



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

The parity has not actually been measured, but + is of course expected.

We have omitted some results that have been superseded by later experiments. See our earlier editions.

Ξ^- MASS

The fit uses the Ξ^- , Ξ^+ , and Ξ^0 masses and the $\Xi^- - \Xi^+$ mass difference. It assumes that the Ξ^- and Ξ^+ masses are the same.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1321.71 ± 0.07 OUR FIT				
1321.70 ± 0.08 ± 0.05	2478 ± 68	ABDALLAH	06E	DLPH from Z decays
• • •				We do not use the following data for averages, fits, limits, etc. • • •
1321.46 ± 0.34	632	DIBIANCA	75	DBC 4.9 GeV/c $K^- d$
1321.12 ± 0.41	268	WILQUET	72	HLBC
1321.87 ± 0.51	195	¹ GOLDWASSER	70	HBC 5.5 GeV/c $K^- p$
1321.67 ± 0.52	6	CHIEN	66	HBC 6.9 GeV/c $\bar{p} p$
1321.4 ± 1.1	299	LONDON	66	HBC
1321.3 ± 0.4	149	PJERROU	65B	HBC
1321.1 ± 0.3	241	² BADIER	64	HBC
1321.4 ± 0.4	517	² JAUNEAU	63D	FBC
1321.1 ± 0.65	62	² SCHNEIDER	63	HBC

¹ GOLDWASSER 70 uses $m_\Lambda = 1115.58$ MeV.

² These masses have been increased 0.09 MeV because the Λ mass increased.

Ξ^+ MASS

The fit uses the Ξ^- , Ξ^+ , and Ξ^0 masses and the $\Xi^- - \Xi^+$ mass difference. It assumes that the Ξ^- and Ξ^+ masses are the same.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1321.71 ± 0.07 OUR FIT				
1321.73 ± 0.08 ± 0.05	2256 ± 63	ABDALLAH	06E	DLPH from Z decays
• • •				We do not use the following data for averages, fits, limits, etc. • • •
1321.6 ± 0.8	35	VOTRUBA	72	HBC 10 GeV/c $K^+ p$
1321.2 ± 0.4	34	STONE	70	HBC
1320.69 ± 0.93	5	CHIEN	66	HBC 6.9 GeV/c $\bar{p} p$

$$(m_{\Xi^-} - m_{\Xi^+}) / m_{\Xi^-}$$

A test of CPT invariance.

VALUE	DOCUMENT ID	TECN	COMMENT
(-2.5 ± 8.7) × 10⁻⁵	ABDALLAH	06E	DLPH from Z decays

Ξ^- MEAN LIFE

Measurements with an error $> 0.2 \times 10^{-10}$ s or with systematic errors not included have been omitted.

VALUE (10^{-10} s)	EVTS	DOCUMENT ID	TECN	COMMENT
1.639 ± 0.015	OUR AVERAGE			
$1.65 \pm 0.07 \pm 0.12$	2478 ± 68	ABDALLAH	06E	DLPH from Z decays
1.652 ± 0.051	32k	BOURQUIN	84	SPEC Hyperon beam
1.665 ± 0.065	41k	BOURQUIN	79	SPEC Hyperon beam
1.609 ± 0.028	4286	HEMINGWAY	78	HBC 4.2 GeV/c $K^- p$
1.67 ± 0.08		DIBIANCA	75	DBC 4.9 GeV/c $K^- d$
1.63 ± 0.03	4303	BALTAY	74	HBC 1.75 GeV/c $K^- p$
$1.73 \begin{smallmatrix} +0.08 \\ -0.07 \end{smallmatrix}$	680	MAYEUR	72	HLBC 2.1 GeV/c K^-
1.61 ± 0.04	2610	DAUBER	69	HBC
1.80 ± 0.16	299	LONDON	66	HBC
1.70 ± 0.12	246	PJERROU	65B	HBC
1.69 ± 0.07	794	HUBBARD	64	HBC
$1.86 \begin{smallmatrix} +0.15 \\ -0.14 \end{smallmatrix}$	517	JAUNEAU	63D	FBC

