



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

$I, J, P$  need confirmation.

In the quark model,  $\Xi_b^0$  and  $\Xi_b^-$  are an isodoublet ( $usb, dsb$ ) state; the lowest  $\Xi_b^0$  and  $\Xi_b^-$  ought to have  $J^P = 1/2^+$ . None of  $I, J$ , or  $P$  have actually been measured.

## $\Xi_b^0$ MASS

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VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>5791.9 ± 0.5 OUR AVERAGE</b>			
5794.3 ± 2.4 ± 0.7	AAIJ	14H	LHCB $pp$ at 7 TeV
5791.80 ± 0.39 ± 0.31	<sup>1</sup> AAIJ	14Z	LHCB $pp$ at 7, 8 TeV
5788.7 ± 4.3 ± 1.4	<sup>2</sup> AALTONEN	14B	CDF $p\bar{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
5787.8 ± 5.0 ± 1.3	<sup>3</sup> AALTONEN	11X	CDF Repl. by AALTONEN 14B
<sup>1</sup> Uses $\Xi_b^0 \rightarrow \Xi_c^+ \pi^-$ and $\Xi_c^+ \rightarrow p K^- \pi^+$ decays. The measurement comes from the mass difference of $\Xi_b^0$ and $\Lambda_b^0$ .			
<sup>2</sup> Uses $\Xi_b^0 \rightarrow \Xi_c^+ \pi^-$ decays.			
<sup>3</sup> Measured in $\Xi_b^0 \rightarrow \Xi_c^+ \pi^-$ with $25.3^{+5.6}_{-5.4}$ candidates.			

### $m_{\Xi_b^0} - m_{\Lambda_b^0}$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>172.5 ± 0.4 OUR AVERAGE</b>			
174.8 ± 2.4 ± 0.5	AAIJ	14H	LHCB $pp$ at 7 TeV
172.44 ± 0.39 ± 0.17	<sup>1</sup> AAIJ	14Z	LHCB $pp$ at 7, 8 TeV
<sup>1</sup> Uses $\Xi_b^0 \rightarrow \Xi_c^+ \pi^-$ and $\Xi_c^+ \rightarrow p K^- \pi^+$ decays.			

## $\Xi_b^0$ MEAN LIFE

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements and asymmetric lifetime errors.

### $\Xi_b^0$ MEAN LIFE

VALUE ( $10^{-12}$ s)	DOCUMENT ID	TECN	COMMENT
<b>1.480 ± 0.030 OUR EVALUATION</b>			
<b>1.477 ± 0.026 ± 0.019</b>	<sup>1</sup> AAIJ	14Z	LHCB $pp$ at 7, 8 TeV
<sup>1</sup> Uses $\Xi_b^0 \rightarrow \Xi_c^+ \pi^-$ and $\Xi_c^+ \rightarrow p K^- \pi^+$ decays. The measurement comes from the value of relative lifetime of $\Xi_b^0$ to $\Lambda_b^0$ .			

### $\tau_{mix}$ ( $1/2\pi$ ) times the oscillation period

VALUE (s)	DOCUMENT ID	TECN	COMMENT
$> 13 \times 10^{-12}$	<sup>1</sup> AAIJ	17BH	LHCB $pp$ at 7, 8 TeV
<sup>1</sup> Uses $\Xi_b^{*-}$ and $\Xi_b^{\prime-}$ decays to $\Xi_b^0 \pi^-$ , where $\Xi_b^0 \rightarrow \Xi_c^+ \pi^-$ , $\Xi_c^+ \rightarrow p K^- \pi^+$ .			

