R25;LINKAGE=A

$\Gamma(D^*(2010)^+ \text{anything})/\Gamma_{total}$ — Γ_{48}/Γ

NODE=S051R46
NODE=S051R46

VALUE	DOCUMENT ID		TECN	COMMENT
0.173±0.016±0.012	[1] ACKERSTAFF	98E	OPAL	$e^+ e^- \to Z$

[1] Uses lepton tags to select $Z \to b\overline{b}$ events.

NODE=S051R46;LINKAGE=A

$\Gamma(D_1(2420)^0 \text{anything})/\Gamma_{total}$ — Γ_{49}/Γ

NODE=S051R32
NODE=S051R32

VALUE	DOCUMENT ID		TECN	COMMENT
0.050±0.014±0.006	[1] ACKERSTAFF	97W	OPAL	$e^+ e^- \to Z$

[1] ACKERSTAFF 97W assumes $B(D_2^*(2460)^0 \to D^{*+}\pi^-) = 0.21 \pm 0.04$ and $\Gamma_{b\overline{b}}/\Gamma_{hadrons} = 0.216$ at Z decay.

NODE=S051R32;LINKAGE=A

$\Gamma(D^*(2010)^\mp D_s^\pm \text{anything})/\Gamma_{total}$ — Γ_{50}/Γ

NODE=S051R54
NODE=S051R54

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.033^{+0.010}_{-0.009}{}^{+0.012}_{-0.009}}$	[1] BARATE	98Q	ALEP	$e^+ e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R54;LINKAGE=A

$\Gamma(D^0 D^*(2010)^\pm \text{anything})/\Gamma_{total}$ — Γ_{51}/Γ

NODE=S051R55
NODE=S051R55

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.030^{+0.009}_{-0.008}{}^{+0.007}_{-0.005}}$	[1] BARATE	98Q	ALEP	$e^+ e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R55;LINKAGE=A

$\Gamma(D^*(2010)^\pm D^\mp \text{anything})/\Gamma_{total}$ — Γ_{52}/Γ

NODE=S051R56
NODE=S051R56

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.025^{+0.010}_{-0.009}{}^{+0.006}_{-0.005}}$	[1] BARATE	98Q	ALEP	$e^+ e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R56;LINKAGE=A

$\Gamma(D^*(2010)^\pm D^*(2010)^\mp \text{anything})/\Gamma_{total}$ — Γ_{53}/Γ

NODE=S051R57
NODE=S051R57

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.012^{+0.004}_{-0.003}\pm 0.002}$	[1] BARATE	98Q	ALEP	$e^+ e^- \to Z$

[1] The systematic error includes the uncertainties due to the charm branching ratios.

NODE=S051R57;LINKAGE=A

$\Gamma(\overline{D} D \text{anything})/\Gamma_{total}$ — Γ_{54}/Γ

NODE=S051R90
NODE=S051R90

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.10\pm 0.032^{+0.107}_{-0.095}}$	[1] ABBIENDI	04I	OPAL	$e^+ e^- \to Z$

[1] Measurement performed using an inclusive identification of B mesons and the D candidates.

NODE=S051R90;LINKAGE=AB

$\Gamma(D_2^*(2460)^0 \text{anything})/\Gamma_{total}$ — Γ_{55}/Γ

NODE=S051R33
NODE=S051R33

VALUE	DOCUMENT ID		TECN	COMMENT
0.047±0.024±0.013	[1] ACKERSTAFF	97W	OPAL	$e^+ e^- \to Z$

[1] ACKERSTAFF 97W assumes $B(D_2^*(2460)^0 \to D^{*+}\pi^-) = 0.21 \pm 0.04$ and $\Gamma_{b\overline{b}}/\Gamma_{hadrons} = 0.216$ at Z decay.

NODE=S051R33;LINKAGE=A

$\Gamma(D_s^- \text{anything})/\Gamma_{total}$ — Γ_{56}/Γ

NODE=S051R26
NODE=S051R26

VALUE	DOCUMENT ID		TECN	COMMENT
0.147±0.017±0.013	[1] BUSKULIC	96Y	ALEP	$e^+ e^- \to Z$

[1] BUSKULIC 96Y reports $0.183 \pm 0.019 \pm 0.009$ from a measurement of $[\Gamma(\overline{b} \to D_s^- \text{anything})/\Gamma_{total}] \times [B(D_s^+ \to \phi\pi^+)]$ assuming $B(D_s^+ \to \phi\pi^+) = 0.036$, which we rescale to our best (shown rounded) value $B(D_s^+ \to \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=S051R26;LINKAGE=A

$\Gamma(D_s^+ \text{anything})/\Gamma_{total}$ — Γ_{57}/Γ

NODE=S051R71
NODE=S051R71

VALUE	DOCUMENT ID		TECN	COMMENT
0.101±0.010±0.029	[1] ABDALLAH	03E	DLPH	$e^+ e^- \to Z$

[1] The second error is the total of systematic uncertainties including the branching fractions used in the measurement.

NODE=S051R71;LINKAGE=SE

$\Gamma(b \to \Lambda_c^+ \text{ anything})/\Gamma_{\text{total}}$ — Γ_{58}/Γ

NODE=S051R27
NODE=S051R27

VALUE	DOCUMENT ID		TECN	COMMENT
$0.076 \pm 0.011 ^{+0.003}_{-0.002}$	[1] BUSKULIC	96Y	ALEP	$e^+e^- \to Z$

[1] BUSKULIC 96Y reports $0.110 \pm 0.014 \pm 0.006$ from a measurement of $[\Gamma(b \to \Lambda_c^+ \text{anything})/\Gamma_{\text{total}}] \times [B(\Lambda_c^+ \to pK^-\pi^+)]$ assuming $B(\Lambda_c^+ \to pK^-\pi^+) = 0.044$, which we rescale to our best (shown rounded) value $B(\Lambda_c^+ \to pK^-\pi^+) = (6.37 \pm 0.21) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. NODE=S051R27;LINKAGE=A

$\Gamma(\overline{c}/c \text{ anything})/\Gamma_{\text{total}}$ — Γ_{59}/Γ

NODE=S051R28
NODE=S051R28

VALUE	DOCUMENT ID		TECN	COMMENT
1.162 ± 0.032 OUR AVERAGE				
$1.12 ^{+0.11}_{-0.10}$	[1] ABBIENDI	04I	OPAL	$e^+e^- \to Z$
$1.166 \pm 0.031 \pm 0.080$	[2] ABREU	00	DLPH	$e^+e^- \to Z$
1.147 ± 0.041	[3] ABREU	98D	DLPH	$e^+e^- \to Z$
$1.230 \pm 0.036 \pm 0.065$	[4] BUSKULIC	96Y	ALEP	$e^+e^- \to Z$

[1] Measurement performed using an inclusive identification of B mesons and the D candidates. NODE=S051R28;LINKAGE=AB

[2] Evaluated via summation of exclusive and inclusive channels. NODE=S051R28;LINKAGE=C3

[3] ABREU 98D results are extracted from a fit to the b-tagging probability distribution based on the impact parameter. NODE=S051R28;LINKAGE=B

[4] BUSKULIC 96Y assumes PDG 96 production fractions for B^0, B^+, B_s, b baryons, and PDG 96 branching ratios for charm decays. This is sum of their inclusive $\overline{D}^0$, D^-, $\overline{D}_s$, and Λ_c branching ratios, corrected to include inclusive Ξ_c and charmonium. NODE=S051R28;LINKAGE=A

$\Gamma(J/\psi(1S) \text{anything})/\Gamma_{\text{total}}$ — Γ_{60}/Γ

NODE=S051S7
NODE=S051S7

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.16 ± 0.10 OUR AVERAGE						
$1.12 \pm 0.12 \pm 0.10$			[1] ABREU	94P	DLPH	$e^+e^- \to Z$
$1.16 \pm 0.16 \pm 0.14$		121	[2] ADRIANI	93J	L3	$e^+e^- \to Z$
$1.21 \pm 0.13 \pm 0.08$			BUSKULIC	92G	ALEP	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$1.3 \pm 0.2 \pm 0.2$			[3] ADRIANI	92	L3	$e^+e^- \to Z$
<4.9	90		MATTEUZZI	83	MRK2	$E^{ee}_{\text{cm}} = 29$ GeV

