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

$I(J^P) = 0(\frac{5}{2}^-)$ 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 $N\overline{K} \rightarrow \Lambda(1830) \rightarrow N\overline{K}$

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 $N\overline{K} \rightarrow \Lambda(1830) \rightarrow \Sigma\pi$

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 $N\overline{K} \rightarrow \Lambda(1830) \rightarrow \Lambda\eta$

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 $N\overline{K} \rightarrow \Lambda(1830) \rightarrow \Xi K$

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 $N\overline{K} \rightarrow \Lambda(1830) \rightarrow \Sigma(1385)\pi$, 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 $N\overline{K} \rightarrow \Lambda(1830) \rightarrow \Sigma(1385)\pi$, 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 $N\overline{K} \rightarrow \Lambda(1830) \rightarrow N\overline{K}^*(892)$, 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 $N\overline{K} \rightarrow \Lambda(1830) \rightarrow N\overline{K}^*(892)$, 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		

Λ(1830) BRANCHING RATIOS

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

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

$\Gamma(\Sigma\pi)/\Gamma_{total}$ — 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.

$\Gamma(\Xi K)/\Gamma_{total}$ — 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.

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

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

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

$\Gamma(\Lambda\eta)/\Gamma_{total}$ 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.

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

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

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ 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.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ 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±0.014	[1] CAMERON	78	DPWA	$K^- p \to \Sigma(1385)\pi$
+0.13 ±0.03	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.

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

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+)