B_s^0

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

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

B_s^0 MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
5367.5± 1.8 OUR FIT Error includes scale factor of 1.1.					
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 $B_s \rightarrow D_s^- \pi^+$.

$m_{B_s^0} - m_B$

m_B is the average of our B masses $(m_{B^\pm}+m_{B^0})/2$.

VALUE (MeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
88.3±1.8 OUR FIT Error includes scale factor of 1.1.					
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	$e^+e^- \rightarrow \Upsilon(5S)$

$m_{B_{sH}^0} - m_{B_{sL}^0}$

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

B_s^0 MEAN LIFE

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements and asymmetric lifetime errors.

VALUE (10^{-12} s)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
1.466±0.059 OUR EVALUATION				
$1.42^{+0.14}_{-0.13} \pm 0.03$		[3] ABREU 00Y	DLPH	$e^+e^- \rightarrow Z$
$1.53^{+0.16}_{-0.15} \pm 0.07$		[4] ABREU,P 00G	DLPH	$e^+e^- \rightarrow Z$
$1.36 \pm 0.09 ^{+0.06}_{-0.05}$		[5] ABE 99D	CDF	$p\overline{p}$ at 1.8 TeV
$1.72^{+0.20}_{-0.19} {}^{+0.18}_{-0.17}$		[6] ACKERSTAFF 98F	OPAL	$e^+e^- \rightarrow Z$
$1.50^{+0.16}_{-0.15} \pm 0.04$		[5] ACKERSTAFF 98G	OPAL	$e^+e^- \rightarrow Z$
$1.47 \pm 0.14 \pm 0.08$		[4] BARATE 98C	ALEP	$e^+e^- \rightarrow Z$
$1.54^{+0.14}_{-0.13} \pm 0.04$		[5] BUSKULIC 96M	ALEP	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.51 ± 0.11		[7] BARATE 98C	ALEP	$e^+e^- \rightarrow Z$
$1.56^{+0.29}_{-0.26} {}^{+0.08}_{-0.07}$		[5] ABREU 96F	DLPH	Repl. by ABREU 00Y
$1.65^{+0.34}_{-0.31} \pm 0.12$		[4] ABREU 96F	DLPH	Repl. by ABREU 00Y
$1.76 \pm 0.20 ^{+0.15}_{-0.10}$		[8] ABREU 96F	DLPH	Repl. by ABREU 00Y
$1.60 \pm 0.26 ^{+0.13}_{-0.15}$		[9] ABREU 96F	DLPH	Repl. by ABREU,P 00G
1.67 ± 0.14		[10] ABREU 96F	DLPH	$e^+e^- \rightarrow Z$
$1.61^{+0.30}_{-0.29} {}^{+0.18}_{-0.16}$	90	[4] BUSKULIC 96E	ALEP	Repl. by BARATE 98C
$1.42^{+0.27}_{-0.23} \pm 0.11$	76	[5] ABE 95R	CDF	Repl. by ABE 99D
$1.74^{+1.08}_{-0.69} \pm 0.07$	8	[11] ABE 95R	CDF	Sup. by ABE 96N
$1.54^{+0.25}_{-0.21} \pm 0.06$	79	[5] AKERS 95G	OPAL	Repl. by ACKERSTAFF 98G
$1.59^{+0.17}_{-0.15} \pm 0.03$	134	[5] BUSKULIC 95O	ALEP	Sup. by BUSKULIC 96M
0.96 ± 0.37	41	[12] ABREU 94E	DLPH	Sup. by ABREU 96F
$1.92^{+0.45}_{-0.35} \pm 0.04$	31	[5] BUSKULIC 94C	ALEP	Sup. by BUSKULIC 95O
$1.13^{+0.35}_{-0.26} \pm 0.09$	22	[5] ACTON 93H	OPAL	Sup. by AKERS 95G

[3] Uses $D_s^- \ell^+$, and $\phi \ell^+$ vertices.

[4] Measured using D_s hadron vertices.

[5] Measured using $D_s^- \ell^+$ vertices.

[6] ACKERSTAFF 98F use fully reconstructed $D_s^- \rightarrow \phi \pi^-$ and $D_s^- \rightarrow K^{*0} K^-$ in the inclusive B_s^0 decay.

[7] Combined results from $D_s^- \ell^+$ and D_s hadron.

[8] Measured using $\phi \ell$ vertices.

[9] Measured using inclusive D_s vertices.

[10] Combined result for the four ABREU 96F methods.

[11] Exclusive reconstruction of $B_s \rightarrow \psi \phi$.

[12] ABREU 94E uses the flight-distance distribution of D_s vertices, ϕ-lepton vertices, and $D_s \mu$ vertices.

B^0_s MEAN LIFE (Flavor specific)

VALUE	*DOCUMENT ID*	*TECN*	*COMMENT*
1.442 ± 0.066 OUR EVALUATION			
$1.44\ \pm0.07$ OUR AVERAGE			
$1.42\ ^{+0.14}_{-0.13}\ \pm0.03$	[13] ABREU 00Y	DLPH	$e^+e^-\rightarrow Z$
$1.36\ \pm0.09\ ^{+0.06}_{-0.05}$	[14] ABE 99D	CDF	$p\overline{p}$ at 1.8 TeV
$1.50\ ^{+0.16}_{-0.15}\ \pm0.04$	[15] ACKERSTAFF 98G	OPAL	$e^+e^-\rightarrow Z$
$1.54\ ^{+0.14}_{-0.13}\ \pm0.04$	[14] BUSKULIC 96M	ALEP	$e^+e^-\rightarrow Z$

[13] Uses $D^-_s\ell^+$, and $\phi\ell^+$ vertices.

[14] Measured using $D^-_s\ell^+$ vertices.

[15] ACKERSTAFF 98F use fully reconstructed $D^-_s\rightarrow\phi\pi^-$ and $D^-_s\rightarrow K^{*0}K^-$ in the inclusive B^0_s decay.