[1] ABREU 94P is an inclusive measurement from b decays at the Z. Uses $J/\psi(1S) \to e^+e^-$ and $\mu^+\mu^-$ channels. Assumes $\Gamma(Z \to b\overline{b})/\Gamma_{\text{hadron}} = 0.22$. NODE=S051S7;LINKAGE=E

[2] ADRIANI 93J is an inclusive measurement from b decays at the Z. Uses $J/\psi(1S) \to \mu^+\mu^-$ and $J/\psi(1S) \to e^+e^-$ channels. NODE=S051S7;LINKAGE=D

[3] ADRIANI 92 measurement is an inclusive result for $B(Z \to J/\psi(1S)X) = (4.1 \pm 0.7 \pm 0.3) \times 10^{-3}$ which is used to extract the b-hadron contribution to $J/\psi(1S)$ production. NODE=S051S7;LINKAGE=CC

$\Gamma(\psi(2S) \text{anything})/\Gamma_{\text{total}}$ — Γ_{61}/Γ

NODE=S051S25
NODE=S051S25

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.0048 \pm 0.0022 \pm 0.0010$	[1] ABREU	94P	DLPH	$e^+e^- \to Z$

[1] ABREU 94P is an inclusive measurement from b decays at the Z. Uses $\psi(2S) \to J/\psi(1S)\pi^+\pi^-$, $J/\psi(1S) \to \mu^+\mu^-$ channels. Assumes $\Gamma(Z \to b\overline{b})/\Gamma_{\text{hadron}} = 0.22$. NODE=S051S25;LINKAGE=E

$\Gamma(\psi(2S) \text{anything})/\Gamma(J/\psi(1S) \text{anything})$ — Γ_{61}/Γ_{60}

NODE=S051R95
NODE=S051R95

VALUE	DOCUMENT ID		TECN	COMMENT
0.263 ± 0.013 OUR AVERAGE				
$0.265 \pm 0.002 \pm 0.016$	[1] AAIJ	20G	LHCB	pp at 13 TeV
$0.266 \pm 0.06 \pm 0.03$	[2,3] AAIJ	12BD	LHCB	pp at 7 TeV
$0.257 \pm 0.015 \pm 0.019$	[4,5] CHATRCHYAN	12AK	CMS	pp at 7 TeV

[1] The first error is statistic; the second error is the total systematic error. NODE=S051R95;LINKAGE=C

[2] AAIJ 12BD reports $B(b \to \psi(2S)X) = (3.08 \pm 0.07 \pm 0.36 \pm 0.27) \times 10^{-3}$ and we divided our best value of $B(b \to \psi(1S)X) = (1.16 \pm 0.10) \times 10^{-2}$ as the ratio listed here. NODE=S051R95;LINKAGE=A

[3] Assumes lepton universality imposing $B(\psi(2s) \to \mu^+\mu^-) = B(\psi(2s) \to e^+e^-)$. NODE=S051R95;LINKAGE=B

[4] CHATRCHYAN 12AK really reports $\Gamma_{61}/\Gamma = (3.08 \pm 0.12 \pm 0.13 \pm 0.42) \times 10^{-3}$ assuming PDG 10 value of $\Gamma_{60}/\Gamma = (1.16 \pm 0.10) \times 10^{-2}$ which we present as a ratio of $\Gamma_{61}/\Gamma_{60} = (26.5 \pm 1.0 \pm 1.1 \pm 2.8) \times 10^{-2}$. NODE=S051R95;LINKAGE=AA

[5] CHATRCHYAN 12AK reports $(26.5 \pm 1.0 \pm 1.1 \pm 2.8) \times 10^{-2}$ from a measurement of $[\Gamma(\overline{b} \to \psi(2S) \text{anything})/\Gamma(\overline{b} \to J/\psi(1S) \text{anything})] \times [B(\psi(2S) \to \mu^+\mu^-)]$ NODE=S051R95;LINKAGE=CH

/ [B($J/\psi(1S)$ → $\mu^+\mu^-$)] assuming B($\psi(2S)$ → $\mu^+\mu^-$) = (7.7 ± 0.8) × 10^{-3},B($J/\psi(1S)$ → $\mu^+\mu^-$) = (5.93 ± 0.06) × 10^{-2}, which we rescale to our best (shown rounded) values B($\psi(2S)$ → $\mu^+\mu^-$) = (8.0 ± 0.6) × 10^{-3}, B($J/\psi(1S)$ → $\mu^+\mu^-$) = (5.961 ± 0.033) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values.

$\Gamma(\chi_{c0}(1P)\,\text{anything})/\Gamma_{\text{total}}$ Γ_{62}/Γ

NODE=S051R43
NODE=S051R43

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
2.9±0.6 OUR AVERAGE [(3.0 ± 0.6) × 10^{-3} OUR 2025 AVERAGE]			
2.9±0.6±0.1	[1] AAIJ 24AP	LHCB	pp at 13 TeV

NEW

[1] AAIJ 24AP reports [$\Gamma(\overline{b} \to \chi_{c0}(1P)\,\text{anything})/\Gamma_{\text{total}}$] × [B($\chi_{c0}(1P)$ → $p\overline{p}$)] = (6.74 ± 1.18 ± 0.62) × 10^{-7} which we divide by our best (shown rounded) value B($\chi_{c0}(1P)$ → $p\overline{p}$) = (2.35 ± 0.12) × 10^{-4}. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=S051R43;LINKAGE=A

$\Gamma(\chi_{c0}(1P)\,\text{anything})/\Gamma(\eta_c(1S)\,\text{anything})$ Γ_{62}/Γ_{66}

NODE=S051R00
NODE=S051R00

VALUE	DOCUMENT ID	TECN	COMMENT
0.26±0.08 OUR AVERAGE [0.32 ± 0.09 OUR 2025 AVERAGE]			
0.26±0.04±0.07	[1] AAIJ 17BB	LHCB	pp at 7, 8 TeV

NEW

[1] AAIJ 17BB reports [$\Gamma(\overline{b} \to \chi_{c0}(1P)\,\text{anything})/\Gamma(\overline{b} \to \eta_c(1S)\,\text{anything})$] / [B($\eta_c(1S)$ → $\phi\phi$)] × [B($\chi_{c0}(1P)$ → $\phi\phi$)] = 0.147 ± 0.023 ± 0.011 which we multiply or divide by our best (shown rounded) values B($\eta_c(1S)$ → $\phi\phi$) = (1.4 ± 0.4) × 10^{-3}, B($\chi_{c0}(1P)$ → $\phi\phi$) = (8.3 ± 0.4) × 10^{-4}. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values.

NODE=S051R00;LINKAGE=A

$\Gamma(\chi_{c1}(1P)\,\text{anything})/\Gamma_{\text{total}}$ Γ_{63}/Γ

NODE=S051R89
NODE=S051R89

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
5.6±1.5 OUR AVERAGE Error includes scale factor of 1.3. [(5.9 ± 1.5) × 10^{-3} OUR 2025 AVERAGE Scale factor = 1.2]				
4.9±1.2±0.2		[1] AAIJ 24AP	LHCB	pp at 13 TeV
$11.3^{+5.8}_{-5.1}$±0.4		[2] ABREU 94P	DLPH	$e^+e^- \to Z$
19 ±7 ±1	19	[3] ADRIANI 93J	L3	$e^+e^- \to Z$

NEW

[1] AAIJ 24AP reports [$\Gamma(\overline{b} \to \chi_{c1}(1P)\,\text{anything})/\Gamma_{\text{total}}$] × [B($\chi_{c1}(1P)$ → $p\overline{p}$)] = (3.88 ± 0.91 ± 0.36) × 10^{-7} which we divide by our best (shown rounded) value B($\chi_{c1}(1P)$ → $p\overline{p}$) = (7.97 ± 0.29) × 10^{-5}. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=S051R89;LINKAGE=A

[2] ABREU 94P reports (1.4 ± $0.6^{+0.4}_{-0.2}$) × 10^{-2} from a measurement of [$\Gamma(\overline{b} \to \chi_{c1}(1P)\,\text{anything})/\Gamma_{\text{total}}$] × [B($\chi_{c1}(1P)$ → $\gamma J/\psi(1S)$)] assuming B($\chi_{c1}(1P)$ → $\gamma J/\psi(1S)$) = (27.3 ± 1.6) × 10^{-2}, which we rescale to our best (shown rounded) value B($\chi_{c1}(1P)$ → $\gamma J/\psi(1S)$) = (33.9 ± 1.2) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. Assumes no $\chi_{c2}(1P)$ and $\Gamma(Z \to b\overline{b})/\Gamma_{\text{hadron}}$=0.22.

