b-baryon ADMIXTURE (Λ_b, Ξ_b, Σ_b, Ω_b)

b-baryon ADMIXTURE MEAN LIFE

Each measurement of the b-baryon mean life is an average over an admixture of various b baryons which decay weakly. Different techniques emphasize different admixtures of produced particles, which could result in a different b-baryon mean life. More b-baryon flavor specific channels are not included in the measurement.

VALUE (10^{-12} s)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.218^{+0.130}_{-0.115}\pm0.042$		[1] ABAZOV	07S	D0	Repl. by ABAZOV 12U
$1.22\ ^{+0.22}_{-0.18}\ \pm0.04$		[1] ABAZOV	05C	D0	Repl. by ABAZOV 07S
$1.16\ \pm0.20\ \pm0.08$		[2] ABREU	99W	DLPH	$e^+e^-\to Z$
$1.19\ \pm0.14\ \pm0.07$		[3] ABREU	99W	DLPH	$e^+e^-\to Z$
$1.14\ \pm0.08\ \pm0.04$		[4] ABREU	99W	DLPH	$e^+e^-\to Z$
$1.11\ ^{+0.19}_{-0.18}\ \pm0.05$		[5] ABREU	99W	DLPH	$e^+e^-\to Z$
$1.29\ ^{+0.24}_{-0.22}\ \pm0.06$		[5] ACKERSTAFF	98G	OPAL	$e^+e^-\to Z$
$1.20\ \pm0.08\ \pm0.06$		[6] BARATE	98D	ALEP	$e^+e^-\to Z$
$1.21\ \pm0.11$		[5] BARATE	98D	ALEP	$e^+e^-\to Z$
$1.32\ \pm0.15\ \pm0.07$		[7] ABE	96M	CDF	$p\overline{p}$ at 1.8 TeV
$1.46\ ^{+0.22}_{-0.21}\ ^{+0.07}_{-0.09}$		ABREU	96D	DLPH	Repl. by ABREU 99W
$1.10\ ^{+0.19}_{-0.17}\ \pm0.09$		[5] ABREU	96D	DLPH	$e^+e^-\to Z$
$1.16\ \pm0.11\ \pm0.06$		[5] AKERS	96	OPAL	$e^+e^-\to Z$
$1.27\ ^{+0.35}_{-0.29}\ \pm0.09$		ABREU	95S	DLPH	Repl. by ABREU 99W
$1.05\ ^{+0.12}_{-0.11}\ \pm0.09$	290	BUSKULIC	95L	ALEP	Repl. by BARATE 98D
$1.04\ ^{+0.48}_{-0.38}\ \pm0.10$	11	[8] ABREU	93F	DLPH	Excess $\Lambda\mu^-$, decay lengths
$1.05\ ^{+0.23}_{-0.20}\ \pm0.08$	157	[9] AKERS	93	OPAL	Excess $\Lambda\ell^-$, decay lengths
$1.12\ ^{+0.32}_{-0.29}\ \pm0.16$	101	[10] BUSKULIC	92I	ALEP	Excess $\Lambda\ell^-$, impact parameters

[1] Measured mean life using fully reconstructed $\Lambda_b^0\to J/\psi\Lambda$ decays.
[2] Measured using $\Lambda\ell^-$ decay length.
[3] Measured using $p\ell^-$ decay length.
[4] This ABREU 99W result is the combined result of the $\Lambda\ell^-$, $p\ell^-$, and excess $\Lambda\mu^-$ impact parameter measurements.
[5] Measured using $\Lambda_c\ell^-$ and $\Lambda\ell^+\ell^-$.
[6] Measured using the excess of $\Lambda\ell^-$, lepton impact parameter.
[7] Measured using $\Lambda_c\ell^-$.
[8] ABREU 93F superseded by ABREU 96D.
[9] AKERS 93 superseded by AKERS 96.
[10] BUSKULIC 92I superseded by BUSKULIC 95L.

b-baryon ADMIXTURE DECAY MODES (Λ_b,Ξ_b,Σ_b,Ω_b)

These branching fractions are actually an average over weakly decaying b-baryons weighted by their production rates at the LHC, LEP, and Tevatron, branching ratios, and detection efficiencies. They scale with the b-baryon production fraction B($b \rightarrow$ b-baryon).

