BOTTOM (BEAUTY) BARYON
$(B = -1)$

$\Lambda_b^0 = u\,d\,b$

Λ_b^0

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

In the quark model, a Λ_b^0 is an isospin-0 $u\,d\,b$ 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

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
5641± 50 OUR AVERAGE					
5640± 50±30	16	[1] ALBAJAR	91E	UA1	$p\overline{p}$ 630 GeV
5640^{+100}_{-210}	52	BARI	91	SFM	$\Lambda_b^0 \rightarrow p D^0 \pi^-$
5650^{+150}_{-200}	90	BARI	91	SFM	$\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^+ \pi^- \pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
not seen		[2] ABE	93B	CDF	$p\overline{p}$ 1.8 TeV
∼ 5750	4	[3] ARENTON	86	FMPS	$\Lambda K_S^0 2\pi^+ 2\pi^-$
5425^{+175}_{-75}		[4] BASILE	81	SFM	See BARI 91

[1] ALBAJAR 91E claims 16 ± 5 events above a background of 9 ± 1 events, a significance of about 5 standard deviations.
[2] ABE 93B states that, based on the signal claimed by ALBAJAR 91E, CDF should have found 30 ± 23 $\Lambda_b^0 \rightarrow J/\psi(1S)\Lambda$ events. Instead, CDF found not more than 2 events.
[3] The decay of the Λ_b^0 to the final state observed by ARENTON 86 is Cabibbo suppressed, whereas the decay of a Ξ_b^0 to this final state is allowed. ARENTON 86 thus only claims to have observed a baryon which probably has a b quark and has a D^0 among the decay products, not necessarily the Λ_b^0.
[4] The first claim to have discovered the Λ_b^0 was reported by BASILE 81. In contrast, DRIJARD 82 reported no observation of Λ_b^0, and this led to some discussion in BASILE 82 and DRIJARD 82B. Further evidence for the Λ_b^0 was again reported by the first authors in BARI 91 (see above) in a second, upgraded experiment where two different Λ_b^0 decay modes were observed.

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^-.

VALUE (10^{-12} s)	EVTS	DOCUMENT ID		TECN	COMMENT
$1.07^{+0.19}_{-0.16}$ OUR AVERAGE					
$1.04^{+0.48}_{-0.38}\pm0.10$	11	ABREU	93F	DLPH	Excess $\Lambda\mu^-$, decay lengths
$1.05^{+0.23}_{-0.20}\pm0.08$	157	AKERS	93	OPAL	Excess $\Lambda\ell^-$, decay lengths
$1.12^{+0.32}_{-0.29}\pm0.16$	101	BUSKULIC	92I	ALEP	Excess $\Lambda\ell^-$, impact parameters

Λ_b^0 DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$J/\psi(1S)\Lambda$	seen
Γ_2	$p D^0 \pi^-$	seen
Γ_3	$\Lambda_c^+ \pi^+ \pi^- \pi^-$	seen
Γ_4	$\Lambda K^0 2\pi^+ 2\pi^-$	
Γ_5	$\Lambda \ell^- X$	seen
Γ_6	$\Lambda_c^+ \ell^- X$	seen

Λ_b^0 BRANCHING RATIOS

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

VALUE	DOCUMENT ID		TECN	COMMENT
seen OUR EVALUATION				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.018±0.011	[5] ALBAJAR	91E	UA1	$J/\psi(1S) \rightarrow \mu^+\mu^-$

[5] The ALBAJAR 91E value assumes the Λ_b production fraction is 10% of the beauty cross section.

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	52	BARI	91	SFM	$D^0 \rightarrow K^-\pi^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen		BASILE	81	SFM	$D^0 \rightarrow K^-\pi^+$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	90	BARI	91	SFM	$\Lambda_c^+ \rightarrow p K^- \pi^+$

$\Gamma(\Lambda K^0 2\pi^+ 2\pi^-)/\Gamma_{total}$ Γ_4/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen	4	[6] ARENTON	86	FMPS	$\Lambda K_S^0 2\pi^+ 2\pi^-$

[6] See the footnote to the ARENTON 86 mass value.

$\Gamma(\Lambda \ell^- X)/\Gamma_{total}$ Γ_5/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	157	AKERS	93	OPAL	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$
seen	101	BUSKULIC	92I	ALEP	Excess of $\Lambda\ell^-$ over $\Lambda\ell^+$

$\Gamma(\Lambda_c^+ \ell^- X)/\Gamma_{total}$ Γ_6/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	21	BUSKULIC	92E	ALEP	$\Lambda_c^+ \rightarrow p K^- \pi^+$

Λ_b^0 REFERENCES

ABE	93B	PR D47 R2639	+Amidei, Anway-Wiese, Apollinari+	(CDF Collab.)
ABREU	93F	PL B311 379	+Adam, Adye, Agasi+	(DELPHI Collab.)
AKERS	93	PL B316 435	+Alexander, Allison, Anderson+	(OPAL Collab.)
Also	92E	PL B281 394	Acton, Alexander, Allison, Allport+	(OPAL Collab.)
BUSKULIC	92E	PL B294 145	+Decamp, Goy, Lees, Minard+	(ALEPH Collab.)
BUSKULIC	92I	PL B297 449	+Decamp, Goy, Lees+	(ALEPH Collab.)
Also	92D	PL B278 209	Decamp, Deschizeaux, Goy+	(ALEPH Collab.)
ALBAJAR	91E	PL B273 540	+Albrow, Allkofer, Ankoviak+	(UA1 Collab.)
BARI	91	NC 104A 1787	+Basile, Bruni, Cara Romeo+	(CERN R422 Collab.)
ARENTON	86	NP B274 707	+Chen, Cormell, Dieterle+	(ARIZ, NDAM, VAND)
BASILE	82	NC 68A 289	+Bonvicini, Romeo+	(CERN R415 Collab.)
DRIJARD	82	PL 108B 361	+	(CERN, CDEF, DORT, HEIDH, LAPP, WARS)
DRIJARD	82B	CERN-EP/82-31	+	(CERN, CDEF, DORT, HEIDH, LAPP, WARS)
BASILE	81	LNC 31 97	+Bonvicini, Romeo+	(CERN R415 Collab.)