B^0_s MEAN LIFE ($B_S\rightarrow J/\psi\phi$)

VALUE	*DOCUMENT ID*	*TECN*	*COMMENT*
1.429 ± 0.088 OUR EVALUATION			
$1.42\ ^{+0.08}_{-0.07}$ OUR AVERAGE			
$1.444\ ^{+0.098}_{-0.090}\ \pm0.020$	[16] ABAZOV 05B	D0	$p\overline{p}$ at 1.96 TeV
$1.40\ ^{+0.15}_{-0.13}\ \pm0.02$	[17] ACOSTA 05	CDF	$p\overline{p}$ at 1.96 TeV
$1.34\ ^{+0.23}_{-0.19}\ \pm0.05$	[16] ABE 98B	CDF	$p\overline{p}$ at 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$1.39\ ^{+0.13}_{-0.16}\ ^{+0.01}_{-0.02}$	[17] ABAZOV 05W	D0	$p\overline{p}$ at 1.96 TeV
$1.34\ ^{+0.23}_{-0.19}\ \pm0.05$	[18] ABE 96N	CDF	Repl. by ABE 98B

[16] Measured using fully reconstructed $B_s\rightarrow J/\psi(1S)\phi$ decay.

[17] Measured using the time-dependent angular analysis of $B^0_s\rightarrow J/\psi\phi$ decays.

[18] ABE 96N uses 58 ± 12 exclusive $B_s\rightarrow J/\psi(1S)\phi$ events.

$\tau_{B^0_s}/\tau_{B^0}$ MEAN LIFE RATIO

$\tau_{B^0_s}/\tau_{B^0}$ (direct measurements)

VALUE	*DOCUMENT ID*	*TECN*	*COMMENT*
$0.91\ \pm0.09\ \pm0.003$	[19] ABAZOV 05W	D0	$p\overline{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.980\ ^{+0.076}_{-0.071}\ \pm0.003$	[20] ABAZOV 05B	D0	Repl. by ABAZOV 05W

[19] Measured using the time-dependent angular analysis of $B^0_s\rightarrow J/\psi\phi$ decays.

[20] Measured mean life ratio using fully reconstructed decays.

B^0_{sH} MEAN LIFE

B^0_{sH} is the heavy mass state of two B^0_s *CP* eigenstates.

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VALUE (10^{-12} s)	*DOCUMENT ID*	*TECN*	*COMMENT*
$\mathbf{1.66^{+0.11}_{-0.12}}$ **OUR EVALUATION**			
1.78±0.32 OUR AVERAGE			
$1.58^{+0.39}_{-0.42}{}^{+0.01}_{-0.02}$	[21] ABAZOV 05W	D0	$p\overline{p}$ at 1.96 TeV
$2.07^{+0.58}_{-0.46}\pm0.03$	[21] ACOSTA 05	CDF	$p\overline{p}$ at 1.96 TeV

[21] Measured using the time-dependent angular analysis of $B^0_s \rightarrow J/\psi\phi$ decays.

B^0_{sL} MEAN LIFE

B^0_{sL} is the light state of two B^0_s *CP* eigenstates.

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

VALUE (10^{-12} s)	*DOCUMENT ID*	*TECN*	*COMMENT*
1.21±0.09 OUR EVALUATION			
$\mathbf{1.18^{+0.10}_{-0.08}}$ **OUR AVERAGE**			
$1.24^{+0.14}_{-0.11}{}^{+0.01}_{-0.02}$	[22] ABAZOV 05W	D0	$p\overline{p}$ at 1.96 TeV
$1.05^{+0.16}_{-0.13}\pm0.02$	[22] ACOSTA 05	CDF	$p\overline{p}$ at 1.96 TeV
1.27±0.33±0.08	[23] BARATE 00K	ALEP	$e^+e^- \rightarrow Z$

[22] Measured using the time-dependent angular analysis of $B^0_s \rightarrow J/\psi\phi$ decays.

[23] Uses $\phi\phi$ correlations from $B^0_s \rightarrow D^{(*)+}_s D^{(*)-}_s$.

$\Delta\Gamma_{B^0_s}/\Gamma_{B^0_s}$

$\Gamma_{B^0_s}$ and $\Delta\Gamma_{B^0_s}$ are the decay rate average and difference between two B^0_s *CP* eigenstates (light − heavy).

"OUR EVALUATION" is an average of all available B_s semi-leptonic lifetime measurements with the $\Delta\Gamma_{B^0_s}/\Gamma_s$ analyses performed by the Heavy Flavor Averaging Group (HFAG) as described in our "Review on B-$\overline{B}$ Mixing" in the B^0 Section of these Listings. The corresponding 95% CL is $-0.02 < \Delta\Gamma_{B^0_s}/\Gamma_{B^0_s} < 0.60$

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$\mathbf{0.31^{+0.11}_{-0.13}}$ **OUR EVALUATION**				
$0.24^{+0.28}_{-0.38}{}^{+0.03}_{-0.04}$		[24,25] ABAZOV	05W	D0	$p\overline{p}$ at 1.96 TeV
$0.65^{+0.25}_{-0.33}\pm0.01$		[24] ACOSTA	05 CDF	$p\overline{p}$ at 1.96 TeV
<0.46	95	[26] ABREU	00Y DLPH	$e^+e^- \to Z$
<0.69	95	[27] ABREU,P	00G DLPH	$e^+e^- \to Z$
$0.25^{+0.21}_{-0.14}$		[28] BARATE	00K ALEP	$e^+e^- \to Z$
<0.83	95	[29] ABE	99D CDF	$p\overline{p}$ at 1.8 TeV
<0.67	95	[30] ACCIARRI	98S L3	$e^+e^- \to Z$

[24] Measured using the time-dependent angular analysis of $B^0_s \to J/\psi\phi$ decays.

[25] Uses $|A_0|^2 - |A_{\|}|^2 = 0.355 \pm 0.066$ from ACOSTA 05.

[26] Uses $D^-_s\ell^+$, and $\phi\ell^+$ vertices.

[27] Measured using D_s hadron vertices.

[28] Uses $\phi\phi$ correlations from $B^0_s \to D^{(*)+}_s D^{(*)-}_s$.

