

B[±]/B⁰ ADMIXTURE

B DECAY MODES

The branching fraction measurements are for an admixture of B mesons at the $\Upsilon(4S)$. The values quoted assume that $B(\Upsilon(4S) \rightarrow B\bar{B}) = 100\%$.

For inclusive branching fractions, *e.g.*, $B \rightarrow D^\pm$ anything, the treatment of multiple D 's in the final state must be defined. One possibility would be to count the number of events with one-or-more D 's and divide by the total number of B 's. Another possibility would be to count the total number of D 's and divide by the total number of B 's, which is the definition of average multiplicity. The two definitions are identical when only one of the specified particles is allowed in the final state. Even though the "one-or-more" definition seems sensible, for practical reasons inclusive branching fractions are almost always measured using the multiplicity definition. For heavy final state particles, authors call their results inclusive branching fractions while for light particles some authors call their results multiplicities. In the B sections, we list all results as inclusive branching fractions, adopting a multiplicity definition. This means that inclusive branching fractions can exceed 100% and that inclusive partial widths can exceed total widths, just as inclusive cross sections can exceed total cross sections.

\bar{B} modes are charge conjugates of the modes below. Reactions indicate the weak decay vertex and do not include mixing.

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Semileptonic and leptonic modes		
Γ_1 $B \rightarrow e^+ \nu_e$ anything	[a] (10.41 ± 0.29) %	S=1.2
Γ_2 $B \rightarrow \bar{p} e^+ \nu_e$ anything	< 1.6 × 10 ⁻³	CL=90%
Γ_3 $B \rightarrow \mu^+ \nu_\mu$ anything	[a] (10.3 ± 0.5) %	
Γ_4 $B \rightarrow \ell^+ \nu_\ell$ anything	[a,b] (10.45 ± 0.21) %	
Γ_5 $B \rightarrow D^- \ell^+ \nu_\ell$ anything	[b] (2.7 ± 0.8) %	
Γ_6 $B \rightarrow \bar{D}^0 \ell^+ \nu_\ell$ anything	[b] (7.0 ± 1.4) %	
Γ_7 $B \rightarrow D^{*-} \ell^+ \nu_\ell$ anything		
Γ_8 $B \rightarrow D^{*0} \ell^+ \nu_\ell$ anything		
Γ_9 $B \rightarrow \bar{D}^{**} \ell^+ \nu_\ell$	[b,c] (2.7 ± 0.7) %	
Γ_{10} $B \rightarrow \bar{D}_1(2420) \ell^+ \nu_\ell$ anything	(7.4 ± 1.6) × 10 ⁻³	
Γ_{11} $B \rightarrow D \pi \ell^+ \nu_\ell$ anything + $D^* \pi \ell^+ \nu_\ell$ anything	(2.3 ± 0.4) %	
Γ_{12} $B \rightarrow \bar{D}_2^*(2460) \ell^+ \nu_\ell$ anything	< 6.5 × 10 ⁻³	CL=95%

Γ_{13}	$B \rightarrow D^{*-} \pi^+ \ell^+ \nu_\ell$ anything	(1.00 ± 0.34) %	
Γ_{14}	$B \rightarrow D_s^- \ell^+ \nu_\ell$ anything	[b] < 9	$\times 10^{-3}$ CL=90%
Γ_{15}	$B \rightarrow D_s^- \ell^+ \nu_\ell K^+$ anything	[b] < 6	$\times 10^{-3}$ CL=90%
Γ_{16}	$B \rightarrow D_s^- \ell^+ \nu_\ell K^0$ anything	[b] < 9	$\times 10^{-3}$ CL=90%
Γ_{17}	$B \rightarrow \ell^+ \nu_\ell$ noncharmed	[b]	
Γ_{18}	$B \rightarrow K^+ \ell^+ \nu_\ell$ anything	[b] (6.0 ± 0.5) %	
Γ_{19}	$B \rightarrow K^- \ell^+ \nu_\ell$ anything	[b] (10 ± 4)	$\times 10^{-3}$
Γ_{20}	$B \rightarrow K^0 / \bar{K}^0 \ell^+ \nu_\ell$ anything	[b] (4.4 ± 0.5) %	

D, D*, or D_s modes

Γ_{21}	$B \rightarrow D^\pm$ anything	(24.1 ± 1.9) %	
Γ_{22}	$B \rightarrow D^0 / \bar{D}^0$ anything	(63.5 ± 2.9) %	S=1.1
Γ_{23}	$B \rightarrow D^*(2010)^\pm$ anything	(22.7 ± 1.6) %	
Γ_{24}	$B \rightarrow D^*(2007)^0$ anything	(26.0 ± 2.7) %	
Γ_{25}	$B \rightarrow D_s^\pm$ anything	[d] (10.0 ± 2.5) %	
Γ_{26}	$B \rightarrow D^{(*)} \bar{D}^{(*)} K^0 + D^{(*)} \bar{D}^{(*)} K^\pm$	[d,e] (7.1 $\begin{smallmatrix} +2.7 \\ -1.7 \end{smallmatrix}$) %	
Γ_{27}	$b \rightarrow c \bar{c} s$	(22 ± 4) %	
Γ_{28}	$B \rightarrow D_s^{(*)} \bar{D}^{(*)}$	[d,e] (4.9 ± 1.3) %	
Γ_{29}	$B \rightarrow D^* D^*(2010)^\pm$	[d] < 5.9	$\times 10^{-3}$ CL=90%
Γ_{30}	$B \rightarrow D D^*(2010)^\pm + D^* D^\pm$	[d] < 5.5	$\times 10^{-3}$ CL=90%
Γ_{31}	$B \rightarrow D D^\pm$	[d] < 3.1	$\times 10^{-3}$ CL=90%
Γ_{32}	$B \rightarrow D_s^{(*)\pm} \bar{D}^{(*)} \chi(n\pi^\pm)$	[d,e] (9 $\begin{smallmatrix} +5 \\ -4 \end{smallmatrix}$) %	
Γ_{33}	$B \rightarrow D^*(2010)\gamma$	< 1.1	$\times 10^{-3}$ CL=90%
Γ_{34}	$B \rightarrow D_s^+ \pi^-, D_s^{*+} \pi^-, D_s^+ \rho^-, D_s^{*+} \rho^-, D_s^+ \pi^0, D_s^{*+} \pi^0, D_s^+ \eta, D_s^{*+} \eta, D_s^+ \rho^0, D_s^{*+} \rho^0, D_s^+ \omega, D_s^{*+} \omega$	[d] < 5	$\times 10^{-4}$ CL=90%
Γ_{35}	$B \rightarrow D_{s1}(2536)^+$ anything	< 9.5	$\times 10^{-3}$ CL=90%

Charmonium modes

Γ_{36}	$B \rightarrow J/\psi(1S)$ anything	(1.15 ± 0.06) %	
Γ_{37}	$B \rightarrow J/\psi(1S)$ (direct) anything	(8.0 ± 0.8)	$\times 10^{-3}$
Γ_{38}	$B \rightarrow \psi(2S)$ anything	(3.5 ± 0.5)	$\times 10^{-3}$
Γ_{39}	$B \rightarrow \chi_{c1}(1P)$ anything	(4.2 ± 0.7)	$\times 10^{-3}$
Γ_{40}	$B \rightarrow \chi_{c1}(1P)$ (direct) anything	(3.7 ± 0.7)	$\times 10^{-3}$
Γ_{41}	$B \rightarrow \chi_{c2}(1P)$ anything	< 3.8	$\times 10^{-3}$ CL=90%
Γ_{42}	$B \rightarrow \eta_c(1S)$ anything	< 9	$\times 10^{-3}$ CL=90%

K or K* modes

Γ_{43}	$B \rightarrow K^\pm$ anything	[d]	(78.9 \pm 2.5) %	
Γ_{44}	$B \rightarrow K^+$ anything		(66 \pm 5) %	
Γ_{45}	$B \rightarrow K^-$ anything		(13 \pm 4) %	
Γ_{46}	$B \rightarrow K^0/\bar{K}^0$ anything	[d]	(64 \pm 4) %	
Γ_{47}	$B \rightarrow K^*(892)^\pm$ anything		(18 \pm 6) %	
Γ_{48}	$B \rightarrow K^*(892)^0/\bar{K}^*(892)^0$ anything	[d]	(14.6 \pm 2.6) %	
Γ_{49}	$B \rightarrow K^*(892)\gamma$			
Γ_{50}	$B \rightarrow K_1(1400)\gamma$	<	4.1 $\times 10^{-4}$	CL=90%
Γ_{51}	$B \rightarrow K_2^*(1430)\gamma$	<	8.3 $\times 10^{-4}$	CL=90%
Γ_{52}	$B \rightarrow K_2(1770)\gamma$	<	1.2 $\times 10^{-3}$	CL=90%
Γ_{53}	$B \rightarrow K_3^*(1780)\gamma$	<	3.0 $\times 10^{-3}$	CL=90%
Γ_{54}	$B \rightarrow K_4^*(2045)\gamma$	<	1.0 $\times 10^{-3}$	CL=90%
Γ_{55}	$B \rightarrow \bar{b} \rightarrow \bar{s}\gamma$		(2.3 \pm 0.7) $\times 10^{-4}$	
Γ_{56}	$B \rightarrow \bar{b} \rightarrow \bar{s}$ gluon	<	6.8 %	CL=90%
Γ_{57}	$B \rightarrow \eta$ anything	<	4.4 $\times 10^{-4}$	CL=90%
Γ_{58}	$B \rightarrow \eta'$ anything		(6.2 $^{+2.1}_{-2.6}$) $\times 10^{-4}$	

Light unflavored meson modes

Γ_{59}	$B \rightarrow \pi^\pm$ anything	[d,f]	(358 \pm 7) %	
Γ_{60}	$B \rightarrow \eta$ anything		(17.6 \pm 1.6) %	
Γ_{61}	$B \rightarrow \rho^0$ anything		(21 \pm 5) %	
Γ_{62}	$B \rightarrow \omega$ anything	<	81 %	CL=90%
Γ_{63}	$B \rightarrow \phi$ anything		(3.5 \pm 0.7) %	S=1.8
Γ_{64}	$B \rightarrow \phi K^*(892)$	<	2.2 $\times 10^{-5}$	CL=90%

