

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

The clearest evidence is an 8-standard-deviation peak in  $\Lambda K^-$  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**

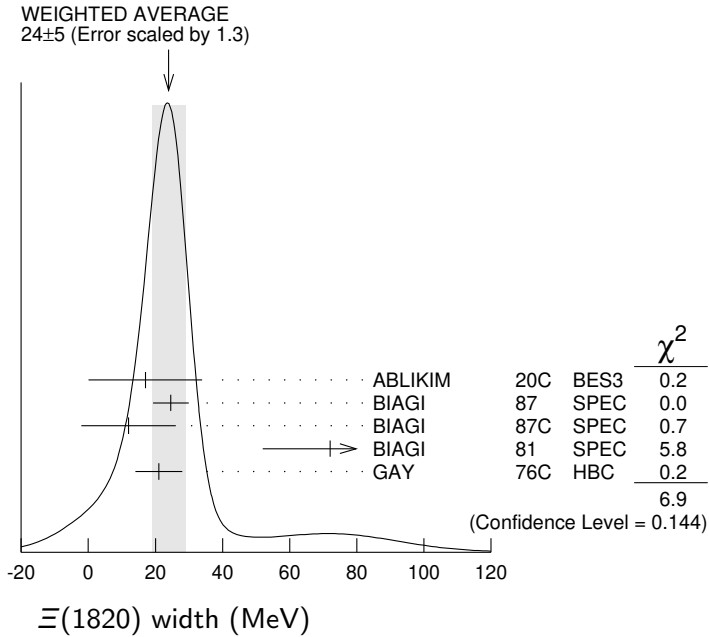
We only average the measurements that appear to us to be most significant and best determined.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
<b>1823 ± 5</b>					<b>OUR ESTIMATE</b>
<b>1823.5 ± 1.4</b>					<b>OUR AVERAGE</b>
1825.5 ± 4.7 ± 4.7	288	ABLIKIM	20C	BES3	– $e^+ e^- \rightarrow \Xi(1820)^- \Xi^+$
1819.4 ± 3.1 ± 2.0	280	<sup>1</sup> 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	$\Sigma^-$ 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	– $\Lambda K^-$
1807 ± 27		DIBIANCA	75	DBC	–0 $\Xi \pi \pi, \Xi^* \pi$
1762 ± 8	28	<sup>2</sup> BADIER	72	HBC	–0 $\Xi \pi, \Xi \pi \pi, Y K$
1838 ± 5	38	<sup>2</sup> BADIER	72	HBC	–0 $\Xi \pi, \Xi \pi \pi, Y K$
1830 ± 10	25	<sup>3</sup> CRENNELL	70B	DBC	–0 3.6, 3.9 GeV/c
1826 ± 12		<sup>4</sup> 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
<b>24 <math>\begin{smallmatrix} +15 \\ -10 \end{smallmatrix}</math></b>					<b>OUR ESTIMATE</b>
<b>24 ± 5</b>					<b>OUR AVERAGE</b>
17.0 ± 15.0 ± 7.9	288	ABLIKIM	20C	BES3	– $e^+ e^- \rightarrow \Xi(1820)^- \Xi^+$
24.6 ± 5.3	280	<sup>1</sup> 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		$\Sigma^-$ 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	—	$\Lambda K^-$
85 ± 58		DIBIANCA	75	DBC	−0	$\Xi \pi \pi, \Xi^* \pi$
51 ± 13		<sup>2</sup> BADIÉ	72	HBC	−0	Lower mass
58 ± 13		<sup>2</sup> BADIÉ	72	HBC	−0	Higher mass
103 +38 −24		<sup>3</sup> CRENNELL	70B	DBC	−0	3.6, 3.9 GeV/c
48 +36 −19		<sup>4</sup> CRENNELL	70B	DBC	−0	3.6, 3.9 GeV/c
55 +40 −20		ALITTI	69	HBC	—	$\Lambda, \Sigma \bar{K}$
12 ± 4		BADIÉ	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 ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $\Lambda \bar{K}$	large
$\Gamma_2$ $\Sigma \bar{K}$	small
$\Gamma_3$ $\Xi \pi$	small
$\Gamma_4$ $\Xi(1530)\pi$	small
$\Gamma_5$ $\Xi \pi \pi$ (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.

