References

1. S. Stone, *Semileptonic B Decays*, HEPSY 93–11, to appear in B Decays, 2[nd] Edition, ed. by S. Stone, World Scientific, Singapore.
2. M. Neubert, *Heavy Quark Symmetry*, SLAC–PUB–6263, June 1993, to appear in Physics Reports.
3. ALEPH: D. Buskulic *et al.*, Phys. Lett. **B298**, 479 (1993).
4. *Updated Measurement of the $b \to \tau^- \overline{\nu}_\tau X$ Branching Ratio*, ALEPH Collaboration, paper submitted to the 5[th] International Symposium on Heavy Flavour Physics, Montreal, 1993.
5. ARGUS: H. Albrecht *et al.*, Phys. Lett. **B249**, 359 (1990).
6. ARGUS: H. Albrecht *et al.*, Phys. Lett. **B318**, 397 (1993).
7. Crystal Ball: K. Wachs *et al.*, Z. Phys. **C42**, 33 (1989).
8. CUSB: C. Yanagisawa *et al.*, Phys. Rev. Lett. **66**, 2436 (1991).
9. CLEO: S. Henderson *et al.*, Phys. Rev. **D45**, 2212 (1992).
10. CLEO: J. Bartelt *et al.*, *Inclusive Measurement of B-Meson Semileptonic Branching Fractions*, submitted to the XVI International Symposium on Lepton and Photon Interactions, Ithaca, New York (1993), p. 274.
11. W. Venus, *b Weak Interaction Physics in High Energy Experiments*, in AIP Conference Proceedings 302, Lepton and Photon Interactons, XVI International Symposium, eds. P. Drell and D. Rubin, Ithaca, NY (1993), p. 274.
12. G. Altarelli, N. Cabibbo, G. Corbò, L. Maiani, and G. Martinelli, Nucl. Phys. **B208**, 365 (1982).
13. N. Isgur, D. Scora, B. Grinstein, and M. Wise, Phys. Rev. **D39**, 799 (1989).
14. DELCO: W. Bacino *et al.*, Phys. Rev. Lett. **43**, 1073 (1979).
15. I. Bigi, B. Blok, M. Shifman, A. Vainshtein, Phys. Lett. **B323**, 408 (1994);
    G. Altarelli and S. Petrarca, Phys. Lett. **B261**, 303 (1991).
16. This average b-hadron lifetime, also used in Sec. 28 on "The Cabibbo-Kobayashi-Maskawa Mixing Matrix," is based on results from LEP experiments and CDF and includes contributions from B_s^0 mesons and b-baryons, which are not produced at the $\Upsilon(4S)$. However, these contributions are thought to be relatively small (LEP experiments typically assume nominal production ratios given by $B^+ : B^0 : B_s^0 : b\text{-baryon} = 0.40 : 0.40 : 0.12 : 0.08$), and their lifetimes are similar to those of B^+ and B^0 mesons. Alternatively, one can use the less precisely measured B^+ and B^0 lifetimes ($\tau_{B0} = 1.50 \pm 0.11$ ps and $\tau_{B^+} = 1.54 \pm 0.11$ ps) from CDF and LEP experiments.
17. D. Besson, *Recent Bottom Physics Results from Threshold Machines*, in AIP Conference Proceedings 302, Lepton and Photon Interactons, XVI International Symposium, eds. P. Drell and D. Rubin, Ithaca, NY (1993), p. 221.
18. M. Luke and M. Savage, Phys. Lett. **B321**, 88 (1994).
19. M. Shifman, N.G. Uraltsev, and A. Vainshtein, Minnesota preprint TPI-MINN-94/13-T and hep-ph/9405207, 1994.
20. ARGUS: H. Albrecht *et al.*, Z. Phys. **C60**, 11 (1993).
21. ARGUS: H. Albrecht *et al.*, Phys. Lett. **B234**, 409 (1990);
    H. Albrecht *et al.*, Phys. Lett. **B255**, 297 (1991).
22. CLEO: R. Fulton *et al.*, Phys. Rev. Lett. **64**, 16 (1990).
23. CLEO: J. Bartelt *et al.*, Phys. Rev. Lett. **71**, 4111 (1993).
24. C. Ramirez, J.F. Donoghue, and G. Burdman, Phys. Rev. **D41**, 1496 (1990);
    M. Artuso, Phys. Lett. **B311**, 307 (1993).
25. CLEO: F. Butler *et al.*, Phys. Rev. Lett. **69**, 2041 (1992).
26. CLEO: For D^0, D.S. Akerib *et al.*, Phys. Rev. Lett. **71**, 3070 (1993);
    Mark III: For D^+, J. Adler *et al.*, Phys. Rev. Lett. **60**, 89 (1988).
27. ARGUS: H. Albrecht *et al.*, Phys. Lett. **B229**, 175 (1989).
28. CLEO: R. Fulton *et al.*, Phys. Rev. **D43**, 651 (1991).
29. ARGUS: H. Albrecht *et al.*, Z. Phys. **C57**, 533 (1993).
30. ARGUS: H. Albrecht *et al.*, Phys. Lett. **B324**, 249 (1994).
31. ARGUS: H. Albrecht *et al.*, Phys. Lett. **B275**, 195 (1992).
32. A. Bean *et al.*, Phys. Rev. Lett. **70**, 2681 (1993).
33. M.E. Luke, Phys. Lett. **B252**, 447 (1990).
34. M. Neubert, Phys. Lett. **B264**, 455 (1991).
35. UKQCD: S.P. Booth *et al.*, Phys. Rev. Lett. **72**, 462 (1994);
    C. Bernard, Y. Shen, and A. Soni, Phys. Lett. **B317**, 164 (1993);
    J. Mandula and M. Ogilvie, Nucl. Phys. (Proc. Suppl.) **B26**, 459 (1992).
36. CLEO: D. Bortoletto *et al.*, Phys. Rev. Lett. **63**, 1667 (1989).
37. CLEO: S. Sanghera *et al.*, Phys. Rev. **D47**, 791 (1993).
38. J.G. Körner and G.A. Schuler, Z. Phys. **C38**, 511 (1988).
39. M. Bauer and M. Wirbel, Z. Phys. **C42**, 671 (1989).
40. N. Isgur and M. Wise, Phys. Lett. **B237**, 527 (1990).
41. M. Neubert *et al.*, in *Heavy Flavours*, edited by A.J. Buras and M. Lindner, Advanced Series on Directions in High Energy Physics (World Scientific, Singapore, 1991).