[29] ABE 99D assumes $\tau_{B^0_s} = 1.55 \pm 0.05$ ps.

[30] ACCIARRI 98S assumes $\tau_{B^0_s} = 1.49 \pm 0.06$ ps and PDG 98 values of b production fraction.

$\Delta\Gamma_{B^0_s}$

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

VALUE (10^{12} s^{-1})	*DOCUMENT ID*	*TECN*	*COMMENT*
0.22±0.09 OUR EVALUATION			
$\mathbf{0.47^{+0.19}_{-0.24}\pm0.01}$	[31] ACOSTA	05 CDF	$p\overline{p}$ at 1.96 TeV

[31] Measured using the time-dependent angular analysis of $B^0_s \to J/\psi\phi$ decays.

$1 / \Gamma_{B^0_s}$

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

VALUE (10^{-12} s)	*DOCUMENT ID*
$\mathbf{1.398^{+0.049}_{-0.050}}$ **OUR EVALUATION**	

B^0_s DECAY MODES

These branching fractions all scale with B($\overline{b} \to B^0_s$), the LEP B^0_s production fraction. The first four were evaluated using B($\overline{b} \to B^0_s$) = (10.7 ± 1.4)% and the rest assume B($\overline{b} \to B^0_s$) = 12%.

The branching fraction B($B^0_s \to D^-_s \ell^+ \nu_\ell$anything) is not a pure measurement since the measured product branching fraction B($\overline{b} \to B^0_s$) × B($B^0_s \to D^-_s \ell^+ \nu_\ell$anything) was used to determine B($\overline{b} \to B^0_s$), as described in the note on "$B^0 - \overline{B}^0$ Mixing"

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.

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	D^-_s anything	(94 ±30) %	
Γ_2	$D^-_s \ell^+ \nu_\ell$anything	[a] (7.9 ± 2.4) %	
Γ_3	$D^-_s \pi^+$	< 13 %	
Γ_4	$D_s{}^{(*)+} D_s{}^{(*)-}$	(23 $^{+21}_{-13}$) %	
Γ_5	$J/\psi(1S)\phi$	(9.3 ± 3.3) × 10^{-4}	
Γ_6	$J/\psi(1S)\pi^0$	< 1.2 × 10^{-3}	90%
Γ_7	$J/\psi(1S)\eta$	< 3.8 × 10^{-3}	90%
Γ_8	$\psi(2S)\phi$	seen	
Γ_9	$\pi^+\pi^-$	< 1.7 × 10^{-4}	90%
Γ_{10}	$\pi^0\pi^0$	< 2.1 × 10^{-4}	90%
Γ_{11}	$\eta\pi^0$	< 1.0 × 10^{-3}	90%
Γ_{12}	$\eta\eta$	< 1.5 × 10^{-3}	90%
Γ_{13}	$\rho^0\rho^0$	< 3.20 × 10^{-4}	90%
Γ_{14}	$\phi\rho^0$	< 6.17 × 10^{-4}	90%
Γ_{15}	$\phi\phi$	(1.4 ± 0.8) × 10^{-5}	

Γ_{16}	$\pi^+ K^-$			$<$ 2.1	$\times 10^{-4}$	90%
Γ_{17}	$K^+ K^-$			$<$ 5.9	$\times 10^{-5}$	90%
Γ_{18}	$\overline{K}^*(892)^0 \rho^0$			$<$ 7.67	$\times 10^{-4}$	90%
Γ_{19}	$\overline{K}^*(892)^0 K^*(892)^0$			$<$ 1.681	$\times 10^{-3}$	90%
Γ_{20}	$\phi K^*(892)^0$			$<$ 1.013	$\times 10^{-3}$	90%
Γ_{21}	$p \overline{p}$			$<$ 5.9	$\times 10^{-5}$	90%
Γ_{22}	$\gamma\gamma$	*B1*		$<$ 1.48	$\times 10^{-4}$	90%
Γ_{23}	$\phi\gamma$			$<$ 1.2	$\times 10^{-4}$	90%

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

Γ_{24}	$\mu^+ \mu^-$	*B1*		$<$ 1.5	$\times 10^{-7}$	90%
Γ_{25}	$e^+ e^-$	*B1*		$<$ 5.4	$\times 10^{-5}$	90%
Γ_{26}	$e^\pm \mu^\mp$	*LF*	[*b*]	$<$ 6.1	$\times 10^{-6}$	90%
Γ_{27}	$\phi(1020) \mu^+ \mu^-$	*B1*		$<$ 4.7	$\times 10^{-5}$	90%
Γ_{28}	$\phi \nu \overline{\nu}$	*B1*		$<$ 5.4	$\times 10^{-3}$	90%

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

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

B_s^0 BRANCHING RATIOS

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

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.94±0.30 OUR AVERAGE					
0.81±0.24±0.22	90	[32] BUSKULIC	96E	ALEP	$e^+ e^- \rightarrow Z$
1.56±0.58±0.44	147	[33] ACTON	92N	OPAL	$e^+ e^- \rightarrow Z$

[32] BUSKULIC 96E separate $c\overline{c}$ and $b\overline{b}$ sources of D_s^+ mesons using a lifetime tag, subtract generic $\overline{b} \rightarrow W^+ \rightarrow D_s^+$ events, and obtain $B(\overline{b} \rightarrow B_s^0) \times B(B_s^0 \rightarrow D_s^- \text{anything}) = 0.088 \pm 0.020 \pm 0.020$ assuming $B(D_s \rightarrow \phi\pi) = (3.5 \pm 0.4) \times 10^{-2}$ and PDG 1994 values for the relative partial widths to other D_s channels. We evaluate using our current values $B(\overline{b} \rightarrow B_s^0) = 0.107 \pm 0.014$ and $B(D_s \rightarrow \phi\pi) = 0.036 \pm 0.009$. Our first error is their experiment's and our second error is that due to $B(\overline{b} \rightarrow B_s^0)$ and $B(D_s \rightarrow \phi\pi)$.

