



$$I(J^P) = 0(\frac{1}{2}^+) \quad \text{Status: } ***$$

In the quark model, a Λ_b^0 is an isospin-0 udb state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I , J , or P have actually been measured.

Λ_b^0 MASS

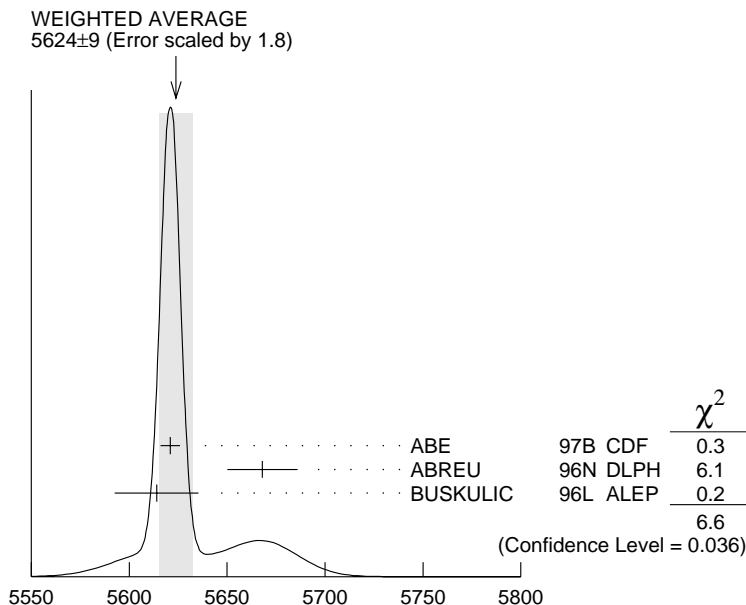
<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
5624 ± 9 OUR AVERAGE		Error includes scale factor of 1.8. See the ideogram below.		
5621 ± 4 ± 3		¹ ABE	97B CDF	$p\bar{p}$ at 1.8 TeV
5668 ± 16 ± 8	4	² ABREU	96N DLPH	$e^+e^- \rightarrow Z$
5614 ± 21 ± 4	4	² BUSKULIC	96L ALEP	$e^+e^- \rightarrow Z$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
not seen		³ ABE	93B CDF	Sup. by ABE 97B
5640 ± 50 ± 30	16	⁴ ALBAJAR	91E UA1	$p\bar{p}$ 630 GeV
5640 ⁺¹⁰⁰ ₋₂₁₀	52	BARI	91 SFM	$\Lambda_b^0 \rightarrow \rho D^0 \pi^-$
5650 ⁺¹⁵⁰ ₋₂₀₀	90	BARI	91 SFM	$\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^+ \pi^- \pi^-$

¹ ABE 97B observed 38 events above a background 18 ± 1.6 events in the mass range 5.60–5.65 GeV/ c^2 , a significance of > 3.4 standard deviations.

² Uses 4 fully reconstructed Λ_b events.

³ ABE 93B states that, based on the signal claimed by ALBAJAR 91E, CDF should have found $30 \pm 23 \Lambda_b^0 \rightarrow J/\psi(1S)\Lambda$ events. Instead, CDF found not more than 2 events.

⁴ ALBAJAR 91E claims 16 ± 5 events above a background of 9 ± 1 events, a significance of about 5 standard deviations.



Λ_b^0 mass (MeV)

Λ_b^0 MEAN LIFE

These are actually measurements of the average lifetime of weakly decaying b baryons weighted by generally unknown production rates, branching fractions, and detection efficiencies. Presumably, the mix is mainly Λ_b^0 , with some Ξ_b^0 and Ξ_b^- .

See b -baryon Admixture section for data on b -baryon mean life average over species of b -baryon particles.

“OUR EVALUATION” is an average of the data listed below performed by the Heavy Flavor Averaging Group (HFAG) as described in our review “Production and Decay of b -flavored Hadrons” in the B^\pm Section of the Listings. The averaging procedure takes into account correlations between the measurements and asymmetric lifetime errors.

VALUE (10^{-12} s)	EVTS	DOCUMENT ID	TECN	COMMENT
1.229±0.080				OUR EVALUATION
1.11 $^{+0.19}_{-0.18}$ ±0.05	5	ABREU	99W DLPH	$e^+ e^- \rightarrow Z$
1.29 $^{+0.24}_{-0.22}$ ±0.06	5	ACKERSTAFF	98G OPAL	$e^+ e^- \rightarrow Z$
1.21 ±0.11	5	BARATE	98D ALEP	$e^+ e^- \rightarrow Z$
1.32 ±0.15 ±0.07		ABE	96M CDF	Excess $\Lambda_c \ell^-$, decay lengths

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

1.19	$\begin{matrix} +0.21 & +0.07 \\ -0.18 & -0.08 \end{matrix}$		ABREU	96D DLPH	Repl. by ABREU 99W
1.14	$\begin{matrix} +0.22 \\ -0.19 \end{matrix} \pm 0.07$	69	AKERS	95K OPAL	Repl. by ACKER-STAFF 98G
1.02	$\begin{matrix} +0.23 \\ -0.18 \end{matrix} \pm 0.06$	44	BUSKULIC	95L ALEP	Repl. by BARATE 98D

⁵ Measured using $\Lambda_c \ell^-$ and $\Lambda \ell^+ \ell^-$.