NODE=S051R89;LINKAGE=J3

[3] ADRIANI 93J reports (2.4 ± 0.9 ± 0.2) × 10^{-2} from a measurement of [$\Gamma(\overline{b} \to \chi_{c1}(1P)\,\text{anything})/\Gamma_{\text{total}}$] × [B($\chi_{c1}(1P)$ → $\gamma J/\psi(1S)$)] assuming B($\chi_{c1}(1P)$ → $\gamma J/\psi(1S)$) = (27.3 ± 1.6) × 10^{-2}, which we rescale to our best (shown rounded) value B($\chi_{c1}(1P)$ → $\gamma J/\psi(1S)$) = (33.9 ± 1.2) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=S051R89;LINKAGE=J4

$\Gamma(\chi_{c1}(1P)\,\text{anything})/\Gamma(J/\psi(1S)\,\text{anything})$ Γ_{63}/Γ_{60}

NODE=S051S59
NODE=S051S59

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.92±0.82	121	[1] ADRIANI 93J	L3	$e^+e^- \to Z$

[1] ADRIANI 93J is a ratio of inclusive measurements from b decays at the Z using only the $J/\psi(1S)$ → $\mu^+\mu^-$ channel since some systematics cancel.

NODE=S051S59;LINKAGE=A

$\Gamma(\chi_{c1}(1P)\,\text{anything})/\Gamma(\chi_{c0}(1P)\,\text{anything})$ Γ_{63}/Γ_{62}

NODE=S051R05
NODE=S051R05

VALUE	DOCUMENT ID	TECN	COMMENT
1.06±0.22 OUR AVERAGE			
1.7 ±0.7 ±0.1	[1] AAIJ 24AP	LHCB	pp at 13 TeV
0.99±0.22±0.06	[2] AAIJ 17BB	LHCB	pp at 7, 8 TeV

[1] AAIJ 24AP reports $[\Gamma(\overline{b} \to \chi_{c1}(1P)\text{anything})/\Gamma(\overline{b} \to \chi_{c0}(1P)\text{anything})]$ / $[B(\chi_{c0}(1P) \to p\overline{p})] \times [B(\chi_{c1}(1P) \to p\overline{p})] = 0.58 \pm 0.23 \pm 0.02$ which we multiply or divide by our best (shown rounded) values $B(\chi_{c0}(1P) \to p\overline{p}) = (2.35 \pm 0.12) \times 10^{-4}$, $B(\chi_{c1}(1P) \to p\overline{p}) = (7.97 \pm 0.29) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values. NODE=S051R05;LINKAGE=B

[2] AAIJ 17BB reports $[\Gamma(\overline{b} \to \chi_{c1}(1P)\text{anything})/\Gamma(\overline{b} \to \chi_{c0}(1P)\text{anything})]$ / $[B(\chi_{c0}(1P) \to \phi\phi)] \times [B(\chi_{c1}(1P) \to \phi\phi)] = 0.50 \pm 0.11 \pm 0.01$ which we multiply or divide by our best (shown rounded) values $B(\chi_{c0}(1P) \to \phi\phi) = (8.3 \pm 0.4) \times 10^{-4}$, $B(\chi_{c1}(1P) \to \phi\phi) = (4.22 \pm 0.20) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values. NODE=S051R05;LINKAGE=A

$\Gamma(\chi_{c1}(1P)\text{anything})/\Gamma(\eta_c(1S)\text{anything})$ Γ_{63}/Γ_{66}

NODE=S051R03
NODE=S051R03

VALUE	DOCUMENT ID	TECN	COMMENT
0.25±0.09 OUR AVERAGE [0.31 ± 0.11 OUR 2025 AVERAGE]			
0.25±0.06±0.07	[1] AAIJ 17BB	LHCB	pp at 7, 8 TeV

NEW

[1] AAIJ 17BB reports $[\Gamma(\overline{b} \to \chi_{c1}(1P)\text{anything})/\Gamma(\overline{b} \to \eta_c(1S)\text{anything})]$ / $[B(\eta_c(1S) \to \phi\phi)] \times [B(\chi_{c1}(1P) \to \phi\phi)] = 0.073 \pm 0.016 \pm 0.006$ which we multiply or divide by our best (shown rounded) values $B(\eta_c(1S) \to \phi\phi) = (1.4 \pm 0.4) \times 10^{-3}$, $B(\chi_{c1}(1P) \to \phi\phi) = (4.22 \pm 0.20) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values. NODE=S051R03;LINKAGE=A

$\Gamma(\chi_{c2}(1P)\text{anything})/\Gamma_{\text{total}}$ Γ_{64}/Γ

NODE=S051R44
NODE=S051R44

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
1.4±1.0 OUR AVERAGE [$(1.6 \pm 1.2) \times 10^{-3}$ OUR 2025 AVERAGE]			
1.4±1.0±0.1	[1] AAIJ 24AP	LHCB	pp at 13 TeV

NEW

[1] AAIJ 24AP reports $[\Gamma(\overline{b} \to \chi_{c2}(1P)\text{anything})/\Gamma_{\text{total}}] \times [B(\chi_{c2}(1P) \to p\overline{p})] = (1.13 \pm 0.83 \pm 0.10) \times 10^{-7}$ which we divide by our best (shown rounded) value $B(\chi_{c2}(1P) \to p\overline{p}) = (8.06 \pm 0.33) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. NODE=S051R44;LINKAGE=A

$\Gamma(\chi_{c2}(1P)\text{anything})/\Gamma(\chi_{c0}(1P)\text{anything})$ Γ_{64}/Γ_{62}

NODE=S051R06
NODE=S051R06

VALUE	DOCUMENT ID	TECN	COMMENT
0.39±0.07 OUR AVERAGE			
0.50±0.35±0.03	[1] AAIJ 24AP	LHCB	pp at 13 TeV
0.38±0.07±0.03	[2] AAIJ 17BB	LHCB	pp at 7, 8 TeV

[1] AAIJ 24AP reports $[\Gamma(\overline{b} \to \chi_{c2}(1P)\text{anything})/\Gamma(\overline{b} \to \chi_{c0}(1P)\text{anything})]$ / $[B(\chi_{c0}(1P) \to p\overline{p})] \times [B(\chi_{c2}(1P) \to p\overline{p})] = 0.17 \pm 0.12 \pm 0.01$ which we multiply or divide by our best (shown rounded) values $B(\chi_{c0}(1P) \to p\overline{p}) = (2.35 \pm 0.12) \times 10^{-4}$, $B(\chi_{c2}(1P) \to p\overline{p}) = (8.06 \pm 0.33) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values. NODE=S051R06;LINKAGE=B

[2] AAIJ 17BB reports $[\Gamma(\overline{b} \to \chi_{c2}(1P)\text{anything})/\Gamma(\overline{b} \to \chi_{c0}(1P)\text{anything})]$ / $[B(\chi_{c0}(1P) \to \phi\phi)] \times [B(\chi_{c2}(1P) \to \phi\phi)] = 0.56 \pm 0.10 \pm 0.01$ which we multiply or divide by our best (shown rounded) values $B(\chi_{c0}(1P) \to \phi\phi) = (8.3 \pm 0.4) \times 10^{-4}$, $B(\chi_{c2}(1P) \to \phi\phi) = (1.22 \pm 0.07) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values. NODE=S051R06;LINKAGE=A

$\Gamma(\chi_{c2}(1P)\text{anything})/\Gamma(\eta_c(1S)\text{anything})$ Γ_{64}/Γ_{66}

