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

$I(J^P) = 0(\frac{1}{2}^-)$ 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 $\overline{K}N \rightarrow \Lambda(1670) \rightarrow \overline{K}N$

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 $N\overline{K} \rightarrow \Lambda(1670) \rightarrow \Sigma\pi$

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.

$\Lambda(1670)$ 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.

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

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

$\Gamma(\Lambda\eta)/\Gamma_{total}$ — 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	$K^- p \to \Lambda\eta$

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

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

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

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

$(\Gamma_i\Gamma_f)^{½}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Lambda(1670) \rightarrow \Sigma\pi$ — $(\Gamma_1\Gamma_2)^{½}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.29±0.06	ZHANG	13A	DPWA	Multichannel
−0.26±0.02	KOISO	85	DPWA	$K^- p \rightarrow \Sigma\pi$
−0.31±0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
−0.29±0.03	HEPP	76B	DPWA	$K^- N \rightarrow \Sigma\pi$
−0.23±0.03	LONDON	75	HLBC	$K^- p \rightarrow \Sigma^0\pi^0$
−0.27±0.02	KANE	74	DPWA	$K^- p \rightarrow \Sigma\pi$
• • • 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.

$(\Gamma_i\Gamma_f)^{½}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Lambda(1670) \rightarrow \Lambda\eta$ — $(\Gamma_1\Gamma_3)^{½}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.30±0.10	ZHANG	13A	DPWA	Multichannel
+0.20±0.05	BAXTER	73	DPWA	$K^- p \rightarrow$ 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	

$(\Gamma_i\Gamma_f)^{½}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Lambda(1670) \rightarrow \Sigma(1385)\pi$, D-wave — $(\Gamma_1\Gamma_4)^{½}/\Gamma$

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

$\Lambda(1670)$ 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