B^0_s

$I(J^P) = 0(0^-)$

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

B^0_s MASS

The fit uses m_{B^+}, $(m_{B^0} - m_{B^+})$, $m_{B^0_s}$, and $(m_{B^0_s} - (m_{B^+} + m_{B^0})/2)$ to determine m_{B^+}, m_{B^0}, $m_{B^0_s}$, and the mass differences.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
5369.3± 2.0 OUR FIT					
5369.6± 2.4 OUR AVERAGE					
5369.9± 2.3±1.3	32	[1] ABE	96B	CDF	$p\overline{p}$ at 1.8 TeV
5374 ±16 ±2	3	ABREU	94D	DLPH	$e^+e^- \rightarrow Z$
5359 ±19 ±7	1	[1] AKERS	94J	OPAL	$e^+e^- \rightarrow Z$
5368.6± 5.6±1.5	2	BUSKULIC	93G	ALEP	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5370 ±40	6	[2] AKERS	94J	OPAL	$e^+e^- \rightarrow Z$
5383.3± 4.5±5.0	14	ABE	93F	CDF	Repl by ABE 96B

[1] From the decay $B_s \rightarrow J/\psi(1S)\phi$.

[2] From the decay $B_s \rightarrow D^-_s \pi^+$.

$m_{B^0_s} - m_B$

m_B is the average of our B masses $(m_{B^\pm}+m_{B^0})/2$. The fits uses m_{B^+}, $(m_{B^0} - m_{B^+})$, $m_{B^0_s}$, and $m_{B^0_s} - m_B$ to determine m_{B^+}, m_{B^0}, $m_{B^0_s}$, and the mass differences.

VALUE (MeV)	CL%	DOCUMENT ID		TECN	COMMENT
90.2±2.2 OUR FIT					
89.7±2.7±1.2		ABE	96B	CDF	$p\overline{p}$ at 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
80 to 130	68	LEE-FRANZINI	90	CSB2	$e^+e^- \rightarrow \Upsilon(5S)$

$m_{B^0_{sH}} - m_{B^0_{sL}}$

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

B^0_s MEAN LIFE

"OUR EVALUATION" is an average of the data listed below performed by the LEP B Lifetimes Working Group as described in our review "Production and Decay of b-flavored Hadrons" in the $B^\pm$ Section of the Listings. The averaging procedure takes into account correlations between the measurements and asymmetric lifetime errors.

VALUE (10^{-12} s)	EVTS	DOCUMENT ID		TECN	COMMENT
$1.61^{+0.10}_{-0.09}$ OUR EVALUATION					
$1.56^{+0.29+0.08}_{-0.26-0.07}$		[3] ABREU	96F	DLPH	$e^+e^- \rightarrow Z$
$1.65^{+0.34}_{-0.31}\pm0.12$		[4] ABREU	96F	DLPH	$e^+e^- \rightarrow Z$
$1.76\pm0.20^{+0.15}_{-0.10}$		[5] ABREU	96F	DLPH	$e^+e^- \rightarrow Z$
$1.60\pm0.26^{+0.13}_{-0.15}$		[6] ABREU	96F	DLPH	$e^+e^- \rightarrow Z$
$1.61^{+0.30+0.18}_{-0.29-0.16}$	90	[4] BUSKULIC	96E	ALEP	$e^+e^- \rightarrow Z$
$1.42^{+0.27}_{-0.23}\pm0.11$	76	[3] ABE	95R	CDF	$p\overline{p}$ at 1.8 TeV
$1.74^{+1.08}_{-0.69}\pm0.07$	8	[7] ABE	95R	CDF	$p\overline{p}$ at 1.8 TeV
$1.54^{+0.25}_{-0.21}\pm0.06$	79	[3] AKERS	95G	OPAL	$e^+e^- \rightarrow Z$
$1.59^{+0.17}_{-0.15}\pm0.03$	134	[3] BUSKULIC	95O	ALEP	$e^+e^- \rightarrow Z$