Baryon modes

Γ_{65}	$B \rightarrow \Lambda_c^\pm$ anything		(6.4 \pm 1.1) %	
Γ_{66}	$B \rightarrow \Lambda_c^+$ anything			
Γ_{67}	$B \rightarrow \bar{\Lambda}_c^-$ anything			
Γ_{68}	$B \rightarrow \bar{\Lambda}_c^- e^+$ anything	<	3.2 $\times 10^{-3}$	CL=90%
Γ_{69}	$B \rightarrow \bar{\Lambda}_c^- p$ anything		(3.6 \pm 0.7) %	
Γ_{70}	$B \rightarrow \bar{\Lambda}_c^- p e^+ \nu_e$	<	1.5 $\times 10^{-3}$	CL=90%
Γ_{71}	$B \rightarrow \bar{\Sigma}_c^{--}$ anything		(4.2 \pm 2.4) $\times 10^{-3}$	
Γ_{72}	$B \rightarrow \bar{\Sigma}_c^-$ anything	<	9.6 $\times 10^{-3}$	CL=90%
Γ_{73}	$B \rightarrow \bar{\Sigma}_c^0$ anything		(4.6 \pm 2.4) $\times 10^{-3}$	
Γ_{74}	$B \rightarrow \bar{\Sigma}_c^0 N$ (N = p or n)	<	1.5 $\times 10^{-3}$	CL=90%
Γ_{75}	$B \rightarrow \Xi_c^0$ anything		(1.4 \pm 0.5) $\times 10^{-4}$	
	$\times B(\Xi_c^0 \rightarrow \Xi^- \pi^+)$			

Γ_{76}	$B \rightarrow \Xi_c^+ \text{ anything}$		$(4.5^{+1.3}_{-1.2}) \times 10^{-4}$	
	$\times B(\Xi_c^+ \rightarrow \Xi^- \pi^+ \pi^+)$			
Γ_{77}	$B \rightarrow p/\bar{p} \text{ anything}$	[d]	$(8.0 \pm 0.4) \%$	
Γ_{78}	$B \rightarrow p/\bar{p} \text{ (direct) anything}$	[d]	$(5.5 \pm 0.5) \%$	
Γ_{79}	$B \rightarrow \Lambda/\bar{\Lambda} \text{ anything}$	[d]	$(4.0 \pm 0.5) \%$	
Γ_{80}	$B \rightarrow \Lambda \text{ anything}$			
Γ_{81}	$B \rightarrow \bar{\Lambda} \text{ anything}$			
Γ_{82}	$B \rightarrow \Xi^-/\Xi^+ \text{ anything}$	[d]	$(2.7 \pm 0.6) \times 10^{-3}$	
Γ_{83}	$B \rightarrow \text{baryons anything}$		$(6.8 \pm 0.6) \%$	
Γ_{84}	$B \rightarrow p\bar{p} \text{ anything}$		$(2.47 \pm 0.23) \%$	
Γ_{85}	$B \rightarrow \Lambda\bar{p}/\bar{\Lambda}p \text{ anything}$	[d]	$(2.5 \pm 0.4) \%$	
Γ_{86}	$B \rightarrow \Lambda\bar{\Lambda} \text{ anything}$		$< 5 \times 10^{-3}$	CL=90%

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

Γ_{87}	$B \rightarrow e^+ e^- s$	B1	$< 5.7 \times 10^{-5}$	CL=90%
Γ_{88}	$B \rightarrow \mu^+ \mu^- s$	B1	$< 5.8 \times 10^{-5}$	CL=90%
Γ_{89}	$B \rightarrow e^\pm \mu^\mp s$	LF	$< 2.2 \times 10^{-5}$	CL=90%

[a] These values are model dependent. See 'Note on Semileptonic Decays' in the B^+ Particle Listings.

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

[c] D^{**} stands for the sum of the $D(1^1P_1)$, $D(1^3P_0)$, $D(1^3P_1)$, $D(1^3P_2)$, $D(2^1S_0)$, and $D(2^1S_1)$ resonances.

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

[e] $D^{(*)}\bar{D}^{(*)}$ stands for the sum of $D^*\bar{D}^*$, $D^*\bar{D}$, $D\bar{D}^*$, and $D\bar{D}$.

[f] Inclusive branching fractions have a multiplicity definition and can be greater than 100%.

B^\pm/B^0 ADMIXTURE BRANCHING RATIOS

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

These branching fraction values are model dependent. See the note on "Semileptonic Decays of B Mesons at the beginning of the B^+ Particle Listings.

VALUE	DOCUMENT ID	TECN	COMMENT
0.1045 ± 0.0021 OUR AVERAGE	Includes data from the 2 datablocks that follow this one.		
0.108 ± 0.002 ± 0.0056	¹ HENDERSON 92	CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$

¹HENDERSON 92 measurement employs e and μ . The systematic error contains 0.004 in quadrature from model dependence. The authors average a variation of the Isgur, Scora, Grinstein, and Wise model with that of the Altarelli-Cabibbo-Corbò-Maiani-Martinelli model for semileptonic decays to correct the acceptance.

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

Γ_1/Γ

These branching fraction values are model dependent. See the note on "Semileptonic Decays of B Mesons at the beginning of the B^+ Particle Listings.

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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The data in this block is included in the average printed for a previous datablock.

0.1041 ± 0.0029 OUR AVERAGE Error includes scale factor of 1.2.

0.1049 ± 0.0017 ± 0.0043	² BARISH	96B CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
0.097 ± 0.005 ± 0.004	³ ALBRECHT	93H ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
0.100 ± 0.004 ± 0.003	⁴ YANAGISAWA	91 CSB2	$e^+ e^- \rightarrow \Upsilon(4S)$
0.103 ± 0.006 ± 0.002	⁵ ALBRECHT	90H ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
0.117 ± 0.004 ± 0.010	⁶ WACHS	89 CBAL	Direct e at $\Upsilon(4S)$
0.120 ± 0.007 ± 0.005	CHEN	84 CLEO	Direct e at $\Upsilon(4S)$

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

0.132 ± 0.008 ± 0.014	⁷ KLOPFEN...	83B CUSB	Direct e at $\Upsilon(4S)$
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² BARISH 96B analysis performed using tagged semileptonic decays of the B . This technique is almost model independent for the lepton branching ratio.

³ ALBRECHT 93H analysis performed using tagged semileptonic decays of the B . This technique is almost model independent for the lepton branching ratio.

⁴ YANAGISAWA 91 also measures an average semileptonic branching ratio at the $\Upsilon(5S)$ of 9.6–10.5% depending on assumptions about the relative production of different B meson species.

⁵ ALBRECHT 90H uses the model of ALTARELLI 82 to correct over all lepton momenta. 0.099 ± 0.006 is obtained using ISGUR 89B.

⁶ Using data above $p(e) = 2.4$ GeV, WACHS 89 determine $\sigma(B \rightarrow e\nu\text{up})/\sigma(B \rightarrow e\nu\text{charm}) < 0.065$ at 90% CL.

⁷ Ratio $\sigma(b \rightarrow e\nu\text{up})/\sigma(b \rightarrow e\nu\text{charm}) < 0.055$ at CL = 90%.

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

Γ_3/Γ

These branching fraction values are model dependent. See the note on "Semileptonic Decays of B Mesons at the beginning of the B^+ Particle Listings.

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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The data in this block is included in the average printed for a previous datablock.

0.103 ± 0.005 OUR AVERAGE

0.100 ± 0.006 ± 0.002	⁸ ALBRECHT	90H ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
0.108 ± 0.006 ± 0.01	CHEN	84 CLEO	Direct μ at $\Upsilon(4S)$
0.112 ± 0.009 ± 0.01	LEVMAN	84 CUSB	Direct μ at $\Upsilon(4S)$

⁸ ALBRECHT 90H uses the model of ALTARELLI 82 to correct over all lepton momenta. 0.097 ± 0.006 is obtained using ISGUR 89B.

$\Gamma(\bar{p} e^+ \nu_e \text{ anything})/\Gamma_{\text{total}}$

Γ_2/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<0.0016	90	ALBRECHT	90H ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
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$\Gamma(D^- \ell^+ \nu_\ell \text{ anything})/\Gamma(\ell^+ \nu_\ell \text{ anything})$

Γ_5/Γ_4

$\ell = e \text{ or } \mu.$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.26 ± 0.07 ± 0.04	⁹ FULTON	91 CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
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⁹ FULTON 91 uses $B(D^+ \rightarrow K^- \pi^+ \pi^+) = (9.1 \pm 1.3 \pm 0.4)\%$ as measured by MARK III.

$\Gamma(\overline{D}^0 \ell^+ \nu_\ell \text{ anything}) / \Gamma(\ell^+ \nu_\ell \text{ anything})$ Γ_6 / Γ_4

$\ell = e \text{ or } \mu.$

VALUE	DOCUMENT ID	TECN	COMMENT
0.67 ± 0.09 ± 0.10	¹⁰ FULTON	91	CLEO $e^+ e^- \rightarrow \Upsilon(4S)$
¹⁰ FULTON 91 uses $B(D^0 \rightarrow K^- \pi^+) = (4.2 \pm 0.4 \pm 0.4)\%$ as measured by MARK III.			

$\Gamma(D^{*-} \ell^+ \nu_\ell \text{ anything}) / \Gamma_{\text{total}}$ Γ_7 / Γ

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.6 ± 0.3 ± 0.1	¹¹ BARISH	95	CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$
¹¹ BARISH 95 use $B(D^0 \rightarrow K^- \pi^+) = (3.91 \pm 0.08 \pm 0.17)\%$ and $B(D^{*+} \rightarrow D^0 \pi^+) = (68.1 \pm 1.0 \pm 1.3)\%$.			

$\Gamma(D^{*0} \ell^+ \nu_\ell \text{ anything}) / \Gamma_{\text{total}}$ Γ_8 / Γ

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.6 ± 0.6 ± 0.1	¹² BARISH	95	CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$
¹² BARISH 95 use $B(D^0 \rightarrow K^- \pi^+) = (3.91 \pm 0.08 \pm 0.17)\%$, $B(D^{*+} \rightarrow D^0 \pi^+) = (68.1 \pm 1.0 \pm 1.3)\%$, $B(D^{*0} \rightarrow D^0 \pi^0) = (63.6 \pm 2.3 \pm 3.3)\%$.			

$\Gamma(\overline{D}^{**} \ell^+ \nu_\ell) / \Gamma_{\text{total}}$ Γ_9 / Γ

D^{**} stands for the sum of the $D(1^1P_1)$, $D(1^3P_0)$, $D(1^3P_1)$, $D(1^3P_2)$, $D(2^1S_0)$, and $D(2^1S_1)$ resonances. $\ell = e \text{ or } \mu$, not sum over e and μ modes.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.027 ± 0.005 ± 0.005		63	¹³ ALBRECHT	93	ARG $e^+ e^- \rightarrow \Upsilon(4S)$
<0.028	95		¹⁴ BARISH	95	CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$

¹³ ALBRECHT 93 assumes the GISW model to correct for unseen modes. Using the BHKT model, the result becomes $0.023 \pm 0.006 \pm 0.004$. Assumes $B(D^{*+} \rightarrow D^0 \pi^+) = 68.1\%$, $B(D^0 \rightarrow K^- \pi^+) = 3.65\%$, $B(D^0 \rightarrow K^- \pi^+ \pi^- \pi^+) = 7.5\%$. We have taken their average e and μ value.

