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.

"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
1.208±0.051 OUR EVALUATION					
1.16 ±0.20 ±0.08		[1] ABREU	99W	DLPH	$e^+e^- \to Z$
1.19 ±0.14 ±0.07		[2] ABREU	99W	DLPH	$e^+e^- \to Z$
1.20 ±0.08 ±0.06		[3] BARATE	98D	ALEP	$e^+e^- \to Z$
$1.10\ ^{+0.19}_{-0.17}$ ±0.09		ABREU	96D	DLPH	Excess $\Lambda\mu^-$ impact parameters
1.16 ±0.11 ±0.06		AKERS	96	OPAL	Excess $\Lambda\ell^-$, decay lengths and impact parameters
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.14 ±0.08 ±0.04		[4] ABREU	99W	DLPH	$e^+e^- \to Z$
$1.46\ ^{+0.22}_{-0.21}\ ^{+0.07}_{-0.09}$		ABREU	96D	DLPH	Repl. by ABREU 99W
$1.27\ ^{+0.35}_{-0.29}$ ±0.09		ABREU	95S	DLPH	Repl. by ABREU 99W
$1.05\ ^{+0.12}_{-0.11}$ ±0.09	290	BUSKULIC	95L	ALEP	Repl. by BARATE 98D
$1.04\ ^{+0.48}_{-0.38}$ ±0.10	11	[5] ABREU	93F	DLPH	Excess $\Lambda\mu^-$, decay lengths
$1.05\ ^{+0.23}_{-0.20}$ ±0.08	157	[6] AKERS	93	OPAL	Excess $\Lambda\ell^-$, decay lengths
$1.12\ ^{+0.32}_{-0.29}$ ±0.16	101	[7] BUSKULIC	92I	ALEP	Excess $\Lambda\ell^-$, impact parameters

[1] Measured using $\Lambda\ell^-$ decay length.
[2] Measured using $p\ell^-$ decay length.
[3] Measured using the excess of $\Lambda\ell^-$, lepton impact parameter.
[4] This ABREU 99W result is the combined result of the $\Lambda\ell^-$, $p\ell^-$, and excess $\Lambda\mu^-$ impact parameter measurements.
[5] ABREU 93F superseded by ABREU 96D.
[6] AKERS 93 superseded by AKERS 96.
[7] BUSKULIC 92I superseded by BUSKULIC 95L.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 b-baryon production fraction B($b \rightarrow$ b-baryon) and are evaluated for our value B($b \rightarrow$ b-baryon) = (11.6 ± 2.0)%.

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."

	Mode	Fraction (Γ_i/Γ)
Γ_1	$p\mu^-\overline{\nu}$ anything	$(4.2^{+1.8}_{-1.5})$ %
Γ_2	$p\ell\overline{\nu}_\ell$ anything	(4.1 ± 1.0) %
Γ_3	p anything	(51 ± 17) %
Γ_4	$\Lambda\ell^-\overline{\nu}_\ell$ anything	(2.7 ± 0.8) %
Γ_5	$\Lambda\ell^+\nu_\ell$ anything	
Γ_6	Λ anything	
Γ_7	$\Lambda_c^+\ell^-\overline{\nu}_\ell$ anything	
Γ_8	$\Lambda/\overline{\Lambda}$ anything	(28 ± 7) %
Γ_9	$\Xi^-\ell^-\overline{\nu}_\ell$ anything	$(4.8 \pm 1.3) \times 10^{-3}$

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

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.042^{+0.016}_{-0.013} \pm 0.007}$	125	[8] ABREU	95S	DLPH	$e^+e^- \rightarrow Z$

[8] ABREU 95S reports [B(b-baryon $\rightarrow p\mu^-\overline{\nu}$anything) × B($\overline{b} \rightarrow$ b-baryon)] = $0.0049 \pm 0.0011^{+0.0015}_{-0.0011}$. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) = $(11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.041 ± 0.007 ± 0.007	[9] BARATE	98V	ALEP	$e^+e^- \rightarrow Z$

[9] BARATE 98V reports [B(b-baryon $\rightarrow p\ell\overline{\nu}_\ell$anything) × B($\overline{b} \rightarrow$ b-baryon)] = $(4.72 \pm 0.66 \pm 0.44) \times 10^{-3}$. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) = $(11.6 \pm 2.0) \times 10^{-2}$. 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
0.080 ± 0.012 ± 0.014	BARATE	98V	ALEP	$e^+e^- \rightarrow Z$

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

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.027±0.008 OUR AVERAGE					
0.028±0.004±0.005		[10] BARATE	98D	ALEP	$e^+e^- \rightarrow Z$
0.025±0.003±0.004		[11] AKERS	96	OPAL	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
0.026±0.006±0.004	262	[12] ABREU	95S	DLPH	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
0.053±0.010±0.009	290	[13] BUSKULIC	95L	ALEP	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen	157	[14] AKERS	93	OPAL	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
0.060±0.018±0.010	101	[15] BUSKULIC	92I	ALEP	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$

[10] BARATE 98D reports [B(b-baryon $\rightarrow$ $\Lambda\ell^-\overline{\nu}_\ell$ anything) $\times$ B($\overline{b} \rightarrow$ b-baryon)] = 0.00326 ± 0.00016 ± 0.00039. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) = (11.6 ± 2.0) $\times 10^{-2}$. 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.

