$\Lambda(1820)$ $5/2^+$

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

This resonance is the cornerstone for all partial-wave analyses in this region. 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).

Most of the quoted errors are statistical only; the systematic errors due to the particular parametrizations used in the partial-wave analyses are not included. For this reason we do not calculate weighted averages for the mass and width.

$\Lambda(1820)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1815 to 1825 (≈ 1820) OUR ESTIMATE				
1823.5±0.8	ZHANG	13A	DPWA	Multichannel
1823 ±3	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1819 ±2	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1822 ±2	GOPAL	77	DPWA	$\overline{K}N$ multichannel
1821 ±2	KANE	74	DPWA	$K^- p \rightarrow \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1830	DECLAIS	77	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1817 or 1819	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel

$\Lambda(1820)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
70 to 90 (≈ 80) OUR ESTIMATE				
89±2	ZHANG	13A	DPWA	Multichannel
77±5	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
72±5	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
81±5	GOPAL	77	DPWA	$\overline{K}N$ multichannel
87±3	KANE	74	DPWA	$K^- p \rightarrow \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
82	DECLAIS	77	DPWA	$\overline{K}N \rightarrow \overline{K}N$
76 or 76	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel

$\Lambda(1820)$ POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1814	ZHANG	13A	DPWA	Multichannel

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
85	ZHANG	13A	DPWA	Multichannel

$\Lambda(1820)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	55–65 %
Γ_2	$\Sigma\pi$	8–14 %
Γ_3	$\Sigma(1385)\pi$	5–10 %
Γ_4	$\Sigma(1385)\pi$, P-wave	
Γ_5	$\Sigma(1385)\pi$, F-wave	
Γ_6	$\Lambda\eta$	
Γ_7	$\Sigma\pi\pi$	
	The above branching fractions are our estimates, not fits or averages.	
Γ_8	$N\overline{K}^*(892)$, S=3/2, P-wave	(3.0±1.0) %

$\Lambda(1820)$ BRANCHING RATIOS

Errors quoted do not include uncertainties in the parametrizations used in the partial-wave analyses and are thus too small. See also "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
0.55 to 0.65 OUR ESTIMATE				
0.54±0.01	ZHANG	13A	DPWA	Multichannel
0.58±0.02	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
0.60±0.03	ALSTON-...	78	DPWA	$\overline{K}N \to \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.51	DECLAIS	77	DPWA	$\overline{K}N \to \overline{K}N$
0.57±0.02	GOPAL	77	DPWA	See GOPAL 80
0.59 or 0.58	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1820) \to \Sigma\pi$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.28±0.01	ZHANG	13A	DPWA	Multichannel
−0.28±0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
−0.28±0.01	KANE	74	DPWA	$K^- p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.25 or −0.25	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel

$\Gamma(\Sigma\pi\pi)/\Gamma_{total}$ Γ_7/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
no clear signal	[2] ARMENTEROS	68C	HDBC	$K^- N \to \Sigma\pi\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1820) \to \Sigma(1385)\pi$, P-wave — $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.20 ± 0.02	ZHANG	13A	DPWA	Multichannel
-0.167 ± 0.054	[3] CAMERON	78	DPWA	$K^- p \to \Sigma(1385)\pi$
$+0.27 \pm 0.03$	PREVOST	74	DPWA	$K^- N \to \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1820) \to \Sigma(1385)\pi$, F-wave — $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.065 \pm 0.029$	[3] CAMERON	78	DPWA	$K^- p \to \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1820) \to \Lambda\eta$ — $(\Gamma_1\Gamma_6)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN
$-0.096^{+0.040}_{-0.020}$	RADER	73	MPWA

$\Gamma(N\overline{K}^*(892), S=3/2, P\text{-wave})/\Gamma_{total}$ — Γ_8/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.03±0.01	ZHANG	13A	DPWA	Multichannel

$\Lambda(1820)$ FOOTNOTES

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

[2] There is a suggestion of a bump, enough to be consistent with what is expected from $\Sigma(1385) \to \Sigma\pi$ decay.

[3] The published sign has been changed to be in accord with the baryon-first convention.

$\Lambda(1820)$ REFERENCES

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
ALSTON-...	78	PR D18 182	M. Alston-Garnjost *et al.*	(LBL, MTHO+) IJP
Also		PRL 38 1007	M. Alston-Garnjost *et al.*	(LBL, MTHO+) IJP
CAMERON	78	NP B143 189	W. Cameron *et al.*	(RHEL, LOIC) IJP
DECLAIS	77	CERN 77-16	Y. Declais *et al.*	(CAEN, CERN) IJP
GOPAL	77	NP B119 362	G.P. Gopal *et al.*	(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
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP
PREVOST	74	NP B69 246	J. Prevost *et al.*	(SACL, CERN, HEID)
RADER	73	NC 16A 178	R.K. Rader *et al.*	(SACL, HEID, CERN+)
ARMENTEROS	68C	NP B8 216	R. Armenteros *et al.*	(CERN, HEID, SACL) I