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

1.67±0.14		[8] ABREU	96F DLPH	$e^+e^- \to Z$
0.96±0.37	41	[9] ABREU	94E DLPH	Sup. by ABREU 96F
$1.92^{+0.45}_{-0.35}\pm0.04$	31	[3] BUSKULIC	94C ALEP	Sup. by BUSKULIC 95O
$1.13^{+0.35}_{-0.26}\pm0.09$	22	[3] ACTON	93H OPAL	Sup. by AKERS 95G

[3] Measured using $D_s^- \ell^+$ vertices.
[4] Measured using D_s hadron vertices.
[5] Measured using $\phi \ell$ vertices.
[6] Measured using inclusive D_s vertices.
[7] Exclusive reconstruction of $B_s \to \psi \phi$.
[8] Combined result for the four ABREU 96F methods.
[9] ABREU 94E uses the flight-distance distribution of D_s vertices, ϕ-lepton vertices, and $D_s \mu$ vertices.

B_s^0 DECAY MODES

These branching fractions all scale with B($\overline{b} \to B_s^0$), the LEP B_s^0 production fraction. The first four were evaluated using B($\overline{b} \to B_s^0$) = $(11.2^{+1.8}_{-1.9})$% and the rest assume B($\overline{b} \to B_s^0$) = 12%.

The branching fraction B($B_s^0 \to D_s^- \ell^+ \nu_\ell$ anything) is not a pure measurement since the measured product branching fraction B($\overline{b} \to B_s^0$) × B($B_s^0 \to D_s^- \ell^+ \nu_\ell$ anything) was used to determine B($\overline{b} \to B_s^0$), as described in the note on "Production and Decay of b-Flavored Hadrons."

	Mode		Fraction (Γ_i/Γ)	Confidence level
Γ_1	D_s^- anything		(87 ±31) %	
Γ_2	$D_s^- \ell^+ \nu_\ell$ anything	[a]	(7.6 ± 2.4) %	
Γ_3	$D_s^- \pi^+$		< 12 %	
Γ_4	$J/\psi(1S)\phi$		< 6 × 10^{-3}	
Γ_5	$\psi(2S)\phi$		seen	
Γ_6	$\pi^0\pi^0$		< 2.1 × 10^{-4}	90%
Γ_7	$\eta\pi^0$		< 1.0 × 10^{-3}	90%
Γ_8	$\eta\eta$		< 1.5 × 10^{-3}	90%
Γ_9	π^+K^-		< 2.6 × 10^{-4}	90%
Γ_{10}	K^+K^-		< 1.4 × 10^{-4}	90%
	$\Delta B = 1$ weak neutral current (*B1*) modes			
Γ_{11}	$\gamma\gamma$	*B1*	< 1.48 × 10^{-4}	90%

[a] Not a pure measurement. See note at head of B_s^0 Decay Modes.

B_s^0 BRANCHING RATIOS

$\Gamma(D_s^-$ anything$)/\Gamma_{total}$ Γ_1/Γ

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
0.87±0.31 OUR AVERAGE				
0.76±0.23±0.23	90	[10] BUSKULIC	96E ALEP	$e^+e^- \to Z$
1.46±0.54±0.44	147	[11] ACTON	92N OPAL	$e^+e^- \to Z$

