

$\Lambda(1670) 1/2^-$  $I(J^P) = 0(\frac{1}{2}^-)$  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>
<b>1670 to 1678 (<math>\approx 1674</math>) OUR ESTIMATE</b>			
1676 $\pm 2$	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
1669 $\begin{smallmatrix} +3 \\ -8 \end{smallmatrix}$	<sup>1</sup> KAMANO 15	DPWA	$\bar{K}N$ multichannel
1677.5 $\pm 0.8$	GARCIA-REC...03	DPWA	$\bar{K}N$ multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1667	ZHANG 13A	DPWA	$\bar{K}N$ 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>
<b>28 to 36 (<math>\approx 32</math>) OUR ESTIMATE</b>			
33 $\pm 4$	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
19 $\begin{smallmatrix} +18 \\ -2 \end{smallmatrix}$	<sup>1</sup> KAMANO 15	DPWA	$\bar{K}N$ multichannel
29.2 $\pm 1.4$	GARCIA-REC...03	DPWA	$\bar{K}N$ multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
26	ZHANG 13A	DPWA	$\bar{K}N$ 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 (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.30 <math>\pm 0.06</math></b>	<b>-145 <math>\pm 11</math></b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.351	164	<sup>1</sup> KAMANO 15	DPWA	$\bar{K}N$ 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 (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.19 <math>\pm 0.06</math></b>	<b>145 <math>\pm 14</math></b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.327	125	<sup>1</sup> KAMANO 15	DPWA	$\bar{K}N$ 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>
<b>0.26 ± 0.09</b>	<b>104 ± 14</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
0.474	59	<sup>1</sup> KAMANO 15	DPWA	Multichannel

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

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

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

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.02 ± 0.02</b>	<b>100 ± 25</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

### Normalized residue in $N\bar{K} \rightarrow \Lambda(1670) \rightarrow \Lambda\omega, S=1/2, S\text{-wave}$

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.09 ± 0.04</b>	<b>-60 ± 35</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

### Normalized residue in $N\bar{K} \rightarrow \Lambda(1670) \rightarrow \Lambda\omega, S=3/2, D\text{-wave}$

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.05 ± 0.04</b>		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.31 ± 0.14</b>	<b>100 ± 45</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.06 ± 0.03</b>	<b>-85 ± 40</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.25 ± 0.08</b>	<b>160 ± 15</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

### Normalized residue in $N\bar{K} \rightarrow \Lambda(1670) \rightarrow \Sigma(1385)\pi$

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.13 ± 0.06</b>	<b>110 ± 12</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

0.0988      -104      <sup>1</sup>KAMANO 15      DPWA      Multichannel

<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>
<b>1670 to 1678 (≈ 1674) OUR ESTIMATE</b>			
1674.3 ± 0.8 ± 4.9	LEE	21A	BELL $\Lambda_C^+ \rightarrow \Lambda(1670)\pi^+$
1677 ± 2	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
1672 ± 3	ZHANG	13A	DPWA 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	$\bar{K}N \rightarrow \bar{K}N$
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. ● ● ●				
1673 ±2	MANLEY	02	DPWA	$\bar{K}N$ multichannel
1668.9±2.0	ABAEV	96	DPWA	$K^- p \rightarrow \Lambda\eta$
1670 ±5	GOPAL	77	DPWA	$\bar{K}N$ multichannel
1664	<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.

### $\Lambda(1670)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>25 to 35 (≈ 30) OUR ESTIMATE</b>			
36.1 ± 2.4 ± 4.8	LEE	21A	BELL $\Lambda_C^+ \rightarrow \Lambda(1670)\pi^+$
33 ± 4	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
29 ± 5	ZHANG	13A	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 $\bar{K}N \rightarrow \bar{K}N$
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. ● ● ●			
23 ± 6	MANLEY	02	DPWA $\bar{K}N$ multichannel
21.1 ± 3.6	ABAEV	96	DPWA $K^- p \rightarrow \Lambda\eta$
45 ± 10	GOPAL	77	DPWA $\bar{K}N$ multichannel
12	<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.

### $\Lambda(1670)$ 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	( 6.0 ± 2.0 ) %
$\Gamma_5$ $N\bar{K}^*(892)$ , <i>S</i> =1/2, <i>S</i> -wave	
$\Gamma_6$ $N\bar{K}^*(892)$ , <i>S</i> =3/2, <i>D</i> -wave	( 5 ± 4 ) %
$\Gamma_7$ $\Lambda\sigma$	( 20 ± 8 ) %

## $\Lambda(1670)$ BRANCHING RATIOS

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

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.20 to 0.30 OUR ESTIMATE</b>			
0.33 ±0.07	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
0.26 ±0.25	ZHANG 13A	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	$\bar{K}N$ multichannel
0.37 ±0.07	MANLEY 02	DPWA	$\bar{K}N$ 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.

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.12 ±0.03</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
• • • 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.

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.20 ±0.08</b>	SARANTSEV 19	DPWA	$\bar{K}N$ 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	$K^-p \rightarrow \Lambda\eta$

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

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

### $\Gamma(\Lambda\sigma)/\Gamma_{\text{total}} \qquad \qquad \qquad \Gamma_7/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.20±0.08</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

<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. • • •			
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
<b>0.05±0.04</b>	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
-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 $\bar{K}N$ 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. • • •

-0.38±0.03	MANLEY	02	DPWA $\bar{K}N$ multichannel
-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
-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 $\bar{K}N$ multichannel
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
-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**

LEE	21A	PR D103 052005	J.Y. Lee <i>et al.</i>	(BELLE Collab.)
SARANTSEV	19	EPJ A55 180	A.V. Sarantsev <i>et al.</i>	(BONN, PNPI)
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-RECIO...	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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