NODE=S063

Ω_b^-

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ***
I, J, P need confirmation.

In the quark model Ω_b^- is *ssb* ground state. None of its quantum numbers has been measured.

NODE=S063

Ω_b^- MASS

NODE=S063M

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
6045.8 ± 0.8 OUR AVERAGE				
6045.7 ± 0.5 ± 0.6	[1] AAIJ	23BD	LHCB	pp at 7, 8, 13 TeV
6047.5 ± 3.8 ± 0.6	[2] AALTONEN	14B	CDF	$p\bar{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6045.9 ± 0.5 ± 0.6	[3] AAIJ	23BD	LHCB	pp at 7, 8, 13 TeV
6044.30 ± 1.20 ± 1.12	[4] AAIJ	21AC	LHCB	Repl. by AAIJ 23BD
6045.1 ± 3.2 ± 0.8	[5] AAIJ	16O	LHCB	Repl. by AAIJ 23BD
6046.0 ± 2.2 ± 0.5	[6] AAIJ	13AV	LHCB	Repl. by AAIJ 23BD
6054.4 ± 6.8 ± 0.9	[7] AALTONEN	09AP	CDF	Repl. by AALTONEN 14B
6165 ±10 ±13	[8] ABAZOV	08AL	D0	$p\bar{p}$ at 1.96 TeV

NODE=S063M

NODE=S063M

OCCUR=2

[1] Combines measurement using $\Omega_b^- \to J/\psi\Omega^-$ decays with results from AAIJ 16O and AAIJ 21AC taking into account correlations amongst systematic uncertainties. Uses Ξ_b^- mass 5797.33 ± 0.24 ± 029 MeV from AAIJ 21.

NODE=S063M;LINKAGE=E

[2] Uses $\Omega_b^- \to J/\psi\Omega^-$ and $\Omega_c^0\pi^-$ decays, with the first evidence for $\Omega_b^- \to \Omega_c^0\pi^-$ at 3.3 σ significance.

NODE=S063M;LINKAGE=AL

[3] Uses $\Omega_b^- \to J/\psi\Omega^-$ decays.

NODE=S063M;LINKAGE=D

[4] Uses $\Omega_b^- \to \Xi_c^+ K^-\pi^-$ and $\Xi_c^+ \to pK^-\pi^+$ decays. Reports the value of 6044.3 ± 1.2 ± $1.1^{+0.19}_{-0.22}$ MeV where the last uncertainty is due to the mass of Ξ_c^+. We have combined the two systematic uncertainties in quadrature.

NODE=S063M;LINKAGE=C

[5] Reconstructed in $\Omega_b^- \to \Omega_c^0\pi^-$, $\Omega_c^0 \to pK^-K^-\pi^+$ decays. Reference Ξ_b^- mass 5797.72 ± 0.6 MeV from AAIJ 14B.

NODE=S063M;LINKAGE=B

[6] Measured in $\Omega_b^- \to J/\psi\Omega^-$ with 19 ± 5 events.

NODE=S063M;LINKAGE=A

[7] Observed in $\Omega_b^- \to J/\psi\Omega^-$ decays with 16^{+6}_{-4} candidates, a significance of 5.5 sigma from a combined mass-lifetime fit.

NODE=S063M;LINKAGE=AA

[8] Observed in $\Omega_b^- \to J/\psi\Omega^-$ decays with 17.8 ± 4.9 ± 0.8 candidates, a significance of 5.4 sigma.

NODE=S063M;LINKAGE=AB

$m_{\Omega_b^-} - m_{\Lambda_b^0}$

NODE=S063DML

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
426.4±2.2±0.4	AAIJ	13AV	LHCB	pp at 7 TeV

NODE=S063DML

$m_{\Omega_b^-} - m_{\Xi_b^-}$

NODE=S063A00

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
248.50±0.51±0.37	[1] AAIJ	23BD	LHCB	pp at 7, 8, 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
248.54±0.51±0.38	[2] AAIJ	23BD	LHCB	pp at 7, 8, 13 TeV
247.3 ±3.2 ±0.5	[3] AAIJ	16O	LHCB	Repl. by AAIJ 23BD

NODE=S063A00

OCCUR=2

[1] Uses $\Omega_b^- \to J/\psi\Omega$ decays combined with the result from AAIJ 16O obtained using $\Omega_b^- \to \Omega_c^0\pi^-$, $\Omega_c^0 \to pK^-K^-\pi^+$ and $\Xi_b^- \to \Xi_c^0\pi^-$, $\Xi_c^0 \to pK^-K^-\pi^+$ decays taking into account correlation of systematic uncertainties.

