

$\Lambda(1830) \ 5/2^-$ $I(J^P) = 0(\frac{5}{2}^-)$ 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 $\bar{K}N$ multichannel
$1899 \begin{smallmatrix} +35 \\ -37 \end{smallmatrix}$	¹ KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$1766 \begin{smallmatrix} +37 \\ -34 \end{smallmatrix}$	² KAMANO	15	DPWA Multichannel
1809	ZHANG	13A	DPWA Multichannel

¹The preferred solution A in KAMANO 15 reports two poles. This entry is from the preferred solution A.

²From 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 $\bar{K}N$ multichannel
$80 \begin{smallmatrix} +100 \\ -34 \end{smallmatrix}$	¹ KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$212 \begin{smallmatrix} +94 \\ -62 \end{smallmatrix}$	² KAMANO	15	DPWA Multichannel
109	ZHANG	13A	DPWA Multichannel

¹The preferred solution A in KAMANO 15 reports two poles. This entry is from the preferred solution A.

²From 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 $N\bar{K} \rightarrow \Lambda(1830) \rightarrow N\bar{K}$

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

¹From the preferred solution A in KAMANO 15.

Normalized residue in $N\bar{K} \rightarrow \Lambda(1830) \rightarrow \Sigma\pi$

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

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

0.00581 179 ¹KAMANO 15 DPWA Multichannel

¹From the preferred solution A in KAMANO 15.

Normalized residue in $N\bar{K} \rightarrow \Lambda(1830) \rightarrow \Lambda\eta$

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.00941 -65 ¹KAMANO 15 DPWA Multichannel

¹From the preferred solution A in KAMANO 15.

Normalized residue in $N\bar{K} \rightarrow \Lambda(1830) \rightarrow \Xi K$

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
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0.010 ±0.005 65 ± 20 SARANTSEV 19 DPWA $\bar{K}N$ multichannel

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

0.0477 94 ¹KAMANO 15 DPWA Multichannel

¹From the preferred solution A in KAMANO 15.

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

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
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0.10 ±0.04 10 ± 25 SARANTSEV 19 DPWA $\bar{K}N$ multichannel

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

0.0237 113 ¹KAMANO 15 DPWA Multichannel

¹From the preferred solution A in KAMANO 15.

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

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
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0.03 ±0.02 SARANTSEV 19 DPWA $\bar{K}N$ multichannel

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

0.000726 127 ¹KAMANO 15 DPWA Multichannel

¹From the preferred solution A in KAMANO 15.

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

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.0278 -177 ¹KAMANO 15 DPWA Multichannel

¹From the preferred solution A in KAMANO 15.

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

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.0255 3 ¹KAMANO 15 DPWA Multichannel

¹From the preferred solution A in KAMANO 15.

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

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.00773 -17 ¹KAMANO 15 DPWA Multichannel

¹From the preferred solution A in KAMANO 15.

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

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.04±0.03		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.05±0.03	-110 ± 35	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

 $\Lambda(1830)$ MASS

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

¹The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. **$\Lambda(1830)$ WIDTH**

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

¹The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. **$\Lambda(1830)$ DECAY MODES**

	<u>Mode</u>	<u>Fraction (Γ_i/Γ)</u>	<u>Scale factor</u>
Γ_1	$N\bar{K}$	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	$N\bar{K}^*(892)$, $S=1/2$, D -wave		
Γ_9	$N\bar{K}^*(892)$, $S=3/2$, D -wave		
Γ_{10}	$N\bar{K}^*(892)$, $S=3/2$, G -wave		

$\Lambda(1830)$ BRANCHING RATIOS

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

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.04 to 0.08 OUR ESTIMATE			
0.055±0.010	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
0.041±0.005	ZHANG 13A	DPWA	Multichannel
0.08 ±0.03	GOPAL 80	DPWA	$\bar{K}N \rightarrow \bar{K}N$
0.02 ±0.02	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
• • • 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	$\bar{K}N$ 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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.42 ±0.08			
	SARANTSEV 19	DPWA	$\bar{K}N$ 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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • 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.

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.40 ±0.15 OUR AVERAGE Error includes scale factor of 3.2.			
0.20 ±0.08	SARANTSEV 19	DPWA	$\bar{K}N$ 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.

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.020±0.015	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • 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.

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

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.134 ¹KAMANO 15 DPWA Multichannel¹From the preferred solution A in KAMANO 15. $\Gamma(N\bar{K}^*(892), S=3/2, D\text{-wave})/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.115 ¹KAMANO 15 DPWA Multichannel¹From the preferred solution A in KAMANO 15. $\Gamma(N\bar{K}^*(892), S=3/2, G\text{-wave})/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.009 ¹KAMANO 15 DPWA Multichannel¹From the preferred solution A in KAMANO 15. $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1830) \rightarrow \Sigma\pi$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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−0.13±0.01 ZHANG 13A DPWA Multichannel

−0.17±0.03 GOPAL 77 DPWA $\bar{K}N$ multichannel−0.15±0.01 KANE 74 DPWA $K^-p \rightarrow \Sigma\pi$

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

−0.17 or −0.17 ¹MARTIN 77 DPWA $\bar{K}N$ multichannel¹The 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 $N\bar{K} \rightarrow \Lambda(1830) \rightarrow \Sigma(1385)\pi$ $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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0.20 to 0.50 OUR ESTIMATE+0.141±0.014 ¹CAMERON 78 DPWA $K^-p \rightarrow \Sigma(1385)\pi$ +0.13 ±0.03 PREVOST 74 DPWA $K^-N \rightarrow \Sigma(1385)\pi$ ¹The 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 $N\bar{K} \rightarrow \Lambda(1830) \rightarrow \Lambda\eta$ $(\Gamma_1\Gamma_7)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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−0.044±0.020 RADER 73 MPWA

 $\Lambda(1830)$ REFERENCES

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

CAMERON	78	NP B143 189	W. Cameron <i>et al.</i>	(RHEL, LOIC) IJP
GOPAL	77	NP B119 362	G.P. Gopal <i>et al.</i>	(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 <i>et al.</i>	(SACL, CERN, HEID)
RADER	73	NC 16A 178	R.K. Rader <i>et al.</i>	(SACL, HEID, CERN+)