 Ξ^+ MEAN LIFE

VALUE (10^{-10} s)	EVTS	DOCUMENT ID	TECN	COMMENT
$1.70 \pm 0.08 \pm 0.12$	2256 \pm 63	ABDALLAH	06E	DLPH from Z decays
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$1.55 \begin{smallmatrix} +0.35 \\ -0.20 \end{smallmatrix}$	35	³ VOTRUBA	72	HBC 10 GeV/c $K^+ p$
1.6 ± 0.3	34	STONE	70	HBC
$1.9 \begin{smallmatrix} +0.7 \\ -0.5 \end{smallmatrix}$	12	³ SHEN	67	HBC
1.51 ± 0.55	5	³ CHIEN	66	HBC 6.9 GeV/c $\bar{p} p$

³The error is statistical only.

$$(\tau_{\Xi^-} - \tau_{\Xi^+}) / \tau_{\Xi^-}$$

A test of CPT invariance.

VALUE	DOCUMENT ID	TECN	COMMENT
-0.01 ± 0.07	ABDALLAH	06E	DLPH from Z decays

 Ξ^- MAGNETIC MOMENT

See the "Quark Model" review.

VALUE (μ_N)	EVTS	DOCUMENT ID	TECN	COMMENT
-0.6507 ± 0.0025	OUR AVERAGE			
-0.6505 ± 0.0025	4.36M	DURYEA	92	SPEC 800 GeV p Be
$-0.661 \pm 0.036 \pm 0.036$	44k	TROST	89	SPEC $\Xi^- \sim 250$ GeV
-0.69 ± 0.04	218k	RAMEIKA	84	SPEC 400 GeV p Be

• • • We do not use the following data for averages, fits, limits, etc. • • •

-0.674 ±0.021 ±0.020	122k	HO	90	SPEC	See
					DURYEYEA 92
-2.1 ±0.8	2436	COOL	74	OSPK	1.8 GeV/c K ⁻ p
-0.1 ±2.1	2724	BINGHAM	70B	OSPK	1.8 GeV/c K ⁻ p

Ξ^+ MAGNETIC MOMENT

See the "Quark Model" review.

VALUE (μ_N)	EVTs	DOCUMENT ID	TECN	COMMENT
+0.657±0.028±0.020	70k	HO	90	SPEC 800 GeV pBe

$$(\mu_{\Xi^-} + \mu_{\Xi^+}) / |\mu_{\Xi^-}|$$

A test of *CPT* invariance. We calculate this from the Ξ^- and Ξ^+ magnetic moments above.

VALUE	DOCUMENT ID
+0.01±0.05 OUR EVALUATION	

Ξ^- DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 $\Lambda\pi^-$	(99.887±0.035) %	
Γ_2 $\Sigma^-\gamma$	(1.27 ±0.23) × 10 ⁻⁴	
Γ_3 $\Lambda e^- \bar{\nu}_e$	(5.63 ±0.31) × 10 ⁻⁴	
Γ_4 $\Lambda\mu^- \bar{\nu}_\mu$	(3.5 ^{+3.5} _{-2.2}) × 10 ⁻⁴	
Γ_5 $\Sigma^0 e^- \bar{\nu}_e$	(8.7 ±1.7) × 10 ⁻⁵	
Γ_6 $\Sigma^0 \mu^- \bar{\nu}_\mu$	< 8 × 10 ⁻⁴	90%
Γ_7 $\Xi^0 e^- \bar{\nu}_e$	< 2.3 × 10 ⁻³	90%

$\Delta S = 2$ forbidden (*S2*) modes

Γ_8 $n\pi^-$	<i>S2</i> < 1.9	× 10 ⁻⁵	90%
Γ_9 $ne^- \bar{\nu}_e$	<i>S2</i> < 3.2	× 10 ⁻³	90%
Γ_{10} $n\mu^- \bar{\nu}_\mu$	<i>S2</i> < 1.5	%	90%
Γ_{11} $p\pi^-\pi^-$	<i>S2</i> < 4	× 10 ⁻⁴	90%
Γ_{12} $p\pi^- e^- \bar{\nu}_e$	<i>S2</i> < 4	× 10 ⁻⁴	90%
Γ_{13} $p\pi^- \mu^- \bar{\nu}_\mu$	<i>S2</i> < 4	× 10 ⁻⁴	90%
Γ_{14} $p\mu^- \mu^-$	<i>L</i> < 4	× 10 ⁻⁸	90%

CONSTRAINED FIT INFORMATION

An overall fit to 4 branching ratios uses 5 measurements and one constraint to determine 5 parameters. The overall fit has a $\chi^2 = 1.0$ for 1 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	-6			
x_3	-8	0		
x_4	-99	0	-1	
x_5	-5	0	0	0
	x_1	x_2	x_3	x_4

Ξ^- BRANCHING RATIOS

A number of early results have been omitted.