[10] BUSKULIC 96E separate $c\overline{c}$ and $b\overline{b}$ sources of D_s^+ mesons using a lifetime tag, subtract generic $\overline{b} \to W^+ \to D_s^+$ events, and obtain B($\overline{b} \to B_s^0$) × B($B_s^0 \to D_s^-$ anything) = 0.088 ± 0.020 ± 0.020 assuming B($D_s \to \phi\pi$) = (3.5 ± 0.4) × 10^{-2} and PDG 1994 values for the relative partial widths to other D_s channels. We evaluate using our current values B($\overline{b} \to B_s^0$) = $0.112^{+0.018}_{-0.019}$ and B($D_s \to \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \to B_s^0$) and B($D_s \to \phi\pi$).
[11] ACTON 92N assume that excess of 147 ± 48 D_s^0 events over that expected from B^0, B^+, and $c\overline{c}$ is all from B_s^0 decay. The product branching fraction is measured to be B($\overline{b} \to B_s^0$)B($B_s^0 \to D_s^-$ anything)×B($D_s^- \to \phi\pi^-$) = (5.9 ± 1.9 ± 1.1) × 10^{-3}.

We evaluate using our current values B($\overline{b} \to B^0_s$) = $0.112^{+0.018}_{-0.019}$ and B($D_s \to \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \to B^0_s$) and B($D_s \to \phi\pi$).

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

The values and averages in this section serve only to show what values result if one assumes our B($\overline{b} \to B^0_s$). They cannot be thought of as measurements since the underlying product branching fractions were also used to determinine B($\overline{b} \to B^0_s$) as described in the note on "Production and Decay of *b*-Flavored Hadrons."

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
0.076±0.024 OUR AVERAGE				
$0.071^{+0.011}_{-0.012}\pm0.021$	134	[12] BUSKULIC 95O	ALEP	$e^+e^- \to Z$
0.14 ±0.06 ±0.04	7	[13] ABREU 92M	DLPH	$e^+e^- \to Z$
0.097±0.034±0.029	18	[14] ACTON 92N	OPAL	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.13 ±0.04 ±0.04	27	[15] BUSKULIC 92E	ALEP	$e^+e^- \to Z$

[12] BUSKULIC 95O use $D_s \ell$ correlations. The measured product branching ratio is B($\overline{b} \to B_s$) × B($B_s \to D^-_s \ell^+ \nu_\ell$ anything) = $(0.82 \pm 0.09^{+0.13}_{-0.14})$% assuming B($D_s \to \phi\pi$) = $(3.5 \pm 0.4) \times 10^{-2}$ and PDG 1994 values for the relative partial widths to the six other D_s channels used in this analysis. Combined with results from $\Upsilon(4S)$ experiments this can be used to extract B($\overline{b} \to B_s$) = $(11.0 \pm 1.2^{+2.5}_{-2.6})$%. We evaluate using our current values B($\overline{b} \to B^0_s$) = $0.112^{+0.018}_{-0.019}$ and B($D_s \to \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \to B^0_s$) and B($D_s \to \phi\pi$).

[13] ABREU 92M measured muons only and obtained product branching ratio B($Z \to b$ or $\overline{b}$) × B($\overline{b} \to B_s$) × B($B_s \to D_s \mu^+ \nu_\mu$ anything) × B($D_s \to \phi\pi$) = $(18 \pm 8) \times 10^{-5}$. We evaluate using our current values B($\overline{b} \to B^0_s$) = $0.112^{+0.018}_{-0.019}$ and B($D_s \to \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \to B^0_s$) and B($D_s \to \phi\pi$). We use B($Z \to b$ or $\overline{b}$) = 2B($Z \to b\overline{b}$) = 2×(0.1546 ± 0.0014).

[14] ACTON 92N is measured using $D_s \to \phi\pi^+$ and $K^*(892)^0 K^+$ events. The product branching fraction measured is measured to be B($\overline{b} \to B^0_s$)B($B^0_s \to D^-_s \ell^+ \nu_\ell$ anything) ×B($D^-_s \to \phi\pi^-$) = $(3.9 \pm 1.1 \pm 0.8) \times 10^{-4}$. We evaluate using our current values B($\overline{b} \to B^0_s$) = $0.112^{+0.018}_{-0.019}$ and B($D_s \to \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \to B^0_s$) and B($D_s \to \phi\pi$).

