

$\Lambda(1690) 3/2^-$

$I(J^P) = 0(\frac{3}{2}^-)$  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).

### $\Lambda(1690)$ POLE POSITION

#### REAL PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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#### 1680 to 1700 ( $\approx 1690$ ) OUR ESTIMATE

1683 $\pm 3$	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
1697 $^{+6}_{-6}$	<sup>1</sup> KAMANO	15	DPWA $\bar{K}N$ multichannel

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

1689	ZHANG	13A	DPWA $\bar{K}N$ multichannel
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<sup>1</sup>From the preferred solution A in KAMANO 15.

#### −2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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#### 60 to 80 ( $\approx 70$ ) OUR ESTIMATE

72 $\pm 5$	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
65 $\pm 14$	<sup>1</sup> KAMANO	15	DPWA $\bar{K}N$ multichannel

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

53	ZHANG	13A	DPWA $\bar{K}N$ multichannel
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<sup>1</sup>From the preferred solution A in KAMANO 15.

### $\Lambda(1690)$ POLE RESIDUES

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

#### Normalized residue in $N\bar{K} \rightarrow \Lambda(1690) \rightarrow N\bar{K}$

MODULUS	PHASE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
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<b>0.24 <math>\pm 0.05</math></b>	<b>−28 <math>\pm 5</math></b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.251	3	<sup>1</sup> KAMANO	15	DPWA Multichannel
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<sup>1</sup>From the preferred solution A in KAMANO 15.

#### Normalized residue in $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma\pi$

MODULUS	PHASE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
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<b>0.35 <math>\pm 0.07</math></b>	<b>175 <math>\pm 6</math></b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.315	−173	<sup>1</sup> KAMANO	15	DPWA $\bar{K}N$ multichannel
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<sup>1</sup>From the preferred solution A in KAMANO 15.

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\eta$**

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.05 ± 0.02</b>	<b>88 ± 8</b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
0.00567	81	<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  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\sigma$**

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.08 ± 0.02</b>	<b>-10 ± 6</b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma(1385)\pi$ , S-wave**

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.11 ± 0.06</b>	<b>170 ± 70</b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
0.134	168	<sup>1</sup> KAMANO	15	DPWA $\bar{K}N$ 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  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma(1385)\pi$ , D-wave**

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.06 ± 0.04</b>	<b>164 ± 15</b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
0.319	-22	<sup>1</sup> KAMANO	15	DPWA $\bar{K}N$ 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  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow N\bar{K}^*(892)$ , S-wave**

<u>VALUE</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  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow N\bar{K}^*(892)$ , D-wave**

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.18 ± 0.05 @ -110 ± 45</b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel

**$\Lambda(1690)$  MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1685 to 1695 (<math>\approx 1690</math>) OUR ESTIMATE</b>			
1689 ± 3	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
1691 ± 3	ZHANG	13A	DPWA $\bar{K}N$ multichannel
1695.7 ± 2.6	KOISO	85	DPWA $K^-p \rightarrow \Sigma\pi$
1690 ± 5	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
1692 ± 5	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
1690 ± 3	HEPP	76B	DPWA $K^-N \rightarrow \Sigma\pi$
1689 ± 1	KANE	74	DPWA $K^-p \rightarrow \Sigma\pi$

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

1690 ± 5	GOPAL	77	DPWA	$\bar{K}N$ multichannel
1687 or 1689	<sup>1</sup> MARTIN	77	DPWA	$\bar{K}N$ multichannel
1692 ± 4	CARROLL	76	DPWA	Isospin-0 total $\sigma$

<sup>1</sup>The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. Another  $D_{03}$   $\Lambda$  at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.

### $\Lambda(1690)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>60 to 80 (<math>\approx 70</math>) OUR ESTIMATE</b>			
75 ± 5	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
54 ± 5	ZHANG	13A	DPWA $\bar{K}N$ multichannel
67.2 ± 5.6	KOISO	85	DPWA $K^- p \rightarrow \Sigma \pi$
61 ± 5	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
64 ± 10	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
82 ± 8	HEPP	76B	DPWA $K^- N \rightarrow \Sigma \pi$
60 ± 4	KANE	74	DPWA $K^- p \rightarrow \Sigma \pi$

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

60 ± 5	GOPAL	77	DPWA	$\bar{K}N$ multichannel
62 or 62	<sup>1</sup> MARTIN	77	DPWA	$\bar{K}N$ multichannel
38	CARROLL	76	DPWA	Isospin-0 total $\sigma$

<sup>1</sup>The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. Another  $D_{03}$   $\Lambda$  at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.