$\Gamma(\Sigma^- \gamma) / \Gamma(\Lambda \pi^-)$

Γ_2 / Γ_1

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.27 ± 0.24 OUR FIT				
1.27 ± 0.23 OUR AVERAGE				
1.22 ± 0.23 ± 0.06	211	⁴ DUBBS	94 E761	Ξ^- 375 GeV
2.27 ± 1.02	9	BIAGI	87B SPEC	SPS hyperon beam

⁴DUBBS 94 also finds weak evidence that the asymmetry parameter α_γ is positive ($\alpha_\gamma = 1.0 \pm 1.3$).

$\Gamma(\Lambda e^- \bar{\nu}_e) / \Gamma(\Lambda \pi^-)$

Γ_3 / Γ_1

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.564 ± 0.031 OUR FIT				
0.564 ± 0.031	2857	BOURQUIN	83 SPEC	SPS hyperon beam
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.30 ± 0.13	11	THOMPSON	80 ASPK	Hyperon beam

$\Gamma(\Lambda \mu^- \bar{\nu}_\mu) / \Gamma(\Lambda \pi^-)$

Γ_4 / Γ_1

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.35^{+0.35}_{-0.22} OUR FIT					
0.35 ± 0.35		1	YEH	74 HBC	Effective denom.=2859
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 2.3	90	0	THOMPSON	80 ASPK	Effective denom.=1017
< 1.3			DAUBER	69 HBC	
< 12			BERGE	66 HBC	

$\Gamma(\Sigma^0 e^- \bar{\nu}_e)/\Gamma(\Lambda\pi^-)$ Γ_5/Γ_1

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
0.087±0.017 OUR FIT				
0.087±0.017	154	BOURQUIN 83	SPEC	SPS hyperon beam

$[\Gamma(\Lambda e^- \bar{\nu}_e) + \Gamma(\Sigma^0 e^- \bar{\nu}_e)]/\Gamma(\Lambda\pi^-)$ $(\Gamma_3+\Gamma_5)/\Gamma_1$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.651±0.031	3011	⁵ BOURQUIN 83	SPEC	SPS hyperon beam
0.68 ±0.22	17	⁶ DUCLOS 71	OSPK	

⁵See the separate BOURQUIN 83 values for $\Gamma(\Lambda e^- \bar{\nu}_e)/\Gamma(\Lambda\pi^-)$ and $\Gamma(\Sigma^0 e^- \bar{\nu}_e)/\Gamma(\Lambda\pi^-)$ above.

⁶DUCLOS 71 cannot distinguish Σ^0 's from Λ 's. The Cabibbo theory predicts the Σ^0 rate is about a factor 6 smaller than the Λ rate.

$\Gamma(\Sigma^0 \mu^- \bar{\nu}_\mu)/\Gamma(\Lambda\pi^-)$ Γ_6/Γ_1

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<0.76	90	0	YEH 74	HBC	Effective denom.=3026
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<5			BERGE 66	HBC	

$\Gamma(\Xi^0 e^- \bar{\nu}_e)/\Gamma(\Lambda\pi^-)$ Γ_7/Γ_1

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<2.3	90	0	YEH 74	HBC	Effective denom.=1000

$\Gamma(n\pi^-)/\Gamma(\Lambda\pi^-)$ Γ_8/Γ_1

$\Delta S=2$. Forbidden in first-order weak interaction.