### $\Xi_b^0$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level
$\Gamma_1$ $pD^0 K^- \times B(b \rightarrow \Xi_b^0)$	$(1.7 \pm 0.6) \times 10^{-6}$	
$\Gamma_2$ $p\bar{K}^0 \pi^- \times B(b \rightarrow \Xi_b^0)/B(\bar{b} \rightarrow B^0)$	$< 1.6 \times 10^{-6}$	90%
$\Gamma_3$ $pK^0 K^- \times B(b \rightarrow \Xi_b^0)/B(\bar{b} \rightarrow B^0)$	$< 1.1 \times 10^{-6}$	90%
$\Gamma_4$ $\Lambda\pi^+\pi^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0)$	$< 1.7 \times 10^{-6}$	90%
$\Gamma_5$ $\Lambda K^-\pi^+ \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0)$	$< 8 \times 10^{-7}$	90%
$\Gamma_6$ $\Lambda K^+ K^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0)$	$< 3 \times 10^{-7}$	90%
$\Gamma_7$ $J/\psi \Lambda$	seen	
$\Gamma_8$ $J/\psi \Xi^0$	seen	
$\Gamma_9$ $\Lambda_c^+ K^- \times B(b \rightarrow \Xi_b^0)$	$(6 \pm 4) \times 10^{-7}$	
$\Gamma_{10}$ $pK^-\pi^+\pi^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0)$	$(1.9 \pm 0.4) \times 10^{-6}$	
$\Gamma_{11}$ $pK^- K^-\pi^+ \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0)$	$(1.73 \pm 0.32) \times 10^{-6}$	
$\Gamma_{12}$ $pK^- K^+ K^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0)$	$(1.8 \pm 1.0) \times 10^{-7}$	

### $\Xi_b^0$ BRANCHING RATIOS

$\Gamma(pD^0 K^- \times B(b \rightarrow \Xi_b^0))/\Gamma_{\text{total}}$   $\Gamma_1/\Gamma$

VALUE (units $10^{-6}$ )	DOCUMENT ID	TECN	COMMENT
<b><math>1.7 \pm 0.4 \pm 0.4</math></b>	<sup>1</sup> AAIJ	14H	LHCB $pp$ at 7 TeV

<sup>1</sup>AAIJ 14H reports  $[\Gamma(\Xi_b \rightarrow pD^0 K^- \times B(\bar{b} \rightarrow \Xi_b))/\Gamma_{\text{total}}] / [B(\bar{b} \rightarrow b\text{-baryon}) / B(\Lambda_b^0 \rightarrow pD^0 K^-)] = 0.44 \pm 0.09 \pm 0.06$  which we multiply by our best values  $B(\bar{b} \rightarrow b\text{-baryon}) = (8.4 \pm 1.1) \times 10^{-2}$ ,  $B(\Lambda_b^0 \rightarrow pD^0 K^-) = (4.6 \pm 0.8) \times 10^{-5}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(p\bar{K}^0 \pi^- \times B(b \rightarrow \Xi_b^0)/B(\bar{b} \rightarrow B^0))/\Gamma_{\text{total}}$   $\Gamma_2/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt; 1.6 \times 10^{-6}</math></b>	90	AAIJ	14Q	LHCB $pp$ at 7 TeV

$\Gamma(pK^0 K^- \times B(b \rightarrow \Xi_b^0)/B(\bar{b} \rightarrow B^0))/\Gamma_{\text{total}}$   $\Gamma_3/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt; 1.1 \times 10^{-6}</math></b>	90	AAIJ	14Q	LHCB $pp$ at 7 TeV

$\Gamma(\Lambda\pi^+\pi^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0))/\Gamma_{\text{total}}$					$\Gamma_4/\Gamma$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<1.7 \times 10^{-6}$	90	AAIJ	16W LHCb	$pp$ at 7, 8 TeV	

$\Gamma(\Lambda K^-\pi^+ \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0))/\Gamma_{\text{total}}$					$\Gamma_5/\Gamma$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<0.8 \times 10^{-6}$	90	AAIJ	16W LHCb	$pp$ at 7, 8 TeV	

$\Gamma(\Lambda K^+ K^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0))/\Gamma_{\text{total}}$					$\Gamma_6/\Gamma$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<0.3 \times 10^{-6}$	90	AAIJ	16W LHCb	$pp$ at 7, 8 TeV	

$\Gamma(J/\psi \Lambda)/\Gamma(J/\psi \Xi^0)$					$\Gamma_7/\Gamma_8$
VALUE (units $10^{-3}$ )		DOCUMENT ID	TECN	COMMENT	
$8.2 \pm 2.1 \pm 0.9$		<sup>1</sup> AAIJ	20U LHCb	$pp$ at 7, 8 and 13 TeV	

<sup>1</sup> The Cabibbo suppressed  $\Xi_b \rightarrow J/\psi \Lambda$  decay is observed for the first time.