¹⁴ BARISH 95 use $B(D^0 \rightarrow K^- \pi^+) = (3.91 \pm 0.08 \pm 0.17)\%$, assume all nonresonant channels are zero, and use GISW model for relative abundances of D^{**} states.

$\Gamma(\overline{D}_1(2420) \ell^+ \nu_\ell \text{ anything}) / \Gamma_{\text{total}}$ Γ_{10} / Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0074 ± 0.0016	¹⁵ BUSKULIC	97B	ALEP $e^+ e^- \rightarrow Z$

• • • We do not use the following data for averages, fits, limits, etc. • • •
seen ¹⁶ BUSKULIC 95B ALEP Repl. by BUSKULIC 97B

¹⁵ BUSKULIC 97B assumes $B(D_1(2420) \rightarrow D^* \pi) = 1$, $B(D_1(2420) \rightarrow D^* \pi^\pm) = 2/3$, and $B(b \rightarrow B) = 0.378 \pm 0.022$.

¹⁶ BUSKULIC 95B reports $f_B \times B(B \rightarrow \overline{D}_1(2420)^0 \ell^+ \nu_\ell \text{ anything}) \times B(\overline{D}_1(2420)^0 \rightarrow \overline{D}^*(2010)^- \pi^+) = (2.04 \pm 0.58 \pm 0.34)10^{-3}$, where f_B is the production fraction for a single B charge state.

$\Gamma(D\pi\ell^+\nu_\ell\text{anything}) + \Gamma(D^*\pi\ell^+\nu_\ell\text{anything})/\Gamma_{\text{total}}$					Γ_{11}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
0.0226±0.0029±0.0033		17 BUSKULIC	97B ALEP	$e^+e^- \rightarrow Z$	

¹⁷ BUSKULIC 97B assumes $B(b \rightarrow B) = 0.378 \pm 0.022$ and uses isospin invariance by assuming that all observed $D^0\pi^+$, $D^{*0}\pi^+$, $D^+\pi^-$, and $D^{*+}\pi^-$ are from D^{**} states. A correction has been applied to account for the production of B_s^0 and Λ_b^0 .

$\Gamma(\bar{D}_2^*(2460)\ell^+\nu_\ell\text{anything})/\Gamma_{\text{total}}$					Γ_{12}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	

<0.0065	95	18 BUSKULIC	97B ALEP	$e^+e^- \rightarrow Z$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen		19 BUSKULIC	95B ALEP	$e^+e^- \rightarrow Z$
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¹⁸ A revised number based on BUSKULIC 97B which assumes $B(D_2^*(2460) \rightarrow D^*\pi^\pm) = 0.20$ and $B(b \rightarrow B) = 0.378 \pm 0.022$.

¹⁹ BUSKULIC 95B reports $f_B \times B(B \rightarrow \bar{D}_2^*(2460)^0\ell^+\nu_\ell\text{anything}) \times B(\bar{D}_2^*(2460)^0 \rightarrow \bar{D}^*(2010)^-\pi^+) \leq 0.81 \times 10^{-3}$ at CL=95%, where f_B is the production fraction for a single B charge state.

$\Gamma(D^{*-}\pi^+\ell^+\nu_\ell\text{anything})/\Gamma_{\text{total}}$					Γ_{13}/Γ
Includes resonant and nonresonant contributions.					
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	

10.0±2.7±2.1		20 BUSKULIC	95B ALEP	$e^+e^- \rightarrow Z$
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²⁰ BUSKULIC 95B reports $f_B \times B(B \rightarrow \bar{D}^*(2010)^-\pi^+\ell^+\nu_\ell\text{anything}) = (3.7 \pm 1.0 \pm 0.7)10^{-3}$. Above value assumes $f_B = 0.37 \pm 0.03$.

$\Gamma(D_s^-\ell^+\nu_\ell\text{anything})/\Gamma_{\text{total}}$					Γ_{14}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	

<0.009	90	21 ALBRECHT	93E ARG	$e^+e^- \rightarrow \Upsilon(4S)$
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²¹ ALBRECHT 93E reports < 0.012 for $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(D_s^-\ell^+\nu_\ell K^+\text{anything})/\Gamma_{\text{total}}$					Γ_{15}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	

<0.006	90	22 ALBRECHT	93E ARG	$e^+e^- \rightarrow \Upsilon(4S)$
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²² ALBRECHT 93E reports < 0.008 for $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(D_s^-\ell^+\nu_\ell K^0\text{anything})/\Gamma_{\text{total}}$					Γ_{16}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	

<0.009	90	23 ALBRECHT	93E ARG	$e^+e^- \rightarrow \Upsilon(4S)$
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²³ ALBRECHT 93E reports < 0.012 for $B(D_s^+ \rightarrow \phi\pi^+) = 0.027$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$.

$\Gamma(\ell^+ \nu_\ell \text{ noncharmed})/\Gamma(\ell^+ \nu_\ell \text{ anything})$

Γ_{17}/Γ_4

ℓ denotes e or μ , not the sum. These experiments measure this ratio in very limited momentum intervals.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
			24 ALBRECHT	94C ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
		107	25 BARTELT	93B CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
		77	26 ALBRECHT	91C ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
		76	27 FULTON	90 CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		41	28 ALBRECHT	90 ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
<0.04	90		29 BEHREND	87 CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
<0.04	90		CHEN	84 CLEO	Direct e at $\Upsilon(4S)$
<0.055	90		KLOPFEN...	83B CUSB	Direct e at $\Upsilon(4S)$

²⁴ ALBRECHT 94C find $\Gamma(b \rightarrow c)/\Gamma(b \rightarrow \text{all}) = 0.99 \pm 0.02 \pm 0.04$.

²⁵ BARTELT 93B (CLEO II) measures an excess of $107 \pm 15 \pm 11$ leptons in the lepton momentum interval 2.3–2.6 GeV/ c which is attributed to $b \rightarrow u\ell\nu_\ell$. This corresponds to a model-dependent partial branching ratio ΔB_{ub} between $(1.15 \pm 0.16 \pm 0.15) \times 10^{-4}$, as evaluated using the KS model (KOERNER 88), and $(1.54 \pm 0.22 \pm 0.20) \times 10^{-4}$ using the ACCMM model (ARTUSO 93). The corresponding values of $|V_{ub}|/|V_{cb}|$ are 0.056 ± 0.006 and 0.076 ± 0.008 , respectively.

²⁶ ALBRECHT 91C result supersedes ALBRECHT 90. Two events are fully reconstructed providing evidence for the $b \rightarrow u$ transition. Using the model of ALTARELLI 82, they obtain $|V_{ub}/V_{cb}| = 0.11 \pm 0.012$ from 77 leptons in the 2.3–2.6 GeV momentum range.

²⁷ FULTON 90 observe 76 ± 20 excess e and μ (lepton) events in the momentum interval $p = 2.4\text{--}2.6$ GeV signaling the presence of the $b \rightarrow u$ transition. The average branching ratio, $(1.8 \pm 0.4 \pm 0.3) \times 10^{-4}$, corresponds to a model-dependent measurement of approximately $|V_{ub}/V_{cb}| = 0.1$ using $B(b \rightarrow c\ell\nu) = 10.2 \pm 0.2 \pm 0.7\%$.

²⁸ ALBRECHT 90 observes 41 ± 10 excess e and μ (lepton) events in the momentum interval $p = 2.3\text{--}2.6$ GeV signaling the presence of the $b \rightarrow u$ transition. The events correspond to a model-dependent measurement of $|V_{ub}/V_{cb}| = 0.10 \pm 0.01$.

²⁹ The quoted possible limits range from 0.018 to 0.04 for the ratio, depending on which model or momentum range is chosen. We select the most conservative limit they have calculated. This corresponds to a limit on $|V_{ub}|/|V_{cb}| < 0.20$. While the endpoint technique employed is more robust than their previous results in CHEN 84, these results do not provide a numerical improvement in the limit.

$\Gamma(K^+ \ell^+ \nu_\ell \text{ anything})/\Gamma(\ell^+ \nu_\ell \text{ anything})$

Γ_{18}/Γ_4

ℓ denotes e or μ , not the sum.

VALUE	DOCUMENT ID	TECN	COMMENT
0.58 \pm 0.05 OUR AVERAGE			
0.594 \pm 0.021 \pm 0.056	ALBRECHT	94C ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
0.54 \pm 0.07 \pm 0.06	³⁰ ALAM	87B CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$

³⁰ ALAM 87B measurement relies on lepton-kaon correlations.

$\Gamma(K^- \ell^+ \nu_\ell \text{ anything})/\Gamma(\ell^+ \nu_\ell \text{ anything})$

Γ_{19}/Γ_4

ℓ denotes e or μ , not the sum.

VALUE	DOCUMENT ID	TECN	COMMENT
0.092 \pm 0.035 OUR AVERAGE			
0.086 \pm 0.011 \pm 0.044	ALBRECHT	94C ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
0.10 \pm 0.05 \pm 0.02	³¹ ALAM	87B CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$

³¹ ALAM 87B measurement relies on lepton-kaon correlations.

$\Gamma(K^0/\bar{K}^0 \ell^+ \nu_\ell \text{ anything})/\Gamma(\ell^+ \nu_\ell \text{ anything})$ Γ_{20}/Γ_4

ℓ denotes e or μ , not the sum. Sum over K^0 and \bar{K}^0 states.

VALUE	DOCUMENT ID	TECN	COMMENT
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0.42 ± 0.05 OUR AVERAGE

0.452 ± 0.038 ± 0.056	32 ALBRECHT	94C ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
0.39 ± 0.06 ± 0.04	33 ALAM	87B CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$

³² ALBRECHT 94C assume a K^0/\bar{K}^0 multiplicity twice that of K_S^0 .

³³ ALAM 87B measurement relies on lepton-kaon correlations.

$\langle n_c \rangle$

VALUE	DOCUMENT ID	TECN	COMMENT
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1.10 ± 0.05	34 GIBBONS	97B CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.98 ± 0.16 ± 0.12	35 ALAM	87B CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
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³⁴ GIBBONS 97B from charm counting using $B(D_S^+ \rightarrow \phi\pi) = 0.036 \pm 0.009$ and $B(\Lambda_c^+ \rightarrow pK^- \pi^+) = 0.044 \pm 0.006$.

³⁵ From the difference between K^- and K^+ widths. ALAM 87B measurement relies on lepton-kaon correlations. It does not consider the possibility of $B\bar{B}$ mixing. We have thus removed it from the average.

