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

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

These measurements of the B mean life are averages over bottom particles produced, weighted by their semileptonic branching ratios, unless otherwise stated. Only the measurements at high energy are averaged since it is expected that the admixtures of B hadrons from Z decay and 1.8 TeV $p\overline{p}$ collisions should should not differ significantly.

VALUE (10^{-12} s)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.537±0.021 OUR AVERAGE						
1.582±0.012±0.032			[1] ABREU	94L	DLPH	$e^+e^- \rightarrow Z$
$1.50\ ^{+0.24}_{-0.21}\ \pm0.03$			[2] ABREU	94P	DLPH	$e^+e^- \rightarrow Z$
1.46 ±0.06 ±0.06		5344	[3] ABE	93J	CDF	$p\overline{p}$ at 1.8 TeV
$1.51\ ^{+0.16}_{-0.14}\ \pm0.11$		130	[4] ACTON	93C	OPAL	$e^+e^- \rightarrow Z$
1.523±0.034±0.038		5372	[5] ACTON	93L	OPAL	$e^+e^- \rightarrow Z$
1.535±0.035±0.028		7357	[5] ADRIANI	93K	L3	$e^+e^- \rightarrow Z$
1.50 ±0.020±0.050			[6] BUSKULIC	93O	ALEP	$e^+e^- \rightarrow Z$
$1.35\ ^{+0.19}_{-0.17}\ \pm0.005$			[7] BUSKULIC	92G	ALEP	$e^+e^- \rightarrow Z$
$1.32\ ^{+0.31}_{-0.25}\ \pm0.15$		37	[8] ALEXANDER	91G	OPAL	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$1.23\ ^{+0.14}_{-0.13}\ \pm0.15$		188	[9] ABREU	93D	DLPH	Sup. by ABREU 94L
1.49 ±0.11 ±0.12		253	[10] ABREU	93G	DLPH	Sup. by ABREU 94L
1.28 ±0.10			[11] ABREU	92	DLPH	Sup. by ABREU 94L
1.37 ±0.07 ±0.06		1354	[12] ACTON	92	OPAL	Sup. by ACTON 93L
1.49 ±0.03 ±0.06			[13] BUSKULIC	92F	ALEP	Sup. by BUSKULIC 93O
1.32 ±0.08 ±0.09		1386	[14] ADEVA	91H	L3	Sup. by ADRIANI 93K
1.29 ±0.06 ±0.10		2973	[15] DECAMP	91C	ALEP	Sup. by BUSKULIC 92F
$1.36\ ^{+0.25}_{-0.23}$			[16] HAGEMANN	90	JADE	E^{ee}_{cm}= 35 GeV
1.13 ±0.15			[17] LYONS	90	RVUE	
1.35 ±0.10 ±0.24			BRAUNSCH...	89B	TASS	E^{ee}_{cm}= 35 GeV
0.98 ±0.12 ±0.13			ONG	89	MRK2	E^{ee}_{cm}= 29 GeV
$1.17\ ^{+0.27}_{-0.22}\ ^{+0.17}_{-0.16}$			KLEM	88	DLCO	E^{ee}_{cm}= 29 GeV
1.29 ±0.20 ±0.21			[18] ASH	87	MAC	E^{ee}_{cm}= 29 GeV
$1.02\ ^{+0.42}_{-0.39}$		301	[19] BROM	87	HRS	E^{ee}_{cm}= 29 GeV
$1.8\ ^{+0.5}_{-0.4}\ \pm0.4$		25	BARTEL	86B	JADE	E^{ee}_{cm}= 35 GeV
$1.83\ ^{+0.38}_{-0.37}\ ^{+0.37}_{-0.34}$			ALTHOFF	84H	TASS	E^{ee}_{cm}= 30–46.8 GeV
$1.16\ ^{+0.37}_{-0.34}\ \pm0.23$		46	KLEM	84	DLCO	Repl. by KLEM 88
1.8 ±0.6 ±0.4			FERNANDEZ	83B	MAC	E^{ee}_{cm}= 29 GeV
$1.20\ ^{+0.45}_{-0.36}\ \pm0.30$			LOCKYER	83	MRK2	Repl. by ONG 89
<1.4	95		BARTEL	82C	JADE	e^+e^-, average E_{cm}= 34 GeV

