$\Lambda(1690)$ 3/2$^-$

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

The measurements of the mass, width, and elasticity published before 1974 are now obsolete and have been omitted. They were last listed in our 1982 edition Physics Letters **111B** 1 (1982).

$\Lambda(1690)$ POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1697^{+6}_{-6}	[1] KAMANO	15	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1689	ZHANG	13A	DPWA	Multichannel

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

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
65±14	[1] KAMANO	15	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
53	ZHANG	13A	DPWA	Multichannel

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

$\Lambda(1690)$ POLE RESIDUES

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1690) \rightarrow N\overline{K}$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.251	3	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1690) \rightarrow \Sigma\pi$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.315	−173	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\eta$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.00567	81	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Lambda(1690) \to \Sigma(1385)\pi$, S-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.134	168	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Lambda(1690) \to \Sigma(1385)\pi$, D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.319	−22	[1] KAMANO	15	DPWA	Multichannel

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

$\Lambda(1690)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1685 to 1695 (≈ 1690) OUR ESTIMATE				
1691 ±3	ZHANG	13A	DPWA	Multichannel
1695.7±2.6	KOISO	85	DPWA	$K^- p \to \Sigma\pi$
1690 ±5	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
1692 ±5	ALSTON-...	78	DPWA	$\overline{K}N \to \overline{K}N$
1690 ±5	GOPAL	77	DPWA	$\overline{K}N$ multichannel
1690 ±3	HEPP	76B	DPWA	$K^- N \to \Sigma\pi$
1689 ±1	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1687 or 1689	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
1692 ±4	CARROLL	76	DPWA	Isospin-0 total σ

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. Another D_{03} Λ at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.

$\Lambda(1690)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
50 to 70 (≈ 60) OUR ESTIMATE				
54 ± 5	ZHANG	13A	DPWA	Multichannel
67.2± 5.6	KOISO	85	DPWA	$K^- p \to \Sigma\pi$
61 ± 5	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
64 ±10	ALSTON-...	78	DPWA	$\overline{K}N \to \overline{K}N$
60 ± 5	GOPAL	77	DPWA	$\overline{K}N$ multichannel
82 ± 8	HEPP	76B	DPWA	$K^- N \to \Sigma\pi$
60 ± 4	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
62 or 62	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
38	CARROLL	76	DPWA	Isospin-0 total σ

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. Another D_{03} Λ at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.

$\Lambda(1690)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	20–30 %
Γ_2	$\Sigma\pi$	20–40 %
Γ_3	$\Lambda\pi\pi$	$\sim$ 25 %
Γ_4	$\Sigma\pi\pi$	$\sim$ 20 %
Γ_5	$\Lambda\eta$	
Γ_6	$\Sigma(1385)\pi$, S-wave	
Γ_7	$\Sigma(1385)\pi$, D-wave	
Γ_8	$N\overline{K}^*(892)$, S=1/2, D-wave	
Γ_9	$N\overline{K}^*(892)$, S=3/2, S-wave	
Γ_{10}	$N\overline{K}^*(892)$, S=3/2, D-wave	

$\Lambda(1690)$ BRANCHING RATIOS

The sum of all the quoted branching ratios is more than 1.0. The two-body ratios are from partial-wave analyses, and thus probably are more reliable than the three-body ratios, which are determined from bumps in cross sections. Of the latter, the $\Sigma\pi\pi$ bump looks more significant. (The error given for the $\Lambda\pi\pi$ ratio looks unreasonably small.) Hardly any of the $\Sigma\pi\pi$ decay can be via $\Sigma(1385)$, for then seven times as much $\Lambda\pi\pi$ decay would be required. 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
0.2 to 0.3 OUR ESTIMATE				
0.25 ±0.04	ZHANG	13A	DPWA	Multichannel
0.23 ±0.03	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
0.22 ±0.03	ALSTON-...	78	DPWA	$\overline{K}N \to \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.239	[1] KAMANO	15	DPWA	Multichannel
0.24 ±0.03	GOPAL	77	DPWA	See GOPAL 80
0.28 or 0.26	[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. Another D_{03} Λ at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.

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

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.387	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(\Lambda\eta)/\Gamma_{total}$ Γ_5/Γ

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

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

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

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.062	[1] KAMANO	15	DPWA	Multichannel

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

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

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.308	[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. • • •				
not seen	[1] KAMANO	15	DPWA	Multichannel

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

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

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

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

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

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Sigma\pi$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.27 ± 0.03	ZHANG	13A	DPWA	Multichannel
-0.34 ± 0.02	KOISO	85	DPWA	$K^- p \to \Sigma\pi$
-0.25 ± 0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
-0.29 ± 0.03	HEPP	76B	DPWA	$K^- N \to \Sigma\pi$
-0.28 ± 0.03	LONDON	75	HLBC	$K^- p \to \Sigma^0\pi^0$
-0.28 ± 0.02	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.30 or -0.28	[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. Another D_{03} Λ at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Lambda\pi\pi$ — $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.25±0.02	[1] BARTLEY	68	HDBC	$K^- p \to \Lambda\pi\pi$

[1] BARTLEY 68 uses only cross-section data. The enhancement is not seen by PREVOST 71.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Sigma\pi\pi$ — $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.21	ARMENTEROS	68C	HDBC	$K^- N \to \Sigma\pi\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Lambda\eta$ — $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.00±0.03	BAXTER	73	DPWA	$K^- p \to$ neutrals

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Sigma(1385)\pi$, S-wave — $(\Gamma_1\Gamma_6)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.28±0.06	ZHANG	13A	DPWA	Multichannel
+0.27±0.04	PREVOST	74	DPWA	$K^- N \to \Sigma(1385)\pi$

Λ(1690) REFERENCES

KAMANO	15	PR C92 025205	H. Kamano *et al.*	(ANL, OSAK)
ZHANG	13A	PR C88 035205	H. Zhang *et al.*	(KSU)
KOISO	85	NP A433 619	H. Koiso *et al.*	(TOKY, MASA)
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
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
CARROLL	76	PRL 37 806	A.S. Carroll *et al.*	(BNL) I
HEPP	76B	PL 65B 487	V. Hepp *et al.*	(CERN, HEIDH, MPIM) IJP
LONDON	75	NP B85 289	G.W. London *et al.*	(BNL, CERN, EPOL+)
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP
PREVOST	74	NP B69 246	J. Prevost *et al.*	(SACL, CERN, HEID)
BAXTER	73	NP B67 125	D.F. Baxter *et al.*	(OXF) IJP
PREVOST	71	Amsterdam Conf.	J. Prevost	(CERN, HEID, SACL)
ARMENTEROS	68C	NP B8 216	R. Armenteros *et al.*	(CERN, HEID, SACL) I
BARTLEY	68	PRL 21 1111	J.H. Bartley *et al.*	(TUFTS, FSU, BRAN) I