$\Lambda(1670)\ 1/2^-$

$I(J^P) = 0(\frac{1}{2}^-)$ 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).

$\Lambda(1670)$ POLE POSITIONS

REAL PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1670 to 1678 (≈ 1674) OUR ESTIMATE				
1676 ±2	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
$1669\ ^{+3}_{-8}$	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel
1677.5±0.8	GARCIA-REC...	03	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1667	ZHANG	13A	DPWA	$\overline{K}N$ multichannel

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

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
28 to 36 (≈ 32) OUR ESTIMATE				
33 ± 4	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
$19\ ^{+18}_{-2}$	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel
29.2± 1.4	GARCIA-REC...	03	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
26	ZHANG	13A	DPWA	$\overline{K}N$ multichannel

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

$\Lambda(1670)$ POLE RESIDUES

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

Normalized residue in $\overline{K}N \to \Lambda(1670) \to \overline{K}N$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.30 ±0.06	**−145 ± 11**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.351	164	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel

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

Normalized residue in $N\overline{K} \to \Lambda(1670) \to \Sigma\pi$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.19 ±0.06	**145 ± 14**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.327	125	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel

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

Normalized residue in $N\overline{K} \to \Lambda(1670) \to \Lambda\eta$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.26 ±0.09	**104 ± 14**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.474	59	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Lambda(1670) \to \Xi K$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.02±0.02	**100 ± 25**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(1670) \to \Lambda\omega$, S=1/2, S-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.09±0.04	**−60 ± 35**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(1670) \to \Lambda\omega$, S=3/2, D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.05±0.04		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(1670) \to N\overline{K}^*(892)$, S=1/2, S-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.31±0.14	**100 ± 45**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(1670) \to N\overline{K}^*(892)$, S=3/2, D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.06±0.03	**−85 ± 40**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(1670) \to \Lambda\sigma$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.25±0.08	**160 ± 15**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(1670) \to \Sigma(1385)\pi$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.13 ±0.06	**110 ± 12**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0988	−104	[1] KAMANO	15	DPWA	Multichannel

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

Λ(1670) MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1670 to 1678 (≈ 1674) OUR ESTIMATE				
1674.3±0.8±4.9	LEE	21A	BELL	$\Lambda_c^+ \to \Lambda(1670)\pi^+$
1677 ±2	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
1672 ±3	ZHANG	13A	DPWA	Multichannel
1670.8±1.7	KOISO	85	DPWA	$K^- p \to \Sigma\pi$
1667 ±5	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$

1671 ±3		ALSTON-...	78	DPWA $\overline{K}N \to \overline{K}N$
1675 ±2		HEPP	76B	DPWA $K^- N \to \Sigma\pi$
1679 ±1		KANE	74	DPWA $K^- p \to \Sigma\pi$
1665 ±5		PREVOST	74	DPWA $K^- N \to \Sigma(1385)\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1673 ±2		MANLEY	02	DPWA $\overline{K}N$ multichannel
1668.9±2.0		ABAEV	96	DPWA $K^- p \to \Lambda\eta$
1670 ±5		GOPAL	77	DPWA $\overline{K}N$ multichannel
1664	[1]	MARTIN	77	DPWA $\overline{K}N$ multichannel

[1] MARTIN 77 obtains identical resonance parameters from a T-matrix pole and from a Breit-Wigner fit.

Λ(1670) WIDTH

VALUE (MeV)		*DOCUMENT ID*		*TECN*	*COMMENT*
25 to 35 (≈ 30) OUR ESTIMATE					
36.1± 2.4±4.8		LEE	21A	BELL	$\Lambda_c^+ \to \Lambda(1670)\pi^+$
33 ± 4		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
29 ± 5		ZHANG	13A	DPWA	$\overline{K}N$ multichannel
34.1± 3.7		KOISO	85	DPWA	$K^- p \to \Sigma\pi$
29 ± 5		GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
29 ± 5		ALSTON-...	78	DPWA	$\overline{K}N \to \overline{K}N$
46 ± 5		HEPP	76B	DPWA	$K^- N \to \Sigma\pi$
40 ± 3		KANE	74	DPWA	$K^- p \to \Sigma\pi$
19 ± 5		PREVOST	74	DPWA	$K^- N \to \Sigma(1385)\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
23 ± 6		MANLEY	02	DPWA	$\overline{K}N$ multichannel
21.1± 3.6		ABAEV	96	DPWA	$K^- p \to \Lambda\eta$
45 ±10		GOPAL	77	DPWA	$\overline{K}N$ multichannel
12	[1]	MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] MARTIN 77 obtains identical resonance parameters from a T-matrix pole and from a Breit-Wigner fit.