$\Gamma(D^\pm \text{ anything})/\Gamma_{\text{total}}$ Γ_{21}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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0.241 ± 0.019 OUR AVERAGE

0.240 ± 0.013 ^{+0.015} _{-0.016}	36 GIBBONS	97B CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$	
0.25 ± 0.04 ± 0.02	37 BORTOLETTO92	CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$	
0.23 ± 0.05 ^{+0.01} _{-0.02}	38 ALBRECHT	91H ARG	$e^+ e^- \rightarrow \Upsilon(4S)$	

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

0.21 ± 0.05 ± 0.01	20k	39 BORTOLETTO87	CLEO	Sup. by BORTOLETTO 92
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³⁶ GIBBONS 97B reports $[B(B \rightarrow D^\pm \text{ anything}) \times B(D^+ \rightarrow K^- \pi^+ \pi^+)] = 0.0216 \pm 0.0008 \pm 0.00082$. We divide by our best value $B(D^+ \rightarrow K^- \pi^+ \pi^+) = (9.0 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³⁷ BORTOLETTO 92 reports $[B(B \rightarrow D^\pm \text{ anything}) \times B(D^+ \rightarrow K^- \pi^+ \pi^+)] = 0.0226 \pm 0.0030 \pm 0.0018$. We divide by our best value $B(D^+ \rightarrow K^- \pi^+ \pi^+) = (9.0 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³⁸ ALBRECHT 91H reports $[B(B \rightarrow D^\pm \text{ anything}) \times B(D^+ \rightarrow K^- \pi^+ \pi^+)] = 0.0209 \pm 0.0027 \pm 0.0040$. We divide by our best value $B(D^+ \rightarrow K^- \pi^+ \pi^+) = (9.0 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³⁹ BORTOLETTO 87 reports $[B(B \rightarrow D^\pm \text{ anything}) \times B(D^+ \rightarrow K^- \pi^+ \pi^+)] = 0.019 \pm 0.004 \pm 0.002$. We divide by our best value $B(D^+ \rightarrow K^- \pi^+ \pi^+) = (9.0 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D^0/\bar{D}^0 \text{ anything})/\Gamma_{\text{total}}$

Γ_{22}/Γ

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.635±0.029 OUR AVERAGE				Error includes scale factor of 1.1.
0.655±0.025±0.015		40 GIBBONS 97B	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
0.61 ±0.05 ±0.01		41 BORTOLETTO92	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
0.51 ±0.08 ±0.01		42 ALBRECHT 91H	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.55 ±0.07 ±0.01	21k	43 BORTOLETTO87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
0.63 ±0.19 ±0.01		44 GREEN 83	CLEO	Repl. by BORTOLETTO 87

40 GIBBONS 97B reports $[B(B \rightarrow D^0/\bar{D}^0 \text{ anything}) \times B(D^0 \rightarrow K^- \pi^+)] = 0.0251 \pm 0.0006 \pm 0.00075$. We divide by our best value $B(D^0 \rightarrow K^- \pi^+) = (3.83 \pm 0.09) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

41 BORTOLETTO 92 reports $[B(B \rightarrow D^0/\bar{D}^0 \text{ anything}) \times B(D^0 \rightarrow K^- \pi^+)] = 0.0233 \pm 0.0012 \pm 0.0014$. We divide by our best value $B(D^0 \rightarrow K^- \pi^+) = (3.83 \pm 0.09) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

42 ALBRECHT 91H reports $[B(B \rightarrow D^0/\bar{D}^0 \text{ anything}) \times B(D^0 \rightarrow K^- \pi^+)] = 0.0194 \pm 0.0015 \pm 0.0025$. We divide by our best value $B(D^0 \rightarrow K^- \pi^+) = (3.83 \pm 0.09) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

43 BORTOLETTO 87 reports $[B(B \rightarrow D^0/\bar{D}^0 \text{ anything}) \times B(D^0 \rightarrow K^- \pi^+)] = 0.0210 \pm 0.0015 \pm 0.0021$. We divide by our best value $B(D^0 \rightarrow K^- \pi^+) = (3.83 \pm 0.09) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

44 GREEN 83 reports $[B(B \rightarrow D^0/\bar{D}^0 \text{ anything}) \times B(D^0 \rightarrow K^- \pi^+)] = 0.024 \pm 0.006 \pm 0.004$. We divide by our best value $B(D^0 \rightarrow K^- \pi^+) = (3.83 \pm 0.09) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D^*(2010)^\pm \text{ anything})/\Gamma_{\text{total}}$

Γ_{23}/Γ

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.227±0.016 OUR AVERAGE				
0.247±0.019±0.01		45 GIBBONS 97B	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
0.205±0.019±0.007		46 ALBRECHT 96D	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
0.230±0.028±0.009		47 BORTOLETTO92	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.283±0.053±0.002		48 ALBRECHT 91H	ARG	Sup. by ALBRECHT 96D
0.22 ±0.04 $\begin{smallmatrix} +0.07 \\ -0.04 \end{smallmatrix}$	5200	49 BORTOLETTO87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
0.27 ±0.06 $\begin{smallmatrix} +0.08 \\ -0.06 \end{smallmatrix}$	510	50 CSORNA 85	CLEO	Repl. by BORTOLETTO 87

45 GIBBONS 97B reports $B(B \rightarrow D^*(2010)^\pm \text{ anything}) = 0.239 \pm 0.015 \pm 0.014 \pm 0.009$ using CLEO measured D and D^* branching fractions. We rescale to our PDG 96 values of D and D^* branching ratios. Our first error is their experiment's error and our second error is the systematic error from using our best value.

46 ALBRECHT 96D reports $B(B \rightarrow D^*(2010)^\pm \text{ anything}) = 0.196 \pm 0.019$ using CLEO measured $B(D^*(2010)^\pm \rightarrow D^0 \pi^\pm) = 0.681 \pm 0.01 \pm 0.013$, $B(D^0 \rightarrow K^- \pi^+) = 0.0401 \pm 0.0014$, $B(D^0 \rightarrow K^- \pi^+ \pi^+ \pi^-) = 0.081 \pm 0.005$. We rescale to our PDG 96

values of D and D^* branching ratios. Our first error is their experiment's error and our second error is the systematic error from using our best value.

47 BORTOLETTO 92 reports $B(B \rightarrow D^*(2010)^+ \text{ anything}) = 0.25 \pm 0.03 \pm 0.04$ using MARK II $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 0.57 \pm 0.06$ and $B(D^0 \rightarrow K^- \pi^+) = 0.042 \pm 0.008$. We rescale to our PDG 96 values of D and D^* branching ratios. Our first error is their experiment's error and our second error is the systematic error from using our best value.

48 ALBRECHT 91H reports $0.348 \pm 0.060 \pm 0.035$ for $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 0.55 \pm 0.04$. We rescale to our best value $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = (67.7 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Uses the PDG 90 $B(D^0 \rightarrow K^- \pi^+) = 0.0371 \pm 0.0025$.

49 BORTOLETTO 87 uses old MARK III (BALTRUSAITIS 86E) branching ratios $B(D^0 \rightarrow K^- \pi^+) = 0.056 \pm 0.004 \pm 0.003$ and also assumes $B(D^*(2010)^+ \rightarrow D^0 \pi^+) = 0.60^{+0.08}_{-0.15}$. The product branching ratio for $B(B \rightarrow D^*(2010)^+) B(D^*(2010)^+ \rightarrow D^0 \pi^+)$ is $0.13 \pm 0.02 \pm 0.012$. Superseded by BORTOLETTO 92.

50 $V-A$ momentum spectrum used to extrapolate below $p = 1$ GeV. We correct the value assuming $B(D^0 \rightarrow K^- \pi^+) = 0.042 \pm 0.006$ and $B(D^{*+} \rightarrow D^0 \pi^+) = 0.6^{+0.08}_{-0.15}$. The product branching fraction is $B(B \rightarrow D^{*+} X) \cdot B(D^{*+} \rightarrow \pi^+ D^0) \cdot B(D^0 \rightarrow K^- \pi^+) = (68 \pm 15 \pm 9) \times 10^{-4}$.

$\Gamma(D^*(2007)^0 \text{ anything})/\Gamma_{\text{total}}$ **Γ_{24}/Γ**

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.260 ± 0.023 ± 0.015	51 GIBBONS	97B CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

51 GIBBONS 97B reports $B(B \rightarrow D^*(2007)^0 \text{ anything}) = 0.247 \pm 0.012 \pm 0.018 \pm 0.018$ using CLEO measured D and D^* branching fractions. We rescale to our PDG 96 values of D and D^* branching ratios. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_s^\pm \text{ anything})/\Gamma_{\text{total}}$ **Γ_{25}/Γ**

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.100 ± 0.025 OUR AVERAGE				

0.117 ± 0.009^{+0.028}_{-0.029} 52 GIBAUT 96 CLE2 $e^+ e^- \rightarrow \Upsilon(4S)$

0.081 ± 0.014^{+0.019}_{-0.020} 53 ALBRECHT 92G ARG $e^+ e^- \rightarrow \Upsilon(4S)$

0.085 ± 0.013^{+0.020}_{-0.021} 257 54 BORTOLETTO90 CLEO $e^+ e^- \rightarrow \Upsilon(4S)$

0.105 ± 0.028^{+0.025}_{-0.026} 55 HAAS 86 CLEO $e^+ e^- \rightarrow \Upsilon(4S)$

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

0.116 ± 0.030 ± 0.028 56 ALBRECHT 87H ARG $e^+ e^- \rightarrow \Upsilon(4S)$

52 GIBAUT 96 reports $0.1211 \pm 0.0039 \pm 0.0088$ for $B(D_s^+ \rightarrow \phi \pi^+) = 0.035$. We rescale to our best value $B(D_s^+ \rightarrow \phi \pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

53 ALBRECHT 92G reports $[B(B \rightarrow D_s^\pm \text{ anything}) \times B(D_s^+ \rightarrow \phi \pi^+)] = 0.00292 \pm 0.00039 \pm 0.00031$. We divide by our best value $B(D_s^+ \rightarrow \phi \pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

54 BORTOLETTO 90 reports $[B(B \rightarrow D_s^\pm \text{ anything}) \times B(D_s^+ \rightarrow \phi \pi^+)] = 0.00306 \pm 0.00047$. We divide by our best value $B(D_s^+ \rightarrow \phi \pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first

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

⁵⁵ HAAS 86 reports $[B(B \rightarrow D_s^\pm \text{ anything}) \times B(D_s^+ \rightarrow \phi \pi^+)] = 0.0038 \pm 0.0010$. We divide by our best value $B(D_s^+ \rightarrow \phi \pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. $64 \pm 22\%$ decays are 2-body.

⁵⁶ ALBRECHT 87H reports $[B(B \rightarrow D_s^\pm \text{ anything}) \times B(D_s^+ \rightarrow \phi \pi^+)] = 0.0042 \pm 0.0009 \pm 0.0006$. We divide by our best value $B(D_s^+ \rightarrow \phi \pi^+) = (3.6 \pm 0.9) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. $46 \pm 16\%$ of $B \rightarrow D_s X$ decays are 2-body. Superseded by ALBRECHT 92G.

$[\Gamma(D^{(*)} \bar{D}^{(*)} K^0) + \Gamma(D^{(*)} \bar{D}^{(*)} K^\pm)] / \Gamma_{\text{total}} \quad \Gamma_{26} / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
$0.071^{+0.025+0.010}_{-0.015-0.009}$	⁵⁷ BARATE	98Q ALEP	$e^+ e^- \rightarrow Z$

⁵⁷ The systematic error includes the uncertainties due to the charm branching ratios.

