

# $\Lambda(1820) F_{05}$

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

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** (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
<b>1815 to 1825 (<math>\approx 1820</math>) OUR ESTIMATE</b>			
1823 $\pm$ 3	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
1819 $\pm$ 2	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
1822 $\pm$ 2	GOPAL	77	DPWA $\bar{K}N$ multichannel
1821 $\pm$ 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 $\bar{K}N \rightarrow \bar{K}N$
1817 or 1819	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel

## $\Lambda(1820)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>70 to 90 (<math>\approx 80</math>) OUR ESTIMATE</b>			
77 $\pm$ 5	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
72 $\pm$ 5	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
81 $\pm$ 5	GOPAL	77	DPWA $\bar{K}N$ multichannel
87 $\pm$ 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 $\bar{K}N \rightarrow \bar{K}N$
76 or 76	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel

## $\Lambda(1820)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	55–65 %
$\Gamma_2$ $\Sigma \pi$	8–14 %
$\Gamma_3$ $\Sigma(1385)\pi$	5–10 %
$\Gamma_4$ $\Sigma(1385)\pi, P\text{-wave}$	
$\Gamma_5$ $\Sigma(1385)\pi, F\text{-wave}$	
$\Gamma_6$ $\Lambda\eta$	
$\Gamma_7$ $\Sigma \pi \pi$	

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

## $\Lambda(1820)$ 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  $\Lambda$  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>0.55 to 0.65 OUR ESTIMATE</b>				
0.58±0.02	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$	
0.60±0.03	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.51	DECLAIS	77	DPWA $\bar{K}N \rightarrow \bar{K}N$	
0.57±0.02	GOPAL	77	DPWA See GOPAL 80	
0.59 or 0.58	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel	

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1820) \rightarrow \Sigma\pi$				$(\Gamma_1\Gamma_2)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
-0.28±0.03	GOPAL	77	DPWA $\bar{K}N$ multichannel	
-0.28±0.01	KANE	74	DPWA $K^-p \rightarrow \Sigma\pi$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.25 or -0.25	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel	

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1820) \rightarrow \Lambda\eta$				$(\Gamma_1\Gamma_6)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
-0.096 <sup>+0.040</sup> <sub>-0.020</sub>	RADER	73	MPWA	

$\Gamma(\Sigma\pi\pi)/\Gamma_{\text{total}}$				$\Gamma_7/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
no clear signal	<sup>2</sup> ARMENTEROS68C	HDBC	$K^-N \rightarrow \Sigma\pi\pi$	

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1820) \rightarrow \Sigma(1385)\pi$ , <i>P</i> -wave				$(\Gamma_1\Gamma_4)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
-0.167±0.054	<sup>3</sup> CAMERON	78	DPWA $K^-p \rightarrow \Sigma(1385)\pi$	
+0.27 ±0.03	PREVOST	74	DPWA $K^-N \rightarrow \Sigma(1385)\pi$	

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1820) \rightarrow \Sigma(1385)\pi$ , <i>F</i> -wave				$(\Gamma_1\Gamma_5)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
+0.065±0.029	<sup>3</sup> CAMERON	78	DPWA $K^-p \rightarrow \Sigma(1385)\pi$	

### $\Lambda(1820)$ FOOTNOTES

- <sup>1</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
- <sup>2</sup> There is a suggestion of a bump, enough to be consistent with what is expected from  $\Sigma(1385) \rightarrow \Sigma\pi$  decay.
- <sup>3</sup> The published sign has been changed to be in accord with the baryon-first convention.

## $\Lambda(1820)$ REFERENCES

PDG	82	PL 111B	M. Roos <i>et al.</i>	(HELSE, 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	77	PRL 38 1007	M. Alston-Garnjost <i>et al.</i>	(LBL, MTHO+) IJP
CAMERON	78	NP B143 189	W. Cameron <i>et al.</i>	(RHEL, LOIC) 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
MARTIN	77	NP B127 349	B.R. Martin, M.K. Pidcock, R.G. Moorhouse	(LOUC+) IJP
Also	77B	NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)
Also	77C	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 <i>et al.</i>	(SACL, CERN, HEID)
RADER	73	NC 16A 178	R.K. Rader <i>et al.</i>	(SACL, HEID, CERN+)
ARMENTEROS	68C	NP B8 216	R. Armenteros <i>et al.</i>	(CERN, HEID, SACL) I

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