NODE=S051R04
NODE=S051R04

VALUE	DOCUMENT ID	TECN	COMMENT
0.096±0.031 OUR AVERAGE [0.12 ± 0.04 OUR 2025 AVERAGE]			
0.096±0.016±0.027	[1] AAIJ 17BB	LHCB	pp at 7, 8 TeV

NEW

[1] AAIJ 17BB reports $[\Gamma(\overline{b} \to \chi_{c2}(1P)\text{anything})/\Gamma(\overline{b} \to \eta_c(1S)\text{anything})]$ / $[B(\eta_c(1S) \to \phi\phi)] \times [B(\chi_{c2}(1P) \to \phi\phi)] = 0.081 \pm 0.013 \pm 0.005$ which we multiply or divide by our best (shown rounded) values $B(\eta_c(1S) \to \phi\phi) = (1.4 \pm 0.4) \times 10^{-3}$, $B(\chi_{c2}(1P) \to \phi\phi) = (1.22 \pm 0.07) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) values. NODE=S051R04;LINKAGE=A

$\Gamma(\chi_c(2P)\text{anything}, \chi_c \to \phi\phi)/\Gamma_{\text{total}}$ Γ_{65}/Γ

NODE=S051R30
NODE=S051R30

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<2.8 × 10^{-7}	95	AAIJ 17BB	LHCB	pp at 7, 8 TeV

$\Gamma(\eta_c(1S)\text{anything})/\Gamma(J/\psi(1S)\text{anything})$ Γ_{66}/Γ_{60}

NODE=S051R40
NODE=S051R40

VALUE	DOCUMENT ID	TECN	COMMENT
0.49±0.04 OUR AVERAGE			
0.49±0.03±0.05	[1] AAIJ 24AP	LHCB	pp at 13 TeV
0.48±0.03±0.06	AAIJ 20H	LHCB	pp at 13 TeV

[1] Using $\eta_c(1S)$ and $J/\psi(1S)$ decays to $p\overline{p}$. NODE=S051R40;LINKAGE=A

$\Gamma(\eta_c(2S)\text{anything},\ \eta_c \to \phi\phi)/\Gamma(\eta_c(1S)\text{anything})$ Γ_{67}/Γ_{66}

NODE=S051R07
NODE=S051R07

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
5.8±2.3 OUR AVERAGE [(7.3 ± 2.8) × 10^{-5} OUR 2025 AVERAGE]				
5.8±1.7±1.6	[1] AAIJ	17BB	LHCB	pp at 7, 8 TeV

NEW

[1] AAIJ 17BB reports $[\Gamma(\overline{b} \to \eta_c(2S)\text{anything},\ \eta_c \to \phi\phi)/\Gamma(\overline{b} \to \eta_c(1S)\text{anything})] / [B(\eta_c(1S) \to \phi\phi)] = 0.040 \pm 0.011 \pm 0.004$ which we multiply by our best (shown rounded) value $B(\eta_c(1S) \to \phi\phi) = (1.4 \pm 0.4) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=S051R07;LINKAGE=A

$\Gamma(\chi_{c1}(3872)\text{anything},\ \chi_{c1} \to \phi\phi)/\Gamma_{\text{total}}$ Γ_{68}/Γ

NODE=S051R08
NODE=S051R08

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<4.5 × 10^{-7}	95	AAIJ	17BB	LHCB	pp at 7, 8 TeV

$\Gamma(\chi_{c0}(3915)\text{anything},\ \chi_{c0} \to \phi\phi)/\Gamma_{\text{total}}$ Γ_{69}/Γ

NODE=S051R09
NODE=S051R09

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<3.1 × 10^{-7}	95	AAIJ	17BB	LHCB	pp at 7, 8 TeV

$\Gamma(\overline{s}\gamma)/\Gamma_{\text{total}}$ Γ_{70}/Γ

NODE=S051S58
NODE=S051S58

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
3.11±0.80±0.72		[1] BARATE	98I	ALEP	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 5.4	90	[2] ADAM	96D	DLPH	$e^+e^- \to Z$
<12	90	[3] ADRIANI	93L	L3	$e^+e^- \to Z$

[1] BARATE 98I uses lifetime tagged $Z \to b\overline{b}$ sample.

NODE=S051S58;LINKAGE=B

[2] ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.

NODE=S051S58;LINKAGE=DQ

[3] ADRIANI 93L result is for $\overline{b} \to \overline{s}\gamma$ is performed inclusively.

NODE=S051S58;LINKAGE=A

$\Gamma(\overline{s}\overline{\nu}\nu)/\Gamma_{\text{total}}$ Γ_{71}/Γ

NODE=S051R67
NODE=S051R67

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<6.4 × 10^{-4}	90	[1] BARATE	01E	ALEP	$e^+e^- \to Z$

[1] The energy-flow and b-tagging algorithms were used.

NODE=S051R67;LINKAGE=QK

$\Gamma(K^\pm\text{anything})/\Gamma_{\text{total}}$ Γ_{72}/Γ

NODE=S051R10
NODE=S051R10

VALUE	DOCUMENT ID		TECN	COMMENT
0.74±0.06 OUR AVERAGE				
0.72±0.02±0.06	BARATE	98V	ALEP	$e^+e^- \to Z$
0.88±0.05±0.18	ABREU	95C	DLPH	$e^+e^- \to Z$

$\Gamma(K^0_S\text{anything})/\Gamma_{\text{total}}$ Γ_{73}/Γ

NODE=S051R11
NODE=S051R11

VALUE	DOCUMENT ID		TECN	COMMENT
0.290±0.011±0.027	ABREU	95C	DLPH	$e^+e^- \to Z$

$\Gamma(\pi^\pm\text{anything})/\Gamma_{\text{total}}$ Γ_{74}/Γ

NODE=S051R34
NODE=S051R34

VALUE	DOCUMENT ID		TECN	COMMENT
3.97±0.02±0.21	BARATE	98V	ALEP	$e^+e^- \to Z$

$\Gamma(\pi^0\text{anything})/\Gamma_{\text{total}}$ Γ_{75}/Γ

NODE=S051R5
NODE=S051R5

VALUE	DOCUMENT ID		TECN	COMMENT
2.78±0.15±0.60	[1] ADAM	96	DLPH	$e^+e^- \to Z$

[1] ADAM 96 measurement obtained from a fit to the rapidity distribution of $\pi^{0's}$ in $Z \to bb$ events.

NODE=S051R5;LINKAGE=A

$\Gamma(\phi\text{anything})/\Gamma_{\text{total}}$ Γ_{76}/Γ

NODE=S051R58
NODE=S051R58

VALUE	DOCUMENT ID		TECN	COMMENT
0.0282±0.0013±0.0019	ABBIENDI	00Z	OPAL	$e^+e^- \to Z$

$\Gamma(p/\overline{p}\text{anything})/\Gamma_{\text{total}}$ Γ_{77}/Γ

NODE=S051R12
NODE=S051R12

VALUE	DOCUMENT ID		TECN	COMMENT
0.131±0.011 OUR AVERAGE				
0.131±0.004±0.011	BARATE	98V	ALEP	$e^+e^- \to Z$
0.141±0.018±0.056	ABREU	95C	DLPH	$e^+e^- \to Z$

$\Gamma(\Lambda/\overline{\Lambda}\text{anything})/\Gamma_{total}$ Γ_{78}/Γ

NODE=S051R13

VALUE	DOCUMENT ID		TECN	COMMENT
0.059 ±0.006 OUR AVERAGE				
0.0587±0.0046±0.0048	ACKERSTAFF	97N	OPAL	$e^+e^- \rightarrow Z$
0.059 ±0.007 ±0.009	ABREU	95C	DLPH	$e^+e^- \rightarrow Z$

$\Gamma(b\text{-baryon anything})/\Gamma_{total}$ Γ_{79}/Γ

NODE=S051R35

VALUE	DOCUMENT ID		TECN	COMMENT
0.102±0.007±0.027	[1] BARATE	98V	ALEP	$e^+e^- \rightarrow Z$

[1] BARATE 98V assumes B($B_s \rightarrow pX$) = 8 ± 4% and B(b-baryon $\rightarrow pX$) = 58 ± 6%.