[1] ABREU 94L combines results from charged particle impact parameters and inclusively reconstructed secondary vertices.
[2] From proper time distribution of $b \rightarrow J/\psi(1S)$anything.
[3] ABE 93J analyzed using $J/\psi(1S) \rightarrow \mu\mu$ vertices.
[4] ACTON 93C analysed using D / $D^*\ell$anything event vertices.
[5] ACTON 93L and ADRIANI 93K analyzed using lepton (e and μ) impact parameter at Z.
[6] BUSKULIC 93O analyzed using dipole method plus lepton (e and μ) impact parameter at Z.
[7] BUSKULIC 92G use $J/\psi(1S)$ tags to measure the average b lifetime. This is comparable to other methods only if the $J/\psi(1S)$ branching fractions of the different b-flavored hadrons are in the same ratio.
[8] Using $Z \rightarrow J/\psi(1S)$X, $J/\psi(1S) \rightarrow \ell^+\ell^-$, ALEXANDER 91G determined the average lifetime for an admixture of B hadrons from the decay point of the $J/\psi(1S)$.

*CITATION: L. Montanet et al., Physical Review D50, 1173 (1994) and 1995 off-year partial update for the 1996 edition (URL: http://pdg.lbl.gov/)

[9] ABREU 93D data analyzed using $D\,/\,D^{*}\ell$anything event vertices.
[10] ABREU 93G data analyzed using charged and neutral vertices.
[11] ABREU 92 is combined result of muon and hadron impact parameter analyses. Hadron tracks gave $(12.7 \pm 0.4 \pm 1.2) \times 10^{-13}$ s for an admixture of B species weighted by production fraction and mean charge multiplicity, while muon tracks gave $(13.0 \pm 1.0 \pm 0.8) \times 10^{-13}$ s for an admixture weighted by production fraction and semileptonic branching fraction.
[12] ACTON 92 is combined result of muon and electron impact parameter analyses.
[13] BUSKULIC 92F uses the lepton impact parameter distribution for data from the 1991 run.
[14] Using $Z \to e^{+}$X or μ^{+}X, ADEVA 91H determined the average lifetime for an admixture of B hadrons from the impact parameter distribution of the lepton.
[15] Using $Z \to e$X or μX, DECAMP 91C determines the average lifetime for an admixture of B hadrons from the signed impact parameter distribution of the lepton.
[16] HAGEMANN 90 uses electrons and muons in an impact parameter analysis.
[17] LYONS 90 combine the results of the B lifetime measuresments of ONG 89, BRAUNSCHWEIG 89B, KLEM 88, and ASH 87, and JADE data by private communication. They use statistical techniques which include variation of the error with the mean life, and possible correlations between the systematic errors. This result is not independent of the measured results used in our average.
[18] We have combined an overall scale error of 15% in quadrature with the systematic error of ±0.7 to obtain ±2.1 systematic error.
[19] Statistical and systematic errors were combined by BROM 87.

$\overline{b}$ DECAY MODES

The branching fraction measurements are for an admixture of B mesons and baryons at energies above the $\Upsilon(4S)$. Only the highest energy results (LEP, Tevatron, Sp$\overline{p}$S) are used in the averages.

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

	Mode		Fraction (Γ_i/Γ)	Scale factor/ Confidence level
	Semileptonic and leptonic modes			
Γ_1	$e^{+}\nu_e$ anything	[a]	$(11.1\ \pm1.0\ )$ %	
Γ_2	$\mu^{+}\nu_\mu$ anything	[a]	$(10.7\ \pm0.7\ )$ %	
Γ_3	$\ell^{+}\nu_\ell$ anything	[a,b]	$(11.2\ \pm0.4\ )$ %	
Γ_4	$\overline{b} \to \overline{c} \to \ell^{-}\overline{\nu}_\ell$ anything	[b]	$(\ 8.2\ \pm1.2\ )$ %	
Γ_5	$\tau^{+}\nu_\tau$ anything		$(\ 3.3\ \pm0.8\ )$ %	S=1.2
	Charmonium modes			
Γ_6	$J/\psi(1S)$anything		$(\ 1.16\pm0.10)$ %	
Γ_7	$\psi(2S)$anything		$(\ 4.8\ \pm2.4\ ) \times 10^{-3}$	
Γ_8	$\chi_{c1}(1P)$anything		$(\ 1.8\ \pm0.5\ )$ %	
	***K* or *K** modes**			
Γ_9	$\overline{s}\gamma$		$< 1.2 \times 10^{-3}$	CL=90%
	$\Delta B = 1$ weak neutral current (*B1*) modes			
Γ_{10}	$e^{+}e^{-}$ anything	*B1*		
Γ_{11}	$\mu^{+}\mu^{-}$ anything	*B1*	$< 5.0 \times 10^{-5}$	CL=90%