[33] 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 $B(\overline{b} \rightarrow B_s^0) B(B_s^0 \rightarrow D_s^- \text{anything}) \times B(D_s^- \rightarrow \phi\pi^-) = (5.9 \pm 1.9 \pm 1.1) \times 10^{-3}$. We evaluate using our current values $B(\overline{b} \rightarrow B_s^0) = 0.107 \pm 0.014$ and $B(D_s \rightarrow \phi\pi) = 0.036 \pm 0.009$. Our first error is their experiment's and our second error is that due to $B(\overline{b} \rightarrow B_s^0)$ and $B(D_s \rightarrow \phi\pi)$.

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

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

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
0.079±0.024 OUR AVERAGE				
0.076±0.012±0.021	134	[34] BUSKULIC 95O	ALEP	$e^+ e^- \rightarrow Z$
0.107±0.043±0.029		[35] ABREU 92M	DLPH	$e^+ e^- \rightarrow Z$
0.103±0.036±0.028	18	[36] ACTON 92N	OPAL	$e^+ e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.13 ±0.04 ±0.04	27	[37] BUSKULIC 92E	ALEP	$e^+ e^- \rightarrow Z$

[34] BUSKULIC 95O use $D_s \ell$ correlations. The measured product branching ratio is B($\overline{b} \rightarrow B_s$) × B($B_s \rightarrow D_s^- \ell^+ \nu_\ell$anything) = $(0.82 \pm 0.09^{+0.13}_{-0.14})$% assuming B($D_s \rightarrow \phi\pi$) = $(3.5 \pm 0.4) \times 10^{-2}$ 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($\overline{b} \rightarrow B_s$) = $(11.0 \pm 1.2^{+2.5}_{-2.6})$%. We evaluate using our current values B($\overline{b} \rightarrow B_s^0$) = 0.107 ± 0.014 and B($D_s \rightarrow \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \rightarrow B_s^0$) and B($D_s \rightarrow \phi\pi$).

[35] ABREU 92M measured muons only and obtained product branching ratio B($Z \rightarrow b$or $\overline{b}$) × B($\overline{b} \rightarrow B_s$) × B($B_s \rightarrow D_s \mu^+ \nu_\mu$anything) × B($D_s \rightarrow \phi\pi$) = $(18 \pm 8) \times 10^{-5}$. We evaluate using our current values B($\overline{b} \rightarrow B_s^0$) = 0.107 ± 0.014 and B($D_s \rightarrow \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \rightarrow B_s^0$) and B($D_s \rightarrow \phi\pi$). We use B($Z \rightarrow b$or $\overline{b}$) = 2B($Z \rightarrow b\overline{b}$) = 2×(0.2212 ± 0.0019).

[36] ACTON 92N is measured using $D_s \rightarrow \phi\pi^+$ and $K^*(892)^0 K^+$ events. The product branching fraction measured is measured to be B($\overline{b} \rightarrow B_s^0$)B($B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell$anything) ×B($D_s^- \rightarrow \phi\pi^-$) = $(3.9 \pm 1.1 \pm 0.8) \times 10^{-4}$. We evaluate using our current values B($\overline{b} \rightarrow B_s^0$) = 0.107 ± 0.014 and B($D_s \rightarrow \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \rightarrow B_s^0$) and B($D_s \rightarrow \phi\pi$).

[37] BUSKULIC 92E is measured using $D_s \rightarrow \phi\pi^+$ 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($\overline{b} \rightarrow B_s^0$)B($B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell$anything) =$0.020 \pm 0.0055^{+0.005}_{-0.006}$. We evaluate using our current values B($\overline{b} \rightarrow B_s^0$) = 0.107 ± 0.014 and B($D_s \rightarrow \phi\pi$) = 0.036 ± 0.009. Our first error is their experiment's and our second error is that due to B($\overline{b} \rightarrow B_s^0$) and B($D_s \rightarrow \phi\pi$). Superseded by BUSKULIC 95O.

$\Gamma(D_s^- \pi^+)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
<0.13	6	[38] AKERS 94J	OPAL	$e^+ e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	1	BUSKULIC 93G	ALEP	$e^+ e^- \rightarrow Z$

[38] AKERS 94J sees ≤ 6 events and measures the limit on the product branching fraction $f(\overline{b} \rightarrow B_s^0)\cdot$B($B_s^0 \rightarrow D_s^- \pi^+$) < 1.3% at CL = 90%. We divide by our current value B($\overline{b} \rightarrow B_s^0$) = 0.105.

$\Gamma(D_s^{(*)+} D_s^{(*)-})/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
$\mathbf{0.23 \pm 0.10^{+0.19}_{-0.09}}$		[39] BARATE	00K	ALEP	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.218	90	BARATE	98Q	ALEP	$e^+e^- \to Z$

[39] Uses $\phi\phi$ correlations from $B_s^0 \to D_s^{(*)+} D_s^{(*)-}$.

$\Gamma(J/\psi(1S)\phi)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (units 10^{-3})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
$\mathbf{0.93 \pm 0.28 \pm 0.17}$		[40] ABE	96Q	CDF	$p\overline{p}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<6	1	[41] AKERS	94J	OPAL	$e^+e^- \to Z$
seen	14	[42] ABE	93F	CDF	$p\overline{p}$ at 1.8 TeV
seen	1	[43] ACTON	92N	OPAL	Sup. by AKERS 94J

[40] ABE 96Q assumes $f_u = f_d$ and $f_s/f_u = 0.40 \pm 0.06$. Uses $B \to J/\psi(1S) K$ and $B \to J/\psi(1S) K^*$ branching fractions from PDG 94. They quote two systematic errors, ± 0.10 and ± 0.14 where the latter is the uncertainty in f_s. We combine in quadrature.

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

[42] ABE 93F measured using $J/\psi(1S) \to \mu^+\mu^-$ and $\phi \to K^+K^-$.

[43] In ACTON 92N a limit on the product branching fraction is measured to be $f(\overline{b} \to B_s^0) \cdot B(B_s^0 \to J/\psi(1S)\phi) \leq 0.22 \times 10^{-2}$.

