Ξ_b^-

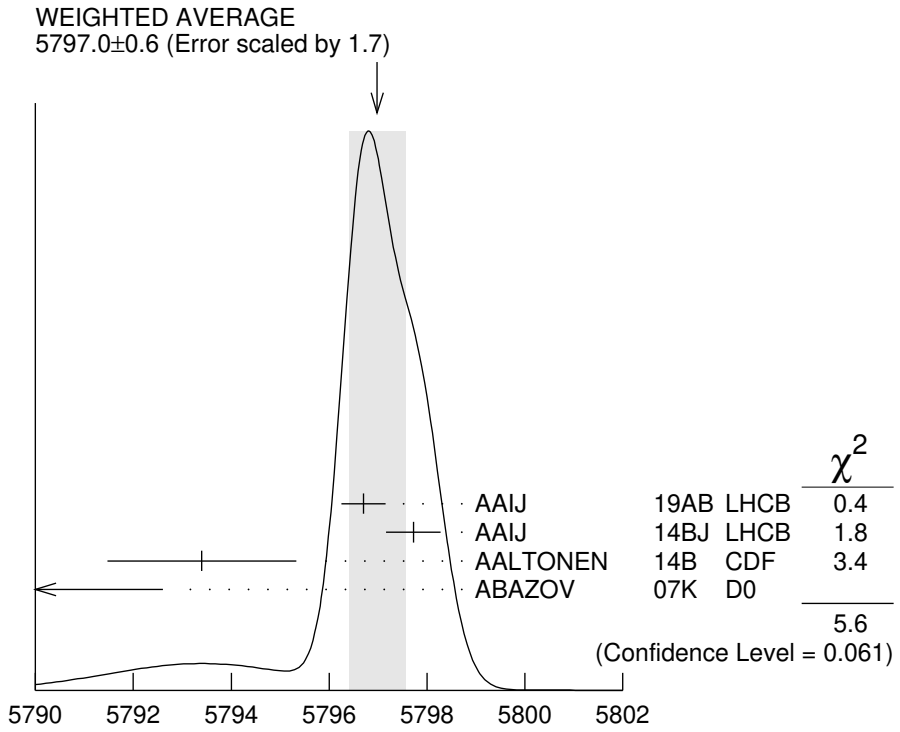
$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$ Status: ***
I, J, P need confirmation.

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

Ξ_b^- MASS

Ξ_b^- MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
5797.0 ± 0.6 OUR AVERAGE	Error includes scale factor of 1.7. See the ideogram below.			
5796.70± 0.39± 0.23	AAIJ	19AB	LHCB	pp at 7, 8 and 13 TeV
5797.72± 0.46± 0.31	[1] AAIJ	14BJ	LHCB	pp at 7, 8 TeV
5793.4 ± 1.8 ± 0.7	[2] AALTONEN	14B	CDF	$p\overline{p}$ at 1.96 TeV
5774 ±11 ±15	[3] ABAZOV	07K	D0	$p\overline{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5795.8 ± 0.9 ± 0.4	[4] AAIJ	13AV	LHCB	Repl. by AAIJ 19AB
5796.7 ± 5.1 ± 1.4	[5] AALTONEN	11X	CDF	Repl. by AALTONEN 14B
5790.9 ± 2.6 ± 0.8	[6] AALTONEN	09AP	CDF	Repl. by AALTONEN 14B
5792.9 ± 2.5 ± 1.7	[7] AALTONEN	07A	CDF	Repl. by AALTONEN 09AP



[1] Reconstructed in $\Xi_b^- \to \Xi_c^0\pi^-$, $\Xi_c^0 \to pK^-K^-\pi^+$ decays. Reference Λ_b^0 mass 5619.30 ± 0.34 MeV from AAIJ 14AA.

[2] Uses $\Xi_b^- \to J/\psi\Xi^-$ and $\Xi_c^0\pi^-$ decays.

[3] Observed in $\Xi_b^- \to J/\psi\Xi^-$ decays with $15.2 \pm 4.4^{+1.9}_{-0.4}$ candidates, a significance of 5.5 sigma.