The branching fractions B(b-baryon $\rightarrow$ $\Lambda\ell^-\overline{\nu}_\ell$anything) and B($\Lambda_b^0 \rightarrow$ $\Lambda_c^+\ell^-\overline{\nu}_\ell$anything) are not pure measurements because the underlying measured products of these with B($b \rightarrow$ b-baryon) were used to determine B($b \rightarrow$ b-baryon), as described in the note "Production and Decay of b-Flavored Hadrons."

For inclusive branching fractions, *e.g.*, $B \rightarrow$ $D^\pm$anything, the values usually are multiplicities, not branching fractions. They can be greater than one.

	Mode	Fraction (Γ_i/Γ)
Γ_1	$p\mu^-\overline{\nu}$anything	($5.6^{+\ 2.2}_{-\ 1.9}$) %
Γ_2	$p\ell\overline{\nu}_\ell$anything	(5.4± 1.2) %
Γ_3	$p$anything	(67 ±21) %
Γ_4	$\Lambda\ell^-\overline{\nu}_\ell$anything	(3.6± 0.6) %
Γ_5	$\Lambda\ell^+\nu_\ell$anything	(3.0± 0.8) %
Γ_6	Λanything	(38 ± 7) %
Γ_7	$\Xi^-\ell^-\overline{\nu}_\ell$anything	(6.3± 1.6) $\times 10^{-3}$

b-baryon ADMIXTURE (Λ_b, Ξ_b, Σ_b, Ω_b) BRANCHING RATIOS

$\Gamma(p\mu^-\overline{\nu}\text{anything})/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE (%)	EVTS	DOCUMENT ID		TECN	COMMENT
$5.6^{+2.1}_{-1.8}\pm0.8$	125	[11] ABREU	95S	DLPH	$e^+e^- \rightarrow Z$

[11] ABREU 95S reports $[\Gamma(b\text{-baryon} \rightarrow p\mu^-\overline{\nu}\text{anything})/\Gamma_{\text{total}}] \times [\text{B}(\overline{b} \rightarrow b\text{-baryon})] = 0.0049 \pm 0.0011^{+0.0015}_{-0.0011}$ which we divide by our best value B($\overline{b} \rightarrow$ b-baryon) = $(8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\ell\overline{\nu}_\ell\text{anything})/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
5.4±0.9±0.7	[12] BARATE	98V	ALEP	$e^+e^- \rightarrow Z$

[12] BARATE 98V reports $[\Gamma(b\text{-baryon} \rightarrow p\ell\overline{\nu}_\ell\text{anything})/\Gamma_{\text{total}}] \times [\text{B}(\overline{b} \rightarrow b\text{-baryon})] = (4.72 \pm 0.66 \pm 0.44) \times 10^{-3}$ which we divide by our best value B($\overline{b} \rightarrow$ b-baryon) = $(8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\ell\overline{\nu}_\ell \text{anything})/\Gamma(p\text{anything})$ Γ_2/Γ_3

VALUE (%)	*DOCUMENT ID*		*TECN*	*COMMENT*
8.0±1.2±1.4	BARATE	98V	ALEP	$e^+e^- \to Z$

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

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

VALUE (%)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
3.6±0.6 OUR AVERAGE					
3.7±0.5±0.5		[13] BARATE	98D	ALEP	$e^+e^- \to Z$
3.3±0.4±0.5		[14] AKERS	96	OPAL	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
3.4±0.8±0.5	262	[15] ABREU	95S	DLPH	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
6.9±1.3±0.9	290	[16] BUSKULIC	95L	ALEP	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen	157	[17] AKERS	93	OPAL	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
8.0±2.3±1.1	101	[18] BUSKULIC	92I	ALEP	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$

