$\Lambda(1830)$ $5/2^-$

$I(J^P) = 0(\frac{5}{2}^-)$ Status: ∗∗∗∗

For results published before 1973 (they are now obsolete), see our 1982 edition Physics Letters **111B** 1 (1982).

The best evidence for this resonance is in the $\Sigma\pi$ channel.

$\Lambda(1830)$ POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1800 to 1860 (≈ 1830) OUR ESTIMATE				
1819.5± 3.0	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
1899 $^{+35}_{-37}$	[1] KAMANO	15	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1766 $^{+37}_{-34}$	[2] KAMANO	15	DPWA	Multichannel
1809	ZHANG	13A	DPWA	Multichannel

[1] The preferred solution A in KAMANO 15 reports two poles. This entry is from the preferred solution A.
[2] From the preferred solution A in KAMANO 15. Not seen in solution B.

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
50 to 80 (≈ 65) OUR ESTIMATE				
62± 5	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
80 $^{+100}_{-34}$	[1] KAMANO	15	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
212 $^{+94}_{-62}$	[2] KAMANO	15	DPWA	Multichannel
109	ZHANG	13A	DPWA	Multichannel

[1] The preferred solution A in KAMANO 15 reports two poles. This entry is from the preferred solution A.
[2] From the preferred solution A in KAMANO 15. Not seen in solution B.

$\Lambda(1830)$ POLE RESIDUES

The normalized residue is the residue divided by $\Gamma_{pole}/2$.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to N\overline{K}$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.055 ±0.010	**20 ± 14**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.00502	−80	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to \Sigma\pi$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.15 ±0.03	**180 ± 10**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.00581	179	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to \Lambda\eta$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.00941	−65	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to \Xi K$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.010 ±0.005	**65 ± 20**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0477	94	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to \Sigma(1385)\pi$, D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.10 ±0.04	**10 ± 25**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0237	113	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to \Sigma(1385)\pi$, G-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.03 ±0.02		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.000726	127	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to N\overline{K}^*(892)$, S=1/2 , D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0278	−177	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to N\overline{K}^*(892)$, S=3/2 , D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0255	3	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to N\overline{K}^*(892)$, S=3/2 , G-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.00773	−17	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

Normalized residue in $N\overline{K} \to \Lambda(1830) \to \Lambda\omega$, S=1/2 , D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.04±0.03		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(1830) \to \Lambda\omega$, S=3/2 , D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.05±0.03	**−110 ± 35**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Λ(1830) MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1820 to 1830 (≈ 1825) OUR ESTIMATE				
1821± 3	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
1820± 4	ZHANG	13A	DPWA	Multichannel
1831±10	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
1825±10	GOPAL	77	DPWA	$\overline{K}N$ multichannel
1825± 1	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1817 or 1818	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

Λ(1830) WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
60 to 120 (≈ 90) OUR ESTIMATE				
64± 7	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
114±10	ZHANG	13A	DPWA	Multichannel
100±10	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
94±10	GOPAL	77	DPWA	$\overline{K}N$ multichannel
119± 3	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
56 or 56	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

Λ(1830) DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor
Γ_1	$N\overline{K}$	0.04 to 0.08	
Γ_2	$\Sigma\pi$	35–75 %	
Γ_3	ΞK		
Γ_4	$\Sigma(1385)\pi$	>15 %	
Γ_5	$\Sigma(1385)\pi$, D-wave	(40 ±15) %	3.2
Γ_6	$\Sigma(1385)\pi$, G-wave		
Γ_7	$\Lambda\eta$		
Γ_8	$N\overline{K}^*(892)$, S=1/2, D-wave		
Γ_9	$N\overline{K}^*(892)$, S=3/2, D-wave		
Γ_{10}	$N\overline{K}^*(892)$, S=3/2, G-wave		

$\Lambda(1830)$ BRANCHING RATIOS

See "Sign conventions for resonance couplings" in the Note on Λ and Σ Resonances.

