

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

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

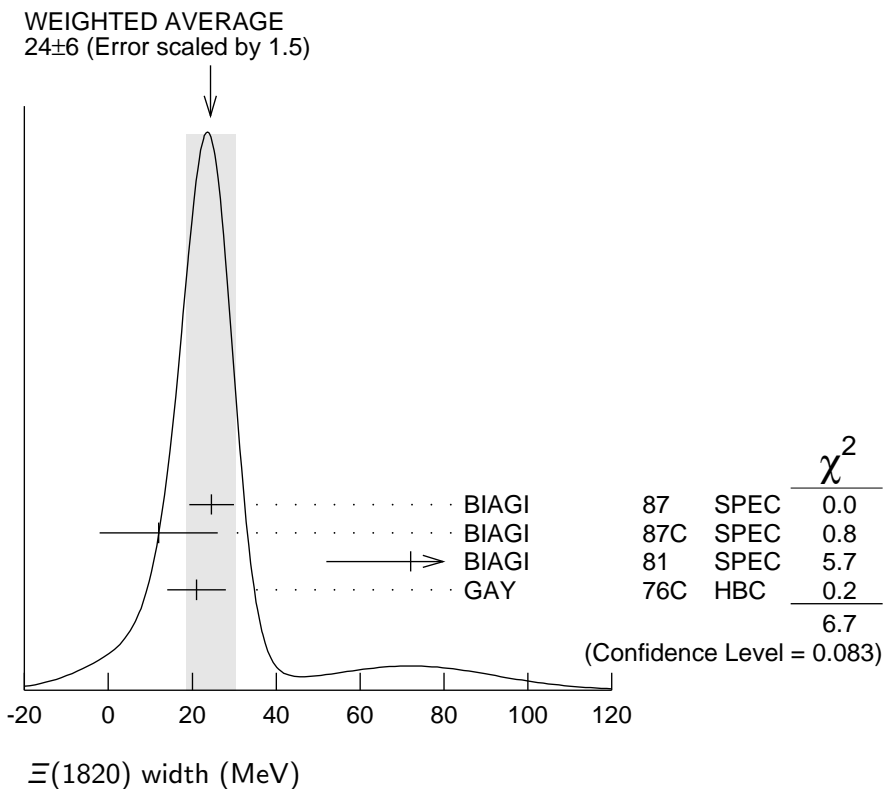
**$\Xi(1820)$  MASS**

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

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b>1823 ± 5 OUR ESTIMATE</b>					
<b>1823.4 ± 1.4 OUR AVERAGE</b>					
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	- $K^- p \rightarrow K^+ (MM)$
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		HALSTEINSLID	63	FBC	-0 $K^-$ freon 3.5 GeV/c

### $\Xi(1820)$ WIDTH

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b>24</b> $\begin{smallmatrix} +15 \\ -10 \end{smallmatrix}$					<b>OUR ESTIMATE</b>
<b>24</b> $\pm 6$					<b>OUR AVERAGE</b> Error includes scale factor of 1.5. See the ideogram below.
24.6 $\pm$ 5.3	280	<sup>1</sup> 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. ● ● ●					
23 $\pm$ 13		ADAMOVICH	99B	WA89	$\Sigma^-$ 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	– $\Lambda K^-$
85 $\pm$ 58		DIBIANCA	75	DBC	–0 $\Xi \pi \pi, \Xi^* \pi$
51 $\pm$ 13		<sup>2</sup> BADIER	72	HBC	–0 Lower mass
58 $\pm$ 13		<sup>2</sup> BADIER	72	HBC	–0 Higher mass
103 $\begin{smallmatrix} +38 \\ -24 \end{smallmatrix}$		<sup>3</sup> CRENNELL	70B	DBC	–0 3.6, 3.9 GeV/c
48 $\begin{smallmatrix} +36 \\ -19 \end{smallmatrix}$		<sup>4</sup> 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 ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $\Lambda \bar{K}$	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.

$\Gamma(\Lambda \bar{K})/\Gamma_{\text{total}}$					$\Gamma_1/\Gamma$
VALUE	DOCUMENT ID	TECN	CHG	COMMENT	
$0.30 \pm 0.15$	ALITTI	69	HBC	—	$K^- p$ 3.9–5 GeV/c

$\Gamma(\Xi \pi)/\Gamma_{\text{total}}$					$\Gamma_3/\Gamma$
VALUE	DOCUMENT ID	TECN	CHG	COMMENT	
$0.10 \pm 0.10$	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>		
<0.36	95	GAY	76C	HBC	–	$K^- p$ 4.2 GeV/c	
<b>0.20±0.20</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>1.5<sup>+0.6</sup><sub>-0.4</sub></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>0.30±0.15</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
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$\Gamma(\Sigma\bar{K})/\Gamma(\Lambda\bar{K})$							$\Gamma_2/\Gamma_1$
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>		
<b>0.24±0.10</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>0.30±0.15</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>0.38±0.27 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	

$\Gamma(\Xi\pi\pi(\text{not } \Xi(1530)\pi))/\Gamma(\Lambda\bar{K})$							$\Gamma_5/\Gamma_1$
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>		
<b>0.30±0.20</b>		BIAGI	87	SPEC	–	$\Xi^- \text{Be}$ 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/c

$\Gamma(\Xi\pi\pi(\text{not } \Xi(1530)\pi))/\Gamma(\Xi(1530)\pi)$	$\Gamma_5/\Gamma_4$				
VALUE	DOCUMENT ID	TECN	CHG	COMMENT	
consistent with zero	GAY	76C	HBC	–	$K^- p$ 4.2 GeV/c
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.3 \pm 0.5$	<sup>8</sup> APSELL	70	HBC	0	$K^- p$ 2.87 GeV/c

### $\Xi(1820)$ 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

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. Apseil <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. Apseil <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
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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

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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