Λ_b^0 DECAY MODES

These branching fractions are actually an average over weakly decaying b -baryons weighted by their production rates in Z decay (or high-energy $p\bar{p}$), branching ratios, and detection efficiencies. They scale with the LEP b -baryon production fraction $B(b \rightarrow b\text{-baryon})$ and are evaluated for our value $B(b \rightarrow b\text{-baryon}) = (11.8 \pm 2.0)\%$.

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."

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 $J/\psi(1S)\Lambda$	$(4.7 \pm 2.8) \times 10^{-4}$	
Γ_2 $pD^0\pi^-$		
Γ_3 $\Lambda_c^+\pi^-$	seen	
Γ_4 $\Lambda_c^+a_1(1260)^-$	seen	
Γ_5 $\Lambda_c^+\pi^+\pi^-\pi^-$		
Γ_6 $\Lambda K^0 2\pi^+ 2\pi^-$		
Γ_7 $\Lambda_c^+ \ell^- \bar{\nu}_\ell \text{ anything}$	[a] $(7.7 \pm 1.8)\%$	
Γ_8 $p\pi^-$	$< 5.0 \times 10^{-5}$	90%
Γ_9 pK^-	$< 5.0 \times 10^{-5}$	90%
Γ_{10} $\Lambda\gamma$	$< 1.3 \times 10^{-3}$	90%

[a] Not a pure measurement. See note at head of Λ_b^0 Decay Modes.

Λ_b^0 BRANCHING RATIOS

$\Gamma(J/\psi(1S)\Lambda)/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$4.7 \pm 2.1 \pm 1.9$		⁶ ABE	97B CDF	$p\bar{p}$ at 1.8 TeV

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

153. $\pm 93.$ $\pm 27.$	16	⁷ ALBAJAR	91E UA1	$J/\psi(1S) \rightarrow \mu^+ \mu^-$
--------------------------	----	----------------------	---------	--------------------------------------

⁶ ABE 97B reports $(0.037 \pm 0.017(\text{stat}) \pm 0.007(\text{sys}))\%$ for $B(b \rightarrow b\text{-baryon}) = 0.1$ and for $B(B^0 \rightarrow J/\psi(1S)K_S^0) = 0.037\%$. We rescale to our PDG 98 best value $B(b \rightarrow b\text{-baryon}) = (10.1^{+3.9}_{-3.1})\%$ and $B(B^0 \rightarrow J/\psi(1S)K_S^0) = (0.044 \pm 0.006)\%$. Our first error is their experiments's error and our second error is the systematic error from using our best value.

⁷ ALBAJAR 91E reports 180 ± 110 for $B(\bar{b} \rightarrow b\text{-baryon}) = 0.10$. We rescale to our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.8 \pm 2.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(pD^0\pi^-)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

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

seen	52	BARI	91 SFM	$D^0 \rightarrow K^- \pi^+$
seen		BASILE	81 SFM	$D^0 \rightarrow K^- \pi^+$

$\Gamma(\Lambda_c^+ \pi^-)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

seen	3	ABREU	96N DLPH	$\Lambda_c^+ \rightarrow p K^- \pi^+$
seen	4	BUSKULIC	96L ALEP	$\Lambda_c^+ \rightarrow p K^- \pi^+, \rho \bar{K}^0,$ $\Lambda \pi^+ \pi^+ \pi^-$

$\Gamma(\Lambda_c^+ a_1(1260)^-)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

seen	1	ABREU	96N DLPH	$\Lambda_c^+ \rightarrow p K^- \pi^+,$ $a_1^- \rightarrow \rho^0 \pi^- \rightarrow$ $\pi^+ \pi^- \pi^-$
-------------	---	-------	----------	---

$\Gamma(\Lambda_c^+ \pi^+ \pi^- \pi^-)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

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

seen	90	BARI	91 SFM	$\Lambda_c^+ \rightarrow p K^- \pi^+$
------	----	------	--------	---------------------------------------

$\Gamma(\Lambda K^0 2\pi^+ 2\pi^-)/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

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

seen	4	⁸ ARENTON	86 FMPS	$\Lambda K_S^0 2\pi^+ 2\pi^-$
------	---	----------------------	---------	-------------------------------

⁸ See the footnote to the ARENTON 86 mass value.