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<0.019	90		BIAGI 82B	SPEC	SPS hyperon beam
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.0	90	0	YEH 74	HBC	Effective denom.=760
<1.1			DAUBER 69	HBC	
<5.0			FERRO-LUZZI 63	HBC	

$\Gamma(ne^- \bar{\nu}_e)/\Gamma(\Lambda\pi^-)$ Γ_9/Γ_1

$\Delta S=2$. Forbidden in first-order weak interaction.

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
< 3.2	90	0	YEH 74	HBC	Effective denom.=715
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<10	90		BINGHAM 65	RVUE	

$\Gamma(n\mu^- \bar{\nu}_\mu)/\Gamma(\Lambda\pi^-)$ Γ_{10}/Γ_1

$\Delta S=2$. Forbidden in first-order weak interaction.

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<15.3	90	0	YEH 74	HBC	Effective denom.=150

$\Gamma(\rho\pi^-\pi^-)/\Gamma(\Lambda\pi^-)$ Γ_{11}/Γ_1

$\Delta S=2$. Forbidden in first-order weak interaction.

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<3.7	90	0	YEH 74	HBC	Effective denom.=6200

$\Gamma(\rho\pi^-e^-\bar{\nu}_e)/\Gamma(\Lambda\pi^-)$ Γ_{12}/Γ_1

$\Delta S=2$. Forbidden in first-order weak interaction.

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<3.7	90	0	YEH 74	HBC	Effective denom.=6200

$\Gamma(\rho\pi^-\mu^-\bar{\nu}_\mu)/\Gamma(\Lambda\pi^-)$ Γ_{13}/Γ_1

$\Delta S=2$. Forbidden in first-order weak interaction.

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<3.7	90	0	YEH 74	HBC	Effective denom.=6200

$\Gamma(\rho\mu^-\mu^-)/\Gamma(\Lambda\pi^-)$ Γ_{14}/Γ_1

A $\Delta L=2$ decay, forbidden by total lepton number conservation.

VALUE (units 10^{-8})	CL%	DOCUMENT ID	TECN	COMMENT
<4.0	90	RAJARAM 05	HYCP	p Cu, 800 GeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$<3.7 \times 10^4$	90	⁷ LITTENBERG 92B	HBC	Uses YEH 74 data
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⁷This LITTENBERG 92B limit and the identical YEH 74 limits for the preceding three modes all result from nonobservance of any 3-prong decays of the Ξ^- . One could as well apply the limit to the *sum* of the four modes.

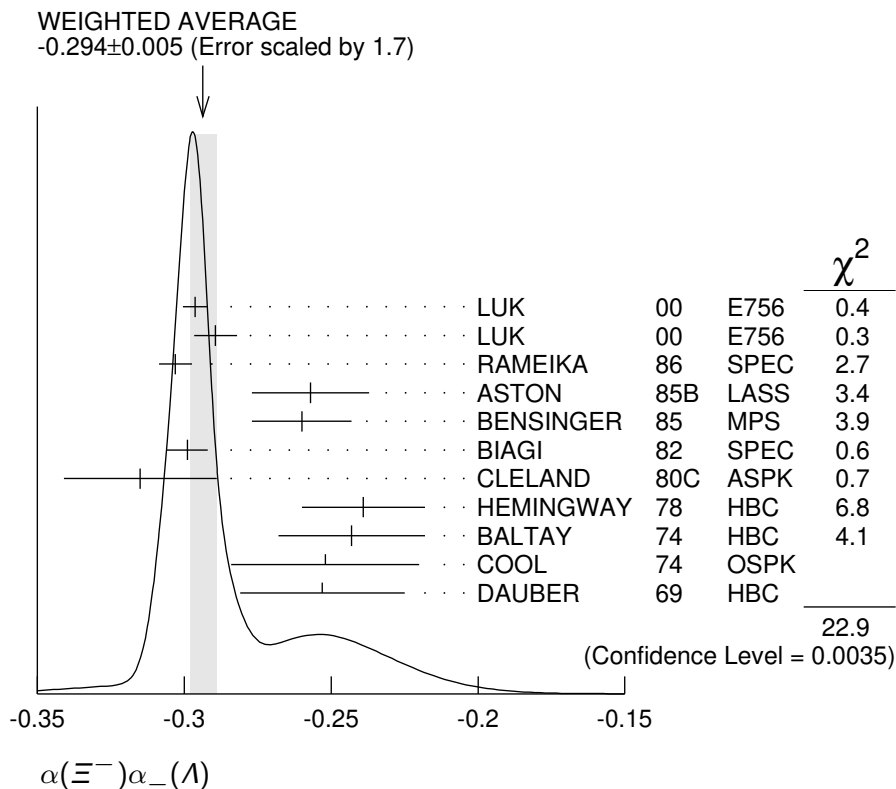
Ξ^- DECAY PARAMETERS

See the "Note on Baryon Decay Parameters" in the neutron Listings.

