$\Xi(1820)\ 3/2^-$

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

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	−	$e^+ e^- \to \Xi(1820)^- \overline{\Xi}^+$
1819.4± 3.1±2.0	280	[1] BIAGI	87	SPEC	0	Ξ^- Be $\to (\Lambda K^-)$ X
1826 ± 3 ±1	54	BIAGI	87C	SPEC	0	Ξ^- Be $\to (\Lambda \overline{K}^0)$ X
1822 ± 6		JENKINS	83	MPS	−	$K^- p \to K^+$ (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		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	−	$\Sigma^- \overline{K}^0$
1870 ± 9	44	BRIEFEL	77	HBC	0	$\Lambda \overline{K}^0$
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	$\Xi\pi$, $\Xi\pi\pi$, YK
1838 ± 5	38	[2] BADIER	72	HBC	−0	$\Xi\pi$, $\Xi\pi\pi$, YK
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	−	Λ, $\Sigma \overline{K}$
1814 ± 4	30	BADIER	65	HBC	0	$\Lambda \overline{K}^0$
1817 ± 7	29	SMITH	65C	HBC	−0	$\Lambda \overline{K}^0$, ΛK^-
1770		HALSTEINSLID	63	FBC	−0	K^- freon 3.5 GeV/c

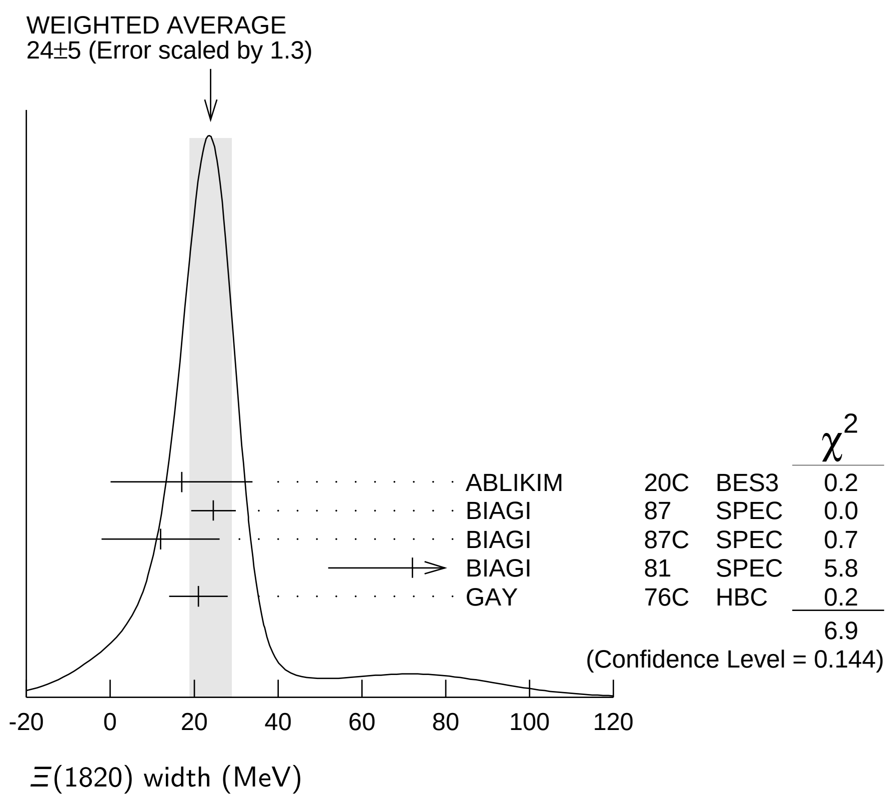
$\Xi(1820)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
24^{+15}_{-10} OUR ESTIMATE						
24 ± 5 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.						
17.0±15.0±7.9	288	ABLIKIM	20C	BES3	−	$e^+ e^- \to \Xi(1820)^- \overline{\Xi}^+$
24.6± 5.3	280	[1] BIAGI	87	SPEC	0	Ξ^- Be $\to (\Lambda K^-)$ X
12 ±14 ±1.7	54	BIAGI	87C	SPEC	0	Ξ^- Be $\to (\Lambda \overline{K}^0)$ 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	–	$\Sigma^- \overline{K}^0$
44	±11	44	BRIEFEL	77	HBC	0	$\Lambda \overline{K}^0$
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	–	Λ, $\Sigma\overline{K}$
12	± 4		BADIER	65	HBC	0	$\Lambda \overline{K}^0$
30	± 7		SMITH	65B	HBC	−0	$\Lambda \overline{K}$
<80			HALSTEINSLID	63	FBC	−0	K^- freon 3.5 GeV/c



