

b-baryon ADMIXTURE ($\Lambda_b, \Xi_b, \Omega_b$)

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. ● ● ●				
$1.218^{+0.130}_{-0.115} \pm 0.042$		¹ ABAZOV	07S D0	Repl. by ABAZOV 12U
$1.22^{+0.22}_{-0.18} \pm 0.04$		¹ ABAZOV	05C D0	Repl. by ABAZOV 07S
$1.16 \pm 0.20 \pm 0.08$		² ABREU	99W DLPH	$e^+e^- \rightarrow Z$
$1.19 \pm 0.14 \pm 0.07$		³ ABREU	99W DLPH	$e^+e^- \rightarrow Z$
$1.14 \pm 0.08 \pm 0.04$		⁴ ABREU	99W DLPH	$e^+e^- \rightarrow Z$
$1.11^{+0.19}_{-0.18} \pm 0.05$		⁵ ABREU	99W DLPH	$e^+e^- \rightarrow Z$
$1.29^{+0.24}_{-0.22} \pm 0.06$		⁵ ACKERSTAFF	98G OPAL	$e^+e^- \rightarrow Z$
$1.20 \pm 0.08 \pm 0.06$		⁶ BARATE	98D ALEP	$e^+e^- \rightarrow Z$
1.21 ± 0.11		⁵ BARATE	98D ALEP	$e^+e^- \rightarrow Z$
$1.32 \pm 0.15 \pm 0.07$		⁷ ABE	96M CDF	$p\bar{p}$ at 1.8 TeV
$1.46^{+0.22}_{-0.21} \pm 0.07 \pm 0.09$		ABREU	96D DLPH	Repl. by ABREU 99W
$1.10^{+0.19}_{-0.17} \pm 0.09$		⁵ ABREU	96D DLPH	$e^+e^- \rightarrow Z$
$1.16 \pm 0.11 \pm 0.06$		⁵ AKERS	96 OPAL	$e^+e^- \rightarrow Z$
$1.27^{+0.35}_{-0.29} \pm 0.09$		ABREU	95S DLPH	Repl. by ABREU 99W
$1.05^{+0.12}_{-0.11} \pm 0.09$	290	BUSKULIC	95L ALEP	Repl. by BARATE 98D
$1.04^{+0.48}_{-0.38} \pm 0.10$	11	⁸ ABREU	93F DLPH	Excess $\Lambda\mu^-$, decay lengths
$1.05^{+0.23}_{-0.20} \pm 0.08$	157	⁹ AKERS	93 OPAL	Excess $\Lambda\ell^-$, decay lengths
$1.12^{+0.32}_{-0.29} \pm 0.16$	101	¹⁰ BUSKULIC	92I ALEP	Excess $\Lambda\ell^-$, impact parameters

¹ Measured mean life using fully reconstructed $\Lambda_b^0 \rightarrow J/\psi \Lambda$ 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⁸ ABREU 93F superseded by ABREU 96D.

⁹ AKERS 93 superseded by AKERS 96.

¹⁰ BUSKULIC 92I superseded by BUSKULIC 95L.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** ($\Lambda_b, \Xi_b, \Omega_b$)

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 $B(b \rightarrow b\text{-baryon})$.

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

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

Mode	Fraction (Γ_i/Γ)	Scale factor
$\Gamma_1 \quad p \mu^- \bar{\nu} \text{ anything}$	$(5.8^{+2.3}_{-2.0})\%$	
$\Gamma_2 \quad p \ell \bar{\nu}_\ell \text{ anything}$	$(5.6 \pm 1.2)\%$	
$\Gamma_3 \quad p \text{ anything}$	$(70 \pm 22)\%$	
$\Gamma_4 \quad \Lambda \ell^- \bar{\nu}_\ell \text{ anything}$	$(3.8 \pm 0.6)\%$	
$\Gamma_5 \quad \Lambda \ell^+ \nu_\ell \text{ anything}$	$(3.2 \pm 0.8)\%$	
$\Gamma_6 \quad \Lambda \text{ anything}$	$(39 \pm 7)\%$	
$\Gamma_7 \quad \Xi^- \ell^- \bar{\nu}_\ell \text{ anything}$	$(4.6 \pm 1.4) \times 10^{-3}$	1.2