$\Gamma(\Lambda_c^+ \ell^- \bar{\nu}_\ell \text{anything})/\Gamma_{\text{total}}$ Γ_7/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
-------	------	-------------	------	---------

0.077 ± 0.018 OUR AVERAGE

0.073 ± 0.013 ± 0.013		⁹ BARATE	98D ALEP	$e^+ e^- \rightarrow Z$
-----------------------	--	---------------------	----------	-------------------------

0.100 ^{+0.034} _{-0.028} ± 0.018	29	¹⁰ ABREU	95S DLPH	$e^+ e^- \rightarrow Z$
---	----	---------------------	----------	-------------------------

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

- 0.064 ± 0.016 ± 0.011 55 11 BUSKULIC 95L ALEP Repl. by BARATE 98D
- 0.13 ± 0.05 ± 0.02 21 12 BUSKULIC 92E ALEP $\Lambda_c^+ \rightarrow p K^- \pi^+$
- ⁹ BARATE 98D reports $[B(\Lambda_b^0 \rightarrow \Lambda_c^+ \ell^- \bar{\nu}_\ell \text{ anything}) \times B(\bar{b} \rightarrow b\text{-baryon})] = 0.0086 \pm 0.0007 \pm 0.0014$. We divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.8 \pm 2.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Measured using $\Lambda_c \ell^-$ and $\Lambda \ell^+ \ell^-$.
- ¹⁰ ABREU 95S reports $[B(\Lambda_b^0 \rightarrow \Lambda_c^+ \ell^- \bar{\nu}_\ell \text{ anything}) \times B(\bar{b} \rightarrow b\text{-baryon})] = 0.0118 \pm 0.0026^{+0.0031}_{-0.0021}$. We divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.8 \pm 2.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ¹¹ BUSKULIC 95L reports $[B(\Lambda_b^0 \rightarrow \Lambda_c^+ \ell^- \bar{\nu}_\ell \text{ anything}) \times B(\bar{b} \rightarrow b\text{-baryon})] = 0.00755 \pm 0.0014 \pm 0.0012$. We divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.8 \pm 2.1) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ¹² BUSKULIC 92E reports $[B(\Lambda_b^0 \rightarrow \Lambda_c^+ \ell^- \bar{\nu}_\ell \text{ anything}) \times B(\bar{b} \rightarrow b\text{-baryon})] = 0.015 \pm 0.0035 \pm 0.0045$. We divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.8 \pm 2.1) \times 10^{-2}$. 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.

$\Gamma(p\pi^-)/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<5.0 × 10⁻⁵	90	¹³ BUSKULIC	96V ALEP	$e^+ e^- \rightarrow Z$

¹³ BUSKULIC 96V assumes PDG 96 production fractions for B^0 , B^+ , B_s , b baryons.

$\Gamma(pK^-)/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<5.0 × 10⁻⁵	90	¹⁴ BUSKULIC	96V ALEP	$e^+ e^- \rightarrow Z$

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

<3.6 × 10 ⁻⁴	90	¹⁵ ADAM	96D DLPH	$e^+ e^- \rightarrow Z$
-------------------------	----	--------------------	----------	-------------------------

¹⁴ BUSKULIC 96V assumes PDG 96 production fractions for B^0 , B^+ , B_s , b baryons.

¹⁵ ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.

$\Gamma(\Lambda\gamma)/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<1.3 × 10⁻³	90	ACOSTA	02G CDF	$p\bar{p}$ at 1.8 TeV

Λ_b^0 REFERENCES

ACOSTA	02G	PR D66 112002	D. Acosta <i>et al.</i>	(CDF Collab.)
ABREU	99W	EPJ C10 185	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACKERSTAFF	98G	PL B426 161	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
BARATE	98D	EPJ C2 197	R. Barate <i>et al.</i>	(ALEPH Collab.)
PDG	98	EPJ C3 1	C. Caso <i>et al.</i>	
ABE	97B	PR D55 1142	F. Abe <i>et al.</i>	(CDF 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.)
ABREU	96N	PL B374 351	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ADAM	96D	ZPHY C72 207	W. Adam <i>et al.</i>	(DELPHI Collab.)
BUSKULIC	96L	PL B380 442	D. Buskulic <i>et al.</i>	(ALEPH Collab.)

BUSKULIC	96V	PL B384 471	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
PDG	96	PR D54 1	R. M. Barnett <i>et al.</i>	
ABREU	95S	ZPHY C68 375	P. Abreu <i>et al.</i>	(DELPHI Collab.)
AKERS	95K	PL B353 402	R. Akers <i>et al.</i>	(OPAL Collab.)
BUSKULIC	95L	PL B357 685	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
ABE	93B	PR D47 R2639	F. Abe <i>et al.</i>	(CDF Collab.)
BUSKULIC	92E	PL B294 145	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
ALBAJAR	91E	PL B273 540	C. Albajar <i>et al.</i>	(UA1 Collab.)
BARI	91	NC 104A 1787	G. Bari <i>et al.</i>	(CERN R422 Collab.)
ARENTON	86	NP B274 707	M.W. Arenton <i>et al.</i>	(ARIZ, NDAM, VAND)
BASILE	81	LNC 31 97	M. Basile <i>et al.</i>	(CERN R415 Collab.)