[13] BARATE 98D reports $[\Gamma(b\text{-baryon} \to \Lambda\ell^-\overline{\nu}_\ell \text{anything})/\Gamma_{\text{total}}] \times [\text{B}(\overline{b} \to b\text{-baryon})] = 0.00326 \pm 0.00016 \pm 0.00039$ which we divide by our best value B($\overline{b} \to$ b-baryon) $= (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Measured using the excess of $\Lambda\ell^-$, lepton impact parameter.

[14] AKERS 96 reports $[\Gamma(b\text{-baryon} \to \Lambda\ell^-\overline{\nu}_\ell \text{anything})/\Gamma_{\text{total}}] \times [\text{B}(\overline{b} \to b\text{-baryon})] = 0.00291 \pm 0.00023 \pm 0.00025$ which we divide by our best value B($\overline{b} \to$ b-baryon) $= (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[15] ABREU 95S reports $[\Gamma(b\text{-baryon} \to \Lambda\ell^-\overline{\nu}_\ell \text{anything})/\Gamma_{\text{total}}] \times [\text{B}(\overline{b} \to b\text{-baryon})] = 0.0030 \pm 0.0006 \pm 0.0004$ which we divide by our best value B($\overline{b} \to$ b-baryon) $= (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[16] BUSKULIC 95L reports $[\Gamma(b\text{-baryon} \to \Lambda\ell^-\overline{\nu}_\ell \text{anything})/\Gamma_{\text{total}}] \times [\text{B}(\overline{b} \to b\text{-baryon})] = 0.0061 \pm 0.0006 \pm 0.0010$ which we divide by our best value B($\overline{b} \to$ b-baryon) $= (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[17] AKERS 93 superseded by AKERS 96.

[18] BUSKULIC 92I reports $[\Gamma(b\text{-baryon} \to \Lambda\ell^-\overline{\nu}_\ell \text{anything})/\Gamma_{\text{total}}] \times [\text{B}(\overline{b} \to b\text{-baryon})] = 0.0070 \pm 0.0010 \pm 0.0018$ which we divide by our best value B($\overline{b} \to$ b-baryon) $= (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Superseded by BUSKULIC 95L.

$\Gamma(\Lambda\ell^+\nu_\ell \text{anything})/\Gamma(\Lambda\text{anything})$ Γ_5/Γ_6

VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
8.0±1.2±0.8	ABBIENDI	99L	OPAL	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
7.0±1.2±0.7	ACKERSTAFF	97N	OPAL	Repl. by ABBIENDI 99L

$\Gamma(\Lambda\text{anything})/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE (%)	*DOCUMENT ID*		*TECN*	*COMMENT*
38± 7 OUR AVERAGE				
40± 5±5	[19] ABBIENDI	99L	OPAL	$e^+e^- \to Z$
$25^{+14}_{-9}\pm3$	[20] ABREU	95C	DLPH	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
45± 7±6	[21] ACKERSTAFF	97N	OPAL	Repl. by ABBIENDI 99L