NODE=S051R35;LINKAGE=A

$\Gamma(\Xi_b^+\text{ anything})/\Gamma(\overline{\Lambda}_b^0\text{anything})$ Γ_{81}/Γ_{80}

NODE=S051R36

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
7.3±1.7 OUR AVERAGE				
6.7±0.5±2.1	[1] AAIJ	19AB	LHCB	pp at 7 and 8 TeV
8.2±0.7±2.6	[1] AAIJ	19AB	LHCB	pp at 13 TeV

OCCUR=2

[1] Measured from R = $[B(\overline{b} \rightarrow \Xi_b^+)\times B(\Xi_b \rightarrow J/\psi\,\Xi^+)]/[B(\overline{b} \rightarrow \overline{\Lambda}_b^0)\times B(\overline{\Lambda}_b^0 \rightarrow J/\psi\,\overline{\Lambda}^0)]$ and assumes $\Gamma_{\Xi_b^+ \rightarrow J/\psi\,\Xi^+}/\Gamma_{\overline{\Lambda}_b^0 \rightarrow J/\psi\,\overline{\Lambda}^0} = 3/2$ related through SU(3) flavor symmetry.

NODE=S051R36;LINKAGE=A

$\Gamma(\text{charged anything})/\Gamma_{total}$ Γ_{82}/Γ

NODE=S051R14

VALUE	DOCUMENT ID		TECN	COMMENT
4.97±0.03±0.06	[1] ABREU	98H	DLPH	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.84±0.04±0.38	ABREU	95C	DLPH	Repl. by ABREU 98H

[1] ABREU 98H measurement excludes the contribution from K^0 and Λ decay.

NODE=S051R14;LINKAGE=A

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

NODE=S051R29

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
$1.7^{+1.0}_{-0.7}\pm0.2$	[1,2] BUSKULIC	96V	ALEP	$e^+e^- \rightarrow Z$

[1] BUSKULIC 96V assumes PDG 96 production fractions for B^0, B^+, B_s, b baryons.

NODE=S051R29;LINKAGE=BV

[2] Average branching fraction of weakly decaying B hadrons into two long-lived charged hadrons, weighted by their production cross section and lifetimes.

NODE=S051R29;LINKAGE=CV

$\Gamma(\text{charmless})/\Gamma_{total}$ Γ_{84}/Γ

NODE=S051R7

VALUE	DOCUMENT ID		TECN	COMMENT
0.007±0.021	[1] ABREU	98D	DLPH	$e^+e^- \rightarrow Z$

[1] ABREU 98D results are extracted from a fit to the b-tagging probability distribution based on the impact parameter. The expected hidden charm contribution of 0.026 ± 0.004 has been subtracted.

NODE=S051R7;LINKAGE=B

$\Gamma(\mu^+\mu^-\text{ anything})/\Gamma_{total}$ Γ_{86}/Γ

NODE=S051S4

Test for $\Delta B = 1$ weak neutral current.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<3.2 $\times 10^{-4}$	90	ABBOTT	98B	D0	$p\overline{p}$ 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5.0 \times 10^{-5}$	90	[1] ALBAJAR	91C	UA1	$E_{cm}^{p\overline{p}}$= 630 GeV
<0.02	95	ALTHOFF	84G	TASS	E_{cm}^{ee}= 34.5 GeV
<0.007	95	ADEVA	83	MRKJ	E_{cm}^{ee}= 30–38 GeV
<0.007	95	BARTEL	83B	JADE	E_{cm}^{ee}= 33–37 GeV

[1] Both ABBOTT 98B and GLENN 98 claim that the efficiency quoted in ALBAJAR 91C was overestimated by a large factor.

NODE=S051S4;LINKAGE=B

$[\Gamma(e^+e^-\text{ anything}) + \Gamma(\mu^+\mu^-\text{ anything})]/\Gamma_{total}$ $(\Gamma_{85}+\Gamma_{86})/\Gamma$

NODE=S051S5

Test for $\Delta B = 1$ weak neutral current.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.008	90	MATTEUZZI	83	MRK2	E_{cm}^{ee}= 29 GeV

$\Gamma(\nu\overline{\nu}\text{anything})/\Gamma_{\text{total}}$ Γ_{87}/Γ

NODE=S051R20

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<3.9 \times 10^{-4}$	[1] GROSSMAN	96	RVUE	$e^+e^- \rightarrow Z$

[1] GROSSMAN 96 limit is derived from the ALEPH BUSKULIC 95 limit B($B^+ \rightarrow \tau^+\nu_\tau$) $< 1.8 \times 10^{-3}$ at CL=90% using conservative simplifying assumptions. NODE=S051R20;LINKAGE=A

χ_b AT HIGH ENERGY

NODE=S051CB

χ_b is the average B-$\overline{B}$ mixing parameter at high-energy $\chi_b = f'_d\chi_d + f'_s\chi_s$ where f'_d and f'_s are the fractions of B^0 and B^0_s hadrons in an unbiased sample of semileptonic b-hadron decays. We consider here $\overline{\chi}$ for hadrons produced in Z decays.

NODE=S051CB

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
12.59± 0.42 OUR EVALUATION		(from LEP-SLC 06, eq. 5.39)			
12.6 ± 0.4 OUR AVERAGE					
13.12± 0.49±0.42		[1] ABBIENDI	03P	OPAL	$e^+e^- \rightarrow Z$
12.7 ± 1.3 ±0.6		[2] ABREU	01L	DLPH	$e^+e^- \rightarrow Z$
11.92± 0.68±0.51		[3] ACCIARRI	99D	L3	$e^+e^- \rightarrow Z$
12.1 ± 1.6 ±0.6		[4] ABREU	94J	DLPH	$e^+e^- \rightarrow Z$
11.4 ± 1.4 ±0.8		[5] BUSKULIC	94G	ALEP	$e^+e^- \rightarrow Z$
12.9 ± 2.2		[6] BUSKULIC	92B	ALEP	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
13.2 ± 0.1 ±2.4		[7] ABAZOV	06S	D0	$p\overline{p}$ at 1.96 TeV
15.2 ± 0.7 ±1.1		[8] ACOSTA	04A	CDF	$p\overline{p}$ at 1.8 TeV
13.1 ± 2.0 ±1.6		[9] ABE	97I	CDF	Repl. by ACOSTA 04A
11.07± 0.62±0.55		[10] ALEXANDER	96	OPAL	Rep. by ABBIENDI 03P
13.6 ± 3.7 ±4.0		[11] UENO	96	AMY	e^+e^- at 57.9 GeV
14.4 ± 1.4 $^{+1.7}_{-1.1}$		[12] ABREU	94F	DLPH	Sup. by ABREU 94J
13.1 ± 1.4		[13] ABREU	94J	DLPH	$e^+e^- \rightarrow Z$
12.3 ± 1.2 ±0.8		ACCIARRI	94D	L3	Repl. by ACCIARRI 99D
15.7 ± 2.0 ±3.2		[14] ALBAJAR	94	UA1	$\sqrt{s} = 630$ GeV
12.1 $^{+4.4}_{-4.0}$ ±1.7	1665	[15] ABREU	93C	DLPH	Sup. by ABREU 94J
14.3 $^{+2.2}_{-2.1}$ ±0.7		[16] AKERS	93B	OPAL	Sup. by ALEXANDER 96
14.5 $^{+4.1}_{-3.5}$ ±1.8		[17] ACTON	92C	OPAL	$e^+e^- \rightarrow Z$
12.1 ± 1.7 ±0.6		[18] ADEVA	92C	L3	Sup. by ACCIARRI 94D
17.6 ± 3.1 ±3.2	1112	[19] ABE	91G	CDF	$p\overline{p}$ 1.8 TeV
14.8 ± 2.9 ±1.7		[20] ALBAJAR	91D	UA1	$p\overline{p}$ 630 GeV
13.2 ±22.0 $^{+1.5}_{-1.2}$	823	[21] DECAMP	91	ALEP	$e^+e^- \rightarrow Z$
17.8 $^{+4.9}_{-4.0}$ ±2.0		[22] ADEVA	90P	L3	$e^+e^- \rightarrow Z$
17 $^{+15}_{-8}$		[23,24] WEIR	90	MRK2	e^+e^- 29 GeV
21 $^{+29}_{-15}$		[23] BAND	88	MAC	$E^{ee}_{\text{cm}} = 29$ GeV
>2 at 90%CL		[23] BAND	88	MAC	$E^{ee}_{\text{cm}} = 29$ GeV
12.1 ± 4.7		[23,25] ALBAJAR	87C	UA1	Repl. by ALBAJAR 91D
<12 at 90%CL		[23,26] SCHAAD	85	MRK2	$E^{ee}_{\text{cm}} = 29$ GeV

