

$\Xi(1820) 3/2^-$ $I(J^P) = \frac{1}{2}(3/2^-)$ 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

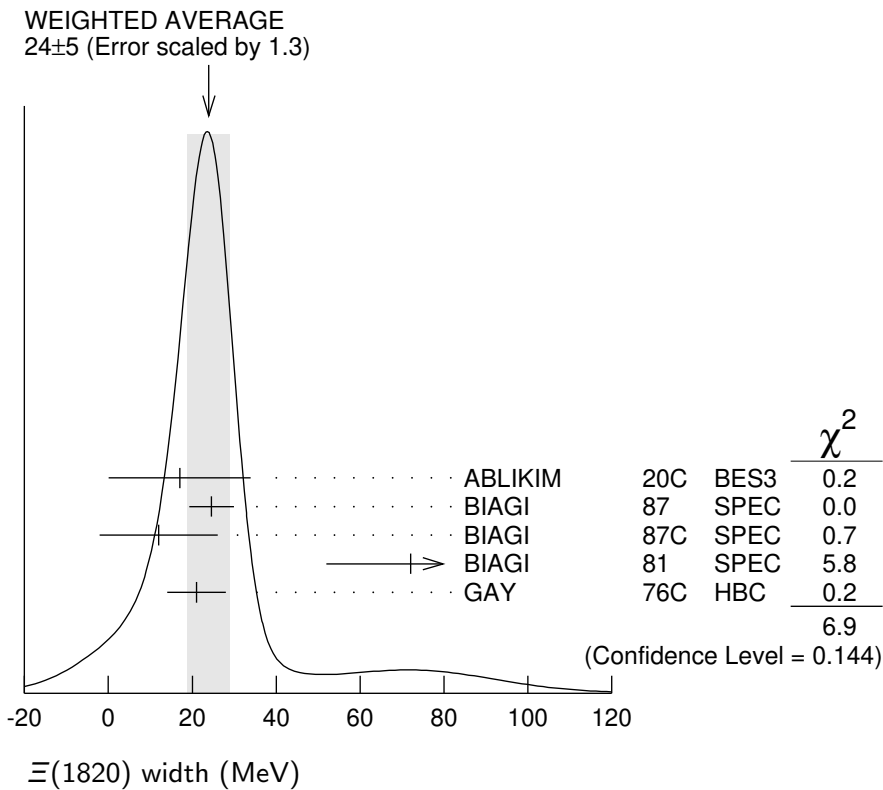
We only average the measurements that appear to us to be most significant and best determined.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1823 ± 5					OUR ESTIMATE
1823.5 ± 1.4					OUR AVERAGE
1825.5 ± 4.7 ± 4.7	288	ABLIKIM	20C	BES3	− $e^+ e^- \rightarrow \Xi(1820)^- \Xi^+$
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	− $K^- p \rightarrow K^+ (\text{MM})$
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		HALSTEINSLID63	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 ± 5					OUR AVERAGE
17.0 ± 15.0 ± 7.9	288	ABLIKIM	20C	BES3	− $e^+ e^- \rightarrow \Xi(1820)^- \Xi^+$
24.6 ± 5.3	280	¹ BIAGI	87	SPEC	0 $\Xi^- \text{Be} \rightarrow (\Lambda K^-) X$
12 ± 14 ± 1.7	54	BIAGI	87C	SPEC	0 $\Xi^- \text{Be} \rightarrow (\Lambda \bar{K}^0) X$

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	—	$\Sigma^- \bar{K}^0$
44 ± 11	44	BRIEFEL	77	HBC	0	$\Lambda \bar{K}^0$
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	—	$\Lambda, \Sigma \bar{K}$
12 ± 4		BADIER	65	HBC	0	$\Lambda \bar{K}^0$
30 ± 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 \pm 0.05	ANISOVICH	12A	DPWA	Multichannel
0.30 \pm 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

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

 $\Gamma(\Sigma\bar{K})/\Gamma_{\text{total}}$ 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
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 $\Gamma(\Sigma\bar{K})/\Gamma(\Lambda\bar{K})$ Γ_2/Γ_1

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

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

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

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

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

ABLIKIM	20C	PRL 124 032002	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ANISOVICH	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)
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		PRL 23 884	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

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