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.

"OUR EVALUATION" is an average of the data listed below performed by the LEP B Lifetimes Working Group as described in our review "Production and Decay of b-flavored Hadrons" in the $B^{\pm}$ Section of these Listings. The averaging procedure takes into account correlations between the measurements and asymmetric lifetime errors.

VALUE (10^{-12} s)	EVTS	DOCUMENT ID		TECN	COMMENT
1.20±0.07 OUR EVALUATION					
$1.20 \pm 0.08 \pm 0.06$		[1] BARATE	98D	ALEP	$e^+e^- \rightarrow Z$
$1.46^{+0.22}_{-0.21}{}^{+0.07}_{-0.09}$		ABREU	96D	DLPH	Excess $\Lambda \ell^- \pi^+$, decay lengths
$1.10^{+0.19}_{-0.17} \pm 0.09$		ABREU	96D	DLPH	Excess $\Lambda \mu^-$ impact parameters
$1.16 \pm 0.11 \pm 0.06$		AKERS	96	OPAL	Excess $\Lambda \ell^-$, decay lengths and impact parameters
$1.27^{+0.35}_{-0.29} \pm 0.09$		ABREU	95S	DLPH	Excess $p \mu^-$, decay lengths
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.25 \pm 0.11 \pm 0.05$		[2] ABREU	96D	DLPH	Combined result
$1.05^{+0.12}_{-0.11} \pm 0.09$	290	BUSKULIC	95L	ALEP	Repl. by BARATE 98D
$1.04^{+0.48}_{-0.38} \pm 0.10$	11	[3] ABREU	93F	DLPH	Excess $\Lambda \mu^-$, decay lengths
$1.05^{+0.23}_{-0.20} \pm 0.08$	157	[4] AKERS	93	OPAL	Excess $\Lambda \ell^-$, decay lengths
$1.12^{+0.32}_{-0.29} \pm 0.16$	101	[5] BUSKULIC	92I	ALEP	Excess $\Lambda \ell^-$, impact parameters

[1] Measured using the excess of $\Lambda \ell^-$, lepton impact parameter.
[2] Combined result of the three ABREU 96D methods and ABREU 95S.
[3] ABREU 93F superseded by ABREU 96D.
[4] AKERS 93 superseded by AKERS 96.
[5] BUSKULIC 92I superseded by BUSKULIC 95L.

b-baryon ADMIXTURE (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 in Z decay (or high-energy $p\overline{p}$), branching ratios, and detection efficiencies. They scale with the LEP Λ_b production fraction B($b \rightarrow \Lambda_b$) and are evaluated for our value B($b \rightarrow \Lambda_b$) = $(10.1^{+3.9}_{-3.1})$%.

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($b \rightarrow \Lambda_b$) were used to determine B($b \rightarrow \Lambda_b$), as described in the note "Production and Decay of b-Flavored Hadrons."

	Mode	Fraction (Γ_i/Γ)
Γ_1	$p \mu^- \overline{\nu}$ anything	(4.9± 2.4) %
Γ_2	$\Lambda \ell^- \overline{\nu}_\ell$ anything	($3.1^{+1.0}_{-1.2}$) %
Γ_3	$\Lambda \ell^+ \nu_\ell$ anything	
Γ_4	Λ anything	
Γ_5	$\Lambda_c^+ \ell^- \overline{\nu}_\ell$ anything	
Γ_6	$\Lambda / \overline{\Lambda}$ anything	(35^{+12}_{-14}) %
Γ_7	$\Xi^- \ell^- \overline{\nu}_\ell$ anything	($5.5^{+2.0}_{-2.4}$) $\times 10^{-3}$

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*
$\mathbf{0.049^{+0.018}_{-0.015}{}^{+0.015}_{-0.019}}$	125	[6] ABREU 95S	DLPH	$e^+ e^- \rightarrow Z$

[6] ABREU 95S reports [B(b-baryon $\rightarrow p \mu^- \overline{\nu}$anything) $\times$ B($\overline{b} \rightarrow \Lambda_b$)] = $0.0049 \pm 0.0011^{+0.0015}_{-0.0011}$. We divide by our best value B($\overline{b} \rightarrow \Lambda_b$) = $(10.1^{+3.9}_{-3.1}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

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

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
$0.031^{+0.010}_{-0.012}$ OUR AVERAGE					
$0.032\pm0.004^{+0.010}_{-0.012}$		[7] BARATE	98D	ALEP	$e^+e^- \to Z$
$0.029\pm0.003^{+0.009}_{-0.011}$		[8] AKERS	96	OPAL	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
$0.030\pm0.007^{+0.009}_{-0.011}$	262	[9] ABREU	95S	DLPH	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
$0.060\pm0.012^{+0.019}_{-0.023}$	290	[10] BUSKULIC	95L	ALEP	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen	157	[11] AKERS	93	OPAL	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
$0.069\pm0.020^{+0.021}_{-0.027}$	101	[12] BUSKULIC	92I	ALEP	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$

[7] BARATE 98D reports [B(b-baryon $\to \Lambda\ell^-\overline{\nu}_\ell$anything) $\times$ B($\overline{b} \to \Lambda_b$)] = $0.00326 \pm 0.00016 \pm 0.00039$. We divide by our best value B($\overline{b} \to \Lambda_b$) = $(10.1^{+3.9}_{-3.1}) \times 10^{-2}$. 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.

