Ξ_b^0, Ξ_b^-

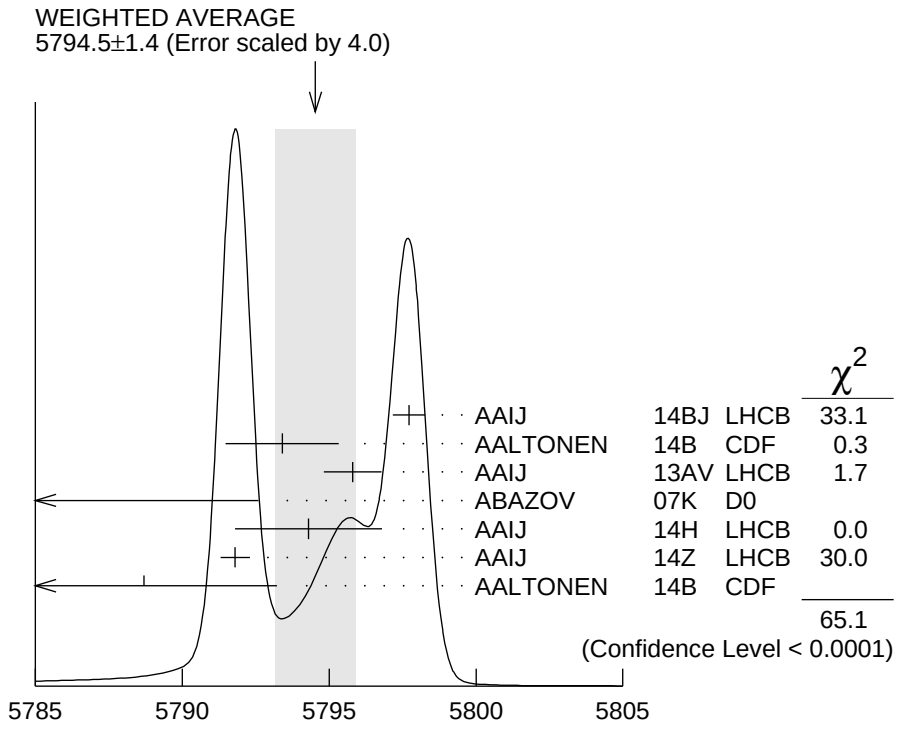
$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$ Status: ***
I, J, P need confirmation.

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 MASSES

Ξ_b^- MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
5794.5 ± 1.4 OUR AVERAGE Includes data from the datablock that follows this one. Error includes scale factor of 4.0. See the ideogram below.				
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
5795.8 ± 0.9 ± 0.4	[3] AAIJ	13AV	LHCB	pp at 7 TeV
5774 ±11 ±15	[4] ABAZOV	07K	D0	$p\overline{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
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 $\Xi_b^- \to \Xi_c^0 \pi^-$, $\Xi_c^0 \to p K^- K^- \pi^+$ 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] Measured in $\Xi_b^- \to J/\psi \Xi^-$ decays.

[4] 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.

[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.

Ξ_b^0 MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.				
5791.9 ±0.5 OUR AVERAGE				
5794.3 ±2.4 ±0.7	AAIJ	14H	LHCB	pp at 7 TeV
5791.80±0.39±0.31	[1] AAIJ	14Z	LHCB	pp at 7, 8 TeV
5788.7 ±4.3 ±1.4	[2] AALTONEN	14B	CDF	$p\overline{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5787.8 ±5.0 ±1.3	[3] AALTONEN	11X	CDF	Repl. by AALTONEN 14B

[1] Uses $\Xi_b^0 \to \Xi_c^+ \pi^-$ and $\Xi_c^+ \to p K^- \pi^+$ decays. The measurement comes from the mass difference of Ξ_b^0 and Λ_b^0.

[2] Uses $\Xi_b^0 \to \Xi_c^+ \pi^-$ decays.

[3] Measured in $\Xi_b^0 \to \Xi_c^+ \pi^-$ with $25.3^{+5.6}_{-5.4}$ candidates.

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

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
177.9 ±0.9 OUR AVERAGE	Error includes scale factor of 2.1.			
178.36±0.46±0.16	[1] AAIJ	14BJ	LHCB	pp at 7, 8 TeV
176.2 ±0.9 ±0.1	[2] AAIJ	13AV	LHCB	pp at 7 TeV

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

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

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

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
172.5 ±0.4 OUR AVERAGE				
174.8 ±2.4 ±0.5	AAIJ	14H	LHCB	pp at 7 TeV
172.44±0.39±0.17	[1] AAIJ	14Z	LHCB	pp at 7, 8 TeV

[1] Uses $\Xi_b^0 \to \Xi_c^+ \pi^-$ and $\Xi_c^+ \to p K^- \pi^+$ decays.