$\Gamma(J/\psi(1S)\pi^0)/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	*CL%*	*DOCUMENT ID*		*TECN*
$\mathbf{<1.2 \times 10^{-3}}$	90	[44] ACCIARRI	97C	L3

[44] ACCIARRI 97C assumes B^0 production fraction ($39.5 \pm 4.0\%$) and B_s ($12.0 \pm 3.0\%$).

$\Gamma(J/\psi(1S)\eta)/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE	*CL%*	*DOCUMENT ID*		*TECN*
$\mathbf{<3.8 \times 10^{-3}}$	90	[45] ACCIARRI	97C	L3

[45] ACCIARRI 97C assumes B^0 production fraction ($39.5 \pm 4.0\%$) and B_s ($12.0 \pm 3.0\%$).

$\Gamma(\psi(2S)\phi)/\Gamma_{\text{total}}$ Γ_8/Γ

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

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

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
$\mathbf{<1.7 \times 10^{-4}}$	90	[46] BUSKULIC	96V	ALEP	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.32 \times 10^{-4}$	90	[47] ABE	00C	SLD	$e^+e^- \to Z$

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

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

$\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<2.1 \times 10^{-4}$	90	[48] ACCIARRI 95H	L3	$e^+e^- \rightarrow Z$

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

$\Gamma(\eta\pi^0)/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<1.0 \times 10^{-3}$	90	[49] ACCIARRI 95H	L3	$e^+e^- \rightarrow Z$

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

$\Gamma(\eta\eta)/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<1.5 \times 10^{-3}$	90	[50] ACCIARRI 95H	L3	$e^+e^- \rightarrow Z$

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

$\Gamma(\rho^0\rho^0)/\Gamma_{\text{total}}$ Γ_{13}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<3.20 \times 10^{-4}$	90	[51] ABE 00C	SLD	$e^+e^- \rightarrow Z$

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

$\Gamma(\phi\rho^0)/\Gamma_{\text{total}}$ Γ_{14}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<6.17 \times 10^{-4}$	90	[52] ABE 00C	SLD	$e^+e^- \rightarrow Z$

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

$\Gamma(\phi\phi)/\Gamma_{\text{total}}$ Γ_{15}/Γ

VALUE (units 10^{-6})	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$14^{+6}_{-5} \pm 6$		[53] ACOSTA 05J	CDF	$p\overline{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1183	90	[54] ABE 00C	SLD	$e^+e^- \rightarrow Z$

[53] Uses B($B^0 \rightarrow J/\psi\phi$) = (1.38 ± 0.49) × 10^{-3} and production cross-section ratio of $\sigma(B_s)/\sigma(B^0) = 0.26 \pm 0.04$.

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

$\Gamma(\pi^+K^-)/\Gamma_{\text{total}}$ Γ_{16}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<2.1 \times 10^{-4}$	90	[55] BUSKULIC 96V	ALEP	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<2.61 \times 10^{-4}$	90	[56] ABE 00C	SLD	$e^+e^- \rightarrow Z$
$<2.6 \times 10^{-4}$	90	[57] AKERS 94L	OPAL	$e^+e^- \rightarrow Z$

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

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

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

$\Gamma(K^+K^-)/\Gamma_{\text{total}}$ Γ_{17}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<5.9 \times 10^{-5}$	90	[58] BUSKULIC 96V	ALEP	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<2.83 \times 10^{-4}$	90	[59] ABE 00C	SLD	$e^+e^- \rightarrow Z$
$<1.4 \times 10^{-4}$	90	[60] AKERS 94L	OPAL	$e^+e^- \rightarrow Z$

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

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

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

$\Gamma(\overline{K}^*(892)^0\rho^0)/\Gamma_{\text{total}}$ Γ_{18}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<7.67 \times 10^{-4}$	90	[61] ABE 00C	SLD	$e^+e^- \rightarrow Z$

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

$\Gamma(\overline{K}^*(892)^0 K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{19}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<16.81 \times 10^{-4}$	90	[62] ABE 00C	SLD	$e^+e^- \rightarrow Z$

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

$\Gamma(\phi K^*(892)^0)/\Gamma_{\text{total}}$ Γ_{20}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<10.13 \times 10^{-4}$	90	[63] ABE 00C	SLD	$e^+e^- \rightarrow Z$

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

$\Gamma(p\overline{p})/\Gamma_{\text{total}}$ Γ_{21}/Γ

Test for ΔB=1 weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<5.9 \times 10^{-5}$	90	[64] BUSKULIC 96V	ALEP	$e^+e^- \rightarrow Z$

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

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ Γ_{22}/Γ

Test for ΔB=1 weak neutral current.

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<14.8 \times 10^{-5}$	90	[65] ACCIARRI 95I	L3	$e^+e^- \rightarrow Z$

[65] ACCIARRI 95I assumes f_{B^0} = 39.5 ± 4.0 and f_{B_s} = 12.0 ± 3.0%.

$\Gamma(\phi\gamma)/\Gamma_{\text{total}}$ Γ_{23}/Γ

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<1.2 \times 10^{-4}$	90	ACOSTA 02G	CDF	$p\overline{p}$ at 1.8 TeV

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

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<7 \times 10^{-4}$	90	[66] ADAM 96D	DLPH	$e^+e^- \rightarrow Z$

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

$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$ Γ_{24}/Γ

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

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<1.5 \times 10^{-7}$	90	[67] ABULENCIA 05	CDF	$p\overline{p}$ at 1.96 TeV

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

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<4.1 \times 10^{-7}$	90	[68] ABAZOV 05E	D0	$p\overline{p}$ at 1.96 TeV
$<5.8 \times 10^{-7}$	90	[69] ACOSTA 04D	CDF	$p\overline{p}$ at 1.96 TeV
$<2.0 \times 10^{-6}$	90	[70] ABE 98	CDF	$p\overline{p}$ at 1.8 TeV
$<3.8 \times 10^{-5}$	90	[71] ACCIARRI 97B	L3	$e^+e^- \rightarrow Z$
$<8.4 \times 10^{-6}$	90	[72] ABE 96L	CDF	Repl. by ABE 98

[67] Assumes production cross section $\sigma(B^+)/\sigma(B_s) = 3.71 \pm 0.41$ and $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+\mu^- K^+) = (5.88 \pm 0.26) \times 10^{-5}$.