$B^{\pm}$

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

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

This section also includes measurements which do not identify the charge state of B.

$B^{\pm}$ MASS

These experiments actually measure the difference between half of $E_{\rm cm}$ and the B mass.

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
5278.7±2.0 OUR FIT					
5278.7±2.0 OUR AVERAGE					
5278.8±0.54±2.0	362	[1] ALAM	94	CLE2	$e^+e^- \to \Upsilon(4S)$
5278.3±0.4 ±2.0		[1] BORTOLETTO	92	CLEO	$e^+e^- \to \Upsilon(4S)$
5280.5±1.0 ±2.0		[1,2] ALBRECHT	90J	ARG	$e^+e^- \to \Upsilon(4S)$
5278.6±0.8 ±2.0		[1] BEBEK	87	CLEO	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5275.8±1.3 ±3.0	32	ALBRECHT	87C	ARG	$e^+e^- \to \Upsilon(4S)$
5278.2±1.8 ±3.0	12	[3] ALBRECHT	87D	ARG	$e^+e^- \to \Upsilon(4S)$

[1] These experiments all report a common systematic error 2.0 MeV. We have artificially increased the systematic error to allow the experiments to be treated as independent measurements in our average. See "Treatment of Errors" section of the Introductory Text.

[2] ALBRECHT 90J assumes 10580 for $\Upsilon(4S)$ mass. Supersedes ALBRECHT 87C and ALBRECHT 87D.

[3] Found using fully reconstructed decays with $J/\psi(1S)$. ALBRECHT 87D assume $m_{\Upsilon(4S)} = 10577$ MeV.

$B^{\pm}$ MEAN LIFE

VALUE (10^{-12} s)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.54±0.11 OUR AVERAGE					
$1.61 \pm 0.16 \pm 0.05$	148	[4] ABE	94D	CDF	$p\overline{p}$ at 1.8 TeV
$1.30^{+0.33}_{-0.29} \pm 0.16$	92	[5] ABREU	93D	DLPH	$e^+e^- \to Z$
$1.56 \pm 0.19 \pm 0.13$	134	[6] ABREU	93G	DLPH	$e^+e^- \to Z$
$1.51^{+0.30}_{-0.28}{}^{+0.12}_{-0.14}$	59	[5] ACTON	93C	OPAL	$e^+e^- \to Z$
$1.47^{+0.22}_{-0.19}{}^{+0.15}_{-0.14}$	77	[5] BUSKULIC	93D	ALEP	$e^+e^- \to Z$

[4] ABE 94D measured mean life using fully reconstructed decays.

[5] Data analyzed using $D\,/\,D^* \ell$anything event vertices.

[6] ABREU 93G data analyzed using charged and neutral vertices.