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

[b] ℓ indicates e or μ mode, not sum over modes.

$B^{\pm}/B^{0}/B^{0}_{s}/B$-baryon ADMIXTURE BRANCHING RATIOS

$\Gamma(\ell^{+}\nu_\ell$ anything$)/\Gamma_{\rm total}$ Γ_3/Γ

These branching fraction values are model dependent. See the note on "Semileptonic Decays of D and B Mesons, Part II" at the beginning of the B^{+} Full Listings.

VALUE	*DOCUMENT ID*	*TECN*	*COMMENT*
0.112±0.004 OUR AVERAGE	Includes data from the 2 datablocks that follow this one.		
0.114±0.003±0.004	[20] BUSKULIC 94G	ALEP	$e^{+}e^{-} \to Z$

[20] BUSKULIC 94G uses e and μ events. This value is from a global fit to the lepton p and p_T (relative to jet) spectra which also determines the b and c production fractions, the fragmentation functions, and the forward-backward asymmetries. This branching ratio depends primarily on the ratio of dileptons to single leptons at high p_T, but the lower p_T portion of the lepton spectrum is included in the global fit to reduce the model dependence. The model dependence is ± 0.0026 and is included in the systematic error.

$\Gamma(e^+ \nu_e \text{anything})/\Gamma_{\text{total}}$ $\quad\Gamma_1/\Gamma$

These branching fraction values are model dependent. See the note on "Semileptonic Decays of D and B Mesons, Part II" at the beginning of the B^+ Full Listings.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.					
0.111±0.010 OUR AVERAGE					
0.107±0.015±0.007	260	[21] ABREU	93C	DLPH	$e^+ e^- \to Z$
$0.109^{+0.014}_{-0.013}$±0.0055	2719	[22] AKERS	93B	OPAL	$e^+ e^- \to Z$
0.138±0.032±0.008		[23] ADEVA	91C	L3	$e^+ e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.086±0.027±0.008		[24] ABE	93E	VNS	E^{ee}_{cm}= 58 GeV
0.111±0.028±0.026		BEHREND	90D	CELL	E^{ee}_{cm}= 43 GeV
0.150±0.011±0.022		BEHREND	90D	CELL	E^{ee}_{cm}= 35 GeV
0.112±0.009±0.011		ONG	88	MRK2	E^{ee}_{cm}= 29 GeV
$0.149^{+0.022}_{-0.019}$		PAL	86	DLCO	E^{ee}_{cm}= 29 GeV
0.110±0.018±0.010		AIHARA	85	TPC	E^{ee}_{cm}= 29 GeV
0.111±0.034±0.040		ALTHOFF	84J	TASS	E^{ee}_{cm}= 34.6 GeV
0.146±0.028		KOOP	84	DLCO	Repl. by PAL 86
0.116±0.021±0.017		NELSON	83	MRK2	E^{ee}_{cm}= 29 GeV

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

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

[23] ADEVA 91C measure the average B($b \to eX$) branching ratio using single and double tagged b enhanced Z events. Combining e and μ results, they obtain 0.113 ± 0.010 ± 0.006. Constraining the initial number of b quarks by the Standard Model prediction (378 ± 3 MeV) for the decay of the Z into $b\overline{b}$, the electron result gives 0.112 ± 0.004 ± 0.008. They obtain 0.119 ± 0.003 ± 0.006 when e and μ results are combined. Used to measure the $b\overline{b}$ width itself, this electron result gives 370 ± 12 ± 24 MeV and combined with the muon result gives 385 ± 7 ± 22 MeV.

