

$\Xi(1820) 3/2^-$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$ Status: ***

The clearest evidence is an 8-standard-deviation peak in ΛK^- seen by GAY 76C. TEODORO 78 favors $J = 3/2$, but cannot make a parity discrimination. BIAGI 87C is consistent with $J = 3/2$ and favors negative parity for this J value.

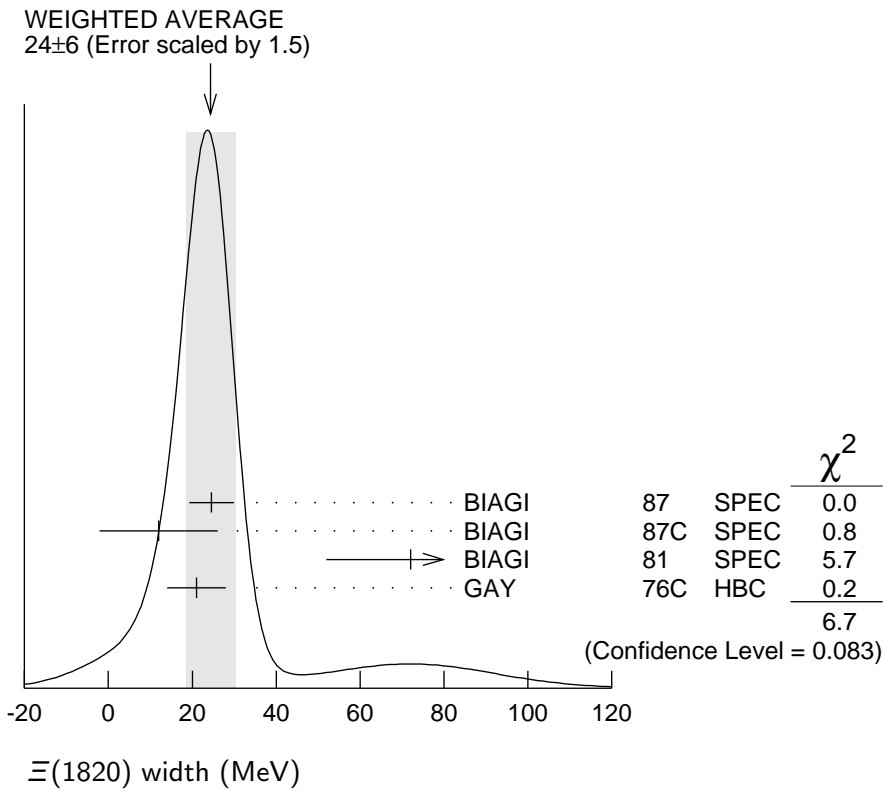
$\Xi(1820)$ MASS

We only average the measurements that appear to us to be most significant and best determined.

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
1823 ± 5					OUR ESTIMATE
1823.4 ± 1.4					OUR AVERAGE
1819.4 ± 3.1 ± 2.0	280	¹ BIAGI	87	SPEC	0 $\Xi^- \text{Be} \rightarrow (\Lambda K^-) X$
1826 ± 3 ± 1	54	BIAGI	87C	SPEC	0 $\Xi^- \text{Be} \rightarrow (\Lambda \bar{K}^0) X$
1822 ± 6		JENKINS	83	MPS	- $K^- p \rightarrow K^+$ (MM)
1830 ± 6	300	BIAGI	81	SPEC	- SPS hyperon beam
1823 ± 2	130	GAY	76C	HBC	- $K^- p$ 4.2 GeV/c
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
1817 ± 3		ADAMOVIICH	99B	WA89	Σ^- nucleus, 345 GeV
1797 ± 19	74	BRIEFEL	77	HBC	0 $K^- p$ 2.87 GeV/c
1829 ± 9	68	BRIEFEL	77	HBC	-0 $\Xi(1530) \pi$
1860 ± 14	39	BRIEFEL	77	HBC	- $\Sigma^- \bar{K}^0$
1870 ± 9	44	BRIEFEL	77	HBC	0 $\Lambda \bar{K}^0$
1813 ± 4	57	BRIEFEL	77	HBC	- ΛK^-
1807 ± 27		DIBIANCA	75	DBC	-0 $\Xi \pi \pi, \Xi^* \pi$
1762 ± 8	28	² BADIÉ	72	HBC	-0 $\Xi \pi, \Xi \pi \pi, Y K$
1838 ± 5	38	² BADIÉ	72	HBC	-0 $\Xi \pi, \Xi \pi \pi, Y K$
1830 ± 10	25	³ CRENNELL	70B	DBC	-0 3.6, 3.9 GeV/c
1826 ± 12		⁴ CRENNELL	70B	DBC	-0 3.6, 3.9 GeV/c
1830 ± 10	40	ALITTI	69	HBC	- $\Lambda, \Sigma \bar{K}$
1814 ± 4	30	BADIÉ	65	HBC	0 $\Lambda \bar{K}^0$
1817 ± 7	29	SMITH	65C	HBC	-0 $\Lambda \bar{K}^0, \Lambda K^-$
1770		HALSTEINSLID	63	FBC	-0 K^- freon 3.5 GeV/c