NODE=S063A00;LINKAGE=C

[2] Uses $\Omega_b^- \to J/\psi\Omega$ decays.

NODE=S063A00;LINKAGE=B

[3] Uses $\Omega_b^- \to \Omega_c^0\pi^-$, $\Omega_c^0 \to pK^-K^-\pi^+$ and $\Xi_b^- \to \Xi_c^0\pi^-$, $\Xi_c^0 \to pK^-K^-\pi^+$ decays.

NODE=S063A00;LINKAGE=A

Ω_b MEAN LIFE

NODE=S063T

VALUE (10^{-12} s)	DOCUMENT ID		TECN	COMMENT
1.64±0.16 OUR EVALUATION	(Produced by HFLAV)			
$1.65^{+0.18}_{-0.16}$ OUR AVERAGE				
1.78±0.26±0.05±0.06	[1] AAIJ	16O	LHCB	pp at 7, 8 TeV
$1.54^{+0.26}_{-0.21}$ ±0.05	[2] AAIJ	14T	LHCB	pp at 7, 8 TeV
$1.66^{+0.53}_{-0.40}$ ±0.02	[2] AALTONEN	14B	CDF	$p\bar{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.13^{+0.53}_{-0.40}$ ±0.02	[3] AALTONEN	09AP	CDF	Repl. by AALTONEN 14B

NODE=S063T

→ UNCHECKED ←

[1] Measured in $\Omega_b^- \to \Omega_c^0\pi^-$, $\Omega_c^0 \to pK^-K^-\pi^+$ decays relative to $\Xi_b^- \to \Xi_c^0\pi^-$, $\Xi_c^0 \to pK^-K^-\pi^+$ decays with reference Ξ_b^- mean life 1.599 ± 0.06 ps from AAIJ 14B. NODE=S063T;LINKAGE=B

[2] Measured in $\Omega_b^- \to J/\psi\Omega^-$ decays. NODE=S063T;LINKAGE=A

[3] Observed in $\Omega_b^- \to J/\psi\Omega^-$ decays with 16^{+6}_{-4} candidates, a significance of 5.5 sigma from a combined mass-lifetime fit. NODE=S063T;LINKAGE=AA

$\tau(\Omega_b^-)/\tau(\Xi_b^-)$ mean life ratio

NODE=S063A01
NODE=S063A01

VALUE	DOCUMENT ID		TECN	COMMENT
1.11±0.16±0.03	[1] AAIJ	16O	LHCB	pp at 7, 8 TeV

[1] Uses $\Omega_b^- \to \Omega_c^0\pi^-$, $\Omega_c^0 \to pK^-K^-\pi^+$ and $\Xi_b^- \to \Xi_c^0\pi^-$, $\Xi_c^0 \to pK^-K^-\pi^+$ decays. NODE=S063A01;LINKAGE=A

Ω_b^- DECAY MODES

NODE=S063210;NODE=S063

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
Γ_1	$J/\psi\Omega^- \times$B($b \to \Omega_b$)	$(1.4^{+0.5}_{-0.4}) \times 10^{-6}$	S=1.6	DESIG=1
Γ_2	$pK^-K^- \times$B($\bar{b} \to \Omega_b$)	$< 2.3 \times 10^{-9}$	CL=90%	DESIG=2
Γ_3	$p\pi^-\pi^- \times$B($\bar{b} \to \Omega_b$)	$< 1.5 \times 10^{-8}$	CL=90%	DESIG=4
Γ_4	$pK^-\pi^- \times$B($\bar{b} \to \Omega_b$)	$< 7 \times 10^{-9}$	CL=90%	DESIG=3
Γ_5	$\Omega_c^0\pi^-$	seen		DESIG=5
Γ_6	$\Omega_c^0\pi^-$, $\Omega_c^0 \to pK^-K^-\pi^+$	seen		DESIG=7;OUR EVAL;→ UNCHECKED ←
Γ_7	$\Xi_c^+K^-\pi^-$	seen		DESIG=6;OUR EVAL;→ UNCHECKED ←
Γ_8	$\Lambda_c^+K^-K^-$			DESIG=8
Γ_9	$\Lambda_c^+K^-\pi^-$			DESIG=9
Γ_{10}	$\Lambda_c^+\pi^-\pi^-$			DESIG=10