[4] Measured in $\Xi_b^- \to J/\psi\Xi^-$ decays.

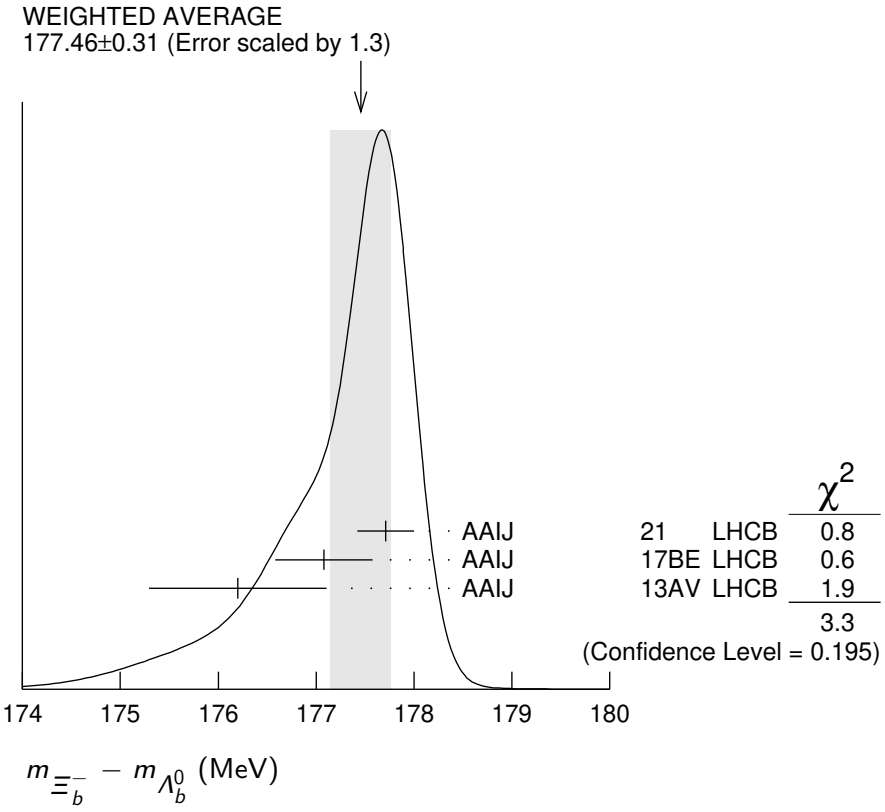
[5] Measured in $\Xi_b^- \to \Xi_c^0\pi^-$ with $25.8^{+5.5}_{-5.2}$ candidates.

[6] Measured in $\Xi_b^- \to J/\psi\Xi^-$ decays with 66^{+14}_{-9} candidates.

[7] Observed in $\Xi_b^- \to J/\psi\Xi^-$ decays with 17.5 ± 4.3 candidates, a significance of 7.7 sigma.

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

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
177.46±0.31 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.			
177.71±0.24±0.16	[1] AAIJ	21	LHCB	pp at 7, 8, 13 TeV
177.08±0.47±0.16	[2] AAIJ	17BE	LHCB	pp at 7, 8 TeV
176.2 ±0.9 ±0.1	[3] AAIJ	13AV	LHCB	pp at 7 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
177.73±0.33±0.14	[4] AAIJ	17BE	LHCB	pp at 7, 8 TeV
178.36±0.46±0.16	[1,5] AAIJ	14BJ	LHCB	Repl. by AAIJ 2021



[1] Reconstructed in $\Xi_b^- \to \Xi_c^0\pi^-$, $\Xi_c^0 \to pK^-K^-\pi^+$ decays.Reference decays $\Lambda_b^0 \to \Lambda_c^+\pi^-$ were used.

[2] Reconstructed in $\Xi_b^- \to J/\psi\Lambda K^-$ decays. Reference decays $\Lambda_b^0 \to J/\psi\Lambda$ were used.