$\Xi(1820)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
24 $\begin{smallmatrix} +15 \\ -10 \end{smallmatrix}$					OUR ESTIMATE
24 ± 6					OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.
24.6 \pm 5.3	280	¹ BIAGI	87	SPEC	0 $\Xi^- \text{Be} \rightarrow (\Lambda K^-) X$
12 \pm 14 \pm 1.7	54	BIAGI	87C	SPEC	0 $\Xi^- \text{Be} \rightarrow (\Lambda \bar{K}^0) X$
72 \pm 20	300	BIAGI	81	SPEC	– SPS hyperon beam
21 \pm 7	130	GAY	76C	HBC	– $K^- p$ 4.2 GeV/c
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
23 \pm 13		ADAMOVICH	99B	WA89	Σ^- nucleus, 345 GeV
99 \pm 57	74	BRIEFEL	77	HBC	0 $K^- p$ 2.87 GeV/c
52 \pm 34	68	BRIEFEL	77	HBC	–0 $\Xi(1530)\pi$
72 \pm 17	39	BRIEFEL	77	HBC	– $\Sigma^- \bar{K}^0$
44 \pm 11	44	BRIEFEL	77	HBC	0 $\Lambda \bar{K}^0$
26 \pm 11	57	BRIEFEL	77	HBC	– ΛK^-
85 \pm 58		DIBIANCA	75	DBC	–0 $\Xi \pi \pi, \Xi^* \pi$
51 \pm 13		² BADIER	72	HBC	–0 Lower mass
58 \pm 13		² BADIER	72	HBC	–0 Higher mass
103 $\begin{smallmatrix} +38 \\ -24 \end{smallmatrix}$		³ CRENNELL	70B	DBC	–0 3.6, 3.9 GeV/c
48 $\begin{smallmatrix} +36 \\ -19 \end{smallmatrix}$		⁴ CRENNELL	70B	DBC	–0 3.6, 3.9 GeV/c
55 $\begin{smallmatrix} +40 \\ -20 \end{smallmatrix}$		ALITTI	69	HBC	– $\Lambda, \Sigma \bar{K}$
12 \pm 4		BADIER	65	HBC	0 $\Lambda \bar{K}^0$
30 \pm 7		SMITH	65B	HBC	–0 $\Lambda \bar{K}$
< 80		HALSTEINSLID63	FBC	–0	K^- freon 3.5 GeV/c



$\Xi(1820)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $\Lambda \bar{K}$	large
Γ_2 $\Sigma \bar{K}$	small
Γ_3 $\Xi \pi$	small
Γ_4 $\Xi(1530)\pi$	small
Γ_5 $\Xi \pi \pi$ (not $\Xi(1530)\pi$)	

$\Xi(1820)$ BRANCHING RATIOS

The dominant modes seem to be $\Lambda \bar{K}$ and (perhaps) $\Xi(1530)\pi$, but the branching fractions are very poorly determined.

$\Gamma(\Lambda \bar{K})/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE	DOCUMENT ID	TECN	CHG	COMMENT	
0.25 ± 0.05 OUR AVERAGE					
0.24 ± 0.05	ANISOVICH	12A	DPWA	Multichannel	
0.30 ± 0.15	ALITTI	69	HBC	$K^- p$ 3.9–5 GeV/c	

$\Gamma(\Xi \pi)/\Gamma_{\text{total}}$					Γ_3/Γ
VALUE	DOCUMENT ID	TECN	CHG	COMMENT	
0.10 ± 0.10					
	ALITTI	69	HBC	$K^- p$ 3.9–5 GeV/c	

$\Gamma(\Xi\pi)/\Gamma(\Lambda\bar{K})$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<0.36	95	GAY	76C	HBC	– $K^- p$ 4.2 GeV/c
0.20 ± 0.20		BADIER	65	HBC	0 $K^- p$ 3 GeV/c

Γ_3/Γ_1

$\Gamma(\Xi\pi)/\Gamma(\Xi(1530)\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
$1.5^{+0.6}_{-0.4}$	APSELL 70	HBC	0	$K^- p$ 2.87 GeV/c

Γ_3/Γ_4

$\Gamma(\Sigma\bar{K})/\Gamma_{total}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
0.30 ± 0.15	ALITTI 69	HBC	–	$K^- p$ 3.9–5 GeV/c

