

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

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

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

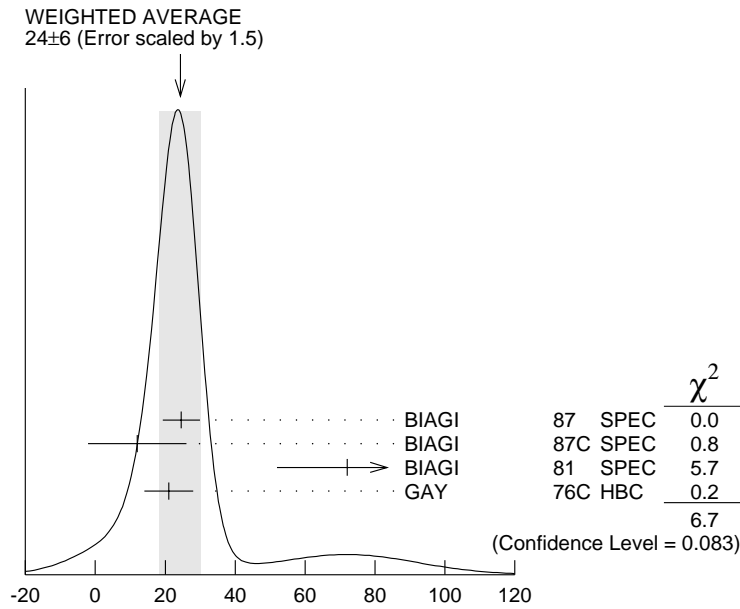
## $\Xi(1820)$ MASS

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

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b>1823 ± 5</b>					<b>OUR ESTIMATE</b>
<b>1823.4 ± 1.4</b>					<b>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. ● ● ●					
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	$\Xi\pi, \Xi\pi\pi, YK$
1838 ± 5	38	<sup>2</sup> BADIER	72 HBC	-0	$\Xi\pi, \Xi\pi\pi, YK$
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

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b>24 <math>\begin{smallmatrix} +15 \\ -10 \end{smallmatrix}</math></b>					<b>OUR ESTIMATE</b>
<b>24 <math>\pm 6</math></b>					<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. ● ● ●					
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



$\Xi(1820)$  width (MeV)

### $\Xi(1820)$ 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	
<b>0.30±0.15</b>	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	
<b>0.10±0.10</b>	ALITTI	69	HBC	—	$K^- p$ 3.9–5 GeV/c

$\Gamma(\Xi\pi)/\Gamma(\Lambda\bar{K})$		$\Gamma_3/\Gamma_1$				
VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT	
<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	

$\Gamma(\Xi\pi)/\Gamma(\Xi(1530)\pi)$		$\Gamma_3/\Gamma_4$				
VALUE	DOCUMENT ID	TECN	CHG	COMMENT		
$1.5^{+0.6}_{-0.4}$	APSELL	70	HBC	0 $K^- p$ 2.87 GeV/c		

$\Gamma(\Sigma\bar{K})/\Gamma_{total}$		$\Gamma_2/\Gamma$				
VALUE	DOCUMENT ID	TECN	CHG	COMMENT		
<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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$\Gamma(\Sigma\bar{K})/\Gamma(\Lambda\bar{K})$		$\Gamma_2/\Gamma_1$				
VALUE	DOCUMENT ID	TECN	CHG	COMMENT		
<b>0.24±0.10</b>	GAY	76C	HBC	– $K^- p$ 4.2 GeV/c		

$\Gamma(\Xi(1530)\pi)/\Gamma_{total}$		$\Gamma_4/\Gamma$				
VALUE	DOCUMENT ID	TECN	CHG	COMMENT		
<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

$\Gamma(\Xi(1530)\pi)/\Gamma(\Lambda\bar{K})$		$\Gamma_4/\Gamma_1$				
VALUE	DOCUMENT ID	TECN	CHG	COMMENT		
<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		

$\Gamma(\Xi\pi\pi(\text{not } \Xi(1530)\pi))/\Gamma(\Lambda\bar{K})$		$\Gamma_5/\Gamma_1$				
VALUE	DOCUMENT ID	TECN	CHG	COMMENT		
<b>0.30±0.20</b>	BIAGI	87	SPEC	– $\Xi^- \text{Be}$ 116 GeV		
<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±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.

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## $\Xi(1820)$ 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	+Anson, 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'Neill, 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

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## 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

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