***b*-baryon ADMIXTURE ($\Lambda_b, \Xi_b, \Omega_b$) BRANCHING RATIOS**

$\Gamma(p \mu^- \bar{\nu} \text{ anything})/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
$5.8^{+2.2}_{-1.9} \pm 0.8$	125	¹ ABREU	95s DLPH	$e^+ e^- \rightarrow Z$	

¹ ABREU 95S reports $[\Gamma(b\text{-baryon} \rightarrow p \mu^- \bar{\nu} \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = 0.0049 \pm 0.0011^{+0.0015}_{-0.0011}$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p \ell \bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}$					Γ_2/Γ
VALUE (%)		DOCUMENT ID	TECN	COMMENT	
$5.6 \pm 0.9 \pm 0.7$		¹ BARATE	98V ALEP	$e^+ e^- \rightarrow Z$	

¹ BARATE 98V reports $[\Gamma(b\text{-baryon} \rightarrow p \ell \bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = (4.72 \pm 0.66 \pm 0.44) \times 10^{-3}$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho\ell\bar{\nu}_\ell \text{ anything})/\Gamma(\rho \text{ anything})$

Γ_2/Γ_3

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

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

Γ_4/Γ

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

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
3.8±0.6 OUR AVERAGE				
3.9±0.5±0.5		¹ BARATE	98D ALEP	$e^+e^- \rightarrow Z$
3.5±0.4±0.5		² AKERS	96 OPAL	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
3.6±0.9±0.5	262	³ ABREU	95S DLPH	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
7.3±1.4±1.0	290	⁴ BUSKULIC	95L ALEP	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	157	⁵ AKERS	93 OPAL	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
8.3±2.5±1.1	101	⁶ BUSKULIC	92I ALEP	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$

¹ BARATE 98D reports $[\Gamma(b\text{-baryon} \rightarrow \Lambda\ell^-\bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = 0.00326 \pm 0.00016 \pm 0.00039$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. 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.

² AKERS 96 reports $[\Gamma(b\text{-baryon} \rightarrow \Lambda\ell^-\bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = 0.00291 \pm 0.00023 \pm 0.00025$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ ABREU 95S reports $[\Gamma(b\text{-baryon} \rightarrow \Lambda\ell^-\bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = 0.0030 \pm 0.0006 \pm 0.0004$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ BUSKULIC 95L reports $[\Gamma(b\text{-baryon} \rightarrow \Lambda\ell^-\bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = 0.0061 \pm 0.0006 \pm 0.0010$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁵ AKERS 93 superseded by AKERS 96.

⁶ BUSKULIC 92I reports $[\Gamma(b\text{-baryon} \rightarrow \Lambda\ell^-\bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = 0.0070 \pm 0.0010 \pm 0.0018$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. 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_5/Γ_6

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
8.0±1.2±0.8	ABBIENDI	99L OPAL	$e^+e^- \rightarrow Z$

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

Γ_6/Γ

VALUE (%) DOCUMENT ID TECN COMMENT

39 ± 7 OUR AVERAGE

42 ± 6 ± 5	¹ ABBIENDI	99L	OPAL	$e^+ e^- \rightarrow Z$
27 ⁺¹⁵ ₋₉ ± 3	² ABREU	95C	DLPH	$e^+ e^- \rightarrow Z$