$\Xi(1820)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\Lambda\overline{K}$	large
Γ_2	$\Sigma\overline{K}$	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 $\Lambda\overline{K}$ and (perhaps) $\Xi(1530)\pi$, but the branching fractions are very poorly determined.

$\Gamma(\Lambda\overline{K})/\Gamma_{total}$ — 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

$\Gamma(\Xi\pi)/\Gamma_{total}$ — Γ_3/Γ

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
0.10±0.10	ALITTI	69	HBC	−	$K^- p$ 3.9–5 GeV/c

$\Gamma(\Xi\pi)/\Gamma(\Lambda\overline{K})$ — 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
$\mathbf{1.5^{+0.6}_{-0.4}}$	APSELL	70	HBC	0	$K^- p$ 2.87 GeV/c

$\Gamma(\Sigma\overline{K})/\Gamma_{total}$ — 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

$\Gamma(\Sigma\overline{K})/\Gamma(\Lambda\overline{K})$ — Γ_2/Γ_1

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

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

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

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

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
0.30±0.20	BIAGI	87	SPEC	–	Ξ^- 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
• • • 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 (Γ = 6.0 ± 1.5 MeV) and 1831.9 ± 2.8 MeV (Γ = 9.6 ± 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.

Ξ(1820) REFERENCES

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ANISOVICH	12A	EPJ A48 15	A.V. Anisovich *et al.*	(BONN, PNPI)
ADAMOVICH	99B	EPJ C11 271	M.I. Adamovich *et al.*	(CERN WA89 Collab.)
BIAGI	87	ZPHY C34 15	S.F. Biagi *et al.*	(BRIS, CERN, GEVA+)
BIAGI	87C	ZPHY C34 175	S.F. Biagi *et al.*	(BRIS, CERN, GEVA+) JP
ASTON	85B	PR D32 2270	D. Aston *et al.*	(SLAC, CARL, CNRC, CINC)
JENKINS	83	PRL 51 951	C.M. Jenkins *et al.*	(FSU, BRAN, LBL+)
BIAGI	81	ZPHY C9 305	S.F. Biagi *et al.*	(BRIS, CAVE, GEVA+)
HASSALL	81	NP B189 397	J.K. Hassall *et al.*	(CAVE, MSU)
TEODORO	78	PL 77B 451	D. Teodoro *et al.*	(AMST, CERN, NIJM+) JP
BRIEFEL	77	PR D16 2706	E. Briefel *et al.*	(BRAN, UMD, SYRA+)
Also		PRL 23 884	S.P. Apsell *et al.*	(BRAN, UMD, SYRA+)
GAY	76C	PL 62B 477	J.B. Gay *et al.*	(AMST, CERN, NIJM) IJ
DIBIANCA	75	NP B98 137	F.A. Dibianca, R.J. Endorf	(CMU)
BADIER	72	NP B37 429	J. Badier *et al.*	(EPOL)
APSELL	70	PRL 24 777	S.P. Apsell *et al.*	(BRAN, UMD, SYRA+) I
CRENNELL	70B	PR D1 847	D.J. Crennell *et al.*	(BNL)
ALITTI	69	PRL 22 79	J. Alitti *et al.*	(BNL, SYRA) I
DAUBER	69	PR 179 1262	P.M. Dauber *et al.*	(LRL)
TRIPP	67	NP B3 10	R.D. Tripp *et al.*	(LRL, SLAC, CERN+)
BADIER	65	PL 16 171	J. Badier *et al.*	(EPOL, SACL, AMST) I
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