[15] BUSKULIC 92E is measured using $D_s \to \phi\pi^+$ and $K^*(892)^0 K^+$ events. They use 2.7 ± 0.7% for the $\phi\pi^+$ branching fraction. The average product branching fraction is measured to be B($\overline{b} \to B^0_s$)B($B^0_s \to D^-_s \ell^+ \nu_\ell$ anything) =$0.020 \pm 0.0055^{+0.005}_{-0.006}$. We evaluate using our current values B($\overline{b} \to B^0_s$) = $0.112^{+0.018}_{-0.019}$ and B($D_s \to \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \to B^0_s$) and B($D_s \to \phi\pi$). Superseded by BUSKULIC 95O.

$\Gamma(D^-_s \pi^+)/\Gamma_{total}$ — Γ_3/Γ

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
<0.12	6	[16] AKERS 94J	OPAL	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	1	BUSKULIC 93G	ALEP	$e^+e^- \to Z$

[16] AKERS 94J sees ≤ 6 events and measures the limit on the product branching fraction $f(\overline{b} \to B^0_s)\cdot$B($B^0_s \to D^-_s \pi^+$) < 1.3% at CL = 90%. We divide by our current value B($\overline{b} \to B^0_s$) = 0.112.

$\Gamma(J/\psi(1S)\phi)/\Gamma_{total}$ — Γ_4/Γ

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
<0.006	1	[17] AKERS 94J	OPAL	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	14	[18] ABE 93F	CDF	$p\overline{p}$ at 1.8 TeV
seen	1	[19] ACTON 92N	OPAL	Sup. by AKERS 94J

[17] AKERS 94J sees one event and measures the limit on the product branching fraction $f(\overline{b} \to B^0_s)\cdot$B($B^0_s \to J/\psi(1S)\phi$) < 7×10^{-4} at CL = 90%. We divide by our current value B($\overline{b} \to B^0_s$) = 0.112.

[18] ABE 93F measured using $J/\psi(1S) \rightarrow \mu^+\mu^-$ and $\phi \rightarrow K^+K^-$.
[19] In ACTON 92N a limit on the product branching fraction is measured to be $f(\overline{b} \rightarrow B_s^0)\cdot B(B_s^0 \rightarrow J/\psi(1S)\phi) \leq 0.22 \times 10^{-2}$.

$\Gamma(\psi(2S)\phi)/\Gamma_{total}$ Γ_5/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	1	BUSKULIC	93G	ALEP	$e^+e^- \rightarrow Z$

$\Gamma(\pi^0\pi^0)/\Gamma_{total}$ Γ_6/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.1 \times 10^{-4}$	90	[20] ACCIARRI	95H	L3	$e^+e^- \rightarrow Z$

[20] ACCIARRI 95H assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.

$\Gamma(\eta\pi^0)/\Gamma_{total}$ Γ_7/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.0 \times 10^{-3}$	90	[21] ACCIARRI	95H	L3	$e^+e^- \rightarrow Z$

[21] ACCIARRI 95H assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.

$\Gamma(\eta\eta)/\Gamma_{total}$ Γ_8/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.5 \times 10^{-3}$	90	[22] ACCIARRI	95H	L3	$e^+e^- \rightarrow Z$

[22] ACCIARRI 95H assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.

$\Gamma(\pi^+K^-)/\Gamma_{total}$ Γ_9/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.6 \times 10^{-4}$	90	[23] AKERS	94L	OPAL	$e^+e^- \rightarrow Z$

[23] Assumes $B(Z \rightarrow b\overline{b}) = 0.217$ and B_d^0 (B_s^0) fraction 39.5% (12%).

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.4 \times 10^{-4}$	90	[24] AKERS	94L	OPAL	$e^+e^- \rightarrow Z$

[24] Assumes $B(Z \rightarrow b\overline{b}) = 0.217$ and B_d^0 (B_s^0) fraction 39.5% (12%).