$\Gamma(\Lambda_c^+ K^- \times B(b \rightarrow \Xi_b^0))/\Gamma(\rho D^0 K^- \times B(b \rightarrow \Xi_b^0))$					$\Gamma_9/\Gamma_1$
VALUE		DOCUMENT ID	TECN	COMMENT	
$0.36 \pm 0.19 \pm 0.02$		<sup>1</sup> AAIJ	14H LHCb	$pp$ at 7 TeV	

<sup>1</sup>AAIJ 14H reports  $[\Gamma(\Xi_b \rightarrow \Lambda_c^+ K^- \times B(\bar{b} \rightarrow \Xi_b))]/\Gamma(\Xi_b \rightarrow \rho D^0 K^- \times B(\bar{b} \rightarrow \Xi_b)) \times [B(\Lambda_c^+ \rightarrow \rho K^- \pi^+)] / [B(D^0 \rightarrow K^- \pi^+)] = 0.57 \pm 0.22 \pm 0.21$  which we multiply or divide by our best values  $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$ ,  $B(D^0 \rightarrow K^- \pi^+) = (3.946 \pm 0.030) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(\rho K^- \pi^+ \pi^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0))/\Gamma_{\text{total}}$					$\Gamma_{10}/\Gamma$
VALUE (units $10^{-6}$ )		DOCUMENT ID	TECN	COMMENT	
$1.91 \pm 0.35 \pm 0.18$		<sup>1</sup> AAIJ	18Q LHCb	$pp$ at 7, 8 TeV	

<sup>1</sup>AAIJ 18Q reports  $[\Gamma(\Xi_b \rightarrow \rho K^- \pi^+ \pi^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0))/\Gamma_{\text{total}}] / [B(\Lambda_c^+ \rightarrow \rho K^- \pi^+)] / [B(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-)] = (6.2 \pm 0.8 \pm 0.2 \pm 0.8) \times 10^{-3}$  which we multiply by our best values  $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$ ,  $B(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-) = (4.9 \pm 0.4) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(\rho K^- K^- \pi^+ \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0))/\Gamma_{\text{total}}$					$\Gamma_{11}/\Gamma$
VALUE (units $10^{-6}$ )		DOCUMENT ID	TECN	COMMENT	
$1.73 \pm 0.27 \pm 0.16$		<sup>1</sup> AAIJ	18Q LHCb	$pp$ at 7, 8 TeV	

<sup>1</sup>AAIJ 18Q reports  $[\Gamma(\Xi_b \rightarrow \rho K^- K^- \pi^+ \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0))/\Gamma_{\text{total}}] / [B(\Lambda_c^+ \rightarrow \rho K^- \pi^+)] / [B(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-)] = (5.6 \pm 0.6 \pm 0.4 \pm 0.5) \times 10^{-3}$  which we multiply by our best values  $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$ ,  $B(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-) = (4.9 \pm 0.4) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(\rho K^- K^+ K^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0))/\Gamma_{\text{total}}$   $\Gamma_{12}/\Gamma$

VALUE (units $10^{-6}$ )	DOCUMENT ID	TECN	COMMENT
<b><math>0.18 \pm 0.09 \pm 0.02</math></b>	<sup>1,2</sup> AAIJ	18Q LHCB	$pp$ at 7, 8 TeV

<sup>1</sup> AAIJ 18Q reports  $[\Gamma(\Xi_b^- \rightarrow \rho K^- K^+ K^- \times B(b \rightarrow \Xi_b^0)/B(b \rightarrow \Lambda_b^0))/\Gamma_{\text{total}}] / [B(\Lambda_c^+ \rightarrow \rho K^- \pi^+)] / [B(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-)] = (0.57 \pm 0.28 \pm 0.08 \pm 0.10) \times 10^{-3}$  which we multiply by our best values  $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.28 \pm 0.32) \times 10^{-2}$ ,  $B(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-) = (4.9 \pm 0.4) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