 **$\Gamma(\Lambda\bar{K})/\Gamma_{\text{total}}$   $\Gamma_1/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b><math>0.25 \pm 0.05</math> OUR AVERAGE</b>				
0.24 ± 0.05	ANISOVICH	12A	DPWA	Multichannel
0.30 ± 0.15	ALITTI	69	HBC	– $K^- p$ 3.9–5 GeV/c

 **$\Gamma(\Xi\pi)/\Gamma_{\text{total}}$   $\Gamma_3/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b><math>0.10 \pm 0.10</math></b>				
	ALITTI	69	HBC	– $K^- p$ 3.9–5 GeV/c

 **$\Gamma(\Xi\pi)/\Gamma(\Lambda\bar{K})$   $\Gamma_3/\Gamma_1$** 

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b>&lt;0.36</b>	95	GAY	76C	HBC	– $K^- p$ 4.2 GeV/c
<b><math>0.20 \pm 0.20</math></b>		BADIER	65	HBC	0 $K^- p$ 3 GeV/c

 **$\Gamma(\Xi\pi)/\Gamma(\Xi(1530)\pi)$   $\Gamma_3/\Gamma_4$** 

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

 **$\Gamma(\Sigma\bar{K})/\Gamma_{\text{total}}$   $\Gamma_2/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b><math>0.30 \pm 0.15</math></b>	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

 **$\Gamma(\Sigma\bar{K})/\Gamma(\Lambda\bar{K})$   $\Gamma_2/\Gamma_1$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b><math>0.24 \pm 0.10</math></b>	GAY	76C	HBC	– $K^- p$ 4.2 GeV/c

 **$\Gamma(\Xi(1530)\pi)/\Gamma_{\text{total}}$   $\Gamma_4/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b><math>0.30 \pm 0.15</math></b>	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	<sup>5</sup> HASSALL	81	HBC	$K^- p$ 6.5 GeV/c
<0.25	<sup>6</sup> DAUBER	69	HBC	$K^- p$ 2.7 GeV/c

 **$\Gamma(\Xi(1530)\pi)/\Gamma(\Lambda\bar{K})$   $\Gamma_4/\Gamma_1$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b><math>0.38 \pm 0.27</math> OUR AVERAGE</b>	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

$\Gamma(\Xi\pi\pi(\text{not } \Xi(1530)\pi))/\Gamma(\Lambda\bar{K})$   $\Gamma_5/\Gamma_1$ 

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
<b>0.30±0.20</b>	BIAGI	87	SPEC	– $\Xi^-$ Be 116 GeV
••• We do not use the following data for averages, fits, limits, etc. •••				
<0.14	<sup>7</sup> BADIER	65	HBC	0 1 st. dev. limit
>0.1	SMITH	65c	HBC	–0 $K^- p$ 2.45–2.7 GeV/ <i>c</i>

 $\Gamma(\Xi\pi\pi(\text{not } \Xi(1530)\pi))/\Gamma(\Xi(1530)\pi)$   $\Gamma_5/\Gamma_4$ 

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
consistent with zero	GAY	76c	HBC	– $K^- p$ 4.2 GeV/ <i>c</i>
••• We do not use the following data for averages, fits, limits, etc. •••				
0.3±0.5	<sup>8</sup> APSELL	70	HBC	0 $K^- p$ 2.87 GeV/ <i>c</i>

 **$\Xi(1820)$  FOOTNOTES**

- <sup>1</sup> BIAGI 87 also sees weak signals in the in the  $\Xi^- \pi^+ \pi^-$  channel at  $1782.6 \pm 1.4$  MeV ( $\Gamma = 6.0 \pm 1.5$  MeV) and  $1831.9 \pm 2.8$  MeV ( $\Gamma = 9.6 \pm 9.9$  MeV).
- <sup>2</sup> 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.
- <sup>3</sup> From a fit to inclusive  $\Xi\pi$ ,  $\Xi\pi\pi$ , and  $\Lambda K^-$  spectra.
- <sup>4</sup> From a fit to inclusive  $\Xi\pi$  and  $\Xi\pi\pi$  spectra only.
- <sup>5</sup> Including  $\Xi\pi\pi$ .
- <sup>6</sup> DAUBER 69 uses in part the same data as SMITH 65C.
- <sup>7</sup> For the decay mode  $\Xi^- \pi^+ \pi^0$  only. This limit includes  $\Xi(1530)\pi$ .
- <sup>8</sup> 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
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MERRILL  
SMITH

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(LRL)  
(LRL) IJP

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