[24] ABE 93E experiment also measures forward-backward asymmetries and fragmentation functions for b and c.

$\Gamma(\mu^+ \nu_\mu \text{anything})/\Gamma_{\text{total}}$ $\quad\Gamma_2/\Gamma$

These branching fraction values are model dependent. See the note on "Semileptonic Decays of D and B Mesons, Part II" at the beginning of the B^+ Full Listings.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.					
0.107±0.007 OUR AVERAGE					
0.110±0.012±0.007	656	[25] ABREU	93C	DLPH	$e^+ e^- \to Z$
$0.101^{+0.010}_{-0.009}$±0.0055	4248	[26] AKERS	93B	OPAL	$e^+ e^- \to Z$
0.113±0.012±0.006		[27] ADEVA	91C	L3	$e^+ e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.104±0.023±0.016		BEHREND	90D	CELL	E^{ee}_{cm}= 43 GeV
0.148±0.010±0.016		BEHREND	90D	CELL	E^{ee}_{cm}= 35 GeV
0.118±0.012±0.010		ONG	88	MRK2	E^{ee}_{cm}= 29 GeV
0.117±0.016±0.015		BARTEL	87	JADE	E^{ee}_{cm}= 34.6 GeV
0.114±0.018±0.025		BARTEL	85J	JADE	Repl. by BARTEL 87
0.117±0.028±0.010		ALTHOFF	84G	TASS	E^{ee}_{cm}= 34.5 GeV
0.105±0.015±0.013		ADEVA	83B	MRKJ	E^{ee}_{cm}= 33–38.5 GeV
$0.155^{+0.054}_{-0.029}$		FERNANDEZ	83D	MAC	E^{ee}_{cm}= 29 GeV

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

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

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

$\Gamma(\overline{b} \to \overline{c} \to \ell^- \overline{\nu}_\ell \text{anything})/\Gamma_{total}$ — Γ_4/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.082±0.003±0.012	[28] BUSKULIC 94G	ALEP	$e^+e^- \to Z$

[28] BUSKULIC 94G uses e and μ events. This value is from the same global fit as their $\Gamma(\overline{b} \to \ell^+ \nu_\ell \text{anything})/\Gamma_{total}$ data.

$\Gamma(\tau^+ \nu_\tau \text{anything})/\Gamma_{total}$ — Γ_5/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
3.3 ±0.8 OUR AVERAGE Error includes scale factor of 1.2.				
2.4 ±0.7 ±0.8	1032	[29] ACCIARRI 94C	L3	$e^+e^- \to Z$
4.08±0.76±0.62		BUSKULIC 93B	ALEP	$e^+e^- \to Z$

[29] This is a direct result using tagged $b\overline{b}$ events at the Z, but species are not separated.

$\Gamma(J/\psi(1S)\text{anything})/\Gamma_{total}$ — Γ_6/Γ

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.16±0.10 OUR AVERAGE					
1.12±0.12±0.10			[30] ABREU 94P	DLPH	$e^+e^- \to Z$
1.16±0.16±0.14		121	[31] ADRIANI 93J	L3	$e^+e^- \to Z$
1.21±0.13±0.08			BUSKULIC 92G	ALEP	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.3 ±0.2 ±0.2			[32] ADRIANI 92	L3	$e^+e^- \to Z$
<4.9	90		MATTEUZZI 83	MRK2	E_{cm}^{ee}= 29 GeV

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

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

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

$\Gamma(\psi(2S)\text{anything})/\Gamma_{total}$ — Γ_7/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0048±0.0022±0.0010	[33] ABREU 94P	DLPH	$e^+e^- \to Z$

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

$\Gamma(\chi_{c1}(1P)\text{anything})/\Gamma_{total}$ — Γ_8/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.018±0.005 OUR AVERAGE				
$0.014\pm0.006^{+0.004}_{-0.002}$		[34] ABREU 94P	DLPH	$e^+e^- \to Z$
0.024±0.009±0.002	19	[35] ADRIANI 93J	L3	$e^+e^- \to Z$

[34] ABREU 94P is an inclusive measurement from b decays at the Z. Uses $\chi_{c1}(1P) \to J/\psi(1S)\gamma$, $J/\psi(1S) \to \mu^+\mu^-$ channels. Assumes no $\chi_{c2}(1P)$ and $\Gamma(Z \to b\overline{b})/\Gamma_{hadron}$=0.22.