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

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 http://www.slac.stanford.edu/xorg/hflav/. 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
1.571±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
$1.55\ ^{+0.10}_{-0.09}\ \pm0.03$	[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. • • •				
$1.56\ ^{+0.27}_{-0.25}\ \pm0.02$	[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.

Ξ_b^0 MEAN LIFE

VALUE (10^{-12} s)	DOCUMENT ID		TECN	COMMENT
1.479±0.031 OUR EVALUATION				
1.477±0.026±0.019	[1] AAIJ	14Z	LHCB	pp at 7, 8 TeV

[1] Uses $\Xi_b^0 \to \Xi_c^+\pi^-$ and $\Xi_c^+ \to pK^-\pi^+$ decays. The measurement comes from the value of relative lifetime of Ξ_b^0 to Λ_b^0.

Ξ_b MEAN LIFE

VALUE (10^{-12} s)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.48^{+0.40}_{-0.31}\pm0.12$	[1] ABDALLAH	05C	DLPH	$e^+e^-\to Z^0$
$1.35^{+0.37+0.15}_{-0.28-0.17}$	[2] BUSKULIC	96T	ALEP	$e^+e^-\to Z$
$1.5\ ^{+0.7}_{-0.4}\ \pm0.3$	[3] ABREU	95V	DLPH	Repl. by ABDALLAH 05C

[1] Used the decay length of Ξ^- accompanied by a lepton of the same sign.
[2] Excess $\Xi^-\ell^-$, impact parameters.
[3] Excess $\Xi^-\ell^-$, decay lengths.

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±0.032±0.016	[1] AAIJ	14BJ	LHCB	pp at 7, 8 TeV

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

Ξ_b DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	$\Xi^-\ell^-\overline{\nu}_\ell X\times$ B($\overline{b}\to\ \Xi_b$)	$(3.9\ \pm1.2\ )\times10^{-4}$	S=1.4
Γ_2	$J/\psi\Xi^-\times$ B($b\to\ \Xi_b^-$)	$(1.02^{+0.26}_{-0.21})\times10^{-5}$	
Γ_3	$pD^0K^-\times$ B($\overline{b}\to\ \Xi_b$)	$(1.8\ \pm0.6\ )\times10^{-6}$	
Γ_4	$p\overline{K}^0\pi^-\times$ B($\overline{b}\to\ \Xi_b$)/B($\overline{b}\to B^0$)	$<1.6\times10^{-6}$	CL=90%
Γ_5	$pK^0K^-\times$ B($\overline{b}\to\ \Xi_b$)/B($\overline{b}\to B^0$)	$<1.1\times10^{-6}$	CL=90%
Γ_6	$pK^-K^-\times$ B($\overline{b}\to\ \Xi_b$)	$(3.6\ \pm0.8\ )\times10^{-8}$	
Γ_7	pK^-K^-		
Γ_8	$p\pi^-\pi^-$		
Γ_9	$pK^-\pi^-$		
Γ_{10}	$\Lambda\pi^+\pi^-\times$ B($b\to\ \Xi_b^0$)/B($b\to\Lambda_b^0$)	$<1.7\times10^{-6}$	CL=90%

Γ_{11}	$\Lambda K^- \pi^+ \times$ B($b \to \Xi_b^0$)/B($b \to \Lambda_b^0$)	< 8	$\times 10^{-7}$	CL=90%
Γ_{12}	$\Lambda K^+ K^- \times$ B($b \to \Xi_b^0$)/B($b \to \Lambda_b^0$)	< 3	$\times 10^{-7}$	CL=90%
Γ_{13}	$\Lambda_c^+ K^- \times$ B($\overline{b} \to \Xi_b$)	(6 $\pm$4)	$\times 10^{-7}$	
Γ_{14}	$\Lambda_b^0 \pi^- \times$ B($b \to \Xi_b^-$)/B($b \to \Lambda_b^0$)	(5.7 $\pm$2.0)	$\times 10^{-4}$	

Ξ_b BRANCHING RATIOS

$\Gamma(\Xi^- \ell^- \overline{\nu}_\ell X \times$ B($\overline{b} \to \Xi_b$)$)/\Gamma_{total}$ Γ_1/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
3.9$\pm$1.2 OUR AVERAGE	Error includes scale factor of 1.4.			
3.0$\pm$1.0$\pm$0.3	ABDALLAH	05C	DLPH	$e^+ e^- \to Z^0$
5.4$\pm$1.1$\pm$0.8	BUSKULIC	96T	ALEP	Excess $\Xi^- \ell^-$ over $\Xi^- \ell^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.9$\pm$2.1$\pm$1.0	ABREU	95V	DLPH	Repl. by ABDALLAH 05C

$\Gamma(J/\psi \Xi^- \times$ B($b \to \Xi_b^-$)$)/\Gamma_{total}$ Γ_2/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($b \to \Xi_b^-$) $)/\Gamma_{total}$] / [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($b \to \Xi_b^-$) $)/\Gamma_{total}$] / [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.

