

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

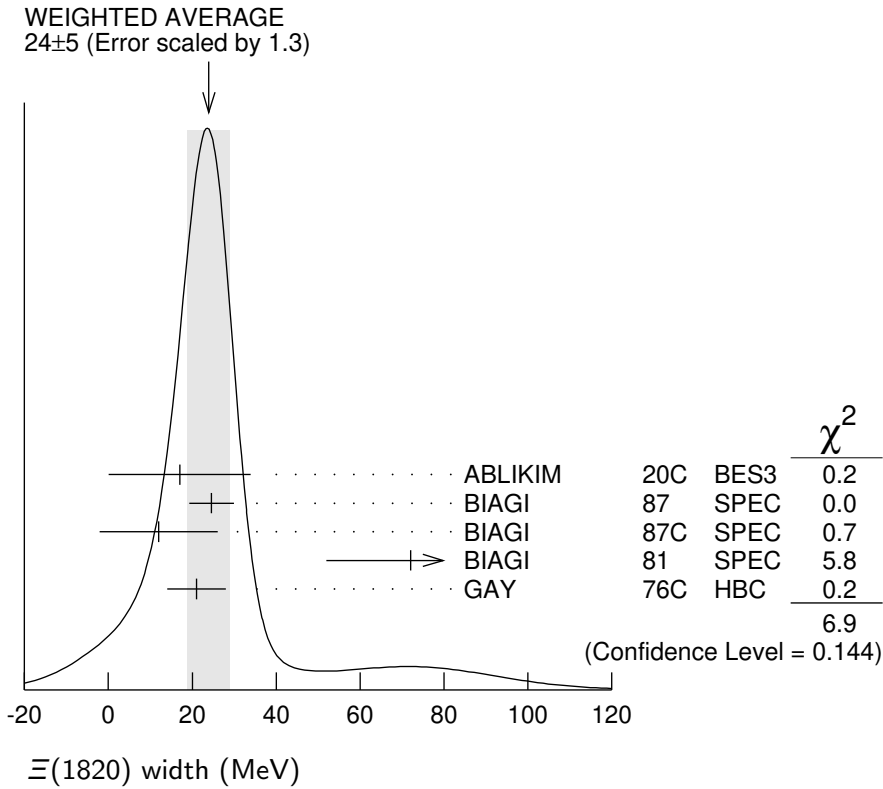
 $\Xi(1820)$ MASS

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
1823.2 ± 1.3					OUR AVERAGE
1821 $\begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 2 \\ 3 \end{smallmatrix}$ ±3	776	ABLIKIM	24N PWA	—	$\psi(3866) \rightarrow \Xi(1820)^- \Xi^+ \rightarrow (K^- \Lambda) \Xi^+$
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 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		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 Error includes scale factor of 1.3. See the ideogram below.
17.0 \pm 15.0 \pm 7.9	288	ABLIKIM	20C	BES3	– $e^+e^- \rightarrow \Xi(1820)^- \Xi^+$
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. ● ● ●					
73 $\begin{smallmatrix} +6 \\ -5 \end{smallmatrix}$ \pm 9	776	ABLIKIM	24N	PWA	– $\psi(3866) \rightarrow \Xi(1820)^- \Xi^+ \rightarrow (K^- \Lambda) \Xi^+$
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	

$\Gamma(\Xi\pi)/\Gamma(\Lambda\bar{K})$							Γ_3/Γ_1
<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	

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

$\Gamma(\Sigma\bar{K})/\Gamma_{\text{total}}$							Γ_2/Γ
<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	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●							
<0.02		TRIPP	67	RVUE		Use SMITH 65c	

$\Gamma(\Sigma\bar{K})/\Gamma(\Lambda\bar{K})$							Γ_2/Γ_1
<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	

$\Gamma(\Xi(1530)\pi)/\Gamma_{\text{total}}$							Γ_4/Γ
<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	
● ● ● 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
<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 ±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
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>		
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
<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 BADIÉ 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	24N	PR D109 072008	M. Ablikim <i>et al.</i>	(BESIII Collab.)
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)
BADIÉ	72	NP B37 429	J. Badié <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+)
BADIÉ	65	PL 16 171	J. Badié <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