

$\Lambda(2100) \ 7/2^-$

$I(J^P) = 0(\frac{7}{2}^-)$ Status: ****

Most of the results published before 1973 are now obsolete and have been omitted. They may be found in our 1982 edition Physics Letters **111B** 1 (1982).

This entry only includes results from partial-wave analyses. Parameters of peaks seen in cross sections and in invariant-mass distributions around 2100 MeV used to be listed in a separate entry immediately following. It may be found in our 1986 edition Physics Letters **170B** 1 (1986).

$\Lambda(2100)$ POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2040±14	SARANTSEV	19	DPWA $\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2023	ZHANG	13A	DPWA Multichannel

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
215±29	SARANTSEV	19	DPWA $\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
239	ZHANG	13A	DPWA Multichannel

$\Lambda(2100)$ POLE RESIDUE

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

Normalized residue in $N\overline{K} \rightarrow \Lambda(2100) \rightarrow N\overline{K}$

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
0.28±0.06	−40 ± 10	SARANTSEV	19	DPWA $\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \rightarrow \Lambda(2100) \rightarrow \Sigma\pi$

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
0.09±0.02	−35 ± 15	SARANTSEV	19	DPWA $\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \rightarrow \Lambda(2100) \rightarrow \Sigma(1385)\pi$, D-wave

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
0.04±0.03		SARANTSEV	19	DPWA $\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \rightarrow \Lambda(2100) \rightarrow \Sigma(1385)\pi$, G-wave

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
0.06±0.03	−45 ± 15	SARANTSEV	19	DPWA $\overline{K}N$ multichannel

Normalized residue in $N\bar{K} \rightarrow \Lambda(2100) \rightarrow N\bar{K}^*(892)$, $S=3/2$, D -wave

<i>MODULUS</i>	<i>PHASE (°)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
0.11±0.06	−30 ± 30	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

$\Lambda(2100)$ MASS

<i>VALUE (MeV)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
2090 to 2110 (≈ 2100) OUR ESTIMATE			
2090±15	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
2086± 6	ZHANG 13A	DPWA	Multichannel
2104±10	GOPAL 80	DPWA	$\bar{K}N \rightarrow \bar{K}N$
2106±30	DEBELLEFON 78	DPWA	$\bar{K}N \rightarrow \bar{K}N$
2110±10	GOPAL 77	DPWA	$\bar{K}N$ multichannel
2105±10	HEMINGWAY 75	DPWA	$K^-p \rightarrow \bar{K}N$
2115±10	KANE 74	DPWA	$K^-p \rightarrow \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2094	BACCARI 77	DPWA	$K^-p \rightarrow \Lambda\omega$
2094	DECLAIS 77	DPWA	$\bar{K}N \rightarrow \bar{K}N$
2110 or 2089	¹ NAKKASYAN 75	DPWA	$K^-p \rightarrow \Lambda\omega$

$\Lambda(2100)$ WIDTH

<i>VALUE (MeV)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
100 to 250 (≈ 200) OUR ESTIMATE			
290±30	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
305±16	ZHANG 13A	DPWA	Multichannel
157±40	DEBELLEFON 78	DPWA	$\bar{K}N \rightarrow \bar{K}N$
250±30	GOPAL 77	DPWA	$\bar{K}N$ multichannel
241±30	HEMINGWAY 75	DPWA	$K^-p \rightarrow \bar{K}N$
152±15	KANE 74	DPWA	$K^-p \rightarrow \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
98	BACCARI 77	DPWA	$K^-p \rightarrow \Lambda\omega$
250	DECLAIS 77	DPWA	$\bar{K}N \rightarrow \bar{K}N$
244 or 302	¹ NAKKASYAN 75	DPWA	$K^-p \rightarrow \Lambda\omega$

$\Lambda(2100)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\bar{K}$	25–35 %
Γ_2 $\Sigma\pi$	~ 5 %
Γ_3 $\Lambda\eta$	<3 %
Γ_4 ΞK	<3 %
Γ_5 $\Lambda\omega$	<8 %

Γ_6	$\Sigma(1385)\pi$, D -wave	
Γ_7	$\Sigma(1385)\pi$, G -wave	$(1.0 \pm 1.0) \%$
Γ_8	$N\bar{K}^*(892)$	10–20 %
Γ_9	$N\bar{K}^*(892)$, $S=3/2$, D -wave	$(4.0 \pm 2.0) \%$
Γ_{10}	$N\bar{K}^*(892)$, $S=1/2$, G -wave	
Γ_{11}	$N\bar{K}^*(892)$, $S=3/2$, G -wave	

$\Lambda(2100)$ BRANCHING RATIOS

See “Sign conventions for resonance couplings” in the Note on Λ and Σ Resonances.