[35] ADRIANI 93J is an inclusive measurement and assumes χ_{c1} come from b decays at Z. Uses $J/\psi(1S) \to \mu^+\mu^-$ channel.

$\Gamma(\chi_{c1}(1P)\text{anything})/\Gamma(J/\psi(1S)\text{anything})$ — Γ_8/Γ_6

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.92±0.82	121	[36] ADRIANI 93J	L3	$e^+e^- \to Z$

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

$\Gamma(\overline{s}\gamma)/\Gamma_{total}$ — Γ_9/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0012	90	[37] ADRIANI 93L	L3	$e^+e^- \to Z$

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

$\Gamma(\mu^+\mu^-\text{ anything})/\Gamma_{\text{total}}$ — Γ_{11}/Γ

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<5.0 × 10^{-5}	90	ALBAJAR	91C	UA1	$E^{p\overline{p}}_{\text{cm}}$= 630 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.02	95	ALTHOFF	84G	TASS	E^{ee}_{cm}= 34.5 GeV
<0.007	95	ADEVA	83	MRKJ	E^{ee}_{cm}= 30–38 GeV
<0.007	95	BARTEL	83B	JADE	E^{ee}_{cm}= 33–37 GeV

$\left[\Gamma(e^+e^-\text{ anything}) + \Gamma(\mu^+\mu^-\text{ anything})\right]/\Gamma_{\text{total}}$ — $(\Gamma_{10}+\Gamma_{11})/\Gamma$