[68] Assumes production cross-section $\sigma(B_s)/\sigma(B^+) = 0.270 \pm 0.034$.

[69] Assumes production cross-section $\sigma(B_s)/\sigma(B^+) = 0.100/0.391$ and the CDF measured value of $\sigma(B^+) = 3.6 \pm 0.6\ \mu$b.

[70] ABE 98 assumes production of $\sigma(B^0) = \sigma(B^+)$ and $\sigma(B_s)/\sigma(B^0) = 1/3$. They normalize to their measured $\sigma(B^0, p_T(B) > 6, |y| < 1.0) = 2.39 \pm 0.32 \pm 0.44\ \mu$b.

[71] ACCIARRI 97B assume PDG 96 production fractions for B^+, B^0, B_s, and Λ_b.

[72] ABE 96L assumes B^+/B_s production ratio 3/1. They normalize to their measured $\sigma(B^+, p_T(B) > 6\text{ GeV}/c, |y| < 1) = 2.39 \pm 0.54\ \mu$b.

$\Gamma(e^+e^-)/\Gamma_{\text{total}}$ Γ_{25}/Γ

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

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<5.4 \times 10^{-5}$	90	[73] ACCIARRI 97B	L3	$e^+e^- \rightarrow Z$

[73] ACCIARRI 97B assume PDG 96 production fractions for B^+, B^0, B_s, and Λ_b.

$\Gamma(e^\pm\mu^\mp)/\Gamma_{\text{total}}$ Γ_{26}/Γ

Test of lepton family number conservation.

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<6.1 \times 10^{-6}$	90	ABE 98V	CDF	$p\overline{p}$ at 1.8 TeV

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

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<4.1 \times 10^{-5}$	90	[74] ACCIARRI 97B	L3	$e^+e^- \rightarrow Z$

[74] ACCIARRI 97B assume PDG 96 production fractions for B^+, B^0, B_s, and Λ_b.

$\Gamma(\phi(1020)\mu^+\mu^-)/\Gamma_{\text{total}}$ Γ_{27}/Γ

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

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
$<4.7 \times 10^{-5}$	90	ACOSTA 02D	CDF	$p\overline{p}$ at 1.8 TeV

$\Gamma(\phi\nu\overline{\nu})/\Gamma_{\text{total}}$ Γ_{28}/Γ

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

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
$<5.4 \times 10^{-3}$	90	[75] ADAM	96D	DLPH	$e^+e^- \rightarrow Z$

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

POLARIZATION IN B_s^0 DECAY

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

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.59±0.12 OUR AVERAGE					
$0.61\pm0.14\pm0.02$		[76] AFFOLDER	00N	CDF	$p\overline{p}$ at 1.8 TeV
$0.56\pm0.21^{+0.02}_{-0.04}$	19	ABE	95Z	CDF	$p\overline{p}$ at 1.8 TeV

[76] AFFOLDER 00N measurements are based on 40 B_s^0 candidates obtained from a data sample of 89 pb^{-1}. The *P*-wave fraction is found to be $0.23 \pm 0.19 \pm 0.04$.

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" in the B^0 Particle Listings above.

χ_s is a measure of the time-integrated B_s^0-$\overline{B}_s^0$ mixing probability that produced $B_s^0(\overline{B}_s^0)$ decays as a $\overline{B}_s^0(B_s^0)$. Mixing violates $\Delta B \neq 2$ rule.

$$\chi_s = \frac{x_s^2}{2(1+x_s^2)}$$

$$x_s = \frac{\Delta m_{B_s^0}}{\Gamma_{B_s^0}} = (m_{B_{sH}^0} - m_{B_{sL}^0})\,\tau_{B_s^0}\,,$$

where *H*, *L* stand for heavy and light states of two B_s^0 *CP* eigenstates and $\tau_{B_s^0} = \frac{1}{0.5(\Gamma_{B_{sH}^0}+\Gamma_{B_{sL}^0})}$.

$\Delta m_{B_s^0} = m_{B_{sH}^0} - m_{B_{sL}^0}$

$\Delta m_{B_s^0}$ is a measure of 2π times the B_s^0-$\overline{B}_s^0$ oscillation frequency in time-dependent mixing experiments.

Preliminary results for $\Delta m_{B_s^0}$ from Tevatron Run II, based on 1 fb^{-1} of data, were reported by CDF and D0 Collaboration in the Spring of 2006.

$\Delta m_{B_s^0} = 17.33^{+0.42}_{-0.21} \pm 0.07$ ps^{-1} (CDF)

$\Delta m_{B_s^0} = [17, 21]$ ps^{-1} at 90% C.L. (D0)

$\Delta m_{B_s^0} = 17.4^{+0.3}_{-0.2}$ (world average)

Because of the high current interest, we mention these preliminary results here but do not include them in the Listings or Tables. See the note on the "B^0-$\overline{B}^0$ mixing" for references.

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account corrections between the measurements.