$\Gamma(c\bar{c}s) / \Gamma_{\text{total}} \quad \Gamma_{27} / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
0.219 ± 0.037	⁵⁸ COAN	98 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

⁵⁸ COAN 98 uses D - ℓ correlation.

$\Gamma(D_s^{(*)} \bar{D}^{(*)}) / \Gamma(D_s^\pm \text{ anything}) \quad \Gamma_{28} / \Gamma_{25}$

Sum over modes.

VALUE	DOCUMENT ID	TECN	COMMENT
0.49 ± 0.04 OUR AVERAGE			
$0.56^{+0.21+0.09}_{-0.15-0.08}$	⁵⁹ BARATE	98Q ALEP	$e^+ e^- \rightarrow Z$
$0.457 \pm 0.019 \pm 0.037$	GIBAUT	96 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
$0.58 \pm 0.07 \pm 0.09$	ALBRECHT	92G ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
0.56 ± 0.10	BORTOLETTO90	CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$

⁵⁹ BARATE 98Q measures $B(B \rightarrow D_s^{(*)} \bar{D}^{(*)}) = 0.056^{+0.021+0.009+0.011}_{-0.015-0.008-0.011}$, where the third error results from the uncertainty on the different D branching ratios and is dominated by the uncertainty on $B(D_s^+ \rightarrow \phi \pi^+)$. We divide $B(B \rightarrow D_s^{(*)} \bar{D}^{(*)})$ by our best value of $B(B \rightarrow D_s \text{ anything}) = 0.1 \pm 0.025$.

$\Gamma(D^* D^{*(2010)\pm}) / \Gamma_{\text{total}} \quad \Gamma_{29} / \Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 5.9 \times 10^{-3}$	90	BARATE	98Q ALEP	$e^+ e^- \rightarrow Z$

$[\Gamma(DD^{*(2010)\pm}) + \Gamma(D^* D^\pm)] / \Gamma_{\text{total}} \quad \Gamma_{30} / \Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 5.5 \times 10^{-3}$	90	BARATE	98Q ALEP	$e^+ e^- \rightarrow Z$

$\Gamma(DD^\pm) / \Gamma_{\text{total}} \quad \Gamma_{31} / \Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 3.1 \times 10^{-3}$	90	BARATE	98Q ALEP	$e^+ e^- \rightarrow Z$

$\Gamma(D_s^{(*)\pm} \bar{D}^{(*)} X(n\pi^\pm))/\Gamma_{\text{total}}$ Γ_{32}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$0.094^{+0.040+0.034}_{-0.031-0.024}$		60 BARATE	98Q ALEP	$e^+e^- \rightarrow Z$

⁶⁰ The systematic error includes the uncertainties due to the charm branching ratios.

$\Gamma(D^*(2010)\gamma)/\Gamma_{\text{total}}$ Γ_{33}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.1 \times 10^{-3}$	90	61 LESIAK	92 CBAL	$e^+e^- \rightarrow \Upsilon(4S)$

⁶¹ LESIAK 92 set a limit on the inclusive process $B(b \rightarrow s\gamma) < 2.8 \times 10^{-3}$ at 90% CL for the range of masses of 892–2045 MeV, independent of assumptions about s-quark hadronization.

$\Gamma(D_s^+ \pi^-, D_s^{*+} \pi^-, D_s^+ \rho^-, D_s^{*+} \rho^-, D_s^+ \pi^0, D_s^{*+} \pi^0, D_s^+ \eta, D_s^{*+} \eta, D_s^+ \rho^0, D_s^{*+} \rho^0, D_s^+ \omega, D_s^{*+} \omega)/\Gamma_{\text{total}}$ Γ_{34}/Γ

Sum over modes.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0005	90	62 ALEXANDER	93B CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

⁶² ALEXANDER 93B reports $< 4.8 \times 10^{-4}$ for $B(D_s^+ \rightarrow \phi\pi^+) = 0.037$. We rescale to our best value $B(D_s^+ \rightarrow \phi\pi^+) = 0.036$. This branching ratio limit provides a model-dependent upper limit $|V_{ub}|/|V_{cb}| < 0.16$ at CL=90%.

$\Gamma(D_{s1}(2536)^+ \text{ anything})/\Gamma_{\text{total}}$ Γ_{35}/Γ

$D_{s1}(2536)^+$ is the narrow P-wave D_s^+ meson with $J^P = 1^+$.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0095	90	63 BISHAI	98 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

⁶³ Assuming factorization, the decay constant $f_{D_{s1}^+}$ is at least a factor of 2.5 times smaller than $f_{D_s^+}$.

$\Gamma(J/\psi(1S) \text{ anything})/\Gamma_{\text{total}}$ Γ_{36}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.15 ± 0.06 OUR AVERAGE				

1.13 ± 0.06 ± 0.02	1489	64 BALEST	95B CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
1.30 ± 0.45 ± 0.02	27	65 MASCHMANN	90 CBAL	$e^+e^- \rightarrow \Upsilon(4S)$
1.24 ± 0.27 ± 0.02	120	66 ALBRECHT	87D ARG	$e^+e^- \rightarrow \Upsilon(4S)$
1.37 ± 0.25 ± 0.02	52	67 ALAM	86 CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

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

1.4 $^{+0.6}_{-0.5}$	7	68 ALBRECHT	85H ARG	$e^+e^- \rightarrow \Upsilon(4S)$
1.1 ± 0.21 ± 0.23	46	69 HAAS	85 CLEO	Repl. by ALAM 86

⁶⁴ BALEST 95B reports $1.12 \pm 0.04 \pm 0.06$ for $B(J/\psi(1S) \rightarrow e^+e^-) = 0.0599 \pm 0.0025$. We rescale to our best value $B(J/\psi(1S) \rightarrow e^+e^-) = (5.93 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.. They measure $J/\psi(1S) \rightarrow e^+e^-$ and $\mu^+\mu^-$ and use PDG 1994 values for the branching fractions. The rescaling is the same for either mode so we use e^+e^- .

- ⁶⁵ MASCHMANN 90 reports $1.12 \pm 0.33 \pm 0.25$ for $B(J/\psi(1S) \rightarrow e^+ e^-) = 0.069 \pm 0.009$. We rescale to our best value $B(J/\psi(1S) \rightarrow e^+ e^-) = (5.93 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ⁶⁶ ALBRECHT 87D reports $1.07 \pm 0.16 \pm 0.22$ for $B(J/\psi(1S) \rightarrow e^+ e^-) = 0.069 \pm 0.009$. We rescale to our best value $B(J/\psi(1S) \rightarrow e^+ e^-) = (5.93 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. ALBRECHT 87D find the branching ratio for J/ψ not from $\psi(2S)$ to be 0.0081 ± 0.0023 .
- ⁶⁷ ALAM 86 reports $1.09 \pm 0.16 \pm 0.21$ for $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.074 \pm 0.012$. We rescale to our best value $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = (5.88 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ⁶⁸ Statistical and systematic errors were added in quadrature. ALBRECHT 85H also report a CL = 90% limit of 0.007 for $B \rightarrow J/\psi(1S) + X$ where $m_X < 1$ GeV.
- ⁶⁹ Dimuon and dielectron events used.

$\Gamma(J/\psi(1S)(\text{direct}) \text{ anything})/\Gamma_{\text{total}}$ Γ_{37}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0080 ± 0.0008	⁷⁰ BALEST	95B CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

⁷⁰ BALEST 95B assume PDG 1994 values for sub mode branching ratios. $J/\psi(1S)$ mesons are reconstructed in $J/\psi(1S) \rightarrow e^+ e^-$ and $J/\psi(1S) \rightarrow \mu^+ \mu^-$. The $B \rightarrow J/\psi(1S)X$ branching ratio contains $J/\psi(1S)$ mesons directly from B decays and also from feeddown through $\psi(2S) \rightarrow J/\psi(1S)$, $\chi_{c1}(1P) \rightarrow J/\psi(1S)$, or $\chi_{c2}(1P) \rightarrow J/\psi(1S)$. Using the measured inclusive rates, BALEST 95B corrects for the feeddown and finds the $B \rightarrow J/\psi(1S)(\text{direct}) X$ branching ratio.

$\Gamma(\psi(2S) \text{ anything})/\Gamma_{\text{total}}$ Γ_{38}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0035 ± 0.0005 OUR AVERAGE				
0.0034 ± 0.0004 ± 0.0003	240	⁷¹ BALEST	95B CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
0.0046 ± 0.0017 ± 0.0011	8	ALBRECHT	87D ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

⁷¹ BALEST 95B assume PDG 1994 values for sub mode branching ratios. They find $B(B \rightarrow \psi(2S)X, \psi(2S) \rightarrow \ell^+ \ell^-) = 0.30 \pm 0.05 \pm 0.04$ and $B(B \rightarrow \psi(2S)X, \psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = 0.37 \pm 0.05 \pm 0.05$. Weighted average is quoted for $B(B \rightarrow \psi(2S)X)$.

$\Gamma(\chi_{c1}(1P) \text{ anything})/\Gamma_{\text{total}}$ Γ_{39}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0042 ± 0.0007 OUR AVERAGE				
0.0040 ± 0.0006 ± 0.0004	112	⁷² BALEST	95B CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
0.0105 ± 0.0035 ± 0.0025		⁷³ ALBRECHT	92E ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

⁷² BALEST 95B assume $B(\chi_{c1}(1P) \rightarrow J/\psi(1S)\gamma) = (27.3 \pm 1.6) \times 10^{-2}$, the PDG 1994 value. Fit to ψ -photon invariant mass distribution allows for a $\chi_{c1}(1P)$ and a $\chi_{c2}(1P)$ component.

⁷³ ALBRECHT 92E assumes no $\chi_{c2}(1P)$ production.

$\Gamma(\chi_{c1}(1P)(\text{direct}) \text{ anything})/\Gamma_{\text{total}}$ Γ_{40}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0037 ± 0.0007	⁷⁴ BALEST	95B CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

⁷⁴ BALEST 95B assume PDG 1994 values. $J/\psi(1S)$ mesons are reconstructed in the $e^+ e^-$ and $\mu^+ \mu^-$ modes. The $B \rightarrow \chi_{c1}(1P)X$ branching ratio contains $\chi_{c1}(1P)$ mesons directly from B decays and also from feeddown through $\psi(2S) \rightarrow \chi_{c1}(1P)\gamma$. Using the measured inclusive rates, BALEST 95B corrects for the feeddown and finds the $B \rightarrow \chi_{c1}(1P)(\text{direct}) X$ branching ratio.

