$\Xi(1820)$ 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.

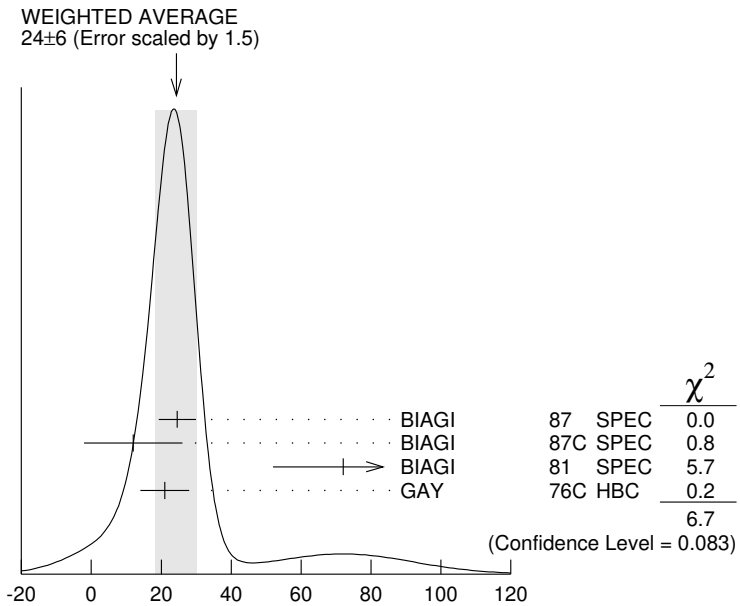
$\Xi(1820)$ MASS

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	Ξ^- Be → (ΛK^-) X
1826 ± 3 ± 1	54	BIAGI	87C	SPEC	0	Ξ^- Be → ($\Lambda \overline{K}^0$) X
1822 ± 6		JENKINS	83	MPS	–	$K^- p$ → 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	–	$\Sigma^- \overline{K}^0$
1870 ± 9	44	BRIEFEL	77	HBC	0	$\Lambda \overline{K}^0$
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	–	Λ, $\Sigma\overline{K}$
1814 ± 4	30	BADIER	65	HBC	0	$\Lambda \overline{K}^0$
1817 ± 7	29	SMITH	65C	HBC	−0	$\Lambda \overline{K}^0$, ΛK^-
1770		HALSTEINSLID	63	FBC	−0	K^- freon 3.5 GeV/c

$\Xi(1820)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
24^{+15}_{-10} OUR ESTIMATE						
24 ± 6 OUR AVERAGE		Error includes scale factor of 1.5. See the ideogram below.				
24.6 ± 5.3	280	[1] BIAGI	87	SPEC	0	Ξ^- Be → (ΛK^-) X
12 ±14 ±1.7	54	BIAGI	87C	SPEC	0	Ξ^- Be → $(\Lambda \overline{K}^0)$ X
72 ±20	300	BIAGI	81	SPEC	–	SPS hyperon beam
21 ± 7	130	GAY	76C	HBC	–	$K^- p$ 4.2 GeV/c
• • • We do not use the following data for averages, fits, limits, etc. • • •						
23 ±13		ADAMOVICH	99B	WA89		Σ^- nucleus, 345 GeV
99 ±57	74	BRIEFEL	77	HBC	0	$K^- p$ 2.87 GeV/c
52 ±34	68	BRIEFEL	77	HBC	−0	$\Xi(1530)\pi$
72 ±17	39	BRIEFEL	77	HBC	–	$\Sigma^- \overline{K}^0$
44 ±11	44	BRIEFEL	77	HBC	0	$\Lambda \overline{K}^0$
26 ±11	57	BRIEFEL	77	HBC	–	ΛK^-
85 ±58		DIBIANCA	75	DBC	−0	$\Xi\pi\pi$, $\Xi^*\pi$
51 ±13		[2] BADIER	72	HBC	−0	Lower mass
58 ±13		[2] BADIER	72	HBC	−0	Higher mass
103^{+38}_{-24}		[3] CRENNELL	70B	DBC	−0	3.6, 3.9 GeV/c
48^{+36}_{-19}		[4] CRENNELL	70B	DBC	−0	3.6, 3.9 GeV/c
55^{+40}_{-20}		ALITTI	69	HBC	–	Λ, $\Sigma\overline{K}$
12 ± 4		BADIER	65	HBC	0	$\Lambda \overline{K}^0$
30 ± 7		SMITH	65B	HBC	−0	$\Lambda \overline{K}$
< 80		HALSTEINSLID	63	FBC	−0	K^- freon 3.5 GeV/c



$\Xi(1820)$ width (MeV)

$\Xi(1820)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\Lambda\overline{K}$	large
Γ_2	$\Sigma\overline{K}$	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 $\Lambda\overline{K}$ and (perhaps) $\Xi(1530)\pi$, but the branching fractions are very poorly determined.

