$\Xi(2030)$

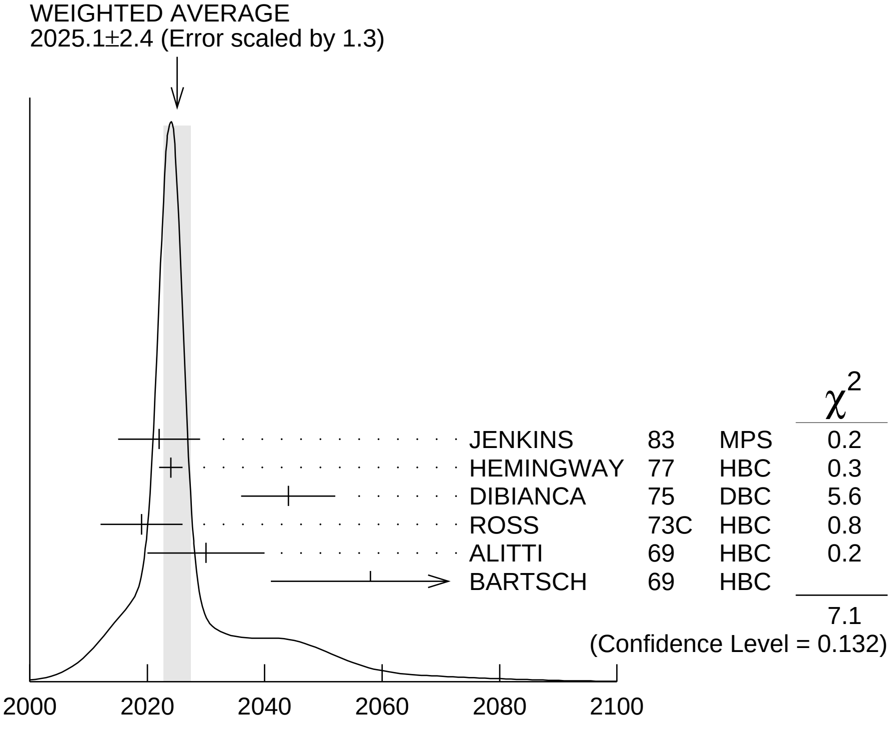
$I(J^P) = \frac{1}{2}(\geq \frac{5}{2}^?)$ Status: ∗∗∗

The evidence for this state has been much improved by HEMINGWAY 77, who see an eight standard deviation enhancement in $\Sigma\overline{K}$ and a weaker coupling to $\Lambda\overline{K}$. ALITTI 68 and HEMINGWAY 77 observe no signals in the $\Xi\pi\pi$ (or $\Xi(1530)\pi$) channel, in contrast to DIBIANCA 75. The decay $(\Lambda/\Sigma)\overline{K}\pi$ reported by BARTSCH 69 is also not confirmed by HEMINGWAY 77.

A moments analysis of the HEMINGWAY 77 data indicates at a level of three standard deviations that $J \geq 5/2$.