$\Gamma(\chi_{c2}(1P)\text{anything})/\Gamma_{\text{total}}$ Γ_{41}/Γ

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<0.0038	90	35	⁷⁵ BALEST	95B CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

⁷⁵ BALEST 95B assume $B(\chi_{c2}(1P) \rightarrow J/\psi(1S)\gamma) = (13.5 \pm 1.1) \times 10^{-2}$, the PDG 1994 value. $J/\psi(1S)$ mesons are reconstructed in the e^+e^- and $\mu^+\mu^-$ modes, and PDG 1994 branching fractions are used. If interpreted as signal, the 35 ± 13 events correspond to $B(B \rightarrow \chi_{c2}(1P)X) = (0.25 \pm 0.10 \pm 0.03) \times 10^{-2}$.

$\Gamma(\eta_c(1S)\text{anything})/\Gamma_{\text{total}}$ Γ_{42}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.009	90	⁷⁶ BALEST	95B CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

⁷⁶ BALEST 95B assume PDG 1994 values for sub mode branching ratios. $J/\psi(1S)$ mesons are reconstructed in $J/\psi(1S) \rightarrow e^+e^-$ and $J/\psi(1S) \rightarrow \mu^+\mu^-$. Search region $2960 < m_{\eta_c(1S)} < 3010 \text{ MeV}/c^2$.

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

VALUE	DOCUMENT ID	TECN	COMMENT
0.789 ± 0.025 OUR AVERAGE			

0.82 ± 0.01 ± 0.05	ALBRECHT	94C ARG	$e^+e^- \rightarrow \Upsilon(4S)$
0.775 ± 0.015 ± 0.025	⁷⁷ ALBRECHT	93I ARG	$e^+e^- \rightarrow \Upsilon(4S)$
0.85 ± 0.07 ± 0.09	ALAM	87B CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

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

seen	⁷⁸ BRODY	82 CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
seen	⁷⁹ GIANNINI	82 CUSB	$e^+e^- \rightarrow \Upsilon(4S)$

⁷⁷ ALBRECHT 93I value is not independent of the sum of $B \rightarrow K^+$ anything and $B \rightarrow K^-$ anything ALBRECHT 94C values.

⁷⁸ Assuming $\Upsilon(4S) \rightarrow B\bar{B}$, a total of $3.38 \pm 0.34 \pm 0.68$ kaons per $\Upsilon(4S)$ decay is found (the second error is systematic). In the context of the standard B -decay model, this leads to a value for $(b\text{-quark} \rightarrow c\text{-quark})/(b\text{-quark} \rightarrow \text{all})$ of $1.09 \pm 0.33 \pm 0.13$.

⁷⁹ GIANNINI 82 at CESR-CUSB observed $1.58 \pm 0.35 K^0$ per hadronic event much higher than 0.82 ± 0.10 below threshold. Consistent with predominant $b \rightarrow cX$ decay.

$\Gamma(K^+\text{anything})/\Gamma_{\text{total}}$ Γ_{44}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.66 ± 0.05	⁸⁰ ALBRECHT	94C ARG	$e^+e^- \rightarrow \Upsilon(4S)$

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

0.620 ± 0.013 ± 0.038	⁸¹ ALBRECHT	94C ARG	$e^+e^- \rightarrow \Upsilon(4S)$
0.66 ± 0.05 ± 0.07	⁸¹ ALAM	87B CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

⁸⁰ Measurement relies on lepton-kaon correlations. It is for the weak decay vertex and does not include mixing of the neutral B meson. Mixing effects were corrected for by assuming a mixing parameter r of $(18.1 \pm 4.3)\%$.

⁸¹ Measurement relies on lepton-kaon correlations. It includes production through mixing of the neutral B meson.

$\Gamma(K^- \text{ anything})/\Gamma_{\text{total}}$ Γ_{45}/Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.13 ± 0.04	⁸² ALBRECHT	94C ARG	$e^+e^- \rightarrow \Upsilon(4S)$
0.165 ± 0.011 ± 0.036	⁸³ ALBRECHT	94C ARG	$e^+e^- \rightarrow \Upsilon(4S)$
0.19 ± 0.05 ± 0.02	⁸³ ALAM	87B CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

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

⁸² Measurement relies on lepton-kaon correlations. It is for the weak decay vertex and does not include mixing of the neutral B meson. Mixing effects were corrected for by assuming a mixing parameter r of $(18.1 \pm 4.3)\%$.

⁸³ Measurement relies on lepton-kaon correlations. It includes production through mixing of the neutral B meson.

$\Gamma(K^0/\bar{K}^0 \text{ anything})/\Gamma_{\text{total}}$ Γ_{46}/Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.64 ± 0.04 OUR AVERAGE			
0.642 ± 0.010 ± 0.042	⁸⁴ ALBRECHT	94C ARG	$e^+e^- \rightarrow \Upsilon(4S)$
0.63 ± 0.06 ± 0.06	ALAM	87B CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

⁸⁴ ALBRECHT 94C assume a K^0/\bar{K}^0 multiplicity twice that of K_S^0 .

$\Gamma(K^*(892)^\pm \text{ anything})/\Gamma_{\text{total}}$ Γ_{47}/Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.182 ± 0.054 ± 0.024	ALBRECHT	94J ARG	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(K^*(892)^0/\bar{K}^*(892)^0 \text{ anything})/\Gamma_{\text{total}}$ Γ_{48}/Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.146 ± 0.016 ± 0.020	ALBRECHT	94J ARG	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(K^*(892)\gamma)/\Gamma_{\text{total}}$ Γ_{49}/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$< 1.5 \times 10^{-3}$	90	⁸⁵ LESIAK	92 CBAL	$e^+e^- \rightarrow \Upsilon(4S)$
$< 2.4 \times 10^{-4}$	90	ALBRECHT	88H ARG	$e^+e^- \rightarrow \Upsilon(4S)$

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

⁸⁵ LESIAK 92 set a limit on the inclusive process $B(b \rightarrow s\gamma) < 2.8 \times 10^{-3}$ at 90% CL for the range of masses of 892–2045 MeV, independent of assumptions about s -quark hadronization.

$\Gamma(K_1(1400)\gamma)/\Gamma_{\text{total}}$ Γ_{50}/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$< 4.1 \times 10^{-4}$	90	ALBRECHT	88H ARG	$e^+e^- \rightarrow \Upsilon(4S)$

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

$< 1.6 \times 10^{-3}$ 90 ⁸⁶ LESIAK 92 set a limit on the inclusive process $B(b \rightarrow s\gamma) < 2.8 \times 10^{-3}$ at 90% CL for the range of masses of 892–2045 MeV, independent of assumptions about s -quark hadronization.

$\Gamma(K_2^*(1430)\gamma)/\Gamma_{\text{total}}$ Γ_{51}/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$< 8.3 \times 10^{-4}$	90	ALBRECHT	88H ARG	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(K_2(1770)\gamma)/\Gamma_{\text{total}}$ Γ_{52}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.2 \times 10^{-3}$	90	⁸⁷ LESIAK	92 CBAL	$e^+e^- \rightarrow \Upsilon(4S)$

⁸⁷ LESIAK 92 set a limit on the inclusive process $B(b \rightarrow s\gamma) < 2.8 \times 10^{-3}$ at 90% CL for the range of masses of 892–2045 MeV, independent of assumptions about *s*-quark hadronization.

$\Gamma(K_3^*(1780)\gamma)/\Gamma_{\text{total}}$ Γ_{53}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<3.0 \times 10^{-3}$	90	ALBRECHT	88H ARG	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(K_4^*(2045)\gamma)/\Gamma_{\text{total}}$ Γ_{54}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.0 \times 10^{-3}$	90	⁸⁸ LESIAK	92 CBAL	$e^+e^- \rightarrow \Upsilon(4S)$

⁸⁸ LESIAK 92 set a limit on the inclusive process $B(b \rightarrow s\gamma) < 2.8 \times 10^{-3}$ at 90% CL for the range of masses of 892–2045 MeV, independent of assumptions about *s*-quark hadronization.

$\Gamma(\bar{b} \rightarrow \bar{s}\gamma)/\Gamma_{\text{total}}$ Γ_{55}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
$(2.32 \pm 0.57 \pm 0.35) \times 10^{-4}$	ALAM	95 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(\bar{b} \rightarrow \bar{s} \text{gluon})/\Gamma_{\text{total}}$ Γ_{56}/Γ

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<0.068	90		⁸⁹ COAN	98 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

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

<0.08	2	⁹⁰ ALBRECHT	95D ARG	$e^+e^- \rightarrow \Upsilon(4S)$
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⁸⁹ COAN 98 uses *D-l* correlation.

⁹⁰ ALBRECHT 95D use full reconstruction of one *B* decay as tag. Two candidate events for charmless *B* decay can be interpreted as either $b \rightarrow s\text{gluon}$ or $b \rightarrow u$ transition. If interpreted as $b \rightarrow s\text{gluon}$ they find a branching ratio of ~ 0.026 or the upper limit quoted above. Result is highly model dependent.

$\Gamma(\eta \text{ anything})/\Gamma_{\text{total}}$ Γ_{57}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<4.4 \times 10^{-4}$	90	⁹¹ BROWDER	98 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

⁹¹ BROWDER 98 search for high momentum $B \rightarrow \eta X_S$ between 2.1 and 2.7 GeV/*c*.

$\Gamma(\eta' \text{ anything})/\Gamma_{\text{total}}$ Γ_{58}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
$(6.2 \pm 1.6^{+1.3}_{-2.0}) \times 10^{-4}$	⁹² BROWDER	98 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

⁹² BROWDER 98 observed a signal of 39.0 ± 11.6 events in high momentum $B \rightarrow \eta' X_S$ production between 2.0 and 2.7 GeV/*c*. The branching fraction is based on the interpretation of $b \rightarrow sg$, where the last error includes additional uncertainties due to the color-suppressed $b \rightarrow$ backgrounds.

$\Gamma(\pi^\pm \text{ anything})/\Gamma_{\text{total}}$ Γ_{59}/Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.585±0.025±0.070	⁹³ ALBRECHT	93I ARG	$e^+e^- \rightarrow \Upsilon(4S)$
⁹³ ALBRECHT 93 excludes π^\pm from K_S^0 and Λ decays. If included, they find $4.105 \pm 0.025 \pm 0.080$.			

$\Gamma(\eta \text{ anything})/\Gamma_{\text{total}}$ Γ_{60}/Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.176±0.011±0.012	KUBOTA	96 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(\rho^0 \text{ anything})/\Gamma_{\text{total}}$ Γ_{61}/Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.208±0.042±0.032	ALBRECHT	94J ARG	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(\omega \text{ anything})/\Gamma_{\text{total}}$ Γ_{62}/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.81	90	ALBRECHT	94J ARG	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(\phi \text{ anything})/\Gamma_{\text{total}}$ Γ_{63}/Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.035 ±0.007 OUR AVERAGE	Error includes scale factor of 1.8.		
0.0390±0.0030±0.0035	ALBRECHT	94J ARG	$e^+e^- \rightarrow \Upsilon(4S)$
0.023 ±0.006 ±0.005	BORTOLETTO	86 CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(\phi K^*(892))/\Gamma_{\text{total}}$ Γ_{64}/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
<2.2 × 10⁻⁵	90	⁹⁴ BERGFELD	98 CLE2
⁹⁴ Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.			