[11] AKERS 96 reports [B(b-baryon $\rightarrow$ $\Lambda\ell^-\overline{\nu}_\ell$ anything) $\times$ B($\overline{b} \rightarrow$ b-baryon)] = 0.00291 ± 0.00023 ± 0.00025. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) = (11.6 ± 2.0) $\times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[12] ABREU 95S reports [B(b-baryon $\rightarrow$ $\Lambda\ell^-\overline{\nu}_\ell$ anything) $\times$ B($\overline{b} \rightarrow$ b-baryon)] = 0.0030 ± 0.0006 ± 0.0004. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) = (11.6 ± 2.0) $\times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[13] BUSKULIC 95L reports [B(b-baryon $\rightarrow$ $\Lambda\ell^-\overline{\nu}_\ell$ anything) $\times$ B($\overline{b} \rightarrow$ b-baryon)] = 0.0061 ± 0.0006 ± 0.0010. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) = (11.6 ± 2.0) $\times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[14] AKERS 93 superseded by AKERS 96.

[15] BUSKULIC 92I reports [B(b-baryon $\rightarrow$ $\Lambda\ell^-\overline{\nu}_\ell$ anything) $\times$ B($\overline{b} \rightarrow$ b-baryon)] = 0.0070 ± 0.0010 ± 0.0018. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) = (11.6 ± 2.0) $\times 10^{-2}$. 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	DOCUMENT ID		TECN	COMMENT
0.080±0.012±0.008	ABBIENDI	99L	OPAL	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.070±0.012±0.007	ACKERSTAFF	97N	OPAL	Repl. by ABBIENDI 99L

$\Gamma(\Lambda/\overline{\Lambda} \text{anything})/\Gamma_{total}$ — Γ_8/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.28±0.07 OUR AVERAGE				
0.30±0.04±0.05	[16] ABBIENDI	99L	OPAL	$e^+e^- \rightarrow Z$
$0.19^{+0.11}_{-0.07}$±0.03	[17] ABREU	95C	DLPH	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				

$0.34 \pm 0.05 \pm 0.06$	[18] ACKERSTAFF 97N OPAL	Repl. by ABBIENDI 99L

[16] ABBIENDI 99L reports [B(b-baryon $\rightarrow$ $\Lambda/\overline{\Lambda}$anything) $\times$ B($\overline{b} \rightarrow$ b-baryon)] $= 0.035 \pm 0.0032 \pm 0.0035$. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) $= (11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[17] ABREU 95C reports $0.28^{+0.17}_{-0.12}$ for B($\overline{b} \rightarrow$ b-baryon) $= 0.08 \pm 0.02$. We rescale to our best value B($\overline{b} \rightarrow$ b-baryon) $= (11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[18] ACKERSTAFF 97N reports [B(b-baryon $\rightarrow$ $\Lambda/\overline{\Lambda}$anything) $\times$ B($\overline{b} \rightarrow$ b-baryon)] $= 0.0393 \pm 0.0046 \pm 0.0037$. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) $= (11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Xi^- \ell^- \overline{\nu}_\ell \text{ anything})/\Gamma_{total}$ — Γ_9/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.0048±0.0013 OUR AVERAGE			
$0.0047 \pm 0.0012 \pm 0.0008$	[19] BUSKULIC 96T	ALEP	Excess $\Xi^- \ell^-$ over $\Xi^- \ell^+$
$0.0051 \pm 0.0020 \pm 0.0009$	[20] ABREU 95V	DLPH	Excess $\Xi^- \ell^-$ over $\Xi^- \ell^+$

[19] BUSKULIC 96T reports [B(b-baryon $\rightarrow$ $\Xi^- \ell^- \overline{\nu}_\ell$ anything) $\times$ B($\overline{b} \rightarrow$ b-baryon)] $= 0.00054 \pm 0.00011 \pm 0.00008$. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) $= (11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[20] ABREU 95V reports [B(b-baryon $\rightarrow$ $\Xi^- \ell^- \overline{\nu}_\ell$ anything) $\times$ B($\overline{b} \rightarrow$ b-baryon)] $= 0.00059 \pm 0.00021 \pm 0.0001$. We divide by our best value B($\overline{b} \rightarrow$ b-baryon) $= (11.6 \pm 2.0) \times 10^{-2}$. 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

ABBIENDI	99L	EPJ C9 1	G. Abbiendi *et al.*	(OPAL Collab.)
ABREU	99W	EPJ C10 185	P. Abreu *et al.*	(DELPHI 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.)
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.)