Γ_2/Γ

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

<0.02	TRIPP 67	RVUE		Use SMITH 65C
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$\Gamma(\Sigma\bar{K})/\Gamma(\Lambda\bar{K})$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
0.24 ± 0.10	GAY 76C	HBC	–	$K^- p$ 4.2 GeV/c

Γ_2/Γ_1

$\Gamma(\Xi(1530)\pi)/\Gamma_{total}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
0.30 ± 0.15	ALITTI 69	HBC	–	$K^- p$ 3.9–5 GeV/c

Γ_4/Γ

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

seen	ASTON 85B	LASS		$K^- p$ 11 GeV/c
not seen	⁵ HASSALL 81	HBC		$K^- p$ 6.5 GeV/c
<0.25	⁶ DAUBER 69	HBC		$K^- p$ 2.7 GeV/c

$\Gamma(\Xi(1530)\pi)/\Gamma(\Lambda\bar{K})$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
0.38 ± 0.27 OUR AVERAGE	Error includes scale factor of 2.3.			
1.0 \pm 0.3	GAY 76C	HBC	–	$K^- p$ 4.2 GeV/c
0.26 \pm 0.13	SMITH 65C	HBC	–0	$K^- p$ 2.45–2.7 GeV/c

Γ_4/Γ_1

$\Gamma(\Xi\pi\pi(\text{not } \Xi(1530)\pi))/\Gamma(\Lambda\bar{K})$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
0.30 ± 0.20	BIAGI 87	SPEC	–	Ξ^- Be 116 GeV

Γ_5/Γ_1

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

<0.14	⁷ BADIER 65	HBC	0	1 st. dev. limit
>0.1	SMITH 65C	HBC	–0	$K^- p$ 2.45–2.7 GeV/c

$\Gamma(\Xi\pi\pi(\text{not } \Xi(1530)\pi))/\Gamma(\Xi(1530)\pi)$	Γ_5/Γ_4
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
consistent with zero	GAY 76C HBC - $K^- p$ 4.2 GeV/c
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.3 ± 0.5	⁸ APSELL 70 HBC 0 $K^- p$ 2.87 GeV/c

$\Xi(1820)$ FOOTNOTES

- ¹ BIAGI 87 also sees weak signals in the in the $\Xi^- \pi^+ \pi^-$ channel at 1782.6 ± 1.4 MeV ($\Gamma = 6.0 \pm 1.5$ MeV) and 1831.9 ± 2.8 MeV ($\Gamma = 9.6 \pm 9.9$ MeV).
- ² BADIER 72 adds all channels and divides the peak into lower and higher mass regions. The data can also be fitted with a single Breit-Wigner of mass 1800 MeV and width 150 MeV.
- ³ From a fit to inclusive $\Xi\pi$, $\Xi\pi\pi$, and ΛK^- spectra.
- ⁴ From a fit to inclusive $\Xi\pi$ and $\Xi\pi\pi$ spectra only.
- ⁵ Including $\Xi\pi\pi$.
- ⁶ DAUBER 69 uses in part the same data as SMITH 65C.
- ⁷ For the decay mode $\Xi^- \pi^+ \pi^0$ only. This limit includes $\Xi(1530)\pi$.
- ⁸ Or less. Upper limit for the 3-body decay.

$\Xi(1820)$ REFERENCES

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ADAMOVIĆ 99B EPJ C11 271	M.I. Adamovich <i>et al.</i>	(CERN WA89 Collab.)
BIAGI 87 ZPHY C34 15	S.F. Biagi <i>et al.</i>	(BRIS, CERN, GEVA+)
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ASTON 85B PR D32 2270	D. Aston <i>et al.</i>	(SLAC, CARL, CNRC, CINC)
JENKINS 83 PRL 51 951	C.M. Jenkins <i>et al.</i>	(FSU, BRAN, LBL+)
BIAGI 81 ZPHY C9 305	S.F. Biagi <i>et al.</i>	(BRIS, CAVE, GEVA+)
HASSALL 81 NP B189 397	J.K. Hassall <i>et al.</i>	(CAVE, MSU)
TEODORO 78 PL 77B 451	D. Teodoro <i>et al.</i>	(AMST, CERN, NIJM+) JP
BRIEFEL 77 PR D16 2706	E. Briefel <i>et al.</i>	(BRAN, UMD, SYRA+)
Also	S.P. Apsell <i>et al.</i>	(BRAN, UMD, SYRA+)
GAY 76C PL 62B 477	J.B. Gay <i>et al.</i>	(AMST, CERN, NIJM) IJ
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CRENNELL 70B PR D1 847	D.J. Crennell <i>et al.</i>	(BNL)
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