$\Gamma(\Lambda_c^\pm \text{ anything})/\Gamma_{\text{total}}$ Γ_{65}/Γ

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.064±0.008±0.008		⁹⁵ CRAWFORD	92 CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.14 ±0.09		⁹⁶ ALBRECHT	88E ARG	$e^+e^- \rightarrow \Upsilon(4S)$
<0.112	90	⁹⁷ ALAM	87 CLEO	$e^+e^- \rightarrow \Upsilon(4S)$

⁹⁵ CRAWFORD 92 result derived from lepton baryon correlations. Assumes all charmed baryons in B^0 and B^\pm decay are Λ_c .

⁹⁶ ALBRECHT 88E measured $B(B \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (0.30 \pm 0.12 \pm 0.06)\%$ and used $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (2.2 \pm 1.0)\%$ from ABRAMS 80 to obtain above number.

⁹⁷ Assuming all baryons result from charmed baryons, ALAM 86 conclude the branching fraction is $7.4 \pm 2.9\%$. The limit given above is model independent.

$\Gamma(\Lambda_c^+ \text{ anything})/\Gamma(\bar{\Lambda}_c^- \text{ anything})$ Γ_{66}/Γ_{67}

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.19±0.13±0.04	⁹⁸ AMMAR	97 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

⁹⁸ AMMAR 97 uses a high-momentum lepton tag ($P_\ell > 1.4 \text{ GeV}/c^2$).

$\Gamma(\bar{\Lambda}_c^- e^+ \text{ anything})/\Gamma(\Lambda_c^\pm \text{ anything})$ Γ_{68}/Γ_{65}

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.05	90	⁹⁹ BONVICINI	98 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

⁹⁹ BONVICINI 98 uses the electron with momentum above 0.6 GeV/c.

$\Gamma(\bar{\Lambda}_c^- p \text{ anything})/\Gamma(\Lambda_c^\pm \text{ anything})$ Γ_{69}/Γ_{65}

VALUE	DOCUMENT ID	TECN	COMMENT
0.57 ± 0.05 ± 0.05	BONVICINI	98 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

$\Gamma(\bar{\Lambda}_c^- p e^+ \nu_e)/\Gamma(\bar{\Lambda}_c^- p \text{ anything})$ Γ_{70}/Γ_{69}

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.04	90	¹⁰⁰ BONVICINI	98 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

¹⁰⁰ BONVICINI 98 uses the electron with momentum above 0.6 GeV/c.

$\Gamma(\bar{\Sigma}_c^{--} \text{ anything})/\Gamma_{\text{total}}$ Γ_{71}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0042 ± 0.0021 ± 0.0011	77	¹⁰¹ PROCARIO	94 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

¹⁰¹ PROCARIO 94 reports $[B(B \rightarrow \bar{\Sigma}_c^{--} \text{ anything}) \times B(\Lambda_c^+ \rightarrow p K^- \pi^+)] = 0.00021 \pm 0.00008 \pm 0.00007$. We divide by our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\bar{\Sigma}_c^- \text{ anything})/\Gamma_{\text{total}}$ Γ_{72}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.010	90	¹⁰² PROCARIO	94 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

¹⁰² PROCARIO 94 reports $[B(B \rightarrow \bar{\Sigma}_c^- \text{ anything}) \times B(\Lambda_c^+ \rightarrow p K^- \pi^+)] = < 0.00048$. We divide by our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 0.050$.

$\Gamma(\bar{\Sigma}_c^0 \text{ anything})/\Gamma_{\text{total}}$ Γ_{73}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0046 ± 0.0021 ± 0.0012	76	¹⁰³ PROCARIO	94 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

¹⁰³ PROCARIO 94 reports $[B(B \rightarrow \bar{\Sigma}_c^0 \text{ anything}) \times B(\Lambda_c^+ \rightarrow p K^- \pi^+)] = 0.00023 \pm 0.00008 \pm 0.00007$. We divide by our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (5.0 \pm 1.3) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\bar{\Sigma}_c^0 N (N = p \text{ or } n))/\Gamma_{\text{total}}$ Γ_{74}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0015	90	¹⁰⁴ PROCARIO	94 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

¹⁰⁴ PROCARIO 94 reports < 0.0017 for $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 0.043$. We rescale to our best value $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = 0.050$.

$\Gamma(\Xi_c^0 \text{ anything} \times B(\Xi_c^0 \rightarrow \Xi^- \pi^+))/\Gamma_{\text{total}}$ Γ_{75}/Γ

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
0.144 ± 0.048 ± 0.021	¹⁰⁵ BARISH	97 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

¹⁰⁵ BARISH 97 find $79 \pm 27 \Xi_c^0$ events.

$\Gamma(\Xi_c^+ \text{ anything} \times B(\Xi_c^+ \rightarrow \Xi^- \pi^+ \pi^+))/\Gamma_{\text{total}}$ Γ_{76}/Γ

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$0.453 \pm 0.096^{+0.085}_{-0.065}$	106 BARISH	97 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

¹⁰⁶ BARISH 97 find $125 \pm 28 \Xi_c^+$ events.

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

Includes p and \bar{p} from Λ and $\bar{\Lambda}$ decay.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.080 ± 0.004 OUR AVERAGE				
$0.080 \pm 0.005 \pm 0.005$		ALBRECHT	93I ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
$0.080 \pm 0.005 \pm 0.003$		CRAWFORD	92 CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
$0.082 \pm 0.005^{+0.013}_{-0.010}$	2163	¹⁰⁷ ALBRECHT	89K ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

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

> 0.021 ¹⁰⁸ ALAM 83B CLEO $e^+ e^- \rightarrow \Upsilon(4S)$

¹⁰⁷ ALBRECHT 89K include direct and nondirect protons.

¹⁰⁸ ALAM 83B reported their result as $> 0.036 \pm 0.006 \pm 0.009$. Data are consistent with equal yields of p and \bar{p} . Using assumed yields below cut, $B(B \rightarrow p + X) = 0.03$ not including protons from Λ decays.

$\Gamma(p/\bar{p}(\text{direct}) \text{ anything})/\Gamma_{\text{total}}$ Γ_{78}/Γ

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.055 ± 0.005 OUR AVERAGE				
$0.055 \pm 0.005 \pm 0.0035$		ALBRECHT	93I ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
$0.056 \pm 0.006 \pm 0.005$		CRAWFORD	92 CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
0.055 ± 0.016	1220	¹⁰⁹ ALBRECHT	89K ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

¹⁰⁹ ALBRECHT 89K subtract contribution of Λ decay from the inclusive proton yield.

$\Gamma(\Lambda/\bar{\Lambda} \text{ anything})/\Gamma_{\text{total}}$ Γ_{79}/Γ

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.040 ± 0.005 OUR AVERAGE				
$0.038 \pm 0.004 \pm 0.006$	2998	CRAWFORD	92 CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
$0.042 \pm 0.005 \pm 0.006$	943	ALBRECHT	89K ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

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

$0.022 \pm 0.003 \pm 0.0022$ ¹¹⁰ ACKERSTAFF 97N OPAL $e^+ e^- \rightarrow Z$

> 0.011 ¹¹¹ ALAM 83B CLEO $e^+ e^- \rightarrow \Upsilon(4S)$

¹¹⁰ ACKERSTAFF 97N assumes $B(b \rightarrow B) = 0.868 \pm 0.041$, i.e., an admixture of B^0 , B^\pm , and B_s .

¹¹¹ ALAM 83B reported their result as $> 0.022 \pm 0.007 \pm 0.004$. Values are for $(B(\Lambda X) + B(\bar{\Lambda} X))/2$. Data are consistent with equal yields of p and \bar{p} . Using assumed yields below cut, $B(B \rightarrow \Lambda X) = 0.03$.

$\Gamma(\Lambda \text{ anything})/\Gamma(\bar{\Lambda} \text{ anything})$ Γ_{80}/Γ_{81}

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$0.43 \pm 0.09 \pm 0.07$	¹¹² AMMAR	97 CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$

¹¹² AMMAR 97 uses a high-momentum lepton tag ($P_\ell > 1.4 \text{ GeV}/c^2$).

$\Gamma(\Xi^- / \Xi^+ \text{ anything}) / \Gamma_{\text{total}}$ Γ_{82} / Γ

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0027 ± 0.0006 OUR AVERAGE				
0.0027 ± 0.0005 ± 0.0004	147	CRAWFORD	92 CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
0.0028 ± 0.0014	54	ALBRECHT	89K ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

$\Gamma(\text{baryons anything}) / \Gamma_{\text{total}}$ Γ_{83} / Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.068 ± 0.005 ± 0.003			
¹¹³	ALBRECHT	92O ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

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

0.076 ± 0.014	¹¹⁴	ALBRECHT	89K ARG	$e^+ e^- \rightarrow \Upsilon(4S)$
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¹¹³ ALBRECHT 92O result is from simultaneous analysis of p and Λ yields, $p\bar{p}$ and $\Lambda\bar{\Lambda}$ correlations, and various lepton-baryon and lepton-baryon-antibaryon correlations. Supersedes ALBRECHT 89K.

¹¹⁴ ALBRECHT 89K obtain this result by adding their their measurements (5.5 ± 1.6)% for direct protons and ($4.2 \pm 0.5 \pm 0.6$)% for inclusive Λ production. They then assume (5.5 ± 1.6)% for neutron production and add it in also. Since each B decay has two baryons, they divide by 2 to obtain (7.6 ± 1.4)%.

$\Gamma(p\bar{p}\text{anything}) / \Gamma_{\text{total}}$ Γ_{84} / Γ

Includes p and \bar{p} from Λ and $\bar{\Lambda}$ decay.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0247 ± 0.0023 OUR AVERAGE				
0.024 ± 0.001 ± 0.004		CRAWFORD	92 CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
0.025 ± 0.002 ± 0.002	918	ALBRECHT	89K ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

$\Gamma(p\bar{p}\text{anything}) / \Gamma(p / \bar{p}\text{anything})$ $\Gamma_{84} / \Gamma_{77}$

Includes p and \bar{p} from Λ and $\bar{\Lambda}$ decay.

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.30 ± 0.02 ± 0.05	¹¹⁵	CRAWFORD	92 CLEO $e^+ e^- \rightarrow \Upsilon(4S)$

¹¹⁵ CRAWFORD 92 value is not independent of their $\Gamma(p\bar{p}\text{anything}) / \Gamma_{\text{total}}$ value.