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

Test for $\Delta B = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<14.8 \times 10^{-5}$	90	[25] ACCIARRI	95I	L3	$e^+e^- \rightarrow Z$

[25] ACCIARRI 95I assumes $f_{B^0} = 39.5 \pm 4.0$ and $f_{B_s} = 12.0 \pm 3.0\%$.

POLARIZATION IN B_s^0 DECAY

Γ_L/Γ in $B_s^0 \rightarrow J/\psi(1S)\phi$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.56 \pm 0.21^{+0.02}_{-0.04}$	19	ABE	95Z	CDF	$p\overline{p}$ at 1.8 TeV

B_s^0-$\overline{B}_s^0$ MIXING

For a discussion of B_s^0-$\overline{B}_s^0$ mixing see the note on "B^0-$\overline{B}^0$ Mixing and *CP* Violation in *B* Decay" in the B^0 Particle Listings above.

χ_s

This B_s^0-$\overline{B}_s^0$ mixing parameter measures the probability (integrated over time) that a produced B_s^0 ($\overline{B}_s^0$) decays as a $\overline{B}_s^0$ (B_s^0). It cannot exceed 0.50. Mixing violates $\Delta B \neq 2$ rule.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
>0.49	95	[26] BUSKULIC	95J	ALEP	$e^+e^- \rightarrow Z$

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

0.74 ± 0.27	95	[27] ABREU	94F	RVUE	$e^+e^- \to Z$
$0.43^{+0.26}_{-0.17}$		[28] ACCIARRI	94D	RVUE	
0.46 ± 0.21		[29] ADEVA	92C	RVUE	Sup. by ACCIARRI 94D
0.53 ± 0.15		[30] ALBAJAR	91D	RVUE	

[26] BUSKULIC 95J is their $\Delta m_{B^0_s}$ measurement combined with $\tau_{B^0_s} = 1.61$ ps, our central value. Assumes $f_s = 11.2\%$.

[27] From a combination of DELPHI (ABREU 94F), CLEO (ARTUSO 89), and ARGUS (ALBRECHT 92L). Estimated from ABREU 94F figure 7.

[28] Uses BARTELT 93 to remove B_d mixing contribution and assuming $f_d = 0.375 \pm 0.05$ and $f_s = 0.15 \pm 0.05$.

[29] From combination of L3 (ADEVA 92C), CLEO (ARTUSO 89), and ARGUS (ALBRECHT 92L). Corresponding limit is > 0.16 at 90%CL.

[30] From combination of UA1 (ALBAJAR 91D), CLEO (BEAN 87B), ARGUS (ALBRECHT 87I), ALEPH (DECAMP 91), and L3 (ADEVA 90P). Corresponding limits are > 0.23 at 95% CL and > 0.27 at 90% CL.

χ_B at high energy

This is a B-$\overline{B}$ mixing measurement for an admixture of B^0 and B^0_s at high energy.