[3] Reconstructed in $\Xi_b^- \to J/\psi\Xi^-$ decays.

[4] Combination of the original statistically independent measurements of AAIJ 17BE and AAIJ 14BJ taking into account correlation between systematic uncertainties.

[5] Combined with AAIJ 17BE.

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

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
5.9 ±0.6 OUR AVERAGE				
5.92±0.60±0.23	[1] AAIJ	14BJ	LHCB	pp at 7, 8 TeV
3.1 ±5.6 ±1.3	[2] AALTONEN	11X	CDF	$p\overline{p}$ at 1.96 TeV

[1] Reconstructed in $\Xi_b^- \to \Xi_c^0\pi^-$, $\Xi_c^0 \to pK^-K^-\pi^+$ decays. Uses $m(\Xi_b^0) - m(\Lambda_b^0)$ = 172.44 ± 0.39 ± 0.17 MeV from AAIJ 14Z.

[2] Derived from measurements in $\Xi_b^0 \to \Xi_c^+\pi^-$ and $\Xi_b^- \to J/\psi\Xi^-$ from AALTONEN 09AP taking correlated systematic uncertainties into account.

Ξ_b^- 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.

Ξ_b^- MEAN LIFE

VALUE (10^{-12} s)	*DOCUMENT ID*		*TECN*	*COMMENT*
1.572±0.040 OUR EVALUATION				
1.57 ±0.04 OUR AVERAGE Error includes scale factor of 1.1.				
1.599±0.041±0.022	[1] AAIJ	14BJ	LHCB	pp at 7, 8 TeV
1.55 $^{+0.10}_{-0.09}$ ±0.03	[2] AAIJ	14T	LHCB	pp at 7, 8 TeV
1.36 ±0.15 ±0.02	AALTONEN	14B	CDF	$p\overline{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.56 $^{+0.27}_{-0.25}$ ±0.02	[3] AALTONEN	09AP	CDF	Repl. by AALTONEN 14B

[1] Reconstructed in $\Xi_b^- \to \Xi_c^0\pi^-$, $\Xi_c^0 \to pK^-K^-\pi^+$ decays. Reference Λ_b^0 lifetime 1.479 ± 0.009 ± 0.010 ps from AAIJ 14U.

[2] Measured in $\Xi_b^- \to J/\psi\Xi^-$ decays.

[3] Measured in $\Xi_b^- \to J/\psi\Xi^-$ decays with 66^{+14}_{-9} candidates.

MEAN LIFE RATIOS

$\tau_{\Xi_b^-} / \tau_{\Lambda_b^0}$ mean life ratio

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
1.089±0.026±0.011	[1] AAIJ	14BJ	LHCB	pp at 7, 8 TeV

[1] Reconstructed in $\Xi_b^- \to \Xi_c^0\pi^-$, $\Xi_c^0 \to pK^-K^-\pi^+$ decays. Reference $\Lambda_b^0 \to \Lambda_c^+\pi^-$.

$\tau_{\Xi_b^-}$ / $\tau_{\Xi_b^0}$ mean life ratio

VALUE	DOCUMENT ID		TECN	COMMENT
$1.083 \pm 0.032 \pm 0.016$	[1] AAIJ	14BJ	LHCB	pp at 7, 8 TeV

[1] Reconstructed in $\Xi_b^- \to \Xi_c^0 \pi^-$, $\Xi_c^0 \to p K^- K^- \pi^+$ decays. Uses Ξ_b^0 measurements from AAIJ 14Z.

