$\Lambda(1890)\ 3/2^+$

$I(J^P) = 0(\frac{3}{2}^+)$ Status: ∗∗∗∗

For results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** 1 (1982).

The $J^P = 3/2^+$ assignment is consistent with all available data (including polarization) and recent partial-wave analyses. The dominant inelastic modes remain unknown.

$\Lambda(1890)$ POLE POSITION

REAL PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1859^{+5}_{-7}	[1] KAMANO	15	DPWA	Multichannel
1876	ZHANG	13A	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15, incompatible with solution B.

−2×IMAGINARY PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$113^{+20}_{-\ 4}$	[1] KAMANO	15	DPWA	Multichannel
145	ZHANG	13A	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15, incompatible with solution B.

$\Lambda(1890)$ INELASTIC POLE RESIDUE

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

Normalized residue in $K N \rightarrow \Lambda(1890) \rightarrow K N$

MODULUS	*PHASE* (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.241	−23	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1890) \rightarrow \Sigma\pi$

MODULUS	*PHASE* (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.101	104	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1890) \rightarrow \Lambda\eta$

MODULUS	*PHASE* (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0485	−54	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1890) \rightarrow \Xi K$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0562	−85	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1890) \rightarrow \Sigma(1385)\pi$, P-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.295	−40	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1890) \rightarrow \Sigma(1385)\pi$, F-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.064	127	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1890) \rightarrow N\overline{K}^*(892)$, S=1/2 , P-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.188	−160	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1890) \rightarrow N\overline{K}^*(892)$, S=3/2 , P-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.209	15	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1890) \rightarrow N\overline{K}^*(892)$, S=3/2, F-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0141	129	[1] KAMANO	15	DPWA	Multichannel

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

$\Lambda(1890)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1850 to 1910 (≈ 1890) OUR ESTIMATE				
1900± 5	ZHANG	13A	DPWA	Multichannel
1897± 5	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1908±10	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1900± 5	GOPAL	77	DPWA	$\overline{K}N$ multichannel
1894±10	HEMINGWAY	75	DPWA	$K^- p \rightarrow \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1856 or 1868	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
1900	[2] NAKKASYAN	75	DPWA	$K^- p \rightarrow \Lambda\omega$

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
[2] Found in one of two best solutions.

$\Lambda(1890)$ WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
60 to 200 (≈ 100) OUR ESTIMATE				
161±15	ZHANG	13A	DPWA	Multichannel
74±10	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
119±20	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
72±10	GOPAL	77	DPWA	$\overline{K}N$ multichannel
107±10	HEMINGWAY	75	DPWA	$K^- p \rightarrow \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
191 or 193	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
100	[2] NAKKASYAN	75	DPWA	$K^- p \rightarrow \Lambda\omega$

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
[2] Found in one of two best solutions.

$\Lambda(1890)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	20–35 %
Γ_2	$\Sigma\pi$	3–10 %
Γ_3	$\Lambda\eta$	
Γ_4	ΞK	
Γ_5	$\Sigma(1385)\pi$	seen
Γ_6	$\Sigma(1385)\pi$, P-wave	
Γ_7	$\Sigma(1385)\pi$, F-wave	
Γ_8	$N\overline{K}^*(892)$	seen
Γ_9	$N\overline{K}^*(892)$, S=1/2	
Γ_{10}	$N\overline{K}^*(892)$, S=1/2, P-wave	
Γ_{11}	$N\overline{K}^*(892)$, S=3/2, P-wave	
Γ_{12}	$N\overline{K}^*(892)$, S=3/2, F-wave	
Γ_{13}	$\Lambda\omega$	

$\Lambda(1890)$ 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*
0.20 to 0.35 OUR ESTIMATE				
0.37 ±0.03	ZHANG	13A	DPWA	Multichannel
0.20 ±0.02	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
0.34 ±0.05	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
0.24 ±0.04	HEMINGWAY	75	DPWA	$K^- p \rightarrow \overline{K}N$

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

0.305	[1] KAMANO	15	DPWA	Multichannel
0.18 $\pm$0.02	GOPAL	77	DPWA	See GOPAL 80
0.36 or 0.34	[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
<0.03	LANGBEIN	72	IPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.04	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(\Lambda\eta)/\Gamma_{total}$ — Γ_3/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.012	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(\Xi K)/\Gamma_{total}$ — Γ_4/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.

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

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.453	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(\Sigma(1385)\pi, F\text{-wave})/\Gamma_{total}$ — Γ_7/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.019	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(N\overline{K}^*(892), S=1/2, P\text{-wave})/\Gamma_{total}$ — Γ_{10}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.073	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(N\overline{K}^*(892), S=3/2, P\text{-wave})/\Gamma_{total}$ — Γ_{11}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.088	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(N\overline{K}^*(892), S=3/2, F\text{-wave})/\Gamma_{total}$ — Γ_{12}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.001	[1] KAMANO	15	DPWA	Multichannel

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1890) \to \Sigma\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.09 ± 0.02	ZHANG	13A	DPWA	Multichannel
-0.09 ± 0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$+0.15$ or $+0.14$	[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 $N\overline{K} \to \Lambda(1890) \to \Sigma(1385)\pi$, P-wave — $(\Gamma_1\Gamma_6)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
<0.03	CAMERON	78	DPWA	$K^- p \to \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1890) \to \Sigma(1385)\pi$, F-wave — $(\Gamma_1\Gamma_7)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
$-0.31\ \pm0.04$	ZHANG	13A	DPWA	Multichannel
-0.126 ± 0.055	[1] CAMERON	78	DPWA	$K^- p \to \Sigma(1385)\pi$

[1] The published sign has been changed to be in accord with the baryon-first convention.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1890) \to N\overline{K}^*(892)$, $S=1/2$ — $(\Gamma_1\Gamma_9)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.17 ± 0.05	ZHANG	13A	DPWA	Multichannel
-0.07 ± 0.03	[1,2] CAMERON	78B	DPWA	$K^- p \to N\overline{K}^*$

[1] Upper limits on the P_3 and F_3 waves are each 0.03.
[2] The published sign has been changed to be in accord with the baryon-first convention.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1890) \to N\overline{K}^*(892)$, $S=3/2$, F-wave — $(\Gamma_1\Gamma_{12})^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.11 ± 0.03	ZHANG	13A	DPWA	Multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Lambda(1890) \rightarrow \Lambda\omega$ $(\Gamma_1\Gamma_{13})^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
seen	BACCARI	77	IPWA	$K^- p \rightarrow \Lambda\omega$
0.032	[1] NAKKASYAN	75	DPWA	$K^- p \rightarrow \Lambda\omega$

[1] Found in one of two best solutions.

Λ(1890) REFERENCES

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
CAMERON	78B	NP B146 327	W. Cameron *et al.*	(RHEL, LOIC) IJP
BACCARI	77	NC 41A 96	B. Baccari *et al.*	(SACL, CDEF) 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
HEMINGWAY	75	NP B91 12	R.J. Hemingway *et al.*	(CERN, HEIDH, MPIM) IJP
NAKKASYAN	75	NP B93 85	A. Nakkasyan	(CERN) IJP
LANGBEIN	72	NP B47 477	W. Langbein, F. Wagner	(MPIM) IJP