NODE=S051CB

→ UNCHECKED ←

OCCUR=2 (ABREU 94J, second entry)

OCCUR=2 (BAND 88, second entry)

[1] The average B mixing parameter is determined simultaneously with b and c forward-backward asymmetries in the fit. NODE=S051CB;LINKAGE=AE

[2] The experimental systematic and model uncertainties are combined in quadrature. NODE=S051CB;LINKAGE=L1

[3] ACCIARRI 99D uses maximum-likelihood fits to extract χ_b as well as the A^b_{FB} in $Z \rightarrow b\overline{b}$ events containing prompt leptons. NODE=S051CB;LINKAGE=9D

[4] This ABREU 94J result is from 5182 $\ell\ell$ and 279 $\Lambda\ell$ events. The systematic error includes 0.004 for model dependence. NODE=S051CB;LINKAGE=D

[5] BUSKULIC 94G data analyzed using ee, $e\mu$, and $\mu\mu$ events. NODE=S051CB;LINKAGE=H

[6] BUSKULIC 92B uses a jet charge technique combined with electrons and muons. NODE=S051CB;LINKAGE=O

[7] Uses the dimuon charge asymmetry. Averaged over the mix of b-flavored hadrons. NODE=S051CB;LINKAGE=AZ

[8] Measurement performed using events containing a dimuon or an e/μ pair. NODE=S051CB;LINKAGE=AC

[9] Uses di-muon events. NODE=S051CB;LINKAGE=T

[10] ALEXANDER 96 uses a maximum likelihood fit to simultaneously extract χ as well as the forward-backward asymmetries in $e^+e^- \rightarrow Z \rightarrow b\overline{b}$ and $c\overline{c}$. NODE=S051CB;LINKAGE=R

[11] UENO 96 extracted χ from the energy dependence of the forward-backward asymmetry. NODE=S051CB;LINKAGE=S
[12] ABREU 94F uses the average electric charge sum of the jets recoiling against a b-quark jet tagged by a high p_T muon. The result is for $\overline{\chi} = f_d \chi_d + 0.9 f_s \chi_s$. NODE=S051CB;LINKAGE=B
[13] This ABREU 94J result combines $\ell\ell$, $\Lambda\ell$, and jet-charge ℓ (ABREU 94F) analyses. It is for $\overline{\chi} = f_d \chi_d + 0.96 f_s \chi_s$. NODE=S051CB;LINKAGE=Q
[14] ALBAJAR 94 uses dimuon events. Not independent of ALBAJAR 91D. NODE=S051CB;LINKAGE=L
[15] ABREU 93C data analyzed using ee, $e\mu$, and $\mu\mu$ events. NODE=S051CB;LINKAGE=P
[16] AKERS 93B analysis performed using dilepton events. NODE=S051CB;LINKAGE=A
[17] ACTON 92C uses electrons and muons. Superseded by AKERS 93B. NODE=S051CB;LINKAGE=N
[18] ADEVA 92C uses electrons and muons. NODE=S051CB;LINKAGE=M
[19] ABE 91G measurement of χ is done with $e\mu$ and ee events. NODE=S051CB;LINKAGE=I
[20] ALBAJAR 91D measurement of χ is done with dimuons. NODE=S051CB;LINKAGE=J
[21] DECAMP 91 done with opposite and like-sign dileptons. Superseded by BUSKULIC 92B. NODE=S051CB;LINKAGE=K
[22] ADEVA 90P measurement uses ee, $\mu\mu$, and $e\mu$ events from 118k events at the Z. Superseded by ADEVA 92C. NODE=S051CB;LINKAGE=C
[23] These experiments are not in the average because the combination of B_s and B_d mesons which they see could differ from those at higher energy. NODE=S051CB;LINKAGE=E9
[24] The WEIR 90 measurement supersedes the limit obtained in SCHAAD 85. The 90% CL are 0.06 and 0.38. NODE=S051CB;LINKAGE=G
[25] ALBAJAR 87C measured $\chi = (\overline{B}^0 \rightarrow B^0 \rightarrow \mu^+ X)$ divided by the average production weighted semileptonic branching fraction for B hadrons at 546 and 630 GeV. NODE=S051CB;LINKAGE=E
[26] Limit is average probability for hadron containing B quark to produce a positive lepton. NODE=S051CB;LINKAGE=BB

CP VIOLATION PARAMETERS in semileptonic *b*-hadron decays.

NODE=S051240

Re(ϵ_b) / (1 + $|\epsilon_b|^2$)

NODE=S051EPS

CP impurity in semileptonic b-hadron decays.

NODE=S051EPS
NODE=S051EPS

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$-6.2 \pm 5.2 \pm 4.7$	[1] AABOUD	17E	ATLS	pp at 8 TeV
$-1.24 \pm 0.38 \pm 0.18$	[2] ABAZOV	14	D0	$p\overline{p}$ at 1.96 TeV
$-1.97 \pm 0.43 \pm 0.23$	[3] ABAZOV	11U	D0	Repl. by ABAZOV 14
$-2.39 \pm 0.63 \pm 0.37$	[4] ABAZOV	10H	D0	Repl. by ABAZOV 11U

[1] AABOUD 17E reports a measurement of charge asymmetry of $A^b_{SL} = (-25 \pm 21 \pm 19) \times 10^{-3}$ in lepton + jets $t\overline{t}$ events in which a b-hadron decays semileptonically to a soft muon. NODE=S051EPS;LINKAGE=C
[2] ABAZOV 14 reports a measurement of like-sign dimuon charge asymmetry of $A^b_{SL} = (-4.96 \pm 1.53 \pm 0.72) \times 10^{-3}$ in semileptonic b-hadron decays. NODE=S051EPS;LINKAGE=A
[3] ABAZOV 11U reports a measurement of like-sign dimuon charge asymmetry of $A^b_{SL} = (-7.87 \pm 1.72 \pm 0.93) \times 10^{-3}$ in semileptonic b-hadron decays. NODE=S051EPS;LINKAGE=AO
[4] ABAZOV 10H reports a measurement of like-sign dimuon charge asymmetry of $A^b_{SL} = (-9.57 \pm 2.51 \pm 1.46) \times 10^{-3}$ in semileptonic b-hadron decays. Using the measured production ratio of B^0_d and B^0_s, and the asymmetry of B^0_d $A^d_{SL} = (-4.7 \pm 4.6) \times 10^{-3}$ measured from B-factories, they obtain the asymmetry for B^0_s as $A^s_{SL} = (-14.6 \pm 7.5) \times 10^{-3}$. NODE=S051EPS;LINKAGE=AB

PRODUCTION ASYMMETRIES

NODE=S051225

$A_C^{b\overline{b}}$

NODE=S051PAY

$A_C^{b\overline{b}} = [N(\Delta y > 0) - N(\Delta y < 0)] / [N(\Delta y > 0) + N(\Delta y < 0)]$ with $\Delta y = |y_b| - |y_{\overline{b}}|$ where $y_{b/\overline{b}}$ is rapidity of b or $\overline{b}$ quarks.