Ξ_b^- DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	$J/\psi \Xi^- \times$ B($b \to \Xi_b^-$)	$(1.02^{+0.26}_{-0.21}) \times 10^{-5}$	
Γ_2	$J/\psi \Lambda K^- \times$ B($b \to \Xi_b^-$)	$(2.5 \pm 0.4) \times 10^{-6}$	
Γ_3	$p K^- K^- \times$ B($b \to \Xi_b^-$)	$(3.7 \pm 0.8) \times 10^{-8}$	
Γ_4	$p K^- K^-$	seen	
Γ_5	$p \pi^- \pi^-$		
Γ_6	$p K^- \pi^-$	seen	
Γ_7	$\Lambda_b^0 \pi^- \times$ B($b \to \Xi_b^-$)/B($b \to \Lambda_b^0$)	$(5.7 \pm 2.0) \times 10^{-4}$	
Γ_8	$\Xi_c^0 \pi^-$	seen	
Γ_9	$\Sigma(1385) K^-$	$(2.6 \pm 2.3) \times 10^{-7}$	
Γ_{10}	$\Lambda(1405) K^-$	$(1.9 \pm 1.2) \times 10^{-7}$	
Γ_{11}	$\Lambda(1520) K^-$	$(7.6 \pm 3.2) \times 10^{-7}$	
Γ_{12}	$\Lambda(1670) K^-$	$(4.5 \pm 2.3) \times 10^{-7}$	
Γ_{13}	$\Sigma(1775) K^-$	$(2.2 \pm 1.5) \times 10^{-7}$	
Γ_{14}	$\Sigma(1915) K^-$	$(2.6 \pm 2.5) \times 10^{-7}$	
Γ_{15}	$\Xi^- \gamma$	$< 1.3 \times 10^{-4}$	95%

Ξ_b^- BRANCHING RATIOS

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

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
$0.102^{+0.026}_{-0.021}$ OUR AVERAGE				
$0.098^{+0.023}_{-0.016} \pm 0.014$	[1] AALTONEN	09AP	CDF	$p\overline{p}$ at 1.96 TeV
$0.16 \pm 0.07 \pm 0.02$	[2] ABAZOV	07K	D0	$p\overline{p}$ at 1.96 TeV

[1] AALTONEN 09AP reports [$\Gamma(\Xi_b \to J/\psi \Xi^- \times$ B($b \to \Xi_b^-$)$)/\Gamma_{\text{total}}$] / [B($\Lambda_b^0 \to J/\psi(1S) \Lambda \times$ B($b \to \Lambda_b^0$))] $= 0.167^{+0.037}_{-0.025} \pm 0.012$ 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.

[2] ABAZOV 07K reports [$\Gamma(\Xi_b \to J/\psi \Xi^- \times$ B($b \to \Xi_b^-$)$)/\Gamma_{\text{total}}$] / [B($\Lambda_b^0 \to J/\psi(1S) \Lambda \times$ B($b \to \Lambda_b^0$))] $= 0.28 \pm 0.09^{+0.09}_{-0.08}$ 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.

$\Gamma(J/\psi\Lambda K^- \times B(b \to \Xi_b^-))/\Gamma_{total}$ Γ_2/Γ

VALUE (units 10^{-6})		*DOCUMENT ID*		*TECN*	*COMMENT*
2.45±0.19±0.35	[1,2]	AAIJ	17BE	LHCB	pp at 7 and 8 TeV

[1] AAIJ 17BE reports $[\Gamma(\Xi_b \to J/\psi\Lambda K^- \times B(b \to \Xi_b^-))/\Gamma_{total}] / [B(\Lambda_b^0 \to J/\psi(1S)\Lambda \times B(b \to \Lambda_b^0))] = (4.19 \pm 0.29 \pm 0.15) \times 10^{-2}$ 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.

[2] Integrated over the b-baryon transverse momentum $p_T < 25$ GeV and rapidity $2.0 < y < 4.5$.

