

$\Lambda(1690) \ 3/2^-$ $I(J^P) = 0(\frac{3}{2}^-)$ 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>
1685 to 1695 (≈ 1690) OUR ESTIMATE			
1691 ± 3	ZHANG	13A	DPWA 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 ± 5	GOPAL	77	DPWA $\bar{K} N$ multichannel
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. ● ● ●			
1687 or 1689	¹ MARTIN	77	DPWA $\bar{K} N$ multichannel
1692 ± 4	CARROLL	76	DPWA Isospin-0 total σ

 $\Lambda(1690)$ WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
50 to 70 (≈ 60) OUR ESTIMATE			
54 ± 5	ZHANG	13A	DPWA 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 $\bar{K} N \rightarrow \bar{K} N$
60 ± 5	GOPAL	77	DPWA $\bar{K} N$ multichannel
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. ● ● ●			
62 or 62	¹ MARTIN	77	DPWA $\bar{K} N$ multichannel
38	CARROLL	76	DPWA Isospin-0 total σ

 $\Lambda(1690)$ 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 (Γ_i/Γ)
Γ_1 $N\bar{K}$	20–30 %
Γ_2 $\Sigma\pi$	20–40 %
Γ_3 $\Lambda\pi\pi$	~ 25 %
Γ_4 $\Sigma\pi\pi$	~ 20 %
Γ_5 $\Lambda\eta$	
Γ_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 Λ and Σ Resonances.

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$ Γ_1/Γ

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.2 to 0.3 OUR ESTIMATE			
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	¹ 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	¹ 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	² 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 ± 0.03	BAXTER 73 DPWA $K^- p \rightarrow \text{neutrals}$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ 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 ± 0.06	ZHANG 13A DPWA Multichannel
$+0.27 \pm 0.04$	PREVOST 74 DPWA $K^- N \rightarrow \Sigma(1385)\pi$

$\Lambda(1690)$ FOOTNOTES

- ¹ The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. Another D_{03} Λ at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.
- ² 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