$\Gamma(N\overline{K})/\Gamma_{\text{total}}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.04 to 0.08 OUR ESTIMATE				
0.055±0.010	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
0.041±0.005	ZHANG	13A	DPWA	Multichannel
0.08 ±0.03	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
0.02 ±0.02	ALSTON-...	78	DPWA	$\overline{K}N \to \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.006	[1] KAMANO	15	DPWA	Multichannel
0.04 ±0.03	GOPAL	77	DPWA	See GOPAL 80
0.04 or 0.04	[2] MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.
[2] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

$\Gamma(\Sigma\pi)/\Gamma_{\text{total}}$ — Γ_2/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.42 ±0.08	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.017	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

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

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.562	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

$\Gamma(\Sigma(1385)\pi$, D-wave$)/\Gamma_{\text{total}}$ — Γ_5/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.40 ±0.15 OUR AVERAGE Error includes scale factor of 3.2.				
0.20 ±0.08	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
0.52 ±0.06	ZHANG	13A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.134	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

$\Gamma(\Sigma(1385)\pi$, G-wave$)/\Gamma_{\text{total}}$ — Γ_6/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.020±0.015	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Gamma(\Lambda\eta)/\Gamma_{\text{total}}$ — Γ_7/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.024	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

$\Gamma(N\overline{K}^*(892), S{=}1/2, D\text{-wave})/\Gamma_{\text{total}}$ — Γ_8/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.134	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

$\Gamma(N\overline{K}^*(892), S{=}3/2, D\text{-wave})/\Gamma_{\text{total}}$ — Γ_9/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.115	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

$\Gamma(N\overline{K}^*(892), S{=}3/2, G\text{-wave})/\Gamma_{\text{total}}$ — Γ_{10}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.009	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \to \Lambda(1830) \to \Sigma\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.13 ± 0.01	ZHANG	13A	DPWA	Multichannel
-0.17 ± 0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
-0.15 ± 0.01	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.17 or -0.17	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \to \Lambda(1830) \to \Sigma(1385)\pi$ — $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.20 to 0.50 OUR ESTIMATE				
$+0.141\pm0.014$	[1] CAMERON	78	DPWA	$K^- p \to \Sigma(1385)\pi$
$+0.13\pm0.03$	PREVOST	74	DPWA	$K^- N \to \Sigma(1385)\pi$

[1] The CAMERON 78 upper limit on G-wave decay is 0.03. The published sign has been changed to be in accord with the baryon-first convention.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \to \Lambda(1830) \to \Lambda\eta$ — $(\Gamma_1\Gamma_7)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN
-0.044 ± 0.020	RADER	73	MPWA

$\Lambda(1830)$ REFERENCES

SARANTSEV	19	EPJ A55 180	A.V. Sarantsev et al.	(BONN, PNPI)
KAMANO	15	PR C92 025205	H. Kamano et al.	(ANL, OSAK)
ZHANG	13A	PR C88 035205	H. Zhang et al.	(KSU)
PDG	82	PL 111B 1	M. Roos et al.	(HELS, CIT, CERN)
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP
ALSTON-...	78	PR D18 182	M. Alston-Garnjost et al.	(LBL, MTHO+) IJP
Also		PRL 38 1007	M. Alston-Garnjost et al.	(LBL, MTHO+) IJP

CAMERON	78	NP B143 189	W. Cameron *et al.*	(RHEL, LOIC) IJP
GOPAL	77	NP B119 362	G.P. Gopal *et al.*	(LOIC, RHEL) IJP
MARTIN	77	NP B127 349	B.R. Martin, M.K. Pidcock, R.G. Moorhouse	(LOUC+) IJP
Also		NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)
Also		NP B126 285	B.R. Martin, M.K. Pidcock	(LOUC) IJP
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP
PREVOST	74	NP B69 246	J. Prevost *et al.*	(SACL, CERN, HEID)
RADER	73	NC 16A 178	R.K. Rader *et al.*	(SACL, HEID, CERN+)