[19] ABBIENDI 99L reports $[\Gamma(b\text{-baryon} \to \Lambda\text{anything})/\Gamma_{\text{total}}] \times [B(\overline{b} \to b\text{-baryon})] = 0.035 \pm 0.0032 \pm 0.0035$ which we divide by our best value $B(\overline{b} \to b\text{-baryon}) = (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[20] ABREU 95C reports $0.28^{+0.17}_{-0.12}$ from a measurement of $[\Gamma(b\text{-baryon} \to \Lambda\text{anything})/\Gamma_{\text{total}}] \times [B(\overline{b} \to b\text{-baryon})]$ assuming $B(\overline{b} \to b\text{-baryon}) = 0.08 \pm 0.02$, which we rescale to our best value $B(\overline{b} \to b\text{-baryon}) = (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[21] ACKERSTAFF 97N reports $[\Gamma(b\text{-baryon} \to \Lambda\text{anything})/\Gamma_{\text{total}}] \times [B(\overline{b} \to b\text{-baryon})] = 0.0393 \pm 0.0046 \pm 0.0037$ which we divide by our best value $B(\overline{b} \to b\text{-baryon}) = (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Xi^-\ell^-\overline{\nu}_\ell\text{anything})/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*	*COMMENT*
6.3±1.6 OUR AVERAGE				
6.1±1.5±0.8	[22] BUSKULIC	96T	ALEP	Excess $\Xi^-\ell^-$ over $\Xi^-\ell^+$
6.7±2.6±0.9	[23] ABREU	95V	DLPH	Excess $\Xi^-\ell^-$ over $\Xi^-\ell^+$

[22] BUSKULIC 96T reports $[\Gamma(b\text{-baryon} \to \Xi^-\ell^-\overline{\nu}_\ell\text{anything})/\Gamma_{\text{total}}] \times [B(\overline{b} \to b\text{-baryon})] = 0.00054 \pm 0.00011 \pm 0.00008$ which we divide by our best value $B(\overline{b} \to b\text{-baryon}) = (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[23] ABREU 95V reports $[\Gamma(b\text{-baryon} \to \Xi^-\ell^-\overline{\nu}_\ell\text{anything})/\Gamma_{\text{total}}] \times [B(\overline{b} \to b\text{-baryon})] = 0.00059 \pm 0.00021 \pm 0.0001$ which we divide by our best value $B(\overline{b} \to b\text{-baryon}) = (8.8 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

b-baryon ADMIXTURE (Λ_b, Ξ_b, Σ_b, Ω_b) REFERENCES

ABAZOV	12U	PR D85 112003	V.M. Abazov *et al.*	(D0 Collab.)
ABAZOV	07S	PRL 99 142001	V.M. Abazov *et al.*	(D0 Collab.)
ABAZOV	05C	PRL 94 102001	V.M. Abazov *et al.*	(D0 Collab.)
ABBIENDI	99L	EPJ C9 1	G. Abbiendi *et al.*	(OPAL Collab.)
ABREU	99W	EPJ C10 185	P. Abreu *et al.*	(DELPHI Collab.)
ACKERSTAFF	98G	PL B426 161	K. Ackerstaff *et al.*	(OPAL Collab.)
BARATE	98D	EPJ C2 197	R. Barate *et al.*	(ALEPH Collab.)
BARATE	98V	EPJ C5 205	R. Barate *et al.*	(ALEPH Collab.)
ACKERSTAFF	97N	ZPHY C74 423	K. Ackerstaff *et al.*	(OPAL Collab.)
ABE	96M	PRL 77 1439	F. Abe *et al.*	(CDF Collab.)
ABREU	96D	ZPHY C71 199	P. Abreu *et al.*	(DELPHI Collab.)
AKERS	96	ZPHY C69 195	R. Akers *et al.*	(OPAL Collab.)
BUSKULIC	96T	PL B384 449	D. Buskulic *et al.*	(ALEPH Collab.)

ABREU	95C	PL B347 447	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	95S	ZPHY C68 375	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	95V	ZPHY C68 541	P. Abreu *et al.*	(DELPHI Collab.)
BUSKULIC	95L	PL B357 685	D. Buskulic *et al.*	(ALEPH Collab.)
ABREU	93F	PL B311 379	P. Abreu *et al.*	(DELPHI Collab.)
AKERS	93	PL B316 435	R. Akers *et al.*	(OPAL Collab.)
BUSKULIC	92I	PL B297 449	D. Buskulic *et al.*	(ALEPH Collab.)