

$\Lambda(1690) \ 3/2^-$  $I(J^P) = 0(\frac{3}{2}^-)$  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**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>1697^{+6}_{-6}</math></b>	<sup>1</sup> KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1689	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>
<b><math>65 \pm 14</math></b>	<sup>1</sup> KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
53	ZHANG	13A	DPWA Multichannel
<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  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow N\bar{K}$** 

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

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

<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. ● ● ●				
0.315	−173	<sup>1</sup> KAMANO	15	DPWA Multichannel
<sup>1</sup> From the preferred solution A in KAMANO 15.				

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

<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. ● ● ●				
0.00567	81	<sup>1</sup> KAMANO	15	DPWA Multichannel
<sup>1</sup> From the preferred solution A in KAMANO 15.				

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

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

0.134	168	<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  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma(1385)\pi$ , D-wave**

<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. • • •

0.319	-22	<sup>1</sup> KAMANO	15	DPWA Multichannel
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<sup>1</sup>From the preferred solution A in KAMANO 15.

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

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**1685 to 1695 ( $\approx 1690$ ) OUR ESTIMATE**

1691 $\pm 3$	ZHANG	13A	DPWA Multichannel
1695.7 $\pm 2.6$	KOISO	85	DPWA $K^- p \rightarrow \Sigma \pi$
1690 $\pm 5$	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
1692 $\pm 5$	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
1690 $\pm 5$	GOPAL	77	DPWA $\bar{K}N$ multichannel
1690 $\pm 3$	HEPP	76B	DPWA $K^- N \rightarrow \Sigma \pi$
1689 $\pm 1$	KANE	74	DPWA $K^- p \rightarrow \Sigma \pi$

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

1687 or 1689	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel
1692 $\pm 4$	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**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**50 to 70 ( $\approx 60$ ) OUR ESTIMATE**

54 $\pm 5$	ZHANG	13A	DPWA Multichannel
67.2 $\pm 5.6$	KOISO	85	DPWA $K^- p \rightarrow \Sigma \pi$
61 $\pm 5$	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
64 $\pm 10$	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
60 $\pm 5$	GOPAL	77	DPWA $\bar{K}N$ multichannel
82 $\pm 8$	HEPP	76B	DPWA $K^- N \rightarrow \Sigma \pi$
60 $\pm 4$	KANE	74	DPWA $K^- p \rightarrow \Sigma \pi$

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

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 %
$\Gamma_3$ $\Lambda\pi\pi$	~ 25 %
$\Gamma_4$ $\Sigma\pi\pi$	~ 20 %
$\Gamma_5$ $\Lambda\eta$	
$\Gamma_6$ $\Sigma(1385)\pi$ , <i>S</i> -wave	
$\Gamma_7$ $\Sigma(1385)\pi$ , <i>D</i> -wave	
$\Gamma_8$ $N\bar{K}^*(892)$ , $S=1/2$ , <i>D</i> -wave	
$\Gamma_9$ $N\bar{K}^*(892)$ , $S=3/2$ , <i>S</i> -wave	
$\Gamma_{10}$ $N\bar{K}^*(892)$ , $S=3/2$ , <i>D</i> -wave	

 **$\Lambda(1690)$  BRANCHING RATIOS**

The sum of all the quoted branching ratios is more than 1.0. The two-body ratios are from partial-wave analyses, and thus probably are more reliable than the three-body ratios, which are determined from bumps in cross sections. Of the latter, the  $\Sigma\pi\pi$  bump looks more significant. (The error given for the  $\Lambda\pi\pi$  ratio looks unreasonably small.) Hardly any of the  $\Sigma\pi\pi$  decay can be via  $\Sigma(1385)$ , for then seven times as much  $\Lambda\pi\pi$  decay would be required. 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>0.2 to 0.3 OUR ESTIMATE</b>			
0.25 $\pm$ 0.04	ZHANG	13A	DPWA 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 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>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.387	<sup>1</sup> KAMANO	15	DPWA Multichannel

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

$\Gamma(\Lambda\eta)/\Gamma_{\text{total}}$   $\Gamma_5/\Gamma$ 

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>From the preferred solution A in KAMANO 15.

 $\Gamma(\Sigma(1385)\pi, S\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_6/\Gamma$ 

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

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

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

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

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

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

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

 $\Gamma(N\bar{K}^*(892), S=1/2, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_8/\Gamma$ 

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>From the preferred solution A in KAMANO 15.

 $\Gamma(N\bar{K}^*(892), S=3/2, S\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_9/\Gamma$ 

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

0.003 KAMANO 15 DPWA Multichannel

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

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

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

<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

<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  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\pi\pi$   $(\Gamma_1 \Gamma_3)^{1/2} / \Gamma$   
VALUE DOCUMENT ID TECN COMMENT

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

$0.25 \pm 0.02$  <sup>1</sup> BARTLEY 68 HDBC  $K^- p \rightarrow \Lambda\pi\pi$

<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  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma\pi\pi$   $(\Gamma_1 \Gamma_4)^{1/2} / \Gamma$   
VALUE DOCUMENT ID TECN COMMENT

0.21 ARMENTEROS68C HDBC  $K^- N \rightarrow \Sigma\pi\pi$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\eta$   $(\Gamma_1 \Gamma_5)^{1/2} / \Gamma$   
VALUE DOCUMENT ID TECN COMMENT

$0.00 \pm 0.03$  BAXTER 73 DPWA  $K^- p \rightarrow$  neutrals

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma(1385)\pi$ , S-wave  $(\Gamma_1 \Gamma_6)^{1/2} / \Gamma$   
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

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