$\Gamma(\Lambda\bar{\Lambda} / \bar{\Lambda}p\text{anything}) / \Gamma_{\text{total}}$ Γ_{85} / Γ

Includes p and \bar{p} from Λ and $\bar{\Lambda}$ decay.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.025 ± 0.004 OUR AVERAGE				
0.029 ± 0.005 ± 0.005		CRAWFORD	92 CLEO	$e^+ e^- \rightarrow \Upsilon(4S)$
0.023 ± 0.004 ± 0.003	165	ALBRECHT	89K ARG	$e^+ e^- \rightarrow \Upsilon(4S)$

$\Gamma(\Lambda\bar{\Lambda} / \bar{\Lambda}p\text{anything}) / \Gamma(\Lambda / \bar{\Lambda}\text{anything})$ $\Gamma_{85} / \Gamma_{79}$

Includes p and \bar{p} from Λ and $\bar{\Lambda}$ decay.

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.76 ± 0.11 ± 0.08	¹¹⁶	CRAWFORD	92 CLEO $e^+ e^- \rightarrow \Upsilon(4S)$

¹¹⁶ CRAWFORD 92 value is not independent of their $[\Gamma(\Lambda\bar{p}\text{anything}) + \Gamma(\bar{\Lambda}p\text{anything})] / \Gamma_{\text{total}}$ value.

$\Gamma(\Lambda\bar{\Lambda}\text{anything})/\Gamma_{\text{total}}$ **Γ_{86}/Γ**

<u>VALUE</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.005	90		CRAWFORD	92	CLEO $e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.0088	90	12	ALBRECHT	89k	ARG $e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(\Lambda\bar{\Lambda}\text{anything})/\Gamma(\Lambda/\bar{\Lambda}\text{anything})$ **Γ_{86}/Γ_{79}**

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.13	90	¹¹⁷ CRAWFORD	92	CLEO $e^+e^- \rightarrow \Upsilon(4S)$
¹¹⁷ CRAWFORD 92 value is not independent of their $\Gamma(\Lambda\bar{\Lambda}\text{anything})/\Gamma_{\text{total}}$ value.				

$\Gamma(e^+e^-s)/\Gamma_{\text{total}}$ **Γ_{87}/Γ**

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

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<5.7 $\times 10^{-5}$	90	GLENN	98	CLEO $e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.05	90	BEBEK	81	CLEO $e^+e^- \rightarrow \Upsilon(4S)$

$\Gamma(\mu^+\mu^-s)/\Gamma_{\text{total}}$ **Γ_{88}/Γ**

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

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<5.8 $\times 10^{-5}$	90	GLENN	98	CLEO $e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.017	90	CHADWICK	81	CLEO $e^+e^- \rightarrow \Upsilon(4S)$

$[\Gamma(e^+e^-s) + \Gamma(\mu^+\mu^-s)]/\Gamma_{\text{total}}$ **$(\Gamma_{87}+\Gamma_{88})/\Gamma$**

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

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<4.2 $\times 10^{-5}$	90	GLENN	98	CLEO $e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.0024	90	¹¹⁸ BEAN	87	CLEO Repl. by GLENN 98
<0.0062	90	¹¹⁹ AVERY	84	CLEO Repl. by BEAN 87

¹¹⁸BEAN 87 reports $[(\mu^+\mu^-)+(e^+e^-)]/2$ and we converted it.

¹¹⁹Determine ratio of B^+ to B^0 semileptonic decays to be in the range 0.25–2.9.

$\Gamma(e^\pm\mu^\mp s)/\Gamma_{\text{total}}$ **Γ_{89}/Γ**

Test for lepton family number conservation.

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.2 $\times 10^{-5}$	90	GLENN	98	CLEO $e^+e^- \rightarrow \Upsilon(4S)$

B^\pm/B^0 ADMIXTURE REFERENCES

BARATE	98Q	EPJ C4 387	R. Barate <i>et al.</i>	(ALEPH Collab.)
BERGFELD	98	PRL 81 272	T. Bergfeld <i>et al.</i>	(CLEO Collab.)
BISHAI	98	PR D57 3847	M. Bishai <i>et al.</i>	(CLEO Collab.)
BONVICINI	98	PR D57 6604	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
BROWDER	98	PRL 81 1786	R.E. Browder <i>et al.</i>	(CLEO Collab.)
COAN	98	PRL 80 1150	T.E. Coan <i>et al.</i>	(CLEO Collab.)
GLENN	98	PRL 80 2289	S. Glenn <i>et al.</i>	(CLEO Collab.)
ACKERSTAFF	97N	ZPHY C74 423	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
AMMAR	97	PR D55 13	R. Ammar <i>et al.</i>	(CLEO Collab.)
BARISH	97	PRL 79 3599	B. Barish <i>et al.</i>	(CLEO Collab.)
BUSKULIC	97B	ZPHY C73 601	D. Buskalic <i>et al.</i>	(ALEPH Collab.)
GIBBONS	97B	PR D56 3783	L. Gibbons <i>et al.</i>	(CLEO Collab.)
ALBRECHT	96D	PL B374 256	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BARISH	96B	PRL 76 1570	B.C. Barish <i>et al.</i>	(CLEO Collab.)
GIBAUT	96	PR D53 4734	D. Gibaut <i>et al.</i>	(CLEO Collab.)
KUBOTA	96	PR D53 6033	Y. Kubota <i>et al.</i>	(CLEO Collab.)
PDG	96	PR D54 1	R. M. Barnett <i>et al.</i>	
ALAM	95	PRL 74 2885	M.S. Alam <i>et al.</i>	(CLEO Collab.)
ALBRECHT	95D	PL B353 554	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BALEST	95B	PR D52 2661	R. Balest <i>et al.</i>	(CLEO Collab.)
BARISH	95	PR D51 1014	B.C. Barish <i>et al.</i>	(CLEO Collab.)
BUSKULIC	95B	PL B345 103	D. Buskalic <i>et al.</i>	(ALEPH Collab.)
ALBRECHT	94C	ZPHY C62 371	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	94J	ZPHY C61 1	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
PROCARIO	94	PRL 73 1306	M. Procario <i>et al.</i>	(CLEO Collab.)
ALBRECHT	93	ZPHY C57 533	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	93E	ZPHY C60 11	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	93H	PL B318 397	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	93I	ZPHY C58 191	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALEXANDER	93B	PL B319 365	J. Alexander <i>et al.</i>	(CLEO Collab.)
ARTUSO	93	PL B311 307	M. Artuso	(SYRA)
BARTELT	93B	PRL 71 4111	J.E. Bartelt <i>et al.</i>	(CLEO Collab.)
ALBRECHT	92E	PL B277 209	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	92G	ZPHY C54 1	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	92O	ZPHY C56 1	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BORTOLETTO	92	PR D45 21	D. Bortoletto <i>et al.</i>	(CLEO Collab.)
CRAWFORD	92	PR D45 752	G. Crawford <i>et al.</i>	(CLEO Collab.)
HENDERSON	92	PR D45 2212	S. Henderson <i>et al.</i>	(CLEO Collab.)
LESIAK	92	ZPHY C55 33	T. Lesiak <i>et al.</i>	(Crystal Ball Collab.)
ALBRECHT	91C	PL B255 297	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	91H	ZPHY C52 353	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
FULTON	91	PR D43 651	R. Fulton <i>et al.</i>	(CLEO Collab.)
YANAGISAWA	91	PRL 66 2436	C. Yanagisawa <i>et al.</i>	(CUSB II Collab.)
ALBRECHT	90	PL B234 409	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	90H	PL B249 359	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BORTOLETTO	90	PRL 64 2117	D. Bortoletto <i>et al.</i>	(CLEO Collab.)
Also	92	PR D45 21	D. Bortoletto <i>et al.</i>	(CLEO Collab.)
FULTON	90	PRL 64 16	R. Fulton <i>et al.</i>	(CLEO Collab.)
MASCHMANN	90	ZPHY C46 555	W.S. Maschmann <i>et al.</i>	(Crystal Ball Collab.)
PDG	90	PL B239	J.J. Hernandez <i>et al.</i>	(IFIC, BOST, CIT+)
ALBRECHT	89K	ZPHY C42 519	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ISGUR	89B	PR D39 799	N. Isgur <i>et al.</i>	(TNT0, CIT)
WACHS	89	ZPHY C42 33	K. Wachs <i>et al.</i>	(Crystal Ball Collab.)
ALBRECHT	88E	PL B210 263	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	88H	PL B210 258	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
KOERNER	88	ZPHY C38 511	J.G. Korner, G.A. Schuler	(MANZ, DESY)
ALAM	87	PRL 59 22	M.S. Alam <i>et al.</i>	(CLEO Collab.)
ALAM	87B	PRL 58 1814	M.S. Alam <i>et al.</i>	(CLEO Collab.)
ALBRECHT	87D	PL B199 451	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	87H	PL B187 425	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BEAN	87	PR D35 3533	A. Bean <i>et al.</i>	(CLEO Collab.)
BEHRENDIS	87	PRL 59 407	S. Behrends <i>et al.</i>	(CLEO Collab.)
BORTOLETTO	87	PR D35 19	D. Bortoletto <i>et al.</i>	(CLEO Collab.)
ALAM	86	PR D34 3279	M.S. Alam <i>et al.</i>	(CLEO Collab.)
BALTRUSAITIS...	86E	PRL 56 2140	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)

BORTOLETTO	86	PRL 56 800	D. Bortoletto <i>et al.</i>	(CLEO Collab.)
HAAS	86	PRL 56 2781	J. Haas <i>et al.</i>	(CLEO Collab.)
ALBRECHT	85H	PL 162B 395	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
CSORNA	85	PRL 54 1894	S.E. Csorna <i>et al.</i>	(CLEO Collab.)
HAAS	85	PRL 55 1248	J. Haas <i>et al.</i>	(CLEO Collab.)
AVERY	84	PRL 53 1309	P. Avery <i>et al.</i>	(CLEO Collab.)
CHEN	84	PRL 52 1084	A. Chen <i>et al.</i>	(CLEO Collab.)
LEVMAN	84	PL 141B 271	G.M. Levman <i>et al.</i>	(CUSB Collab.)
ALAM	83B	PRL 51 1143	M.S. Alam <i>et al.</i>	(CLEO Collab.)
GREEN	83	PRL 51 347	J. Green <i>et al.</i>	(CLEO Collab.)
KLOPFEN...	83B	PL 130B 444	C. Klopfenstein <i>et al.</i>	(CUSB Collab.)
ALTARELLI	82	NP B208 365	G. Altarelli <i>et al.</i>	(ROMA, INFN, FRAS)
BRODY	82	PRL 48 1070	A.D. Brody <i>et al.</i>	(CLEO Collab.)
GIANNINI	82	NP B206 1	G. Giannini <i>et al.</i>	(CUSB Collab.)
BEBEK	81	PRL 46 84	C. Bebek <i>et al.</i>	(CLEO Collab.)
CHADWICK	81	PRL 46 88	K. Chadwick <i>et al.</i>	(CLEO Collab.)
ABRAMS	80	PRL 44 10	G.S. Abrams <i>et al.</i>	(SLAC, LBL)
