

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

 **$\Lambda(1690)$  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>			
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 $\sigma$

 **$\Lambda(1690)$  WIDTH**

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

 **$\Lambda(1690)$  POLE POSITION****REAL PART**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1689	ZHANG	13A	DPWA Multichannel

**-2xIMAGINARY PART**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
53	ZHANG	13A	DPWA Multichannel

**$\Lambda(1690)$  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 %
$\Gamma_5$ $\Lambda\eta$	
$\Gamma_6$ $\Sigma(1385)\pi$ , S-wave	

The above branching fractions are our estimates, not fits or averages.

 **$\Lambda(1690)$  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±0.04	ZHANG	13A	DPWA Multichannel
0.23±0.03	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
0.22±0.03	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.24±0.03	GOPAL	77	DPWA See GOPAL 80
0.28 or 0.26	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel

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

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

 **$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\pi\pi$   $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$** 

<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. • • •			
0.25±0.02	<sup>2</sup> BARTLEY	68	HDBC $K^-p \rightarrow \Lambda\pi\pi$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ 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 $K^- N \rightarrow \Sigma(1385)\pi$

### $\Lambda(1690)$ FOOTNOTES

<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.

<sup>2</sup> BARTLEY 68 uses only cross-section data. The enhancement is not seen by PREVOST 71.

### $\Lambda(1690)$ REFERENCES

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