$\Gamma(pK^-K^- \times B(b \to \Xi_b^-))/\Gamma_{total}$ Γ_3/Γ

VALUE (units 10^{-8})		*DOCUMENT ID*		*TECN*	*COMMENT*
3.7±0.8±0.2	[1]	AAIJ	17F	LHCB	pp at 7, 8 TeV

[1] AAIJ 17F reports $[\Gamma(\Xi_b \to pK^-K^- \times B(\overline{b} \to \Xi_b))/\Gamma_{total}] / [B(B^+ \to K^+K^-K^+)] / [B(\overline{b} \to B^+)] = (2.65 \pm 0.35 \pm 0.47) \times 10^{-3}$ which we multiply by our best values $B(B^+ \to K^+K^-K^+) = (3.40 \pm 0.14) \times 10^{-5}$, $B(\overline{b} \to B^+) = (40.8 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(pK^-K^-)/\Gamma_{total}$ Γ_4/Γ

VALUE (units 10^{-6})		*DOCUMENT ID*		*TECN*	*COMMENT*
2.3±0.9	[1]	AAIJ	21AH	LHCB	pp at 7, 8, 13 TeV

[1] Obtained using the ratio of fragmentation and branching fractions relative to the $B^- \to K^+K^-K^-$ decay.

$\Gamma(p\pi^-\pi^-)/\Gamma(pK^-K^-)$ Γ_5/Γ_4

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.56	90	[1] AAIJ	17F	LHCB	pp at 7, 8 TeV

[1] Measures the ratio as $0.28 \pm 0.16 \pm 0.13$.

$\Gamma(pK^-\pi^-)/\Gamma(pK^-K^-)$ Γ_6/Γ_4

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.98±0.27±0.09	AAIJ	17F	LHCB	pp at 7, 8 TeV

$\Gamma(\Lambda_b^0\pi^- \times B(b \to \Xi_b^-)/B(b \to \Lambda_b^0))/\Gamma_{total}$ Γ_7/Γ

VALUE (units 10^{-4})		*DOCUMENT ID*		*TECN*	*COMMENT*
$5.7 \pm 1.8^{+0.8}_{-0.9}$	[1]	AAIJ	15BA	LHCB	pp at 7, 8 TeV

[1] A signal is reported with a significance of 3.2 standard deviations in the decay chain of $\Xi_b^- \to \Lambda_b^0\pi^-$, $\Lambda_b^0 \to \Lambda_c^+\pi^-$, and $\Lambda_c^+ \to pK^-\pi^+$.

$\Gamma(\Xi_c^0\pi^-)/\Gamma_{total}$ Γ_8/Γ

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

$\Gamma(\Sigma(1385)K^-)/\Gamma_{total}$ Γ_9/Γ

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
0.26±0.11±0.20	[1] AAIJ	21AH	LHCB	pp at 7, 8 and 13 TeV

[1] Obtained from an amplitude analysis of quasi-two-body contributions to the $\Xi_b^- \to RK^-$ decay, with $R \to pK^-$.

$\Gamma(\Lambda(1405)K^-)/\Gamma_{total}$ Γ_{10}/Γ

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
0.19±0.06±0.10	[1] AAIJ	21AH	LHCB	pp at 7, 8 and 13 TeV

[1] Obtained from an amplitude analysis of quasi-two-body contributions to the $\Xi_b^- \to RK^-$ decay, with $R \to pK^-$.

$\Gamma(\Lambda(1520)K^-)/\Gamma_{total}$ Γ_{11}/Γ

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
0.76±0.09±0.31	[1] AAIJ	21AH	LHCB	pp at 7, 8 and 13 TeV

[1] Obtained from an amplitude analysis of quasi-two-body contributions to the $\Xi_b^- \to RK^-$ decay, with $R \to pK^-$.

$\Gamma(\Lambda(1670)K^-)/\Gamma_{total}$ Γ_{12}/Γ

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
0.45±0.07±0.22	[1] AAIJ	21AH	LHCB	pp at 7, 8 and 13 TeV

[1] Obtained from an amplitude analysis of quasi-two-body contributions to the $\Xi_b^- \to RK^-$ decay, with $R \to pK^-$.

$\Gamma(\Sigma(1775)K^-)/\Gamma_{total}$ Γ_{13}/Γ

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
0.22±0.08±0.13	[1] AAIJ	21AH	LHCB	pp at 7, 8 and 13 TeV

[1] Obtained from an amplitude analysis of quasi-two-body contributions to the $\Xi_b^- \to RK^-$ decay, with $R \to pK^-$.

$\Gamma(\Sigma(1915)K^-)/\Gamma_{total}$ Γ_{14}/Γ

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
0.26±0.09±0.23	[1] AAIJ	21AH	LHCB	pp at 7, 8 and 13 TeV

[1] Obtained from an amplitude analysis of quasi-two-body contributions to the $\Xi_b^- \to RK^-$ decay, with $R \to pK^-$.

$\Gamma(\Xi^-\gamma)/\Gamma_{total}$ Γ_{15}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.3 \times 10^{-4}$	95	[1] AAIJ	22F	LHCB	pp at 13 TeV

[1] Used $\Xi_b^- \to \Xi^- J/\psi$ as normalization and an integrated luminosity of 5.4 fb^{-1}.

P VIOLATION ASYMMETRY

$A_P(\Xi_b)$, Ξ_b^- – Ξ_b^+ production asymmetry

$A_P(\Xi_b) = [\sigma(\Xi_b^-) - \sigma(\Xi_b^+)\,]/[\sigma(\Xi_b^-) + \sigma(\Xi_b^+)]$

VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
−2 ±4 OUR AVERAGE				
1.1±5.6±1.9	[1,2] AAIJ	19AB	LHCB	pp at 7 and 8 TeV
−3.9±4.9±2.5	[1,2] AAIJ	19AB	LHCB	pp at 13 TeV

[1] Baryon kinematic range $p_T < 20$ GeV/c and $2 < \eta < 6$.
[2] Measured using previous measurements of $A_P(\Lambda_b)$ in AAIJ 17BF.

CP VIOLATION in Ξ_b deays

$A_{CP}(\Xi_b) = [\mathrm{B}(\Xi_b^- \to f) - \mathrm{B}(\Xi_b^+ \to \overline{f})\,]/\mathrm{Sum}$

$A_{CP}(\Xi_b^- \to \Sigma(1385)K^-)$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
(−27±34±73) × 10^{-2}	AAIJ	21AH	LHCB	pp at 7, 8, 13 TeV

$A_{CP}(\Xi_b^- \to \Lambda(1405)K^-)$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
(−1±24±32) × 10^{-2}	AAIJ	21AH	LHCB	pp at 7, 8, 13 TeV

$A_{CP}(\Xi_b^- \to \Lambda(1520)K^-)$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
(−5±9±8) × 10^{-2}	AAIJ	21AH	LHCB	pp at 7, 8, 13 TeV

$A_{CP}(\Xi_b^- \to \Lambda(1670)K^-)$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
(3±14±10) × 10^{-2}	AAIJ	21AH	LHCB	pp at 7, 8, 13 TeV

$A_{CP}(\Xi_b^- \to \Sigma(1775)K^-)$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
(−47±26±14) × 10^{-2}	AAIJ	21AH	LHCB	pp at 7, 8, 13 TeV

$A_{CP}(\Xi_b^- \to \Sigma(1915)K^-)$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
(11±26±22) × 10^{-2}	AAIJ	21AH	LHCB	pp at 7, 8, 13 TeV

Ξ_b^- REFERENCES

AAIJ	22F	JHEP 2201 069	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	21	PR D103 012004	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	21AH	PR D104 052010	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	19AB	PR D99 052006	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	17BE	PL B772 265	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	17BF	PL B774 139	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	15BA	PRL 115 241801	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14AA	PRL 112 202001	R. Aaij *et al.*	(LHCb Collab.)

AAIJ	14BJ	PRL 113 242002	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14T	PL B736 154	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14U	PL B734 122	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14Z	PRL 113 032001	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	11X	PRL 107 102001	T. Aaltonen *et al.*	(CDF Collab.)
AALTONEN	09AP	PR D80 072003	T. Aaltonen *et al.*	(CDF Collab.)
AALTONEN	07A	PRL 99 052002	T. Aaltonen *et al.*	(CDF Collab.)
ABAZOV	07K	PRL 99 052001	V.M. Abazov *et al.*	(D0 Collab.)