$\Gamma(p D^0 K^- \times$ B($\overline{b} \to \Xi_b$)$)/\Gamma_{total}$ Γ_3/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
(1.8$\pm$0.4$\pm$0.4) $\times 10^{-6}$	[1] AAIJ	14H	LHCB	pp at 7 TeV

[1] AAIJ 14H reports [$\Gamma(\Xi_b \to p D^0 K^- \times$ B($\overline{b} \to \Xi_b$) $)/\Gamma_{total}$] / [B($\overline{b} \to$ b-baryon)] / [B($\Lambda_b^0 \to p D^0 K^-$)] = $0.44 \pm 0.09 \pm 0.06$ which we multiply by our best values B($\overline{b} \to$ b-baryon) = $(8.8 \pm 1.2) \times 10^{-2}$, B($\Lambda_b^0 \to p D^0 K^-$) = $(4.7 \pm 0.8) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(p\overline{K}^0 \pi^- \times$ B($\overline{b} \to \Xi_b$)/B($\overline{b} \to B^0$))$/\Gamma_{total}$ Γ_4/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 1.6 \times 10^{-6}$	90	AAIJ	14Q	LHCB	pp at 7 TeV

$\Gamma(pK^0K^- \times B(\overline{b} \to \Xi_b)/B(\overline{b} \to B^0))/\Gamma_{total}$ Γ_5/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.1 \times 10^{-6}$	90	AAIJ	14Q	LHCB	pp at 7 TeV

$\Gamma(pK^-K^- \times B(\overline{b} \to \Xi_b))/\Gamma_{total}$ Γ_6/Γ

VALUE (units 10^{-8})	DOCUMENT ID		TECN	COMMENT
$3.6 \pm 0.8 \pm 0.2$	[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 $B(B^+ \to K^+K^-K^+) = (3.40 \pm 0.14) \times 10^{-5}$, $B(\overline{b} \to B^+) = (40.4 \pm 0.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(p\pi^-\pi^-)/\Gamma(pK^-K^-)$ Γ_8/Γ_7

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_9/Γ_7

VALUE	DOCUMENT ID		TECN	COMMENT
$0.98 \pm 0.27 \pm 0.09$	AAIJ	17F	LHCB	pp at 7, 8 TeV

$\Gamma(\Lambda\pi^+\pi^- \times B(b \to \Xi_b^0)/B(b \to \Lambda_b^0))/\Gamma_{total}$ Γ_{10}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.7 \times 10^{-6}$	90	AAIJ	16W	LHCB	pp at 7, 8 TeV

$\Gamma(\Lambda K^-\pi^+ \times B(b \to \Xi_b^0)/B(b \to \Lambda_b^0))/\Gamma_{total}$ Γ_{11}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<0.8 \times 10^{-6}$	90	AAIJ	16W	LHCB	pp at 7, 8 TeV

$\Gamma(\Lambda K^+K^- \times B(b \to \Xi_b^0)/B(b \to \Lambda_b^0))/\Gamma_{total}$ Γ_{12}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<0.3 \times 10^{-6}$	90	AAIJ	16W	LHCB	pp at 7, 8 TeV

$\Gamma(\Lambda_c^+K^- \times B(\overline{b} \to \Xi_b))/\Gamma(pD^0K^- \times B(\overline{b} \to \Xi_b))$ Γ_{13}/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
$0.35 \pm 0.19 \pm 0.02$	[1] AAIJ	14H	LHCB	pp at 7 TeV

[1] AAIJ 14H reports $[\Gamma(\Xi_b \to \Lambda_c^+K^- \times B(\overline{b} \to \Xi_b))/\Gamma(\Xi_b \to pD^0K^- \times B(\overline{b} \to \Xi_b))] \times [B(\Lambda_c^+ \to pK^-\pi^+)] / [B(D^0 \to K^-\pi^+)] = 0.57 \pm 0.22 \pm 0.21$ which we multiply or divide by our best values $B(\Lambda_c^+ \to pK^-\pi^+) = (6.35 \pm 0.33) \times 10^{-2}$, $B(D^0 \to K^-\pi^+) = (3.89 \pm 0.04) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

$\Gamma(\Lambda_b^0\pi^- \times B(b \to \Xi_b^-)/B(b \to \Lambda_b^0))/\Gamma_{total}$ Γ_{14}/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 $\Lambda_c^+ \to pK^-\pi^+$.

Ξ_b REFERENCES

AAIJ	17F	PRL 118 071801	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	16W	JHEP 1605 081	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	14H	PR D89 032001	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14Q	JHEP 1404 087	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.)
ABDALLAH	05C	EPJ C44 299	J. Abdallah *et al.*	(DELPHI Collab.)
BUSKULIC	96T	PL B384 449	D. Buskulic *et al.*	(ALEPH Collab.)
ABREU	95V	ZPHY C68 541	P. Abreu *et al.*	(DELPHI Collab.)