• • • We do not use the following data for averages, fits, limits, etc. • • •

47 ± 7 ± 6	³ ACKERSTAFF	97N	OPAL	Repl. by ABBIENDI 99L
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¹ ABBIENDI 99L reports $[\Gamma(b\text{-baryon} \rightarrow \Lambda \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = 0.035 \pm 0.0032 \pm 0.0035$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² ABREU 95C reports $0.28^{+0.17}_{-0.12}$ from a measurement of $[\Gamma(b\text{-baryon} \rightarrow \Lambda \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})]$ assuming $B(\bar{b} \rightarrow b\text{-baryon}) = 0.08 \pm 0.02$, which we rescale to our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ ACKERSTAFF 97N reports $[\Gamma(b\text{-baryon} \rightarrow \Lambda \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = 0.0393 \pm 0.0046 \pm 0.0037$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

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

Γ_7/Γ

VALUE (units 10⁻³) DOCUMENT ID TECN COMMENT

4.6 ± 1.4 OUR AVERAGE Error includes scale factor of 1.2.

3.6 ± 1.2 ± 0.5	¹ ABDALLAH	05C	DLPH	$e^+ e^- \rightarrow Z^0$
6.4 ± 1.6 ± 0.8	² BUSKULIC	96T	ALEP	Excess $\Xi^- \ell^-$ over $\Xi^- \ell^+$

• • • We do not use the following data for averages, fits, limits, etc. • • •

7.0 ± 2.8 ± 0.9	³ ABREU	95V	DLPH	Repl. by ABDALLAH 05C
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¹ ABDALLAH 05C reports $[\Gamma(b\text{-baryon} \rightarrow \Xi^- \ell^- \bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = (3.0 \pm 1.0 \pm 0.3) \times 10^{-4}$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² BUSKULIC 96T reports $[\Gamma(b\text{-baryon} \rightarrow \Xi^- \ell^- \bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = (5.4 \pm 1.1 \pm 0.8) \times 10^{-4}$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ ABREU 95V reports $[\Gamma(b\text{-baryon} \rightarrow \Xi^- \ell^- \bar{\nu}_\ell \text{ anything})/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow b\text{-baryon})] = (5.9 \pm 2.1 \pm 1.0) \times 10^{-4}$ which we divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

b -baryon ADMIXTURE ($\Lambda_b, \Xi_b, \Omega_b$) REFERENCES

ABAZOV	12U	PR D85 112003	V.M. Abazov <i>et al.</i>	(D0 Collab.)
ABAZOV	07S	PRL 99 142001	V.M. Abazov <i>et al.</i>	(D0 Collab.)
ABAZOV	05C	PRL 94 102001	V.M. Abazov <i>et al.</i>	(D0 Collab.)
ABDALLAH	05C	EPJ C44 299	J. Abdallah <i>et al.</i>	(DELPHI Collab.)
ABBIENDI	99L	EPJ C9 1	G. Abbiendi <i>et al.</i>	(OPAL Collab.)
ABREU	99W	EPJ C10 185	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACKERSTAFF	98G	PL B426 161	K. Akerstaff <i>et al.</i>	(OPAL Collab.)
BARATE	98D	EPJ C2 197	R. Barate <i>et al.</i>	(ALEPH Collab.)

BARATE	98V	EPJ C5 205	R. Barate <i>et al.</i>	(ALEPH Collab.)
ACKERSTAFF	97N	ZPHY C74 423	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
ABE	96M	PRL 77 1439	F. Abe <i>et al.</i>	(CDF Collab.)
ABREU	96D	ZPHY C71 199	P. Abreu <i>et al.</i>	(DELPHI Collab.)
AKERS	96	ZPHY C69 195	R. Akers <i>et al.</i>	(OPAL Collab.)
BUSKULIC	96T	PL B384 449	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
ABREU	95C	PL B347 447	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ABREU	95S	ZPHY C68 375	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ABREU	95V	ZPHY C68 541	P. Abreu <i>et al.</i>	(DELPHI Collab.)
BUSKULIC	95L	PL B357 685	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
ABREU	93F	PL B311 379	P. Abreu <i>et al.</i>	(DELPHI Collab.)
AKERS	93	PL B316 435	R. Akers <i>et al.</i>	(OPAL Collab.)
BUSKULIC	92I	PL B297 449	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