NODE=S051PAY

NODE=S051PAY

VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*	
Average is meaningless.					
$0.4 \pm 0.4 \pm 0.3$	[1] AAIJ	14AS	LHCB	pp at 7 TeV	
$2.0 \pm 0.9 \pm 0.6$	[2] AAIJ	14AS	LHCB	pp at 7 TeV	OCCUR=2
$1.6 \pm 1.7 \pm 0.6$	[3] AAIJ	14AS	LHCB	pp at 7 TeV	OCCUR=3

[1] Measured for $40 < M(b\overline{b}) < 75$ GeV/c^2. NODE=S051PAY;LINKAGE=A
[2] Measured for $75 < M(b\overline{b}) < 105$ GeV/c^2. NODE=S051PAY;LINKAGE=B
[3] Measured for $M(b\overline{b}) > 105$ GeV/c^2. NODE=S051PAY;LINKAGE=C

$B^{\pm}/B^{0}/B^{0}_{s}/b$-baryon ADMIXTURE REFERENCES

NODE=S051

AAIJ	24AP	EPJ C84 1274	R. Aaij *et al.*	(LHCb Collab.)	REFID=63208
AAIJ	21Y	PR D104 032005	R. Aaij *et al.*	(LHCb Collab.)	REFID=61375
AAIJ	20G	EPJ C80 185	R. Aaij *et al.*	(LHCb Collab.)	REFID=60417
AAIJ	20H	EPJ C80 191	R. Aaij *et al.*	(LHCb Collab.)	REFID=60419
AAIJ	20V	PRL 124 122002	R. Aaij *et al.*	(LHCb Collab.)	REFID=60545
AAIJ	19AB	PR D99 052006	R. Aaij *et al.*	(LHCb Collab.)	REFID=59843
AAIJ	19AD	PR D100 031102	R. Aaij *et al.*	(LHCb Collab.)	REFID=59907
AAIJ	19AI	PR D100 112006	R. Aaij *et al.*	(LHCb Collab.)	REFID=60040
AABOUD	17E	JHEP 1702 071	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57793
AAIJ	17BB	EPJ C77 609	R. Aaij *et al.*	(LHCb Collab.)	REFID=58191
AAD	15CM	PRL 115 262001	G. Aad *et al.*	(ATLAS Collab.)	REFID=57003
AAIJ	14AS	PRL 113 082003	R. Aaij *et al.*	(LHCb Collab.)	REFID=56071
ABAZOV	14	PR D89 012002	V.M. Abazov *et al.*	(D0 Collab.)	REFID=55621
AAIJ	13P	JHEP 1304 001	R. Aaij *et al.*	(LHCb Collab.)	REFID=54975
AAIJ	12BD	EPJ C72 2100	R. Aaij *et al.*	(LHCb Collab.)	REFID=54850
Also		EPJ C80 49 (errat.)	R. Aaij *et al.*	(LHCb Collab.)	REFID=60672
AAIJ	12J	PR D85 032008	R. Aaji *et al.*	(LHCb Collab.)	REFID=54064
CHATRCHYAN	12AK	JHEP 1202 011	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54566
AAIJ	11F	PRL 107 211801	R. Aaij *et al.*	(LHCb Collab.)	REFID=53857
ABAZOV	11U	PR D84 052007	V.M. Abazov *et al.*	(D0 Collab.)	REFID=53796
ABAZOV	10H	PRL 105 081801	V.M. Abazov *et al.*	(D0 Collab.)	REFID=53366
Also		PR D82 032001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=53365
PDG	10	JP G37 075021	K. Nakamura *et al.*	(PDG Collab.)	REFID=53229
AALTONEN	09E	PR D79 032001	T. Aaltonen *et al.*	(CDF Collab.)	REFID=52701
AALTONEN	08N	PR D77 072003	T. Aaltonen *et al.*	(CDF Collab.)	REFID=52342
ABAZOV	06S	PR D74 092001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=51499
LEP-SLC	06	PRPL 427 257	ALEPH, DELPHI, L3, OPAL, SLD and working groups		REFID=51219;ERROR=1;ERROR=2
ABBIENDI	04I	EPJ C35 149	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=49967
ABDALLAH	04E	EPJ C33 307	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=49917
ACOSTA	04A	PR D69 012002	D. Acosta *et al.*	(CDF Collab.)	REFID=49854
ABBIENDI	03M	EPJ C30 467	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=49553
ABBIENDI	03P	PL B577 18	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=49606
ABDALLAH	03E	PL B561 26	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=49370
ABDALLAH	03K	PL B576 29	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=49645
HEISTER	02G	EPJ C22 613	A. Heister *et al.*	(ALEPH Collab.)	REFID=48605
ABBIENDI	01Q	PL B520 1	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=48401
ABBIENDI	01R	EPJ C21 399	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=48461
ABREU	01L	EPJ C20 455	P. Abreu *et al.*	(DELPHI Collab.)	REFID=48197
BARATE	01E	EPJ C19 213	R. Barate *et al.*	(ALEPH Collab.)	REFID=48135
ABBIENDI	00E	EPJ C13 225	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=47478
ABBIENDI	00Z	PL B492 13	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=47795
ABREU	00	EPJ C12 225	P. Abreu *et al.*	(DELPHI Collab.)	REFID=47374
ABREU	00C	PL B496 43	P. Abreu *et al.*	(DELPHI Collab.)	REFID=47434
ABREU	00D	PL B478 14	P. Abreu *et al.*	(DELPHI Collab.)	REFID=47470
ABREU	00R	PL B475 407	P. Abreu *et al.*	(DELPHI Collab.)	REFID=47657
ACCIARRI	00	EPJ C13 47	M. Acciarri *et al.*	(L3 Collab.)	REFID=47433
AFFOLDER	00E	PRL 84 1663	T. Affolder *et al.*	(CDF Collab.)	REFID=47436
ABBIENDI	99J	EPJ C12 609	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=46738
ABE	99P	PR D60 092005	F. Abe *et al.*	(CDF Collab.)	REFID=47232
ACCIARRI	99D	PL B448 152	M. Acciarri *et al.*	(L3 Collab.)	REFID=46733
BARATE	99G	EPJ C6 555	R. Barate *et al.*	(ALEPH Collab.)	REFID=46720
ABBOTT	98B	PL B423 419	B. Abbott *et al.*	(D0 Collab.)	REFID=45868
ABE	98B	PR D57 5382	F. Abe *et al.*	(CDF Collab.)	REFID=45880
ABREU	98D	PL B426 193	P. Abreu *et al.*	(DELPHI Collab.)	REFID=45876
ABREU	98H	PL B425 399	P. Abreu *et al.*	(DELPHI Collab.)	REFID=45933
ACCIARRI	98	PL B416 220	M. Acciarri *et al.*	(L3 Collab.)	REFID=45831
ACCIARRI	98K	PL B436 174	M. Acciarri *et al.*	(L3 Collab.)	REFID=46158
ACKERSTAFF	98E	EPJ C1 439	K. Ackerstaff *et al.*	(OPAL Collab.)	REFID=45837
BARATE	98I	PL B429 169	R. Barate *et al.*	(ALEPH Collab.)	REFID=46061
BARATE	98Q	EPJ C4 387	R. Barate *et al.*	(ALEPH Collab.)	REFID=46146
BARATE	98V	EPJ C5 205	R. Barate *et al.*	(ALEPH Collab.)	REFID=46151
GLENN	98	PRL 80 2289	S. Glenn *et al.*	(CLEO Collab.)	REFID=45869
ABE	97I	PR D55 2546	F. Abe *et al.*	(CDF Collab.)	REFID=45362
ACKERSTAFF	97F	ZPHY C73 397	K. Ackerstaff *et al.*	(OPAL Collab.)	REFID=45414
ACKERSTAFF	97N	ZPHY C74 423	K. Ackerstaff *et al.*	(OPAL Collab.)	REFID=45488
ACKERSTAFF	97W	ZPHY C76 425	K. Ackerstaff *et al.*	(OPAL Collab.)	REFID=45788
ABREU	96E	PL B377 195	P. Abreu *et al.*	(DELPHI Collab.)	REFID=44701
ACCIARRI	96C	ZPHY C71 379	M. Acciarri *et al.*	(L3 Collab.)	REFID=44826
ADAM	96	ZPHY C69 561	W. Adam *et al.*	(DELPHI Collab.)	REFID=44627
ADAM	96D	ZPHY C72 207	W. Adam *et al.*	(DELPHI Collab.)	REFID=45276
ALEXANDER	96	ZPHY C70 357	G. Alexander *et al.*	(OPAL Collab.)	REFID=44628
BUSKULIC	96F	PL B369 151	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=44690
BUSKULIC	96V	PL B384 471	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=44909
BUSKULIC	96Y	PL B388 648	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=44963
GROSSMAN	96	NP B465 369	Y. Grossman, Z. Ligeti, E. Nardi	(REHO, CIT)	REFID=44692
Also		NP B480 753 (errat.)	Y. Grossman, Z. Ligeti, E. Nardi		REFID=45344
PDG	96	PR D54 1	R. M. Barnett *et al.*	(PDG Collab.)	REFID=44495
UENO	96	PL B381 365	K. Ueno *et al.*	(AMY Collab.)	REFID=44850
ABE,K	95B	PRL 75 3624	K. Abe *et al.*	(SLD Collab.)	REFID=44550
ABREU	95C	PL B347 447	P. Abreu *et al.*	(DELPHI Collab.)	REFID=44210
ABREU	95D	ZPHY C66 323	P. Abreu *et al.*	(DELPHI Collab.)	REFID=44261
ADAM	95	ZPHY C68 363	W. Adam *et al.*	(DELPHI Collab.)	REFID=44465
AKERS	95Q	ZPHY C67 57	R. Akers *et al.*	(OPAL Collab.)	REFID=44367
BUSKULIC	95	PL B343 444	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=44119
ABREU	94F	PL B322 459	P. Abreu *et al.*	(DELPHI Collab.)	REFID=43740
ABREU	94J	PL B332 488	P. Abreu *et al.*	(DELPHI Collab.)	REFID=43901
ABREU	94L	ZPHY C63 3	P. Abreu *et al.*	(DELPHI Collab.)	REFID=43995
ABREU	94P	PL B341 109	P. Abreu *et al.*	(DELPHI Collab.)	REFID=44067
ACCIARRI	94C	PL B332 201	M. Acciarri *et al.*	(L3 Collab.)	REFID=43897
ACCIARRI	94D	PL B335 542	M. Acciarri *et al.*	(L3 Collab.)	REFID=43963
ALBAJAR	94	ZPHY C61 41	C. Albajar *et al.*	(UA1 Collab.)	REFID=43909