Λ(1670) DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	20–30 %
Γ_2	$\Sigma\pi$	25–55 %
Γ_3	$\Lambda\eta$	10–25 %
Γ_4	$\Sigma(1385)\pi$, D-wave	(6.0±2.0) %
Γ_5	$N\overline{K}^*(892)$, S=1/2, S-wave	
Γ_6	$N\overline{K}^*(892)$, S=3/2, D-wave	(5 ±4) %
Γ_7	$\Lambda\sigma$	(20 ±8) %

$\Lambda(1670)$ 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
0.20 to 0.30 OUR ESTIMATE				
0.33 ±0.07	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
0.26 ±0.25	ZHANG	13A	DPWA	$\overline{K}N$ multichannel
0.18 ±0.03	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
0.17 ±0.03	ALSTON-...	78	DPWA	$\overline{K}N \to \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.318	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel
0.37 ±0.07	MANLEY	02	DPWA	$\overline{K}N$ multichannel
0.20 ±0.03	GOPAL	77	DPWA	See GOPAL 80
0.15	[2] MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.
[2] MARTIN 77 obtains identical resonance parameters 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
0.12 ±0.03	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.289	[1] KAMANO	15	DPWA	Multichannel

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

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.20 ±0.08	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.373	KAMANO	15	DPWA	Multichannel
0.30 ±0.08	ABAEV	96	DPWA	$K^- p \to \Lambda\eta$

$\Gamma(\Sigma(1385)\pi, D\text{-wave})/\Gamma_{\text{total}}$ — Γ_4/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.06 ±0.02	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.019	KAMANO	15	DPWA	Multi-channel

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.20±0.08	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Gamma(N\overline{K}^*(892), S{=}1/2, S\text{-wave})/\Gamma_{\text{total}}$ — 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] Not seen in the preferred solution A in KAMANO 15.

$\Gamma(N\overline{K}^*(892), S=3/2, D\text{-wave})/\Gamma_{total}$ — Γ_6/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.05±0.04	ZHANG	13A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	[1] KAMANO	15	DPWA	Multichannel

[1] Not seen in the preferred solution A in KAMANO 15.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1670) \to \Sigma\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.29±0.06	ZHANG	13A	DPWA	Multichannel
−0.26±0.02	KOISO	85	DPWA	$K^- p \to \Sigma\pi$
−0.31±0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
−0.29±0.03	HEPP	76B	DPWA	$K^- N \to \Sigma\pi$
−0.23±0.03	LONDON	75	HLBC	$K^- p \to \Sigma^0\pi^0$
−0.27±0.02	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.38±0.03	MANLEY	02	DPWA	$\overline{K}N$ multichannel
−0.13	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] MARTIN 77 obtains identical resonance parameters from a T-matrix pole and from a Breit-Wigner fit.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1670) \to \Lambda\eta$ — $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.30±0.10	ZHANG	13A	DPWA	Multichannel
+0.20±0.05	BAXTER	73	DPWA	$K^- p \to$ neutrals
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.24±0.04	MANLEY	02	DPWA	$\overline{K}N$ multichannel
0.24	KIM	71	DPWA	K-matrix analysis
0.26	ARMENTEROS	69C	HBC	
0.20 or 0.23	BERLEY	65	HBC	

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1670) \to \Sigma(1385)\pi$, D-wave — $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.17±0.06	MANLEY	02	DPWA	$\overline{K}N$ multichannel
−0.18±0.05	PREVOST	74	DPWA	$K^- N \to \Sigma(1385)\pi$

$\Lambda(1670)$ REFERENCES

LEE	21A	PR D103 052005	J.Y. Lee *et al.*	(BELLE Collab.)
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)
GARCIA-REC...	03	PR D67 076009	C. Garcia-Recio *et al.*	(GRAN, VALE)
MANLEY	02	PRL 88 012002	D.M. Manley *et al.*	(BNL Crystal Ball Collab.)
ABAEV	96	PR C53 385	V.V. Abaev, B.M.K. Nefkens	(UCLA)
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
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
KIM	71	PRL 27 356	J.K. Kim	(HARV) IJP
Also		Duke Conf. 161	J.K. Kim	(HARV) IJP
Hyperon Resonances, 1970				
ARMENTEROS	69C	Lund Paper 229	R. Armenteros *et al.*	(CERN, HEID, SACL) IJP
Values are quoted in LEVI-SETTI 69.				
BERLEY	65	PRL 15 641	D. Berley *et al.*	(BNL) IJP