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

VALUE	DOCUMENT ID	TECN	COMMENT
0.25 to 0.35 (≈ 0.30) OUR ESTIMATE			
0.24 ± 0.05	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
0.23 ± 0.01	ZHANG 13A	DPWA	Multichannel
0.34 ± 0.03	GOPAL 80	DPWA	$\bar{K}N \rightarrow \bar{K}N$
0.24 ± 0.06	DEBELLEFON 78	DPWA	$\bar{K}N \rightarrow \bar{K}N$
0.31 ± 0.03	HEMINGWAY 75	DPWA	$K^- p \rightarrow \bar{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.29	DECLAIS 77	DPWA	$\bar{K}N \rightarrow \bar{K}N$
0.30 ± 0.03	GOPAL 77	DPWA	See GOPAL 80

$\Gamma(\Sigma\pi)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.030 ± 0.015	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

$\Gamma(\Sigma(1385)\pi, D\text{-wave})/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
< 0.01	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

$\Gamma(\Sigma(1385)\pi, G\text{-wave})/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.01 ± 0.01	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

$\Gamma(N\bar{K}^*(892), S=3/2, D\text{-wave})/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.04 ± 0.02	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(2100) \rightarrow \Sigma\pi$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
$+0.03 \pm 0.01$	ZHANG 13A	DPWA	Multichannel
$+0.12 \pm 0.04$	GOPAL 77	DPWA	$\bar{K}N$ multichannel
$+0.11 \pm 0.01$	KANE 74	DPWA	$K^- p \rightarrow \Sigma\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(2100) \rightarrow \Lambda\eta$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
-0.050 ± 0.020	RADER 73	MPWA	$K^- p \rightarrow \Lambda\eta$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(2100) \rightarrow \Xi K$			$(\Gamma_1 \Gamma_4)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT
0.035 ± 0.018	LITCHFIELD	71	DPWA $K^- p \rightarrow \Xi K$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.003	MULLER	69B	DPWA $K^- p \rightarrow \Xi K$
0.05	TRIPP	67	RVUE $K^- p \rightarrow \Xi K$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(2100) \rightarrow \Lambda\omega$			$(\Gamma_1 \Gamma_5)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT
-0.070	² BACCARI	77	DPWA GD_{37} wave
+0.011	² BACCARI	77	DPWA GG_{17} wave
+0.008	² BACCARI	77	DPWA GG_{37} wave
0.122 or 0.154	¹ NAKKASYAN	75	DPWA $K^- p \rightarrow \Lambda\omega$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(2100) \rightarrow N\bar{K}^*(892), S=3/2, D\text{-wave}$			$(\Gamma_1 \Gamma_9)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT
$+0.16 \pm 0.02$	ZHANG	13A	DPWA Multichannel
$+0.21 \pm 0.04$	CAMERON	78B	DPWA $K^- p \rightarrow N\bar{K}^*$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(2100) \rightarrow N\bar{K}^*(892), S=1/2, G\text{-wave}$			$(\Gamma_1 \Gamma_{10})^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT
-0.03 ± 0.02	ZHANG	13A	DPWA Multichannel
-0.04 ± 0.03	³ CAMERON	78B	DPWA $K^- p \rightarrow N\bar{K}^*$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(2100) \rightarrow N\bar{K}^*(892), S=3/2, G\text{-wave}$			$(\Gamma_1 \Gamma_{11})^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT
$+0.08 \pm 0.02$	ZHANG	13A	DPWA Multichannel

$\Lambda(2100)$ FOOTNOTES

¹ The NAKKASYAN 75 values are from the two best solutions found. Each has the $\Lambda(2100)$ and one additional resonance (P_3 or F_5).

² Note that the three for BACCARI 77 entries are for three different waves.

³ The published sign has been changed to be in accord with the baryon-first convention. The upper limit on the G_3 wave is 0.03.

$\Lambda(2100)$ REFERENCES

SARANTSEV	19	EPJ A55 180	A.V. Sarantsev <i>et al.</i>	(BONN, PNPI)
ZHANG	13A	PR C88 035205	H. Zhang <i>et al.</i>	(KSU)
PDG	86	PL 170B 1	M. Aguilar-Benitez <i>et al.</i>	(CERN, CIT+)
PDG	82	PL 111B 1	M. Roos <i>et al.</i>	(HELS, CIT, CERN)
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP
CAMERON	78B	NP B146 327	W. Cameron <i>et al.</i>	(RHEL, LOIC) IJP
DEBELLEFON	78	NC 42A 403	A. de Bellefon <i>et al.</i>	(CDEF, SACL) IJP
BACCARI	77	NC 41A 96	B. Baccari <i>et al.</i>	(SACL, CDEF) IJP
DECLAIS	77	CERN 77-16	Y. Declais <i>et al.</i>	(CAEN, CERN) IJP

GOPAL	77	NP B119 362	G.P. Gopal <i>et al.</i>	(LOIC, RHEL) IJP
HEMINGWAY	75	NP B91 12	R.J. Hemingway <i>et al.</i>	(CERN, HEIDH, MPIM) IJP
NAKKASYAN	75	NP B93 85	A. Nakkasyan	(CERN) IJP
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP
RADER	73	NC 16A 178	R.K. Rader <i>et al.</i>	(SACL, HEID, CERN+)
LITCHFIELD	71	NP B30 125	P.J. Litchfield <i>et al.</i>	(RHEL, CDEF, SACL) IJP
MULLER	69B	Thesis UCRL 19372	R.A. Muller	(LRL)
TRIPP	67	NP B3 10	R.D. Tripp <i>et al.</i>	(LRL, SLAC, CERN+)