$$\chi_B = f_d\chi_d + f_s\chi_s$$

where f_d and f_s are the production fractions of B^0_d and B^0_s mesons relative to all b-flavored hadrons. Only the measurements at the Z and higher energy $p\overline{p}$ are averaged.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.126±0.008 OUR AVERAGE						
$0.121\pm0.016\pm0.006$			[31] ABREU	94J	DLPH	$e^+e^- \to Z$
$0.123\pm0.012\pm0.008$			ACCIARRI	94D	L3	$e^+e^- \to Z$
$0.114\pm0.014\pm0.008$			[32] BUSKULIC	94G	ALEP	$e^+e^- \to Z$
$0.143^{+0.022}_{-0.021}\pm0.007$			[33] AKERS	93B	OPAL	$e^+e^- \to Z$
0.129 ± 0.022			[34] BUSKULIC	92B	ALEP	$e^+e^- \to Z$
$0.176\pm0.031\pm0.032$		1112	[35] ABE	91G	CDF	$p\overline{p}$ 1.8 TeV
$0.148\pm0.029\pm0.017$			[36] ALBAJAR	91D	UA1	$p\overline{p}$ 630 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$0.144\pm0.014^{+0.017}_{-0.011}$			[37] ABREU	94F	DLPH	Sup. by ABREU 94J
0.131 ± 0.014			[38] ABREU	94J	DLPH	$e^+e^- \to Z$
$0.157\pm0.020\pm0.032$			[39] ALBAJAR	94	UA1	$\sqrt{s} = 630$ GeV
$0.121^{+0.044}_{-0.040}\pm0.017$		1665	[40] ABREU	93C	DLPH	Sup. by ABREU 94J
$0.145^{+0.041}_{-0.035}\pm0.018$			[41] ACTON	92C	OPAL	$e^+e^- \to Z$
$0.121\pm0.017\pm0.006$			[42] ADEVA	92C	L3	Sup. by ACCIARRI 94D
$0.132\pm0.22\ ^{+0.015}_{-0.012}$		823	[43] DECAMP	91	ALEP	$e^+e^- \to Z$
$0.178^{+0.049}_{-0.040}\pm0.020$			[44] ADEVA	90P	L3	$e^+e^- \to Z$
$0.17\ ^{+0.15}_{-0.08}$			[45,46] WEIR	90	MRK2	e^+e^- 29 GeV
$0.21\ ^{+0.29}_{-0.15}$			[45] BAND	88	MAC	$E^{ee}_{cm} = 29$ GeV
>0.02	90		[45] BAND	88	MAC	$E^{ee}_{cm} = 29$ GeV
0.121 ± 0.047			[45,47] ALBAJAR	87C	UA1	Repl. by ALBAJAR 91D
<0.12	90		[45,48] SCHAAD	85	MRK2	$E^{ee}_{cm} = 29$ GeV

[31] This ABREU 94J result is from 5182 $\ell\ell$ and 279 $\Lambda\ell$ events. The systematic error includes 0.004 for model dependence.

[32] BUSKULIC 94G data analyzed using ee, $e\mu$, and $\mu\mu$ events.

[33] AKERS 93B analysis performed using dilepton events.

[34] BUSKULIC 92B uses a jet charge technique combined with electrons and muons.

[35] ABE 91G measurement of χ is done with $e\mu$ and ee events.

[36] ALBAJAR 91D measurement of χ is done with dimuons.

[37] 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 $\overline{\chi} = f_d\chi_d + 0.9 f_s\chi_s$.

[38] This ABREU 94J result combines $\ell\ell$, $\Lambda\ell$, and jet-charge ℓ (ABREU 94F) analyses. It is for $\overline{\chi} = f_d\chi_d + 0.96 f_s\chi_s$.

[39] ALBAJAR 94 uses dimuon events. Not independent of ALBAJAR 91D.

[40] ABREU 93C data analyzed using ee, $e\mu$, and $\mu\mu$ events.

[41] ACTON 92C uses electrons and muons. Superseded by AKERS 93B.

[42] ADEVA 92C uses electrons and muons.

[43] DECAMP 91 done with opposite and like-sign dileptons. Superseded by BUSKULIC 92B.
[44] ADEVA 90P measurement uses ee, $\mu\mu$, and $e\mu$ events from 118k events at the Z. Superseded by ADEVA 92C.
[45] 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.
[46] The WEIR 90 measurement supersedes the limit obtained in SCHAAD 85. The 90% CL are 0.06 and 0.38.
[47] 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.
[48] Limit is average probability for hadron containing B quark to produce a positive lepton.

$\Delta m_{B^0_s} = m_{B^0_{sH}} - m_{B^0_{sL}}$

$\Delta m_{B^0_s}$ is a measure of the B^0_s-$\overline{B}^0_s$ oscillation frequency in time-dependent mixing experiments.