BUSKULIC	94G	ZPHY C62 179	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=43911
ABE	93E	PL B313 288	K. Abe *et al.*	(VENUS Collab.)	REFID=43491
ABE	93J	PRL 71 3421	F. Abe *et al.*	(CDF Collab.)	REFID=43576
ABREU	93C	PL B301 145	P. Abreu *et al.*	(DELPHI Collab.)	REFID=43236
ABREU	93D	ZPHY C57 181	P. Abreu *et al.*	(DELPHI Collab.)	REFID=43267
ABREU	93G	PL B312 253	P. Abreu *et al.*	(DELPHI Collab.)	REFID=43443
ACTON	93C	PL B307 247	P.D. Acton *et al.*	(OPAL Collab.)	REFID=43352
ACTON	93L	ZPHY C60 217	P.D. Acton *et al.*	(OPAL Collab.)	REFID=43595
ADRIANI	93J	PL B317 467	O. Adriani *et al.*	(L3 Collab.)	REFID=43583
ADRIANI	93K	PL B317 474	O. Adriani *et al.*	(L3 Collab.)	REFID=43578
ADRIANI	93L	PL B317 637	O. Adriani *et al.*	(L3 Collab.)	REFID=43593
AKERS	93B	ZPHY C60 199	R. Akers *et al.*	(OPAL Collab.)	REFID=43594
BUSKULIC	93B	PL B298 479	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=43287
BUSKULIC	93O	PL B314 459	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=43533
ABREU	92	ZPHY C53 567	P. Abreu *et al.*	(DELPHI Collab.)	REFID=41870
ACTON	92	PL B274 513	D.P. Acton *et al.*	(OPAL Collab.)	REFID=41927
ACTON	92C	PL B276 379	D.P. Acton *et al.*	(OPAL Collab.)	REFID=41981
ADEVA	92C	PL B288 395	B. Adeva *et al.*	(L3 Collab.)	REFID=42153
ADRIANI	92	PL B288 412	O. Adriani *et al.*	(L3 Collab.)	REFID=42150
BUSKULIC	92B	PL B284 177	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=42157
BUSKULIC	92F	PL B295 174	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=43136
BUSKULIC	92G	PL B295 396	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=43142
ABE	91G	PRL 67 3351	F. Abe *et al.*	(CDF Collab.)	REFID=41872
ADEVA	91C	PL B261 177	B. Adeva *et al.*	(L3 Collab.)	REFID=41533
ADEVA	91H	PL B270 111	B. Adeva *et al.*	(L3 Collab.)	REFID=41873
ALBAJAR	91C	PL B262 163	C. Albajar *et al.*	(UA1 Collab.)	REFID=41551
ALBAJAR	91D	PL B262 171	C. Albajar *et al.*	(UA1 Collab.)	REFID=41552
ALEXANDER	91G	PL B266 485	G. Alexander *et al.*	(OPAL Collab.)	REFID=41772
DECAMP	91	PL B258 236	D. Decamp *et al.*	(ALEPH Collab.)	REFID=41485
DECAMP	91C	PL B257 492	D. Decamp *et al.*	(ALEPH Collab.)	REFID=41527
ADEVA	90P	PL B252 703	B. Adeva *et al.*	(L3 Collab.)	REFID=41431
BEHREND	90D	ZPHY C47 333	H.J. Behrend *et al.*	(CELLO Collab.)	REFID=41735
HAGEMANN	90	ZPHY C48 401	J. Hagemann *et al.*	(JADE Collab.)	REFID=41436
LYONS	90	PR D41 982	L. Lyons, A.J. Martin, D.H. Saxon	(OXF, BRIS+)	REFID=41240
WEIR	90	PL B240 289	A.J. Weir *et al.*	(Mark II Collab.)	REFID=41213
BRAUNSCH...	89B	ZPHY C44 1	R. Braunschweig *et al.*	(TASSO Collab.)	REFID=40859
ONG	89	PRL 62 1236	R.A. Ong *et al.*	(Mark II Collab.)	REFID=40782
BAND	88	PL B200 221	H.R. Band *et al.*	(MAC Collab.)	REFID=40478
KLEM	88	PR D37 41	D.E. Klem *et al.*	(DELCO Collab.)	REFID=40399
ONG	88	PRL 60 2587	R.A. Ong *et al.*	(Mark II Collab.)	REFID=40607
ALBAJAR	87C	PL B186 247	C. Albajar *et al.*	(UA1 Collab.)	REFID=40390
ASH	87	PRL 58 640	W.W. Ash *et al.*	(MAC Collab.)	REFID=40378
BARTEL	87	ZPHY C33 339	W. Bartel *et al.*	(JADE Collab.)	REFID=40359
BROM	87	PL B195 301	J.M. Brom *et al.*	(HRS Collab.)	REFID=40385
PAL	86	PR D33 2708	T. Pal *et al.*	(DELCO Collab.)	REFID=11479
AIHARA	85	ZPHY C27 39	H. Aihara *et al.*	(TPC Collab.)	REFID=11469
BARTEL	85J	PL 163B 277	W. Bartel *et al.*	(JADE Collab.)	REFID=11473
SCHAAD	85	PL 160B 188	T. Schaad *et al.*	(Mark II Collab.)	REFID=11575
ALTHOFF	84G	ZPHY C22 219	M. Althoff *et al.*	(TASSO Collab.)	REFID=11464
ALTHOFF	84J	PL 146B 443	M. Althoff *et al.*	(TASSO Collab.)	REFID=11599
KOOP	84	PRL 52 970	D.E. Koop *et al.*	(DELCO Collab.)	REFID=11468
ADEVA	83	PRL 50 799	B. Adeva *et al.*	(Mark-J Collab.)	REFID=11585
ADEVA	83B	PRL 51 443	B. Adeva *et al.*	(Mark-J Collab.)	REFID=10610
BARTEL	83B	PL 132B 241	W. Bartel *et al.*	(JADE Collab.)	REFID=11588
FERNANDEZ	83D	PRL 50 2054	E. Fernandez *et al.*	(MAC Collab.)	REFID=11590
MATTEUZZI	83	PL 129B 141	C. Matteuzzi *et al.*	(Mark II Collab.)	REFID=11595
NELSON	83	PRL 50 1542	M.E. Nelson *et al.*	(Mark II Collab.)	REFID=11596