$\alpha(\Xi^-)\alpha_-(\Lambda)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-0.294 ± 0.005 OUR AVERAGE		Error includes scale factor of 1.7. See the ideogram below.		
-0.2963 ± 0.0042	189k	LUK	00	E756 p Be, 800 GeV
-0.2894 ± 0.0073	63k	⁸ LUK	00	E756 p Be, 800 GeV
$-0.303 \pm 0.004 \pm 0.004$	192k	RAMEIKA	86	SPEC 400 GeV p Be
-0.257 ± 0.020	11k	ASTON	85B	LASS 11 GeV/c $K^- p$
-0.260 ± 0.017	21k	BENSINGER	85	MPS 5 GeV/c $K^- p$
-0.299 ± 0.007	150k	BIAGI	82	SPEC SPS hyperon beam
-0.315 ± 0.026	9046	CLELAND	80C	ASPK BNL hyperon beam
-0.239 ± 0.021	6599	HEMINGWAY	78	HBC 4.2 GeV/c $K^- p$
-0.243 ± 0.025	4303	BALTAY	74	HBC 1.75 GeV/c $K^- p$
-0.252 ± 0.032	2436	COOL	74	OSPK 1.8 GeV/c $K^- p$
-0.253 ± 0.028	2781	DAUBER	69	HBC

⁸This LUK 00 value is for $\alpha(\Xi^+)\alpha_+(\bar{\Lambda})$. We assume CP conservation here by including it in the average for $\alpha(\Xi^-)\alpha_-(\Lambda)$. But see the second data block below for the CP test.



α FOR $\Xi^- \rightarrow \Lambda\pi^-$

The above average, $\alpha(\Xi^-)\alpha_-(\Lambda) = -0.294 \pm 0.005$, divided by our current average $\alpha_-(\Lambda) = 0.732 \pm 0.014$, gives the following value for $\alpha(\Xi^-)$:

VALUE	DOCUMENT ID
-0.401 ± 0.010	OUR EVALUATION

$$\frac{[\alpha(\Xi^-)\alpha_-(\Lambda) - \alpha(\Xi^+)\alpha_+(\bar{\Lambda})]}{[\alpha(\Xi^-)\alpha_-(\Lambda) + \alpha(\Xi^+)\alpha_+(\bar{\Lambda})]}$$

This is zero if CP is conserved. The α 's are the decay-asymmetry parameters for $\Xi^- \rightarrow \Lambda\pi^-$ and $\Lambda \rightarrow p\pi^-$ and for $\Xi^+ \rightarrow \bar{\Lambda}\pi^+$ and $\bar{\Lambda} \rightarrow \bar{p}\pi^+$.

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$0.0 \pm 5.1 \pm 4.4$	158M	HOLMSTROM 04	HYCP	p Cu, 800 GeV
••• We do not use the following data for averages, fits, limits, etc. •••				
+120 ± 140	252k	LUK	00 E756	p Be, 800 GeV

ϕ ANGLE FOR $\Xi^- \rightarrow \Lambda\pi^-$

($\tan\phi = \beta/\gamma$)

VALUE ($^\circ$)	EVTS	DOCUMENT ID	TECN	COMMENT
-2.1 ± 0.8				OUR AVERAGE
$-2.39 \pm 0.64 \pm 0.64$	144M	⁹ HUANG 04	HYCP	p Cu, 800 GeV
$-1.61 \pm 2.66 \pm 0.37$	1.35M	¹⁰ CHAKRAVO... 03	E756	p Be, 800 GeV
5 ± 10	11k	ASTON 85B	LASS	$K^- p$
14.7 ± 16.0	21k	¹¹ BENSINGER 85	MPS	5 GeV/c $K^- p$
11 ± 9	4303	BALTAY 74	HBC	1.75 GeV/c $K^- p$
5 ± 16	2436	COOL 74	OSPK	1.8 GeV/c $K^- p$
-14 ± 11	2781	DAUBER 69	HBC	Uses $\alpha_\Lambda = 0.647 \pm 0.020$
0 ± 12	1004	¹² BERGE 66	HBC	