VALUE (10^{12} $\hbar$ s^{-1})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>14.4 (CL = 95%) OUR EVALUATION					
$>$ 8.0	95	[77] ABDALLAH	04J	DLPH	$e^+ e^- \rightarrow Z^0$
$>$ 4.9	95	[78] ABDALLAH	04J	DLPH	$e^+ e^- \rightarrow Z^0$
$>$ 5.0	95	[79] ABDALLAH	03B	DLPH	$e^+ e^- \rightarrow Z$
$>$10.3	95	[80] ABE	03	SLD	$e^+ e^- \rightarrow Z$
$>$10.9	95	[81] HEISTER	03E	ALEP	$e^+ e^- \rightarrow Z$
$>$ 5.3	95	[82] ABE	02V	SLD	$e^+ e^- \rightarrow Z$
$>$ 1.0	95	[83] ABBIENDI	01D	OPAL	$e^+ e^- \rightarrow Z$
$>$ 4.0	95	[84] ABREU,P	00G	DLPH	$e^+ e^- \rightarrow Z$
$>$ 5.2	95	[85] ABBIENDI	99S	OPAL	$e^+ e^- \rightarrow Z$
$>$ 5.8	95	[86] ABE	99J	CDF	$p\overline{p}$ at 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$>$ 8.5	95	[87] ABDALLAH	04J	DLPH	$e^+ e^- \rightarrow Z^0$
$>$ 7.4	95	[88] ABREU	00Y	DLPH	Repl. by ABDALLAH 04J
$<$96	95	[89] ABE	99D	CDF	$p\overline{p}$ at 1.8 TeV
$>$ 9.6	95	[90] BARATE	99J	ALEP	$e^+ e^- \rightarrow Z$
$>$ 7.9	95	[91] BARATE	98C	ALEP	Repl. by BARATE 99J
$>$ 3.1	95	[92] ACKERSTAFF	97U	OPAL	Repl. by ABBIENDI 99S
$>$ 2.2	95	[93] ACKERSTAFF	97V	OPAL	Repl. by ABBIENDI 99S
$>$ 6.5	95	[94] ADAM	97	DLPH	Repl. by ABREU 00Y
$>$ 6.6	95	[95] BUSKULIC	96M	ALEP	Repl. by BARATE 98C
$>$ 2.2	95	[93] AKERS	95J	OPAL	Sup. by ACKERSTAFF 97V
$>$ 5.7	95	[96] BUSKULIC	95J	ALEP	$e^+ e^- \rightarrow Z$
$>$ 1.8	95	[93] BUSKULIC	94B	ALEP	$e^+ e^- \rightarrow Z$

[77] Uses leptons emitted with large momentum transverse to a jet and improved techniques for vertexing and flavor-tagging.

[78] Updates of D_s-lepton analysis.

[79] Events with a high transverse momentum lepton were removed and an inclusively reconstructed vertex was required.

[80] ABE 03 uses the novel "charge dipole" technique to reconstruct separate secondary and tertiary vertices originating from the $B \rightarrow D$ decay chain. The analysis excludes $\Delta m_s < 4.9\,\mathrm{ps}^{-1}$ and $7.9 < \Delta m_s < 10.3\,\mathrm{ps}^{-1}$.

[81] Three analyses based on complementary event selections: (1) fully-reconstructed hadronic decays; (2) semileptonic decays with D_s exclusively reconstructed; (3) inclusive semileptonic decays.

[82] ABE 02V uses exclusively reconstructed D_s^- mesons and excludes $\Delta m_s < 1.4\,\mathrm{ps}^{-1}$ and $2.4 < \Delta m_s < 5.3\,\mathrm{ps}^{-1}$ at 95%CL.

[83] Uses fully or partially reconstructed $D_s \ell$ vertices and a mixing tag as a flavor tagging.

[84] Uses inclusive D_s vertices and fully reconstructed B_s decays and a multi-variable discriminant as a flavor tagging.

[85] Uses ℓ-Q_{hem} and ℓ-ℓ.

[86] ABE 99J uses ϕ ℓ-ℓ correlation.

[87] Combined results from all Delphi analyses.

[88] Replaced by ABDALLAH 04A. Uses $D_s^- \ell^+$, and $\phi\ell^+$ vertices, and a multi-variable discriminant as a flavor tagging.

[89] ABE 99D assumes $\tau_{B_s^0} = 1.55 \pm 0.05$ ps and $\Delta\Gamma/\Delta m = (5.6 \pm 2.6) \times 10^{-3}$.

[90] BARATE 99J uses combination of an inclusive lepton and D_s^--based analyses.

[91] BARATE 98C combines results from $D_s h$-ℓ/Q_{hem}, $D_s h$-K in the same side, $D_s \ell$-ℓ/Q_{hem} and $D_s \ell$-K in the same side.

[92] Uses ℓ-Q_{hem}.

[93] Uses ℓ-ℓ.

[94] ADAM 97 combines results from $D_s \ell$-Q_{hem}, ℓ-Q_{hem}, and ℓ-ℓ.

[95] BUSKULIC 96M uses D_s lepton correlations and lepton, kaon, and jet charge tags.

[96] BUSKULIC 95J uses ℓ-Q_{hem}. They find $\Delta m_s > 5.6$ [> 6.1] for f_s=10% [12%]. We interpolate to our central value f_s=10.5%.

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

This is derived by the Heavy Flavor Averaging Group (HFAG) from the results on $\Delta m_{B_s^0}$ and "OUR EVALUATION" of the B_s^0 mean lifetime.

VALUE	*CL%*	*DOCUMENT ID*
>19.9 (CL = 95%) OUR EVALUATION		

χ_s

This B_s^0-$\overline{B}_s^0$ integrated mixing parameter is derived from x_s above.