### $\Lambda(1690)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	20–30 %
$\Gamma_2$ $\Sigma \pi$	20–40 %
$\Gamma_3$ $\Lambda \sigma$	(5.0 ± 2.0) %
$\Gamma_4$ $\Lambda \pi \pi$	~ 25 %
$\Gamma_5$ $\Sigma \pi \pi$	~ 20 %
$\Gamma_6$ $\Lambda \eta$	
$\Gamma_7$ $\Sigma(1385)\pi$ , S-wave	(9 ± 5) %
$\Gamma_8$ $\Sigma(1385)\pi$ , D-wave	(3.0 ± 2.0) %
$\Gamma_9$ $N\bar{K}^*(892)$ , S=1/2, D-wave	
$\Gamma_{10}$ $N\bar{K}^*(892)$ , S=3/2, S-wave	
$\Gamma_{11}$ $N\bar{K}^*(892)$ , S=3/2, D-wave	

**$\Lambda(1690)$  BRANCHING RATIOS** **$\Gamma(N\bar{K})/\Gamma_{\text{total}}$   $\Gamma_1/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.20 to 0.28 OUR ESTIMATE</b>			
0.23 $\pm$ 0.05	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
0.25 $\pm$ 0.04	ZHANG 13A	DPWA	$\bar{K}N$ multichannel
0.23 $\pm$ 0.03	GOPAL 80	DPWA	$\bar{K}N \rightarrow \bar{K}N$
0.22 $\pm$ 0.03	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.239	<sup>1</sup> KAMANO 15	DPWA	$\bar{K}N$ multichannel
0.24 $\pm$ 0.03	GOPAL 77	DPWA	See GOPAL 80
0.28 or 0.26	<sup>2</sup> MARTIN 77	DPWA	$\bar{K}N$ multichannel

<sup>1</sup> From the preferred solution A in KAMANO 15.<sup>2</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. Another  $D_{03}$   $\Lambda$  at 1966 MeV is also suggested by MARTIN 77, but is very uncertain. **$\Gamma(\Sigma\pi)/\Gamma_{\text{total}}$   $\Gamma_2/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.50 <math>\pm</math> 0.10</b>			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.387	<sup>1</sup> KAMANO 15	DPWA	$\bar{K}N$ multichannel

<sup>1</sup> From the preferred solution A in KAMANO 15. **$\Gamma(\Lambda\eta)/\Gamma_{\text{total}}$   $\Gamma_6/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\sim$ 0.01	SARANTSEV 19	DPWA	$\bar{K}N$ 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> From the preferred solution A in KAMANO 15. **$\Gamma(\Lambda\sigma)/\Gamma_{\text{total}}$   $\Gamma_3/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.05 <math>\pm</math> 0.02</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

 **$\Gamma(\Sigma(1385)\pi, S\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_7/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.09 <math>\pm</math> 0.05</b>			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.062	<sup>1</sup> KAMANO 15	DPWA	$\bar{K}N$ multichannel

<sup>1</sup> From the preferred solution A in KAMANO 15. **$\Gamma(\Sigma(1385)\pi, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_8/\Gamma$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.03 <math>\pm</math> 0.02</b>			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.308	<sup>1</sup> KAMANO 15	DPWA	$\bar{K}N$ multichannel

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

$\Gamma(N\bar{K}^*(892), S=1/2, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_9/\Gamma$

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

not seen	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
not seen	<sup>1</sup> KAMANO	15	DPWA $\bar{K}N$ multichannel

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

$\Gamma(N\bar{K}^*(892), S=3/2, S\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_{10}/\Gamma$

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

0.003	KAMANO	15	DPWA Multichannel
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$\Gamma(N\bar{K}^*(892), S=3/2, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_{11}/\Gamma$

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma\pi$   $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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$-0.27 \pm 0.03$	ZHANG	13A	DPWA Multichannel
$-0.34 \pm 0.02$	KOISO	85	DPWA $K^-p \rightarrow \Sigma\pi$
$-0.25 \pm 0.03$	GOPAL	77	DPWA $\bar{K}N$ multichannel
$-0.29 \pm 0.03$	HEPP	76B	DPWA $K^-N \rightarrow \Sigma\pi$
$-0.28 \pm 0.03$	LONDON	75	HLBC $K^-p \rightarrow \Sigma^0\pi^0$
$-0.28 \pm 0.02$	KANE	74	DPWA $K^-p \rightarrow \Sigma\pi$

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

$-0.30$ or $-0.28$	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel
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<sup>1</sup>The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. Another  $D_{03} \Lambda$  at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\pi\pi$   $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

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

$0.25 \pm 0.02$	<sup>1</sup> BARTLEY	68	HDBC $K^-p \rightarrow \Lambda\pi\pi$
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<sup>1</sup>BARTLEY 68 uses only cross-section data. The enhancement is not seen by PREVOST 71.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma\pi\pi$   $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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0.21	ARMENTEROS68C	HDBC	$K^-N \rightarrow \Sigma\pi\pi$
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$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\eta$   $(\Gamma_1\Gamma_6)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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$0.00 \pm 0.03$	BAXTER	73	DPWA $K^-p \rightarrow$ neutrals
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$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma(1385)\pi$ , S-wave	$(\Gamma_1 \Gamma_7)^{1/2} / \Gamma$
VALUE	DOCUMENT ID TECN COMMENT
$-0.28 \pm 0.06$	ZHANG 13A DPWA Multichannel
$+0.27 \pm 0.04$	PREVOST 74 DPWA $K^- N \rightarrow \Sigma(1385)\pi$

### $\Lambda(1690)$ REFERENCES

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)
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
CARROLL 76	PRL 37 806	A.S. Carroll <i>et al.</i>	(BNL) I
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
PREVOST 71	Amsterdam Conf.	J. Prevost	(CERN, HEID, SACL)
ARMENTEROS 68C	NP B8 216	R. Armenteros <i>et al.</i>	(CERN, HEID, SACL) I
BARTLEY 68	PRL 21 1111	J.H. Bartley <i>et al.</i>	(TUFTS, FSU, BRAN) I