$\Gamma(\Lambda\overline{K})/\Gamma_{total}$ — Γ_1/Γ

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

$\Gamma(\Xi\pi)/\Gamma_{total}$ — Γ_3/Γ

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
0.10±0.10	ALITTI	69	HBC	–	K^-p 3.9–5 GeV/c

$\Gamma(\Xi\pi)/\Gamma(\Lambda\overline{K})$ — Γ_3/Γ_1

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

$\Gamma(\Xi\pi)/\Gamma(\Xi(1530)\pi)$ — Γ_3/Γ_4

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

$\Gamma(\Sigma\overline{K})/\Gamma_{total}$ — Γ_2/Γ

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
0.30±0.15	ALITTI	69	HBC	–	K^-p 3.9–5 GeV/c
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.02	TRIPP	67	RVUE		Use SMITH 65C

$\Gamma(\Sigma\overline{K})/\Gamma(\Lambda\overline{K})$ — Γ_2/Γ_1

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

$\Gamma(\Xi(1530)\pi)/\Gamma_{total}$ — Γ_4/Γ

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

$\Gamma(\Xi(1530)\pi)/\Gamma(\Lambda\overline{K})$ — Γ_4/Γ_1

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

$\Gamma(\Xi\pi\pi(\text{not}\,\Xi(1530)\pi))/\Gamma(\Lambda\overline{K})$ — Γ_5/Γ_1

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
0.30±0.20	BIAGI	87	SPEC	–	Ξ^- Be 116 GeV
• • • 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

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
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 (Γ = 6.0 ± 1.5 MeV) and 1831.9 ± 2.8 MeV (Γ = 9.6 ± 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 *et al.*	(CERN WA89 Collab.)	
BIAGI	87	ZPHY C34 15	S.F. Biagi *et al.*	(BRIS, CERN, GEVA+)	
BIAGI	87C	ZPHY C34 175	S.F. Biagi *et al.*	(BRIS, CERN, GEVA+)	JP
ASTON	85B	PR D32 2270	D. Aston *et al.*	(SLAC, CARL, CNRC, CINC)	
JENKINS	83	PRL 51 951	C.M. Jenkins *et al.*	(FSU, BRAN, LBL+)	
BIAGI	81	ZPHY C9 305	S.F. Biagi *et al.*	(BRIS, CAVE, GEVA+)	
HASSALL	81	NP B189 397	J.K. Hassall *et al.*	(CAVE, MSU)	
TEODORO	78	PL 77B 451	D. Teodoro *et al.*	(AMST, CERN, NIJM+)	JP
BRIEFEL	77	PR D16 2706	E. Briefel *et al.*	(BRAN, UMD, SYRA+)	
Also	69	PRL 23 884	S.P. Apsell *et al.*	(BRAN, UMD, SYRA+)	
GAY	76	NC 31A 593	J.B. Gay *et al.*	(NEUC, LAUS, LIVP, CURIN)	
GAY	76C	PL 62B 477	J.B. Gay *et al.*	(AMST, CERN, NIJM)	IJ
DIBIANCA	75	NP B98 137	F.A. Dibianca, R.J. Endorf	(CMU)	
BADIER	72	NP B37 429	J. Badier *et al.*	(EPOL)	
APSELL	70	PRL 24 777	S.P. Apsell *et al.*	(BRAN, UMD, SYRA+)	I
CRENNELL	70B	PR D1 847	D.J. Crennell *et al.*	(BNL)	
ALITTI	69	PRL 22 79	J. Alitti *et al.*	(BNL, SYRA)	I
DAUBER	69	PR 179 1262	P.M. Dauber *et al.*	(LRL)	
TRIPP	67	NP B3 10	R.D. Tripp *et al.*	(LRL, SLAC, CERN+)	
BADIER	65	PL 16 171	J. Badier *et al.*	(EPOL, SACL, AMST)	I
SMITH	65B	Athens Conf. 251	G.A. Smith, J.S. Lindsey	(LRL)	
SMITH	65C	PRL 14 25	G.A. Smith *et al.*	(LRL)	IJP
HALSTEINSLID	63	Siena Conf. 1 73	A. Halsteinslid *et al.*	(BERG, CERN, EPOL+)	I

OTHER RELATED PAPERS

TEODORO	78	PL 77B 451	D. Teodoro *et al.*	(AMST, CERN, NIJM+)	JP
BRIEFEL	75	PR D12 1859	E. Briefel *et al.*	(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 *et al.*	(LRL)	IJP