VALUE	*CL%*	*DOCUMENT ID*
>0.49878 (CL = 95%) OUR EVALUATION		

B_s^0 REFERENCES

ABAZOV	05B	PRL 94 042001	V.M. Abazov *et al.*	(D0 Collab.)
ABAZOV	05E	PRL 94 071802	V.M. Abazov *et al.*	(D0 Collab.)
ABAZOV	05W	PRL 95 171801	V.M. Abazov *et al.*	(D0 Collab.)
ABULENCIA	05	PRL 95 221805	A. Abulencia *et al.*	(CDF Collab.)
ACOSTA	05	PRL 94 101803	D. Acosta *et al.*	(CDF Collab.)
ACOSTA	05J	PRL 95 031801	D. Acosta *et al.*	(CDF Collab.)
ABDALLAH	04A	PL B585 63	J. Abdallah *et al.*	(DELPHI Collab.)
ABDALLAH	04J	EPJ C35 35	J. Abdallah *et al.*	(DELPHI Collab.)
ACOSTA	04D	PRL 93 032001	D. Acosta *et al.*	(CDF Collab.)
ABDALLAH	03B	EPJ C28 155	J. Abdallah *et al.*	(DELPHI Collab.)
ABE	03	PR D67 012006	K. Abe *et al.*	(SLD Collab.)
HEISTER	03E	EPJ C29 143	A. Heister *et al.*	(ALEPH Collab.)
ABE	02V	PR D66 032009	K. Abe *et al.*	(SLD Collab.)
ACOSTA	02D	PR D65 111101R	D. Acosta *et al.*	(CDF Collab.)
ACOSTA	02G	PR D66 112002	D. Acosta *et al.*	(CDF Collab.)
ABBIENDI	01D	EPJ C19 241	G. Abbiendi *et al.*	(OPAL Collab.)
ABE	00C	PR D62 071101R	K. Abe *et al.*	(SLD Collab.)
ABREU	00Y	EPJ C16 555	P. Abreu *et al.*	(DELPHI Collab.)
ABREU,P	00G	EPJ C18 229	P. Abreu *et al.*	(DELPHI Collab.)
AFFOLDER	00N	PRL 85 4668	T. Affolder *et al.*	(CDF Collab.)
BARATE	00K	PL B486 286	R. Barate *et al.*	(ALEPH Collab.)
ABBIENDI	99S	EPJ C11 587	G. Abbiendi *et al.*	(OPAL Collab.)
ABE	99D	PR D59 032004	F. Abe *et al.*	(CDF Collab.)
ABE	99J	PRL 82 3576	F. Abe *et al.*	(CDF Collab.)
BARATE	99J	EPJ C7 553	R. Barate *et al.*	(ALEPH Collab.)
Also		EPJ C12 181 (erratum)	R. Barate *et al.*	(ALEPH Collab.)
ABE	98	PR D57 R3811	F. Abe *et al.*	(CDF Collab.)

ABE	98B	PR D57 5382	F. Abe *et al.*	(CDF Collab.)
ABE	98V	PRL 81 5742	F. Abe *et al.*	(CDF Collab.)
ACCIARRI	98S	PL B438 417	M. Acciarri *et al.*	(L3 Collab.)
ACKERSTAFF	98F	EPJ C2 407	K. Ackerstaff *et al.*	(OPAL Collab.)
ACKERSTAFF	98G	PL B426 161	K. Ackerstaff *et al.*	(OPAL Collab.)
BARATE	98C	EPJ C4 367	R. Barate *et al.*	(ALEPH Collab.)
BARATE	98Q	EPJ C4 387	R. Barate *et al.*	(ALEPH Collab.)
PDG	98	EPJ C3 1	C. Caso *et al.*	
ACCIARRI	97B	PL B391 474	M. Acciarri *et al.*	(L3 Collab.)
ACCIARRI	97C	PL B391 481	M. Acciarri *et al.*	(L3 Collab.)
ACKERSTAFF	97U	ZPHY C76 401	K. Ackerstaff *et al.*	(OPAL Collab.)
ACKERSTAFF	97V	ZPHY C76 417	K. Ackerstaff *et al.*	(OPAL Collab.)
ADAM	97	PL B414 382	W. Adam *et al.*	(DELPHI Collab.)
ABE	96B	PR D53 3496	F. Abe *et al.*	(CDF Collab.)
ABE	96L	PRL 76 4675	F. Abe *et al.*	(CDF Collab.)
ABE	96N	PRL 77 1945	F. Abe *et al.*	(CDF Collab.)
ABE	96Q	PR D54 6596	F. Abe *et al.*	(CDF Collab.)
ABREU	96F	ZPHY C71 11	P. Abreu *et al.*	(DELPHI Collab.)
ADAM	96D	ZPHY C72 207	W. Adam *et al.*	(DELPHI Collab.)
BUSKULIC	96E	ZPHY C69 585	D. Buskulic *et al.*	(ALEPH Collab.)
BUSKULIC	96M	PL B377 205	D. Buskulic *et al.*	(ALEPH Collab.)
BUSKULIC	96V	PL B384 471	D. Buskulic *et al.*	(ALEPH Collab.)
PDG	96	PR D54 1	R. M. Barnett *et al.*	
ABE	95R	PRL 74 4988	F. Abe *et al.*	(CDF Collab.)
ABE	95Z	PRL 75 3068	F. Abe *et al.*	(CDF Collab.)
ACCIARRI	95H	PL B363 127	M. Acciarri *et al.*	(L3 Collab.)
ACCIARRI	95I	PL B363 137	M. Acciarri *et al.*	(L3 Collab.)
AKERS	95G	PL B350 273	R. Akers *et al.*	(OPAL Collab.)
AKERS	95J	ZPHY C66 555	R. Akers *et al.*	(OPAL Collab.)
BUSKULIC	95J	PL B356 409	D. Buskulic *et al.*	(ALEPH Collab.)
BUSKULIC	95O	PL B361 221	D. Buskulic *et al.*	(ALEPH Collab.)
ABREU	94D	PL B324 500	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	94E	ZPHY C61 407	P. Abreu *et al.*	(DELPHI Collab.)
Also		PL B289 199	P. Abreu *et al.*	(DELPHI Collab.)
AKERS	94J	PL B337 196	R. Akers *et al.*	(OPAL Collab.)
AKERS	94L	PL B337 393	R. Akers *et al.*	(OPAL Collab.)
BUSKULIC	94B	PL B322 441	D. Buskulic *et al.*	(ALEPH Collab.)
BUSKULIC	94C	PL B322 275	D. Buskulic *et al.*	(ALEPH Collab.)
PDG	94	PR D50 1173	L. Montanet *et al.*	(CERN, LBL, BOST+)
ABE	93F	PRL 71 1685	F. Abe *et al.*	(CDF Collab.)
ACTON	93H	PL B312 501	P.D. Acton *et al.*	(OPAL Collab.)
BUSKULIC	93G	PL B311 425	D. Buskulic *et al.*	(ALEPH Collab.)
ABREU	92M	PL B289 199	P. Abreu *et al.*	(DELPHI Collab.)
ACTON	92N	PL B295 357	P.D. Acton *et al.*	(OPAL Collab.)
BUSKULIC	92E	PL B294 145	D. Buskulic *et al.*	(ALEPH Collab.)
LEE-FRANZINI	90	PRL 65 2947	J. Lee-Franzini *et al.*	(CUSB II Collab.)