$\Xi(2030)$ MASS

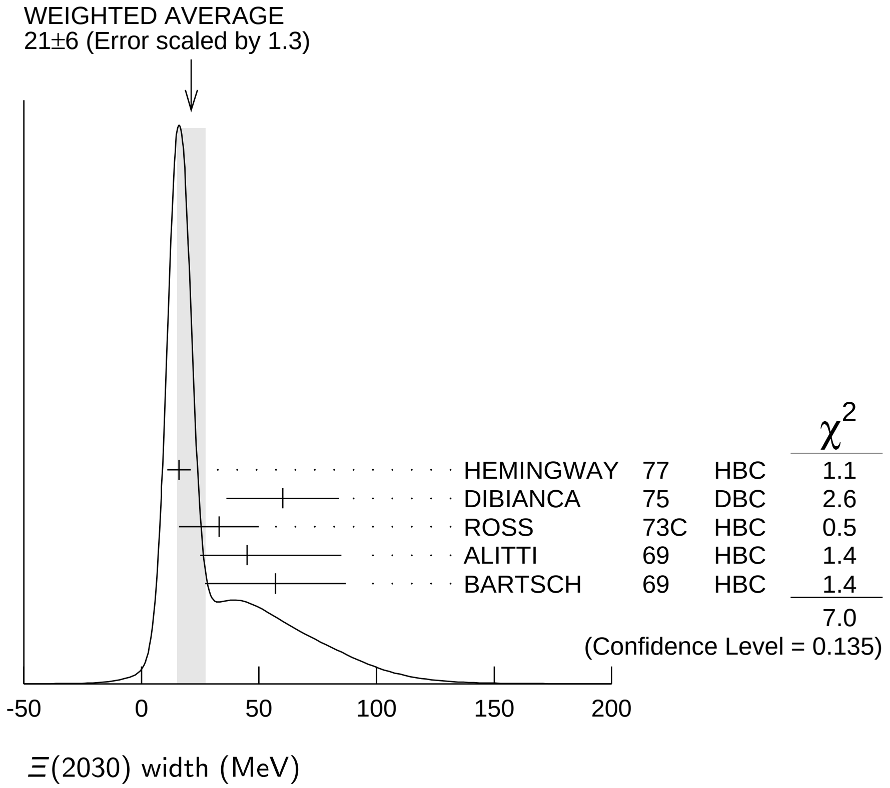
VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
2025 ± 5 OUR ESTIMATE					
2025.1± 2.4 OUR AVERAGE		Error includes scale factor of 1.3. See the ideogram below.			
2022 ± 7		JENKINS 83	MPS	−	$K^- p \rightarrow K^+$ MM
2024 ± 2	200	HEMINGWAY 77	HBC	−	$K^- p$ 4.2 GeV/c
2044 ± 8		DIBIANCA 75	DBC	−0	$\Xi\pi\pi$, $\Xi^*\pi$
2019 ± 7	15	ROSS 73C	HBC	−0	$\Sigma\overline{K}$
2030 ±10	42	ALITTI 69	HBC	−	$K^- p$ 3.9–5 GeV/c
2058 ±17	40	BARTSCH 69	HBC	−0	$K^- p$ 10 GeV/c



$\Xi(2030)$ mass (MeV)

$\Xi(2030)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
20^{+15}_{-5} OUR ESTIMATE						
21 ± 6 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.					
16 ± 5	200	HEMINGWAY	77	HBC	$-$	$K^- p$ 4.2 GeV/c
60 ± 24		DIBIANCA	75	DBC	-0	$\Xi \pi \pi$, $\Xi^* \pi$
33 ± 17	15	ROSS	73C	HBC	-0	$\Sigma \overline{K}$
45^{+40}_{-20}		ALITTI	69	HBC	$-$	$K^- p$ 3.9–5 GeV/c
57 ± 30		BARTSCH	69	HBC	-0	$K^- p$ 10 GeV/c



$\Xi(2030)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\Lambda \overline{K}$	$\sim$ 20 %
Γ_2	$\Sigma \overline{K}$	$\sim$ 80 %
Γ_3	$\Xi \pi$	small
Γ_4	$\Xi(1530) \pi$	small
Γ_5	$\Xi \pi \pi$ (not $\Xi(1530)\ \pi$)	small
Γ_6	$\Lambda \overline{K} \pi$	small
Γ_7	$\Sigma \overline{K} \pi$	small

$\Xi(2030)$ BRANCHING RATIOS

$\Gamma(\Xi\pi)/\big[\Gamma(\Lambda\overline{K})+\Gamma(\Sigma\overline{K})+\Gamma(\Xi\pi)+\Gamma(\Xi(1530)\pi)\big]$ $\Gamma_3/(\Gamma_1+\Gamma_2+\Gamma_3+\Gamma_4)$

VALUE	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.30	ALITTI 69	HBC	$-$	1 standard dev. limit

$\Gamma(\Xi\pi)/\Gamma(\Sigma\overline{K})$ Γ_3/Γ_2

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
<0.19	95	HEMINGWAY 77	HBC	$-$	$K^- p$ 4.2 GeV/c