• • • We do not use the following data for averages, fits, limits, etc. • • •

–26	±30	2724	BINGHAM	70B	OSPK	
0	±20.4	364	¹² LONDON	66	HBC	Using $\alpha_\Lambda=0.62$
54	±30	356	¹² CARMONY	64B	HBC	

⁹ From this result and α_Ξ , HUANG 04 gets $\beta_\Xi = -0.037 \pm 0.011 \pm 0.010$ and $\gamma_\Xi = 0.888 \pm 0.0004 \pm 0.006$. And the strong p–s phase difference for $\Lambda\pi^-$ scattering is $(4.6 \pm 1.4 \pm 1.2)^\circ$.

¹⁰ From this result and α_Ξ , CHAKRAVORTY 03 obtains $\beta_\Xi = -0.025 \pm 0.042 \pm 0.006$ and $\gamma_\Xi = 0.889 \pm 0.001 \pm 0.007$. And the strong p–s phase difference for $\Lambda\pi^-$ scattering is $(3.17 \pm 5.28 \pm 0.73)^\circ$.

¹¹ BENSINGER 85 used $\alpha_\Lambda = 0.642 \pm 0.013$.

¹² The errors have been multiplied by 1.2 due to approximations used for the Ξ polarization; see DAUBER 69 for a discussion.

g_A / g_V FOR $\Xi^- \rightarrow \Lambda e^- \bar{\nu}_e$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
–0.25±0.05	1992	¹³ BOURQUIN 83	SPEC	SPS hyperon beam

¹³ BOURQUIN 83 assumes that $g_2 = 0$. Also, the sign has been changed to agree with our conventions, given in the “Note on Baryon Decay Parameters” in the neutron Listings.

Ξ^- REFERENCES

We have omitted some papers that have been superseded by later experiments. See our earlier editions.