Ω_b^- BRANCHING RATIOS

NODE=S063215

$\Gamma(J/\psi\Omega^- \times$B($b \to \Omega_b$)$)/\Gamma_{\text{total}}$ Γ_1/Γ

NODE=S063R01
NODE=S063R01

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
1.4 $^{+0.5}_{-0.4}$ OUR AVERAGE	Error includes scale factor of 1.6.			
$1.22 \pm 0.12^{+0.31}_{-0.26}$	[1,2] AAIJ	23BD	LHCB	pp at 13 TeV
$2.6\ ^{+1.0}_{-0.7} \pm 0.4$	[3] AALTONEN	09AP	CDF	$p\bar{p}$ at 1.96 TeV
$8 \pm 4 \pm 2$	[4] ABAZOV	08AL	D0	$p\bar{p}$ at 1.96 TeV

[1] AAIJ 23BD reports [$\Gamma(\Omega_b^- \to J/\psi\Omega^- \times$B($b \to \Omega_b$)$)/\Gamma_{\text{total}}$] / [B($\Xi_b^- \to J/\psi\Xi^- \times$ B($b \to \Xi_b^-$)$)$] $= 0.120 \pm 0.008 \pm 0.008$ which we multiply by our best value B($\Xi_b^- \to J/\psi\Xi^- \times$ B($b \to \Xi_b^-$)$) = (1.02^{+0.26}_{-0.21}) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S063R01;LINKAGE=A

[2] Reconstructing beauty baryons in the kinematic region $2 < \eta < 6$ and $p_T < 20$ GeV/c with their decays to a J/ψ meson and a hyperon. NODE=S063R01;LINKAGE=B

[3] AALTONEN 09AP reports [$\Gamma(\Omega_b^- \to J/\psi\Omega^- \times$B($b \to \Omega_b$)$)/\Gamma_{\text{total}}$] / [B($\Lambda_b^0 \to J/\psi(1S)\Lambda \times$ B($b \to \Lambda_b^0$)$)$] $= 0.045^{+0.017}_{-0.012} \pm 0.004$ which we multiply by our best value B($\Lambda_b^0 \to J/\psi(1S)\Lambda \times$ B($b \to \Lambda_b^0$)$) = (5.8 \pm 0.8) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S063R01;LINKAGE=AA

[4] ABAZOV 08AL reports [$\Gamma(\Omega_b^- \to J/\psi\Omega^- \times$B($b \to \Omega_b$)$)/\Gamma_{\text{total}}$] / [B($\Xi_b \to J/\psi\Xi^- \times$ B($b \to \Xi_b^-$)$)$] $= 0.80 \pm 0.32^{+0.14}_{-0.22}$ which we multiply by our best value B($\Xi_b \to J/\psi\Xi^- \times$ B($b \to \Xi_b^-$)$) = (1.02^{+0.26}_{-0.21}) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S063R01;LINKAGE=AB

$\Gamma(pK^-K^- \times$B($\bar{b} \to \Omega_b$)$)/\Gamma_{\text{total}}$ Γ_2/Γ

NODE=S063R00
NODE=S063R00

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
$< 2.3 \times 10^{-4}$	90	[1] AAIJ	21AH	LHCB	pp at 7, 8, 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 2.5 \times 10^{-4}$	90	[2] AAIJ	17F	LHCB	pp at 7, 8 TeV

[1] AAIJ 21AH reports $[\Gamma(\Omega_b^- \to p K^- K^- \times B(\bar{b} \to \Omega_b^-))/\Gamma_{total}] / [B(\Xi_b^- \to p K^- K^- \times B(b \to \Xi_b^-))] < 62 \times 10^{-3}$ which we multiply by our best value $B(\Xi_b^- \to p K^- K^- \times B(b \to \Xi_b^-)) = 3.7 \times 10^{-8}$. NODE=S063R00;LINKAGE=C

[2] AAIJ 17F reports $[\Gamma(\Omega_b^- \to p K^- K^- \times B(\bar{b} \to \Omega_b^-))/\Gamma_{total}] / [B(B^+ \to K^+ K^- K^+)] / [B(\bar{b} \to B^+)] < 18 \times 10^{-5}$ which we multiply by our best values $B(B^+ \to K^+ K^- K^+) = 3.40 \times 10^{-5}$, $B(\bar{b} \to B^+) = 40.8 \times 10^{-2}$. NODE=S063R00;LINKAGE=A

$\Gamma(p\pi^-\pi^- \times B(\bar{b} \to \Omega_b^-))/\Gamma_{total}$ Γ_3/Γ

NODE=S063R02
NODE=S063R02

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
$< 1.5 \times 10^{-3}$	90	[1] AAIJ	17F	LHCB	pp at 7, 8 TeV