VALUE (10^{12} $\hbar$ s^{-1})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>5.9	95	[49] BUSKULIC	95J	ALEP	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
>2.2	95	[50] AKERS	95J	OPAL	$e^+e^- \rightarrow Z$
>1.8	95	[50] BUSKULIC	94B	ALEP	$e^+e^- \rightarrow Z$

[49] BUSKULIC 95J determine $\Delta m_{B^0_s}$ from time dependence of B mixing using a jet charge technique to tag initial quark state and a lepton tag to determine flavor of the decaying b quark. They find $\Delta m_s > 5.6$ [> 6.1] $\hbar$ ps^{-1} when $f_s = 10\%$ [12%]. We interpolate to our central value $f_s = 11.2\%$.
[50] Uses dileptons.

$x_s = \Delta m_{B^0_s}/\Gamma_{B^0_s}$

This section combines the results from the previous two sections.

Time integrated mixing measurement of χ determine this quantity directly via

$$\frac{\Delta m_{B^0_s}}{\Gamma_{B^0_s}} = \left(\frac{\chi}{0.5-\chi}\right)^{1/2}$$

while time-dependent mixing measurements determine $\Delta m_{B^0_s} = m_{B^0_{sH}} - m_{B^0_{sL}}$ which are combined with $\tau_{B^0_s}$ to give

$$\frac{\Delta m_{B^0_s}}{\Gamma_{B^0_s}} = \frac{(m_{B^0_{sH}} - m_{B^0_{sL}})\ \tau_{B^0_s}}{\hbar} .$$

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>9.5	95	[51] BUSKULIC	95J	ALEP	$e^+e^- \rightarrow Z$

[51] BUSKULIC 95J is their $\Delta m_{B^0_s}$ measurement combined with $\tau_{B^0_s} = 1.61$ ps, our central value. Assumes $f_s = 11.2\%$.

B^0_s REFERENCES

ABE	96B	PR D53 3496	+Albrow, Amendolia, Amidei+	(CDF Collab.)
ABREU	96F	ZPHY C (submitted)	+Adam, Adye, Agasi+	(DELPHI Collab.)
CERN-PPE/96-32				
BUSKULIC	96E	ZPHY C69 585	+Casper, De Bonis, Decamp+	(ALEPH Collab.)
ABE	95R	PRL 74 4988	+Albrow, Amendolia, Amidei+	(CDF Collab.)
ABE	95Z	PRL 75 3068	+Albrow, Amendolia, Amidei+	(CDF Collab.)
ACCIARRI	95H	PL B363 127	+Adam, Adriani, Aguilar-Benitez+	(L3 Collab.)
ACCIARRI	95I	PL B363 137	+Adam, Adriani, Aguilar-Benitez+	(L3 Collab.)
AKERS	95G	PL B350 273	+Alexander, Allison, Ametewee+	(OPAL Collab.)
AKERS	95J	ZPHY C66 555	+Alexander, Allison, Ametewee+	(OPAL Collab.)
BUSKULIC	95J	PL B356 409	+Casper, De Bonis, Decamp+	(ALEPH Collab.)
BUSKULIC	95O	PL B361 221	+Casper, De Bonis, Decamp+	(ALEPH Collab.)
ABREU	94D	PL B324 500	+Adam, Adye, Agasi, Aleksan+	(DELPHI Collab.)
ABREU	94E	ZPHY C61 407	+Adam, Adye, Agasi, Aleksan+	(DELPHI Collab.)
Also	92M	PL B289 199	Abreu, Adam, Adye, Agasi, Alekseev+	(DELPHI Collab.)
ABREU	94F	PL B322 459	+Adam, Adye, Agasi, Ajinenko+	(DELPHI Collab.)
ABREU	94J	PL B332 488	+Adam, Adye, Agasi, Ajinenko+	(DELPHI Collab.)
ACCIARRI	94D	PL B335 542	+Adam, Adriani, Aguilar-Benitez, Ahlen+	(L3 Collab.)
AKERS	94J	PL B337 196	+Alexander, Allison, Anderson, Arcelli+	(OPAL Collab.)
AKERS	94L	PL B337 393	+Alexander, Allison, Anderson, Arcelli+	(OPAL Collab.)
ALBAJAR	94	ZPHY C61 41	+Ankoviak, Bartha, Bezaguet, Boehrer+	(UA1 Collab.)
BUSKULIC	94B	PL B322 441	+De Bonis, Decamp, Ghez, Goy, Lees+	(ALEPH Collab.)
BUSKULIC	94C	PL B322 275	+De Bonis, Decamp, Ghez, Goy, Lees+	(ALEPH Collab.)
BUSKULIC	94G	ZPHY C62 179	+Casper, De Bonis, Decamp, Ghez+	(ALEPH Collab.)
ABE	93F	PRL 71 1685	+Albrow, Amidei, Anway-Wiese+	(CDF Collab.)
ABREU	93C	PL B301 145	+Adam, Adye, Agasi, Aleksan+	(DELPHI Collab.)