<sup>2</sup> AAIJ 18Q sees excess with a significance of  $2.3\sigma$ . Using  $B(\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-) = (0.430 \pm 0.036) \times 10^{-2}$  and  $B(\Lambda_c^+ \rightarrow \rho K^- \pi^+) = (6.46 \pm 0.24) \times 10^{-2}$  the authors set two sided limit [0.11–0.25] at 90% C.L.

**P AND CP VIOLATION ASYMMETRIES**

**$a_P(\Xi_b^0 \rightarrow \rho K^- K^- \pi^+)$**

Observable calculated as average of the triple products for  $\Xi_b^0$  and  $\bar{\Xi}_b^0$ , which is sensitive to parity violation.

VALUE (%)	DOCUMENT ID	TECN	COMMENT
<b><math>-3.04 \pm 5.19 \pm 0.36</math></b>	<sup>1</sup> AAIJ	18AG LHCB	$pp$ at 7, 8 TeV

<sup>1</sup> Measured over full phase space of the decay.

**$a_{CP}(\Xi_b^0 \rightarrow \rho K^- K^- \pi^+)$**

Observable calculated as half of the difference between triple products for  $\Xi_b^0$  and  $\bar{\Xi}_b^0$ , which is sensitive to CP violation.

VALUE (%)	DOCUMENT ID	TECN	COMMENT
<b><math>-3.58 \pm 5.19 \pm 0.36</math></b>	<sup>1</sup> AAIJ	18AG LHCB	$pp$ at 7, 8 TeV

<sup>1</sup> Measured over full phase space of the decay.

**$\Delta A_{CP}(\Xi_b^0 \rightarrow \rho K^- \pi^+ \pi^-)$**

$\Delta A_{CP} \equiv A_{CP}(\Xi_b^0 \rightarrow \rho K^- \pi^+ \pi^-) - A_{CP}(\bar{\Xi}_b^0 \rightarrow (\Xi_c^+ \rightarrow \rho K^- \pi^+) \pi^-)$

VALUE (units $10^{-2}$ )	DOCUMENT ID	TECN	COMMENT
<b><math>-17 \pm 11 \pm 1</math></b>	<sup>1</sup> AAIJ	19AH LHCB	$pp$ at 7 and 8 TeV

<sup>1</sup> Full phase space.

**$\Delta A_{CP}(\Xi_b^0 \rightarrow \rho K^- \pi^+ K^-)$**

$\Delta A_{CP} \equiv A_{CP}(\Xi_b^0 \rightarrow \rho K^- \pi^+ K^-) - A_{CP}(\bar{\Xi}_b^0 \rightarrow (\Xi_c^+ \rightarrow \rho K^- \pi^+) \pi^-)$

VALUE (units $10^{-2}$ )	DOCUMENT ID	TECN	COMMENT
<b><math>-6.8 \pm 8.0 \pm 0.8</math></b>	<sup>1</sup> AAIJ	19AH LHCB	$pp$ at 7 and 8 TeV

<sup>1</sup> Full phase space.

## $\Xi_b^0$ REFERENCES

AAIJ	20U	PRL 124 111802	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	19AH	EPJ C79 745	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	18AG	JHEP 1808 039	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	18Q	JHEP 1802 098	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	17BH	PRL 119 181807	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	16W	JHEP 1605 081	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	14H	PR D89 032001	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	14Q	JHEP 1404 087	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	14Z	PRL 113 032001	R. Aaij <i>et al.</i>	(LHCb Collab.)
AALTONEN	14B	PR D89 072014	T. Aaltonen <i>et al.</i>	(CDF Collab.)
AALTONEN	11X	PRL 107 102001	T. Aaltonen <i>et al.</i>	(CDF Collab.)

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