[1] AAIJ 17F reports $[\Gamma(\Omega_b^- \to p\pi^-\pi^- \times B(\bar{b} \to \Omega_b^-))/\Gamma_{total}] / [B(B^+ \to K^+ K^- K^+)] / [B(\bar{b} \to B^+)] < 109 \times 10^{-5}$ which we multiply by our best values $B(B^+ \to K^+ K^- K^+) = 3.40 \times 10^{-5}$, $B(\bar{b} \to B^+) = 40.8 \times 10^{-2}$. NODE=S063R02;LINKAGE=A

$\Gamma(pK^-\pi^- \times B(\bar{b} \to \Omega_b^-))/\Gamma_{total}$ Γ_4/Γ

NODE=S063R03
NODE=S063R03

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
$< 7 \times 10^{-4}$	90	[1] AAIJ	17F	LHCB	pp at 7, 8 TeV

[1] AAIJ 17F reports $[\Gamma(\Omega_b^- \to p K^- \pi^- \times B(\bar{b} \to \Omega_b^-))/\Gamma_{total}] / [B(B^+ \to K^+ K^- K^+)] / [B(\bar{b} \to B^+)] < 51 \times 10^{-5}$ which we multiply by our best values $B(B^+ \to K^+ K^- K^+) = 3.40 \times 10^{-5}$, $B(\bar{b} \to B^+) = 40.8 \times 10^{-2}$. NODE=S063R03;LINKAGE=A

$\Gamma(\Omega_c^0\pi^-)/\Gamma_{total}$ Γ_5/Γ

NODE=S063R04
NODE=S063R04

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AAIJ	16O	LHCB	pp at 7, 8 TeV

$\Gamma(\Xi_c^+ K^-\pi^-)/\Gamma(\Omega_c^0\pi^-,\ \Omega_c^0 \to p K^- K^-\pi^+)$ Γ_7/Γ_6

NODE=S063R06
NODE=S063R06

VALUE (units 10^2)	DOCUMENT ID		TECN	COMMENT
2.2±0.2±1.0	[1] AAIJ	21AC	LHCB	pp at 7, 8, 13 TeV

[1] AAIJ 21AC reports $[\Gamma(\Omega_b^- \to \Xi_c^+ K^-\pi^-)/\Gamma(\Omega_b^- \to \Omega_c^0\pi^-,\ \Omega_c^0 \to p K^- K^-\pi^+)] \times [B(\Xi_c^+ \to p K^-\pi^+)] = 1.35 \pm 0.11 \pm 0.05$ which we divide by our best value $B(\Xi_c^+ \to p K^-\pi^+) = (6.2 \pm 3.0) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S063R06;LINKAGE=A

$\Gamma(\Lambda_c^+ K^-\pi^-)/\Gamma(\Lambda_c^+ K^- K^-)$ Γ_9/Γ_8

NODE=S063R07
NODE=S063R07

VALUE	DOCUMENT ID		TECN	COMMENT
<0.56	AAIJ	24T	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\Lambda_c^+\pi^-\pi^-)/\Gamma(\Lambda_c^+ K^- K^-)$ Γ_{10}/Γ_8

NODE=S063R08
NODE=S063R08

VALUE	DOCUMENT ID		TECN	COMMENT
<0.37	AAIJ	24T	LHCB	pp at 7, 8, 13 TeV

Ω_b^- REFERENCES

NODE=S063

AAIJ	24T	JHEP 2408 132	R. Aaij	(LHCb Collab.)
AAIJ	23BD	PR D108 052008	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	21	PR D103 012004	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	21AC	PR D104 L091102	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	21AH	PR D104 052010	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	17F	PRL 118 071801	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	16O	PR D93 092007	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14B	PL B728 234	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14T	PL B736 154	R. Aaij *et al.*	(LHCb Collab.)
AALTONEN	14B	PR D89 072014	T. Aaltonen *et al.*	(CDF Collab.)
AAIJ	13AV	PRL 110 182001	R. Aaij *et al.*	(LHCb Collab.)
AALTONEN	09AP	PR D80 072003	T. Aaltonen *et al.*	(CDF Collab.)
ABAZOV	08AL	PRL 101 232002	V.M. Abazov *et al.*	(D0 Collab.)

NODE=S063 REFID=62879 REFID=62589 REFID=60752 REFID=61439 REFID=61517 REFID=57754 REFID=57283 REFID=55626 REFID=55762 REFID=55804 REFID=55206 REFID=53055 REFID=52603