

$\Xi(1820) D_{13}$

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

The clearest evidence is an 8-standard-deviation peak in ΛK^- seen by GAY 76. 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.

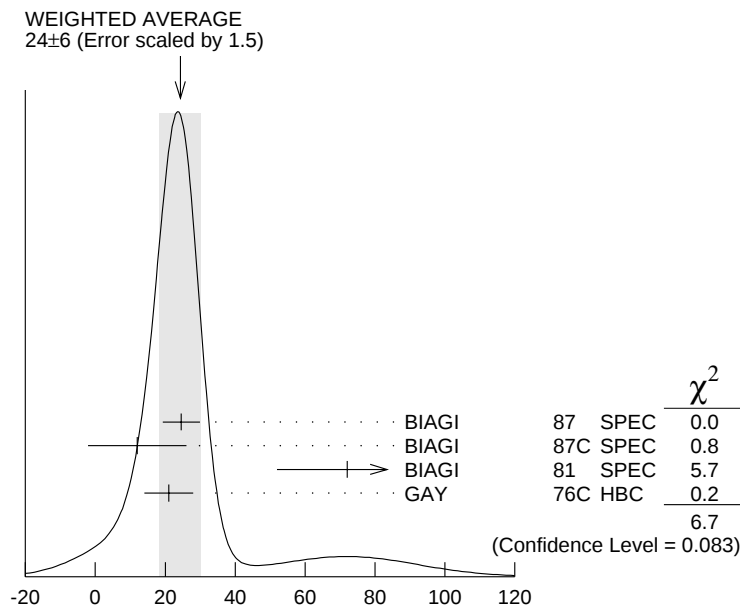
$\Xi(1820)$ MASS

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

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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		ADAMOVICH	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 BADIER	72 HBC	—0	$\Xi \pi, \Xi \pi \pi, Y K$
1838 ± 5	38	² BADIER	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	BADIER	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	$\Xi^- \text{Be} \rightarrow (\Lambda \overline{K}^0) X$
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	—	$\Sigma^- \overline{K}^0$
44 $\pm$ 11	44	BRIEFEL	77 HBC	0	$\Lambda \overline{K}^0$
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	—	$\Lambda, \Sigma \overline{K}$
12 $\pm$ 4		BADIER	65 HBC	0	$\Lambda \overline{K}^0$
30 $\pm$ 7		SMITH	65B HBC	—0	$\Lambda \overline{K}$
< 80		HALSTEINSLID63	FBC	—0	K^- freon 3.5 GeV/c



$\Xi(1820)$ width (MeV)

$\Xi(1820)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad \Lambda \bar{K}$	large
$\Gamma_2 \quad \Sigma \bar{K}$	small
$\Gamma_3 \quad \Xi \pi$	small
$\Gamma_4 \quad \Xi(1530) \pi$	small
$\Gamma_5 \quad \Xi \pi \pi \text{ (not } \Xi(1530) \pi \text{)}$	

$\Xi(1820)$ 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	
0.30±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

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

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT
<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 $\Gamma(\Xi\pi)/\Gamma(\Xi(1530)\pi)$

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

 Γ_3/Γ_4 $\Gamma(\Sigma\bar{K})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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
-------	-------	---------	--	---------------

 $\Gamma(\Sigma\bar{K})/\Gamma(\Lambda\bar{K})$

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

 Γ_2/Γ_1 $\Gamma(\Xi(1530)\pi)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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

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

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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 $\Gamma(\Xi\pi\pi(\text{not } \Xi(1530)\pi))/\Gamma(\Lambda\bar{K})$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
0.30 ± 0.20	BIAGI	87 SPEC	—	$\Xi^- \text{ Be}$ 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

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

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
consistent with zero	GAY	76C HBC	—	$K^- p$ 4.2 GeV/c

 Γ_5/Γ_4

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

0.3 $\pm$ 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

ADAMOVICH	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+)
BIAGI	87C	ZPHY C34 175	S.F. Biagi <i>et al.</i>	(BRIS, CERN, GEVA+) JP
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	69	PRL 23 884	S.P. Apsell <i>et al.</i>	(BRAN, UMD, SYRA+)
GAY	76	NC 31A 593	J.B. Gay <i>et al.</i>	(NEUC, LAUS, LIVP, CURIN)
GAY	76C	PL 62B 477	J.B. Gay <i>et al.</i>	(AMST, CERN, NIJM) IJ
DIBIANCA	75	NP B98 137	F.A. Dibianca, R.J. Endorf	(CMU)
BADIER	72	NP B37 429	J. Badier <i>et al.</i>	(EPOL)
APSELL	70	PRL 24 777	S.P. Apsell <i>et al.</i>	(BRAN, UMD, SYRA+) I
CRENNELL	70B	PR D1 847	D.J. Crennell <i>et al.</i>	(BNL)
ALITTI	69	PRL 22 79	J. Alitti <i>et al.</i>	(BNL, SYRA) I
DAUBER	69	PR 179 1262	P.M. Dauber <i>et al.</i>	(LRL)
TRIPP	67	NP B3 10	R.D. Tripp <i>et al.</i>	(LRL, SLAC, CERN+)
BADIER	65	PL 16 171	J. Badier <i>et al.</i>	(EPOL, SACL, AMST) I
SMITH	65B	Athens Conf. 251	G.A. Smith, J.S. Lindsey	(LRL)
SMITH	65C	PRL 14 25	G.A. Smith <i>et al.</i>	(LRL) IJP
HALSTEINSLID	63	Siena Conf. 1 73	A. Halsteinslid <i>et al.</i>	(BERG, CERN, EPOL+) I

OTHER RELATED PAPERS

TEODORO	78	PL 77B 451	D. Teodoro <i>et al.</i>	(AMST, CERN, NIJM+) JP
BRIEFEL	75	PR D12 1859	E. Briefel <i>et al.</i>	(BRAN, UMD, SYRA+)
SCHMIDT	73	Purdue Conf. 363	P.E. Schmidt	(BRAN)
MERRILL	68	PR 167 1202	D.W. Merrill, J. Button-Shafer	(LRL)
SMITH	64	PRL 13 61	G.A. Smith <i>et al.</i>	(LRL) IJP