

$\Lambda(1670) \ 1/2^-$ $I(J^P) = 0(\frac{1}{2}^-)$ 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**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1669^{+3}_{-8}	¹ KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1667	ZHANG	13A	DPWA Multichannel
¹ From the preferred solution A in KAMANO 15.			

-2×IMAGINARY PART

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
19^{+18}_{-2}	¹ KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
26	ZHANG	13A	DPWA 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 $\bar{K}N \rightarrow \Lambda(1670) \rightarrow \bar{K}N$

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.351	164	¹ KAMANO	15	DPWA Multichannel
¹ From the preferred solution A in KAMANO 15.				

Normalized residue in $N\bar{K} \rightarrow \Lambda(1670) \rightarrow \Sigma\pi$

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.327	125	¹ KAMANO	15	DPWA Multichannel
¹ From the preferred solution A in KAMANO 15.				

Normalized residue in $N\bar{K} \rightarrow \Lambda(1670) \rightarrow \Lambda\eta$

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● 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 $N\bar{K} \rightarrow \Lambda(1670) \rightarrow \Sigma(1385)\pi$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.0988	-104	¹ KAMANO	15	DPWA Multichannel
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¹From the preferred solution A in KAMANO 15.

 $\Lambda(1670)$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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1660 to 1680 (≈ 1670) OUR ESTIMATE

1672 ± 3	ZHANG	13A	DPWA Multichannel
1677.5 ± 0.8	¹ GARCIA-REC...03	03	DPWA $\bar{K}N$ multichannel
1673 ± 2	MANLEY	02	DPWA $\bar{K}N$ multichannel
1670.8 ± 1.7	KOISO	85	DPWA $K^- p \rightarrow \Sigma \pi$
1667 ± 5	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
1671 ± 3	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
1670 ± 5	GOPAL	77	DPWA $\bar{K}N$ multichannel
1675 ± 2	HEPP	76B	DPWA $K^- N \rightarrow \Sigma \pi$
1679 ± 1	KANE	74	DPWA $K^- p \rightarrow \Sigma \pi$
1665 ± 5	PREVOST	74	DPWA $K^- N \rightarrow \Sigma(1385)\pi$

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

1668.9 ± 2.0	ABAEV	96	DPWA $K^- p \rightarrow \Lambda \eta$
1664	² MARTIN	77	DPWA $\bar{K}N$ multichannel

¹GARCIA-RECIO 03 gives pole, not Breit-Wigner, parameters, but the narrow width of the $\Lambda(1670)$ means there will be little difference.

²MARTIN 77 obtains identical resonance parameters from a T-matrix pole and from a Breit-Wigner fit.

 $\Lambda(1670)$ WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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25 to 50 (≈ 35) OUR ESTIMATE

29 ± 5	ZHANG	13A	DPWA Multichannel
29.2 ± 1.4	¹ GARCIA-REC...03	03	DPWA $\bar{K}N$ multichannel
23 ± 6	MANLEY	02	DPWA $\bar{K}N$ multichannel
34.1 ± 3.7	KOISO	85	DPWA $K^- p \rightarrow \Sigma \pi$
29 ± 5	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
29 ± 5	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
45 ± 10	GOPAL	77	DPWA $\bar{K}N$ multichannel
46 ± 5	HEPP	76B	DPWA $K^- N \rightarrow \Sigma \pi$
40 ± 3	KANE	74	DPWA $K^- p \rightarrow \Sigma \pi$
19 ± 5	PREVOST	74	DPWA $K^- N \rightarrow \Sigma(1385)\pi$

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

21.1 ± 3.6	ABAEV	96	DPWA $K^- p \rightarrow \Lambda \eta$
12	² MARTIN	77	DPWA $\bar{K}N$ multichannel

¹GARCIA-RECIO 03 gives pole, not Breit-Wigner, parameters, but the narrow width of the $\Lambda(1670)$ means there will be little difference.

²MARTIN 77 obtains identical resonance parameters from a T-matrix pole and from a Breit-Wigner fit.

$\Lambda(1670)$ DECAY MODES

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

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

¹From the preferred solution A in KAMANO 15.

²MARTIN 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

<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. • • •			
0.289	¹ KAMANO	15	DPWA Multichannel

¹From the preferred solution A in KAMANO 15.

 $\Gamma(\Lambda\eta)/\Gamma_{\text{total}}$ 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. • • •			
0.373	KAMANO	15	DPWA Multichannel
0.30 \pm 0.08	ABAEV	96	DPWA $K^-p \rightarrow \Lambda\eta$

 $\Gamma(\Sigma(1385)\pi, D\text{-wave})/\Gamma_{\text{total}}$ Γ_4/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. • • •			
0.019	KAMANO	15	DPWA Multi-channel

$\Gamma(N\bar{K}^*(892), S=1/2, S\text{-wave})/\Gamma_{\text{total}}$ Γ_5/Γ

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

not seen ¹KAMANO 15 DPWA Multichannel

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

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.05±0.04 ZHANG 13A DPWA Multichannel

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

not seen ¹KAMANO 15 DPWA Multichannel

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

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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−0.29±0.06 ZHANG 13A DPWA Multichannel
 −0.38±0.03 MANLEY 02 DPWA $\bar{K}N$ multichannel
 −0.26±0.02 KOISO 85 DPWA $K^-p \rightarrow \Sigma\pi$
 −0.31±0.03 GOPAL 77 DPWA $\bar{K}N$ 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. • • •

−0.13 ¹MARTIN 77 DPWA $\bar{K}N$ multichannel

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1670) \rightarrow \Lambda\eta$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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−0.30±0.10 ZHANG 13A DPWA Multichannel
 +0.24±0.04 MANLEY 02 DPWA $\bar{K}N$ 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 KIM 71 DPWA K-matrix analysis
 0.26 ARMENTEROS69C HBC
 0.20 or 0.23 BERLEY 65 HBC

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

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

$\Lambda(1670)$ REFERENCES

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)
GARCIA-REC...	03	PR D67 076009	C. Garcia-Recio <i>et al.</i>	(GRAN, VALE)
MANLEY	02	PRL 88 012002	D.M. Manley <i>et al.</i>	(BNL Crystal Ball Collab.)
ABAEV	96	PR C53 385	V.V. Abaev, B.M.K. Nefkens	(UCLA)
KOISO	85	NP A433 619	H. Koiso <i>et al.</i>	(TOKY, MASA)
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
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
HEPP	76B	PL 65B 487	V. Hepp <i>et al.</i>	(CERN, HEIDH, MPIM) IJP
LONDON	75	NP B85 289	G.W. London <i>et al.</i>	(BNL, CERN, EPOL+)
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP
PREVOST	74	NP B69 246	J. Prevost <i>et al.</i>	(SACL, CERN, HEID)
BAXTER	73	NP B67 125	D.F. Baxter <i>et al.</i>	(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 <i>et al.</i>	(CERN, HEID, SACL) IJP
Values are quoted in LEVI-SETTI	69.			
BERLEY	65	PRL 15 641	D. Berley <i>et al.</i>	(BNL) IJP