$\Gamma(\Lambda\overline{K})/\big[\Gamma(\Lambda\overline{K})+\Gamma(\Sigma\overline{K})+\Gamma(\Xi\pi)+\Gamma(\Xi(1530)\pi)\big]$ $\Gamma_1/(\Gamma_1+\Gamma_2+\Gamma_3+\Gamma_4)$

VALUE	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
0.25 ± 0.15	ALITTI 69	HBC	$-$	$K^- p$ 3.9–5 GeV/c

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

VALUE	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
0.22 ± 0.09	HEMINGWAY 77	HBC	$-$	$K^- p$ 4.2 GeV/c

$\Gamma(\Sigma\overline{K})/\big[\Gamma(\Lambda\overline{K})+\Gamma(\Sigma\overline{K})+\Gamma(\Xi\pi)+\Gamma(\Xi(1530)\pi)\big]$ $\Gamma_2/(\Gamma_1+\Gamma_2+\Gamma_3+\Gamma_4)$

VALUE	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
0.75 ± 0.20	ALITTI 69	HBC	$-$	$K^- p$ 3.9–5 GeV/c

$\Gamma(\Xi(1530)\pi)/\big[\Gamma(\Lambda\overline{K})+\Gamma(\Sigma\overline{K})+\Gamma(\Xi\pi)+\Gamma(\Xi(1530)\pi)\big]$ $\Gamma_4/(\Gamma_1+\Gamma_2+\Gamma_3+\Gamma_4)$

VALUE	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.15	ALITTI 69	HBC	$-$	1 standard dev. limit

$\big[\Gamma(\Xi(1530)\pi)+\Gamma(\Xi\pi\pi(\text{not }\Xi(1530)\pi))\big]/\Gamma(\Sigma\overline{K})$ $(\Gamma_4+\Gamma_5)/\Gamma_2$

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
<0.11	95	[1] HEMINGWAY 77	HBC	$-$	$K^- p$ 4.2 GeV/c

$\Gamma(\Lambda\overline{K}\pi)/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	*DOCUMENT ID*	*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
seen	BARTSCH 69	HBC	$K^- p$ 10 GeV

$\Gamma(\Lambda\overline{K}\pi)/\Gamma(\Sigma\overline{K})$ Γ_6/Γ_2

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
<0.32	95	HEMINGWAY 77	HBC	$-$	$K^- p$ 4.2 GeV/c

$\Gamma(\Sigma\overline{K}\pi)/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE	*DOCUMENT ID*	*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
seen	BARTSCH 69	HBC	$K^- p$ 10 GeV

$\Gamma(\Sigma\overline{K}\pi)/\Gamma(\Sigma\overline{K})$ Γ_7/Γ_2

VALUE	*CL%*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
<0.04	95	[2] HEMINGWAY 77	HBC	$-$	$K^- p$ 4.2 GeV/c

Ξ(2030) FOOTNOTES

[1] For the decay mode $\Xi^- \pi^+ \pi^-$ only.

[2] For the decay mode $\Sigma^\pm K^- \pi^\mp$ only.

Ξ(2030) REFERENCES

JENKINS	83	PRL 51 951	C.M. Jenkins *et al.*	(FSU, BRAN, LBL+)
HEMINGWAY	77	PL 68B 197	R.J. Hemingway *et al.*	(AMST, CERN, NIJM+) IJ
Also		PL 62B 477	J.B. Gay *et al.*	(AMST, CERN, NIJM)
DIBIANCA	75	NP B98 137	F.A. Dibianca, R.J. Endorf	(CMU)
ROSS	73C	Purdue Conf. 345	R.T. Ross, J.L. Lloyd, D. Radojicic	(OXF)
ALITTI	69	PRL 22 79	J. Alitti *et al.*	(BNL, SYRA) I
BARTSCH	69	PL 28B 439	J. Bartsch *et al.*	(AACH, BERL, CERN+)
ALITTI	68	PRL 21 1119	J. Alitti *et al.*	(BNL, SYRA)