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

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

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

ABREU 94L ZPHY C63 3 +Adam, Adye, Agasi, Aleksan+ (DELPHI Collab.)
ABREU 94P PL B341 109 +Adam, Adye, Agasi, Ajinenko+ (DELPHI Collab.)
ACCIARRI 94C PL B332 201 +Adam, Adriani, Aguilar-Benitez, Ahlen+ (L3 Collab.)
BUSKULIC 94G ZPHY C62 179 +Casper, DeBonis, Decamp, Ghez+ (ALEPH Collab.)
ABE 93E PL B313 288 +Amako, Arai, Arima, Asano+ (VENUS Collab.)
ABE 93J PRL 71 3421 +Albrow, Amidei, Anway-Wiese+ (CDF Collab.)
ABREU 93C PL B301 145 +Adam, Adye, Agasi, Aleksan+ (DELPHI Collab.)
ABREU 93D ZPHY C57 181 +Adam, Adye, Agasi, Alekseev+ (DELPHI Collab.)
ABREU 93G PL B312 253 +Adam, Adye, Agasi, Ajinenko+ (DELPHI Collab.)
ACTON 93C PL B307 247 +Alexander, Allison, Allport, Anderson+ (OPAL Collab.)
ACTON 93L ZPHY C60 217 +Akers, Alexander, Allison, Anderson+ (OPAL Collab.)
ADRIANI 93J PL B317 467 +Aguilar-Benitez, Ahlen, Alcaraz+ (L3 Collab.)
ADRIANI 93K PL B317 474 +Aguilar-Benitez, Ahlen, Alcarez+ (L3 Collab.)
ADRIANI 93L PL B317 637 +Aguilar-Benitez, Ahlen, Alcaraz+ (L3 Collab.)
AKERS 93B ZPHY C60 199 +Alexander, Allison, Anderson, Arcelli+ (OPAL Collab.)
BUSKULIC 93B PL B298 479 +Decamp, Goy, Lees, Minard+ (ALEPH Collab.)
BUSKULIC 93O PL B314 459 +De Bonis, Decamp, Ghez, Goy+ (ALEPH Collab.)
ABREU 92 ZPHY C53 567 +Adam, Adami, Adye+ (DELPHI Collab.)
ACTON 92 PL B274 513 +Alexander, Allison, Allport, Anderson+ (OPAL Collab.)
ADRIANI 92 PL B288 412 +Aguilar-Benitez, Ahlen, Akbari+ (L3 Collab.)
BUSKULIC 92F PL B295 174 +Decamp, Goy, Lees, Minard+ (ALEPH Collab.)
BUSKULIC 92G PL B295 396 +Decamp, Goy, Lees, Minard+ (ALEPH Collab.)
ADEVA 91C PL B261 177 +Adriani, Aguilar-Benitez, Akbari+ (L3 Collab.)
ADEVA 91H PL B270 111 +Adrani, Aguilar-Benitez, Akbari, Alcaraz+ (L3 Collab.)
ALBAJAR 91C PL B262 163 +Albrow, Allkofer, Ankoviak, Apsimon+ (UA1 Collab.)
ALEXANDER 91G PL B266 485 +Allison, Allport+ (OPAL Collab.)
DECAMP 91C PL B257 492 +Deschizeaux, Goy, Lees, Minard+ (ALEPH Collab.)
BEHREND 90D ZPHY C47 333 +Criegee, Field, Franke, Jung+ (CELLO Collab.)
HAGEMANN 90 ZPHY C48 401 +Ramcke, Allison, Ambrus, Barlow+ (JADE Collab.)
LYONS 90 PR D41 982 +Martin, Saxon (OXF, BRIS, RAL)
BRAUNSCH... 89B ZPHY C44 1 Braunschweig, Gerhards, Kirschfink+ (TASSO Collab.)
ONG 89 PRL 62 1236 +Jaros, Abrams, Amidei, Baden+ (Mark II Collab.)
KLEM 88 PR D37 41 +Atwood, Barish+ (DELCO Collab.)
ONG 88 PRL 60 2587 +Weir, Abrams, Amidei+ (Mark II Collab.)
ASH 87 PRL 58 640 +Band, Bloom, Bosman+ (MAC Collab.)
BARTEL 87 ZPHY C33 339 +Becker, Felst, Haidt+ (JADE Collab.)
BROM 87 PL B195 301 +Abachi, Akerlof, Baringer+ (HRS Collab.)
BARTEL 86B ZPHY C31 349 +Becker, Cords, Felst, Haidt+ (JADE Collab.)
PAL 86 PR D33 2708 +Atwood, Barish, Bonneaud+ (DELCO Collab.)
AIHARA 85 ZPHY C27 39 +Alston-Garnjost, Badtke, Bakken+ (TPC Collab.)
BARTEL 85J PL 163B 277 +Becker, Cords, Felst+ (JADE Collab.)
ALTHOFF 84G ZPHY C22 219 +Braunschweig, Kirschfink+ (TASSO Collab.)
ALTHOFF 84H PL 149B 524 +Braunschweig, Kirschfink+ (TASSO Collab.)
ALTHOFF 84J PL 146B 443 +Branschweig, Kirschfink+ (TASSO Collab.)
KLEM 84 PRL 53 1873 +Dubois, Young, Atwood+ (DELCO Collab.)
KOOP 84 PRL 52 970 +Sakuda, Atwood, Baillon+ (DELCO Collab.)
ADEVA 83 PRL 50 799 +Barber, Becker, Berdugo+ (Mark-J Collab.)
ADEVA 83B PRL 51 443 +Barber, Becker, Berdugo+ (Mark-J Collab.)
BARTEL 83B PL 132B 241 +Becker, Bowdery, Cords+ (JADE Collab.)
FERNANDEZ 83B PRL 51 1022 +Ford, Read, Smith+ (MAC Collab.)
FERNANDEZ 83D PRL 50 2054 +Ford, Read, Smith+ (MAC Collab.)
LOCKYER 83 PRL 51 1316 +Jaros, Nelson, Abrams+ (Mark II Collab.)
MATTEUZZI 83 PL 129B 141 +Abrams, Amidei, Blocker+ (Mark II Collab.)
NELSON 83 PRL 50 1542 +Blondel, Trilling, Abrams+ (Mark II Collab.)
BARTEL 82C PL 114B 71 +Cords, Dittmann, Eichler+ (JADE Collab.)