

$\Lambda(1670) \ 1/2^-$  $I(J^P) = 0(\frac{1}{2}^-)$  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>
$1669^{+3}_{-8}$	<sup>1</sup> KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1667	ZHANG	13A	DPWA Multichannel
<sup>1</sup> 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>
$19^{+18}_{-2}$	<sup>1</sup> KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
26	ZHANG	13A	DPWA Multichannel
<sup>1</sup> 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	<sup>1</sup> KAMANO	15	DPWA Multichannel
<sup>1</sup> 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	<sup>1</sup> KAMANO	15	DPWA Multichannel
<sup>1</sup> 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	<sup>1</sup> KAMANO	15	DPWA Multichannel
<sup>1</sup> 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 (<math>^{\circ}</math>)</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	<sup>1</sup> KAMANO	15	DPWA Multichannel
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<sup>1</sup>From 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 ( $\approx 1670$ ) OUR ESTIMATE**

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

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

1668.9 $\pm 2.0$	ABAEV	96	DPWA $K^- p \rightarrow \Lambda \eta$
1664	<sup>2</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel

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

<sup>2</sup>MARTIN 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 ( $\approx 35$ ) OUR ESTIMATE**

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

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

21.1 $\pm 3.6$	ABAEV	96	DPWA $K^- p \rightarrow \Lambda \eta$
12	<sup>2</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel

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

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

## $\Lambda(1670)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	20–30 %
$\Gamma_2$ $\Sigma\pi$	25–55 %
$\Gamma_3$ $\Lambda\eta$	10–25 %
$\Gamma_4$ $\Sigma(1385)\pi$ , <i>D</i> -wave	
$\Gamma_5$ $N\bar{K}^*(892)$ , $S=1/2$ , <i>S</i> -wave	
$\Gamma_6$ $N\bar{K}^*(892)$ , $S=3/2$ , <i>D</i> -wave	(5±4) %

## $\Lambda(1670)$ BRANCHING RATIOS

See “Sign conventions for resonance couplings” in the Note on  $\Lambda$  and  $\Sigma$  Resonances.

### $\Gamma(N\bar{K})/\Gamma_{\text{total}}$ $\Gamma_1/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.20 to 0.30 OUR ESTIMATE</b>			
0.26 ± 0.25	ZHANG	13A	DPWA Multichannel
0.37 ± 0.07	MANLEY	02	DPWA $\bar{K}N$ multichannel
0.18 ± 0.03	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
0.17 ± 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	<sup>1</sup> KAMANO	15	DPWA Multichannel
0.20 ± 0.03	GOPAL	77	DPWA See GOPAL 80
0.15	<sup>2</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel

<sup>1</sup>From the preferred solution A in KAMANO 15.

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

### $\Gamma(\Sigma\pi)/\Gamma_{\text{total}}$ $\Gamma_2/\Gamma$

<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	<sup>1</sup> KAMANO	15	DPWA Multichannel

<sup>1</sup>From the preferred solution A in KAMANO 15.

### $\Gamma(\Lambda\eta)/\Gamma_{\text{total}}$ $\Gamma_3/\Gamma$

<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 ± 0.08	ABAEV	96	DPWA $K^- p \rightarrow \Lambda\eta$

### $\Gamma(\Sigma(1385)\pi, D\text{-wave})/\Gamma_{\text{total}}$ $\Gamma_4/\Gamma$

<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

$\Gamma(N\bar{K}^*(892), S=1/2, S\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_5/\Gamma$

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

not seen <sup>1</sup>KAMANO 15 DPWA Multichannel

<sup>1</sup>Not seen in the preferred solution A in KAMANO 15.

$\Gamma(N\bar{K}^*(892), S=3/2, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_6/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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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 <sup>1</sup>KAMANO 15 DPWA Multichannel

<sup>1</sup>Not seen in the preferred solution A in KAMANO 15.

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

VALUE	DOCUMENT ID	TECN	COMMENT
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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 <sup>1</sup>MARTIN 77 DPWA  $\bar{K}N$  multichannel

<sup>1</sup>MARTIN 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  $N\bar{K} \rightarrow \Lambda(1670) \rightarrow \Lambda\eta$   $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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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  $N\bar{K} \rightarrow \Lambda(1670) \rightarrow \Sigma(1385)\pi, D\text{-wave}$   $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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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

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