ACTON	93H	PL B312 501	+Akers, Alexander, Allison, Anderson+	(OPAL Collab.)
AKERS	93B	ZPHY C60 199	+Alexander, Allison, Anderson, Arcelli+	(OPAL Collab.)
BARTELT	93	PRL 71 1680	+Csorna, Egyed, Jain, Sheldon+	(CLEO Collab.)
BUSKULIC	93G	PL B311 425	+De Bonis, Decamp, Ghez, Goy, Lees+	(ALEPH Collab.)
ABREU	92M	PL B289 199	+Adam, Adye, Agasi, Alekseev+	(DELPHI Collab.)
ACTON	92C	PL B276 379	+Alexander, Allison, Allport, Anderson+	(OPAL Collab.)
ACTON	92N	PL B295 357	+Alexander, Allison, Allport, Anderson+	(OPAL Collab.)
ADEVA	92C	PL B288 395	+Adriani, Aguilar-Benitez, Ahlen+	(L3 Collab.)
ALBRECHT	92L	ZPHY C55 357	+Ehrlichmann, Hamacher, Krueger, Nau+	(ARGUS Collab.)
BUSKULIC	92B	PL B284 177	+Decamp, Goy, Lees, Minard+	(ALEPH Collab.)
BUSKULIC	92E	PL B294 145	+Decamp, Goy, Lees, Minard+	(ALEPH Collab.)
ABE	91G	PRL 67 3351	+Amidei, Apollinari, Atac, Auchincloss+	(CDF Collab.)
ALBAJAR	91D	PL B262 171	+Albrow, Allkofer, Ankoviak, Apsimon+	(UA1 Collab.)
DECAMP	91	PL B258 236	+Deschizeaux, Goy, Lees, Minard+	(ALEPH Collab.)
ADEVA	90P	PL B252 703	+Adriani, Aguilar-Benitez, Akbari, Alcaraz+	(L3 Collab.)
LEE-FRANZINI	90	PRL 65 2947	+Heintz, Lovelock, Narain, Schamberger+	(CUSB II Collab.)
WEIR	90	PL B240 289	+Abrams, Adolphsen, Alexander, Alvarez+	(Mark II Collab.)
ARTUSO	89	PRL 62 2233	+Bebek, Berkelman, Blucher+	(CLEO Collab.)
BAND	88	PL B200 221	+Camporesi, Chadwick+	(MAC Collab.)
ALBAJAR	87C	PL B186 247	+Albrow, Allkofer, Arnison+	(UA1 Collab.)
ALBRECHT	87I	PL B192 245	+Andam, Binder, Boeckmann+	(ARGUS Collab.)
BEAN	87B	PRL 58 183	+Bobbink, Brock, Engler+	(CLEO Collab.)
SCHAAD	85	PL 160B 188	+Nelson, Abrams, Amidei+	(Mark II Collab.)

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