$\Xi(1820)\ D_{13}$

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

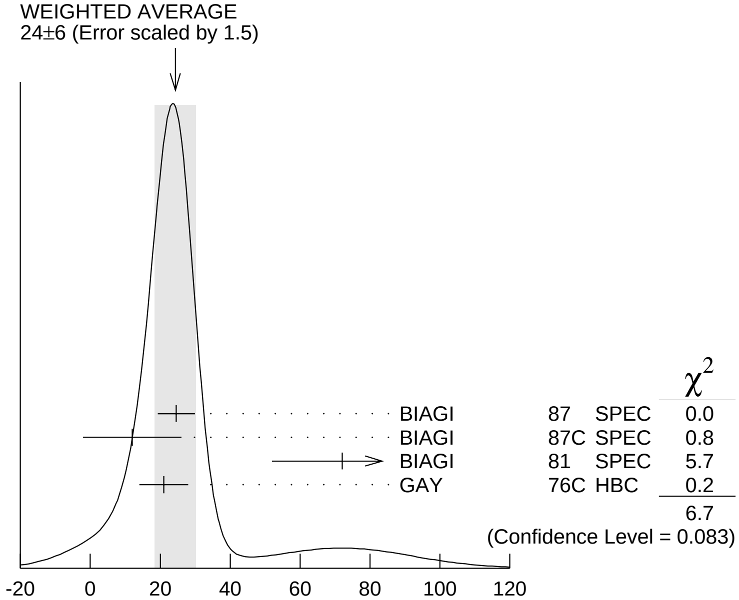
$\Xi(1820)$ MASS

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	−	$K^- p \rightarrow K^+$ (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. • • •						
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	$\Xi\pi$, $\Xi\pi\pi$, YK
1838 ± 5	38	[2] BADIER	72	HBC	−0	$\Xi\pi$, $\Xi\pi\pi$, YK
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. • • •						
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
$\mathbf{1.5^{+0.6}_{-0.4}}$	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

BIAGI	87	ZPHY C34 15	+	(BRIS, CERN, GEVA, HEIDP, LAUS, LOQM, RAL)	
BIAGI	87C	ZPHY C34 175	+	(BRIS, CERN, GEVA, HEIDP, LAUS, LOQM, RAL)	JP
ASTON	85B	PR D32 2270	+Carnegie+	(SLAC, CARL, CNRC, CINC)	
JENKINS	83	PRL 51 951	+Albright, Diamond+	(FSU, BRAN, LBL, CINC, MASD)	
BIAGI	81	ZPHY C9 305	+	(BRIS, CAVE, GEVA, HEIDP, LAUS, LOQM, RHEL)	
HASSALL	81	NP B189 397	+Ansorge, Carter, Neale+	(CAVE, MSU)	
TEODORO	78	PL 77B 451	+Diaz, Dionisi, Blokzijl+	(AMST, CERN, NIJM, OXF)	JP
BRIEFEL	77	PR D16 2706	+Gourevitch, Chang+	(BRAN, UMD, SYRA, TUFTS)	
Also	69	PRL 23 884	Apsell+	(BRAN, UMD, SYRA, TUFTS)	
GAY	76	NC 31A 593	+Jeanneret, Bogdanski+	(NEUC, LAUS, LIVP, CURIN)	
GAY	76C	PL 62B 477	+Armenteros, Berge+	(AMST, CERN, NIJM)	IJ
DIBIANCA	75	NP B98 137	+Endorf	(CMU)	
BADIER	72	NP B37 429	+Barrelet, Charlton, Videau	(EPOL)	
APSELL	70	PRL 24 777	+	(BRAN, UMD, SYRA, TUFTS)	I
CRENNELL	70B	PR D1 847	+Karshon, Lai, O'Neall, Scarr, Schumann	(BNL)	
ALITTI	69	PRL 22 79	+Barnes, Flaminio, Metzger+	(BNL, SYRA)	I
DAUBER	69	PR 179 1262	+Berge, Hubbard, Merrill, Miller	(LRL)	
TRIPP	67	NP B3 10	+Leith+	(LRL, SLAC, CERN, HEID, SACL)	
BADIER	65	PL 16 171	+Demoulin, Goldberg+	(EPOL, SACL, AMST)	I
SMITH	65B	Athens Conf. 251	+Lindsey	(LRL)	
SMITH	65C	PRL 14 25	+Lindsey, Button-Shafer, Murray	(LRL)	IJP
HALSTEINSLID	63	Siena Conf. 1 73	+	(BERG, CERN, EPOL, RHEL, LOUC)	I

OTHER RELATED PAPERS

TEODORO	78	PL 77B 451	+Diaz, Dionisi, Blokzijl+	(AMST, CERN, NIJM, OXF)	JP
BRIEFEL	75	PR D12 1859	+Gourevitch+	(BRAN, UMD, SYRA, TUFTS)	
SCHMIDT	73	Purdue Conf. 363		(BRAN)	
MERRILL	68	PR 167 1202	+Shafer	(LRL)	
SMITH	64	PRL 13 61	+Lindsey, Murray, Button-Shafer+	(LRL)	IJP