ABDALLAH	06E	PL B639 179	J. Abdallah <i>et al.</i>	(DELPHI Collab.)
RAJARAM	05	PRL 94 181801	D. Rajaram <i>et al.</i>	(FNAL HyperCP Collab.)
HOLMSTROM	04	PRL 93 262001	T. Holmstrom <i>et al.</i>	(FNAL HyperCP Collab.)
HUANG	04	PRL 93 011802	M. Huang <i>et al.</i>	(FNAL HyperCP Collab.)
CHAKRAVO...	03	PRL 91 031601	A. Chakravorty <i>et al.</i>	(FNAL E756 Collab.)
LUK	00	PRL 85 4860	K.B. Luk <i>et al.</i>	(FNAL E756 Collab.)
DUBBS	94	PRL 72 808	T. Dubbs <i>et al.</i>	(FNAL E761 Collab.)
DURYEA	92	PRL 68 768	J. Duryea <i>et al.</i>	(MINN, FNAL, MICH, RUTG)
LITTENBERG	92B	PR D46 892	L.S. Littenberg, R.E. Shrock	(BNL, STON)
HO	90	PRL 65 1713	P.M. Ho <i>et al.</i>	(MICH, FNAL, MINN, RUTG)
Also		PR D44 3402	P.M. Ho <i>et al.</i>	(MICH, FNAL, MINN, RUTG)
TROST	89	PR D40 1703	L.H. Trost <i>et al.</i>	(FNAL-715 Collab.)
BIAGI	87B	ZPHY C35 143	S.F. Biagi <i>et al.</i>	(BRIS, CERN, GEVA+)
RAMEIKA	86	PR D33 3172	R. Rameika <i>et al.</i>	(RUTG, MICH, WISC+)
ASTON	85B	PR D32 2270	D. Aston <i>et al.</i>	(SLAC, CARL, CNRC, CINC)
BENSINGER	85	NP B252 561	J.R. Bensingier <i>et al.</i>	(CHIC, ELMT, FNAL+)
BOURQUIN	84	NP B241 1	M.H. Bourquin <i>et al.</i>	(BRIS, GEVA, HEIDP+)
RAMEIKA	84	PRL 52 581	R. Rameika <i>et al.</i>	(RUTG, MICH, WISC+)
BOURQUIN	83	ZPHY C21 1	M.H. Bourquin <i>et al.</i>	(BRIS, GEVA, HEIDP+)
BIAGI	82	PL 112B 265	S.F. Biagi <i>et al.</i>	(BRIS, CAVE, GEVA+)
BIAGI	82B	PL 112B 277	S.F. Biagi <i>et al.</i>	(LOQM, GEVA, RL+)
CLELAND	80C	PR D21 12	W.E. Cleland <i>et al.</i>	(PITT, BNL)
THOMPSON	80	PR D21 25	J.A. Thompson <i>et al.</i>	(PITT, BNL)
BOURQUIN	79	PL 87B 297	M.H. Bourquin <i>et al.</i>	(BRIS, GEVA, HEIDP+)
HEMINGWAY	78	NP B142 205	R.J. Hemingway <i>et al.</i>	(CERN, ZEEM, NIJM+)
DIBIANCA	75	NP B98 137	F.A. Dibianca, R.J. Endorf	(CMU)
BALTAY	74	PR D9 49	C. Baltay <i>et al.</i>	(COLU, BING) J
COOL	74	PR D10 792	R.L. Cool <i>et al.</i>	(BNL)
Also		PRL 29 1630	R.L. Cool <i>et al.</i>	(BNL)
YEH	74	PR D10 3545	N. Yeh <i>et al.</i>	(BING, COLU)
MAYEUR	72	NP B47 333	C. Mayeur <i>et al.</i>	(BRUX, CERN, TUFTS, LOUC)
VOTRUBA	72	NP B45 77	M.F. Votruba, A. Safder, T.M. Ratcliffe	(BIRM+)
WILQUET	72	PL 42B 372	G. Wilquet <i>et al.</i>	(BRUX, CERN, TUFTS+)
DUCLOS	71	NP B32 493	J. Duclos <i>et al.</i>	(CERN)

BINGHAM	70B	PR D1 3010	G.M. Bingham <i>et al.</i>	(UCSD, WASH)
GOLDWASSER	70	PR D1 1960	E.L. Goldwasser, P.F. Schultz	(ILL)
STONE	70	PL 32B 515	S.L. Stone <i>et al.</i>	(ROCH)
DAUBER	69	PR 179 1262	P.M. Dauber <i>et al.</i>	(LRL) J
SHEN	67	PL 25B 443	B.C. Shen, A. Firestone, G. Goldhaber	(UCB+)
BERGE	66	PR 147 945	J.P. Berge <i>et al.</i>	(LRL)
CHIEN	66	PR 152 1171	C.Y. Chien <i>et al.</i>	(YALE, BNL)
LONDON	66	PR 143 1034	G.W. London <i>et al.</i>	(BNL, SYRA)
BINGHAM	65	PRSL 285 202	H.H. Bingham	(CERN)
PJERROU	65B	PRL 14 275	G.M. Pjerrou <i>et al.</i>	(UCLA)
Also		Thesis	G.M. Pjerrou	(UCLA)
BADIER	64	Dubna Conf. 1 593	J. Badier <i>et al.</i>	(EPOL, SACL, ZEEM)
CARMONY	64B	PRL 12 482	D.D. Carmony <i>et al.</i>	(UCLA) J
HUBBARD	64	PR 135 B183	J.R. Hubbard <i>et al.</i>	(LRL)
FERRO-LUZZI	63	PR 130 1568	M. Ferro-Luzzi <i>et al.</i>	(LRL)
JAUNEAU	63D	Siena Conf. 4	L. Jauneau <i>et al.</i>	(EPOL, CERN, LOUC+)
Also		PL 5 261	L. Jauneau <i>et al.</i>	(EPOL, CERN, LOUC+)
SCHNEIDER	63	PL 4 360	J. Schneider	(CERN)