[8] AKERS 96 reports [B(b-baryon $\to \Lambda\ell^-\overline{\nu}_\ell$anything) $\times$ B($\overline{b} \to \Lambda_b$)] = $0.00291 \pm 0.00023 \pm 0.00025$. We divide by our best value B($\overline{b} \to \Lambda_b$) = $(10.1^{+3.9}_{-3.1}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[9] ABREU 95S reports [B(b-baryon $\to \Lambda\ell^-\overline{\nu}_\ell$anything) $\times$ B($\overline{b} \to \Lambda_b$)] = $0.0030 \pm 0.0006 \pm 0.0004$. We divide by our best value B($\overline{b} \to \Lambda_b$) = $(10.1^{+3.9}_{-3.1}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[10] BUSKULIC 95L reports [B(b-baryon $\to \Lambda\ell^-\overline{\nu}_\ell$anything) $\times$ B($\overline{b} \to \Lambda_b$)] = $0.0061 \pm 0.0006 \pm 0.0010$. We divide by our best value B($\overline{b} \to \Lambda_b$) = $(10.1^{+3.9}_{-3.1}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[11] AKERS 93 superseded by AKERS 96.

[12] BUSKULIC 92I reports [B(b-baryon $\to \Lambda\ell^-\overline{\nu}_\ell$anything) $\times$ B($\overline{b} \to \Lambda_b$)] = $0.0070 \pm 0.0010 \pm 0.0018$. We divide by our best value B($\overline{b} \to \Lambda_b$) = $(10.1^{+3.9}_{-3.1}) \times 10^{-2}$. 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_3/Γ_4

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
$0.070\pm0.012\pm0.007$	ACKERSTAFF	97N	OPAL	$e^+e^- \to Z$

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

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
$0.35^{+0.12}_{-0.14}$ OUR AVERAGE				
$0.39\pm0.06^{+0.12}_{-0.15}$	[13] ACKERSTAFF	97N	OPAL	$e^+e^- \to Z$
$0.22^{+0.12}_{-0.08}{}^{+0.07}_{-0.09}$	[14] ABREU	95C	DLPH	$e^+e^- \to Z$

[13] ACKERSTAFF 97N reports $[B(b\text{-baryon} \to \Lambda/\overline{\Lambda}\text{anything}) \times B(\overline{b} \to \Lambda_b)] = 0.0393 \pm 0.0046 \pm 0.0037$. We divide by our best value $B(\overline{b} \to \Lambda_b) = (10.1^{+3.9}_{-3.1}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[14] ABREU 95C reports $0.28^{+0.17}_{-0.12}$ for $B(\overline{b} \to \Lambda_b) = 0.08 \pm 0.02$. We rescale to our best value $B(\overline{b} \to \Lambda_b) = (10.1^{+3.9}_{-3.1}) \times 10^{-2}$. 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	*DOCUMENT ID*	*TECN*	*COMMENT*
$\mathbf{0.0055^{+0.0020}_{-0.0024}}$ **OUR AVERAGE**			
$0.0053 \pm 0.0013^{+0.0016}_{-0.0021}$	[15] BUSKULIC 96T	ALEP	Excess $\Xi^- \ell^-$ over $\Xi^- \ell^+$
$0.0058 \pm 0.0023^{+0.0018}_{-0.0023}$	[16] ABREU 95V	DLPH	Excess $\Xi^- \ell^-$ over $\Xi^- \ell^+$

[15] BUSKULIC 96T reports $[B(b\text{-baryon} \to \Xi^- \ell^- \overline{\nu}_\ell \text{anything}) \times B(\overline{b} \to \Lambda_b)] = 0.00054 \pm 0.00011 \pm 0.00008$. We divide by our best value $B(\overline{b} \to \Lambda_b) = (10.1^{+3.9}_{-3.1}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[16] ABREU 95V reports $[B(b\text{-baryon} \to \Xi^- \ell^- \overline{\nu}_\ell \text{anything}) \times B(\overline{b} \to \Lambda_b)] = 0.00059 \pm 0.00021 \pm 0.0001$. We divide by our best value $B(\overline{b} \to \Lambda_b) = (10.1^{+3.9}_{-3.1}) \times 10^{-2}$. 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

BARATE	98D	EPJ C2 197	R. Barate+	(ALEPH Collab.)
ACKERSTAFF	97N	ZPHY C74 423	K. Ackerstaff+	(OPAL Collab.)
ABREU	96D	ZPHY C71 199	+Adam, Adye, Agasi+	(DELPHI Collab.)
AKERS	96	ZPHY C69 195	+Alexander, Allison, Altekamp+	(OPAL Collab.)
BUSKULIC	96T	PL B384 449	+De Bonis, Decamp, Ghez+	(ALEPH Collab.)
ABREU	95C	PL B347 447	+Adam, Adye, Agasi+	(DELPHI Collab.)
ABREU	95S	ZPHY C68 375	+Adam, Adye, Agasi+	(DELPHI Collab.)
ABREU	95V	ZPHY C68 541	+Adam, Adye, Agasi+	(DELPHI Collab.)
BUSKULIC	95L	PL B357 685	+Casper, De Bonis, Decamp+	(ALEPH Collab.)
ABREU	93F	PL B311 379	+Adam, Adye, Agasi+	(DELPHI Collab.)
AKERS	93	PL B316 435	+Alexander, Allison, Anderson+	(OPAL Collab.)
BUSKULIC	92I	PL B297 449	+Decamp, Goy, Lees+	(ALEPH Collab.)