$\Lambda(2110)$ $5/2^+$

$I(J^P) = 0(\frac{5}{2}^+)$ Status: ∗∗∗

For results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** 1 (1982). All the references have been retained.

This resonance is in the Baryon Summary Table, but the evidence for it could be better.

$\Lambda(2110)$ POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
2048±10	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1970	ZHANG	13A	DPWA	$\overline{K}N$ multichannel

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
255±20	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
350	ZHANG	13A	DPWA	$\overline{K}N$ multichannel

$\Lambda(2110)$ POLE RESIDUE

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

Normalized residue in $N\overline{K} \to \Lambda(2110) \to N\overline{K}$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.020±0.005	**5 ± 15**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(2110) \to \Sigma\pi$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.13±0.03	**0 ± 15**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(2110) \to \Xi K$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.005±0.005		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(2110) \to \Lambda\omega$, S=1/2, P-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.01±0.01		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(2110) \to \Lambda\omega$, S=3/2, P-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.03±0.01	**−7 ± 16**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Lambda(2110) \to \Lambda\omega$, S=3/2, F-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.01±0.01		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Λ(2110) MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
2050 to 2130 (≈ 2090) OUR ESTIMATE				
2086±12	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
2036±13	ZHANG	13A	DPWA	$\overline{K}N$ multichannel
2092±25	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
2125±25	CAMERON	78B	DPWA	$K^- p \to N\overline{K}^*$
2106±50	DEBELLEFON	78	DPWA	$\overline{K}N \to \overline{K}N$
2140±20	DEBELLEFON	77	DPWA	$K^- p \to \Sigma\pi$
2100±50	GOPAL	77	DPWA	$\overline{K}N$ multichannel
2112± 7	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2137	BACCARI	77	DPWA	$K^- p \to \Lambda\omega$
2103	[1] NAKKASYAN	75	DPWA	$K^- p \to \Lambda\omega$

Λ(2110) WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
200 to 300 (≈ 250) OUR ESTIMATE				
274±25	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
400±38	ZHANG	13A	DPWA	$\overline{K}N$ multichannel
245±25	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
160±30	CAMERON	78B	DPWA	$K^- p \to N\overline{K}^*$
251±50	DEBELLEFON	78	DPWA	$\overline{K}N \to \overline{K}N$
140±20	DEBELLEFON	77	DPWA	$K^- p \to \Sigma\pi$
200±50	GOPAL	77	DPWA	$\overline{K}N$ multichannel
190±30	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
132	BACCARI	77	DPWA	$K^- p \to \Lambda\omega$
391	[1] NAKKASYAN	75	DPWA	$K^- p \to \Lambda\omega$

Λ(2110) DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	5–25 %
Γ_2	$\Sigma\pi$	10–40 %
Γ_3	$\Lambda\omega$	seen
Γ_4	$\Lambda\omega$, S=1/2 , P-wave	
Γ_5	$\Lambda\omega$, S=3/2 , P-wave	(5.0±2.0) %
Γ_6	$\Lambda\omega$, S=3/2 , F-wave	

Γ_7	ΞK	
Γ_8	$\Sigma(1385)\pi$	seen
Γ_9	$\Sigma(1385)\pi$, P-wave	
Γ_{10}	$N\overline{K}^*(892)$	10–60 %
Γ_{11}	$N\overline{K}^*(892)$, S=1/2	
Γ_{12}	$N\overline{K}^*(892)$, S=3/2, P-wave	

$\Lambda(2110)$ BRANCHING RATIOS

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

$\Gamma(N\overline{K})/\Gamma_{total}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.05 to 0.25 OUR ESTIMATE				
0.020±0.005	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
0.083±0.005	ZHANG	13A	DPWA	$\overline{K}N$ multichannel
0.07 ±0.03	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
0.27 ±0.06	[2] DEBELLEFON	78	DPWA	$\overline{K}N \to \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.07 ±0.03	GOPAL	77	DPWA	See GOPAL 80

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.88±0.20	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Gamma(\Lambda\omega, S=1/2, P\text{-wave})/\Gamma_{total}$ — Γ_4/Γ

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

$\Gamma(\Lambda\omega, S=3/2, P\text{-wave})/\Gamma_{total}$ — Γ_5/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.05±0.02	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Gamma(\Lambda\omega, S=3/2, F\text{-wave})/\Gamma_{total}$ — Γ_6/Γ

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

$\Gamma(\Xi K)/\Gamma_{total}$ — Γ_7/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$\sim$ 0	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(2110) \to \Sigma\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+0.04±0.01	ZHANG	13A	DPWA	Multichannel
+0.14±0.01	DEBELLEFON	77	DPWA	$K^- p \to \Sigma\pi$
+0.20±0.03	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.10±0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Lambda(2110) \rightarrow \Lambda\omega$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE		DOCUMENT ID		TECN	COMMENT
<0.05		BACCARI	77	DPWA	$K^- p \rightarrow \Lambda\omega$
0.112	[1]	NAKKASYAN	75	DPWA	$K^- p \rightarrow \Lambda\omega$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Lambda(2110) \rightarrow \Sigma(1385)\pi$, P-wave $(\Gamma_1\Gamma_9)^{1/2}/\Gamma$

VALUE		DOCUMENT ID		TECN	COMMENT
$+0.04 \pm 0.01$		ZHANG	13A	DPWA	Multichannel
$+0.071 \pm 0.025$	[3]	CAMERON	78	DPWA	$K^- p \rightarrow \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Lambda(2110) \rightarrow N\overline{K}^*(892)$, S=1/2 $(\Gamma_1\Gamma_{11})^{1/2}/\Gamma$

VALUE		DOCUMENT ID		TECN	COMMENT
-0.09 ± 0.01		ZHANG	13A	DPWA	Multichannel
-0.17 ± 0.04	[4]	CAMERON	78B	DPWA	$K^- p \rightarrow N\overline{K}^*$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Lambda(2110) \rightarrow N\overline{K}^*(892)$, S=3/2, P-wave $(\Gamma_1\Gamma_{12})^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.24 ± 0.01	ZHANG	13A	DPWA	Multichannel

Λ(2110) FOOTNOTES

[1] Found in one of two best solutions.
[2] The published error of 0.6 was a misprint.
[3] The CAMERON 78 upper limit on F-wave decay is 0.03. The sign here has been changed to be in accord with the baryon-first convention.
[4] The published sign has been changed to be in accord with the baryon-first convention. The CAMERON 78B upper limits on the P_3 and F_3 waves are each 0.03.

Λ(2110) REFERENCES

SARANTSEV	19	EPJ A55 180	A.V. Sarantsev et al.	(BONN, PNPI)
ZHANG	13A	PR C88 035205	H. Zhang et al.	(KSU)
PDG	82	PL 111B 1	M. Roos et al.	(HELS, CIT, CERN)
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP
CAMERON	78	NP B143 189	W. Cameron et al.	(RHEL, LOIC) IJP
CAMERON	78B	NP B146 327	W. Cameron et al.	(RHEL, LOIC) IJP
DEBELLEFON	78	NC 42A 403	A. de Bellefon et al.	(CDEF, SACL) IJP
BACCARI	77	NC 41A 96	B. Baccari et al.	(SACL, CDEF) IJP
DEBELLEFON	77	NC 37A 175	A. de Bellefon et al.	(CDEF, SACL) IJP
GOPAL	77	NP B119 362	G.P. Gopal et al.	(LOIC, RHEL) IJP
NAKKASYAN	75	NP B93 85	A. Nakkasyan	(CERN) IJP
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP