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

$I(J^P) = 0(\frac{5}{2}^+)$ 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** (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±3 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 1819±2 | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 1822±2 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 1821±2 | KANE | 74 | DPWA | $K^-p \to \Sigma\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 1830 | DECLAIS | 77 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 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** | | | | |
| 77±5 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 72±5 | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 81±5 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 87±3 | KANE | 74 | DPWA | $K^-p \to \Sigma\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 82 | DECLAIS | 77 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 76 or 76 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

## $\Lambda(1820)$ DECAY MODES

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

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

## Λ(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.

### $\Gamma(N\overline{K})/\Gamma_{total}$ $\Gamma_1/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **0.55 to 0.65 OUR ESTIMATE** | | | | |
| 0.58±0.02 | GOPAL | 80 | DPWA | $\overline{K}N \rightarrow \overline{K}N$ |
| 0.60±0.03 | ALSTON-... | 78 | DPWA | $\overline{K}N \rightarrow \overline{K}N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.51 | DECLAIS | 77 | DPWA | $\overline{K}N \rightarrow \overline{K}N$ |
| 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 $N\overline{K} \rightarrow \Lambda(1820) \rightarrow \Sigma\pi$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| −0.28±0.03 | GOPAL | 77 | DPWA | $\overline{K}N$ 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 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

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

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

### $\Gamma(\Sigma\pi\pi)/\Gamma_{total}$ $\Gamma_7/\Gamma$

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

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

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| −0.167±0.054 | [3] CAMERON | 78 | DPWA | $K^-p \rightarrow \Sigma(1385)\pi$ |
| +0.27 ±0.03 | PREVOST | 74 | DPWA | $K^-N \rightarrow \Sigma(1385)\pi$ |

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

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

## Λ(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 $\Sigma(1385) \rightarrow \Sigma\pi$ decay.

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

## Λ(1820) REFERENCES


| | | | | |
|---|---|---|---|---|
| PDG | 82 | PL 111B | Roos, Porter, Aguilar-Benitez+ | (HELS, CIT, CERN) |
| GOPAL | 80 | Toronto Conf. 159 | | (RHEL) IJP |
| ALSTON-... | 78 | PR D18 182 | Alston-Garnjost, Kenney+ | (LBL, MTHO, CERN) IJP |
| Also | 77 | PRL 38 1007 | Alston-Garnjost, Kenney+ | (LBL, MTHO, CERN) IJP |
| CAMERON | 78 | NP B143 189 | +Franek, Gopal, Bacon, Butterworth+ | (RHEL, LOIC) IJP |
| DECLAIS | 77 | CERN 77-16 | +Duchon, Louvel, Patry, Seguinot+ | (CAEN, CERN) IJP |
| GOPAL | 77 | NP B119 362 | +Ross, VanHorn, McPherson+ | (LOIC, RHEL) IJP |
| MARTIN | 77 | NP B127 349 | +Pidcock, Moorhouse | (LOUC, GLAS) IJP |
| Also | 77B | NP B126 266 | Martin, Pidcock | (LOUC) |
| Also | 77C | NP B126 285 | Martin, Pidcock | (LOUC) IJP |
| KANE | 74 | LBL-2452 | | (LBL) IJP |
| PREVOST | 74 | NP B69 246 | +Barloutaud+ | (SACL, CERN, HEID) |
| RADER | 73 | NC 16A 178 | +Barloutaud+ | (SACL, HEID, CERN, RHEL, CDEF) |
| ARMENTEROS | 68C | NP B8 216 | +Baillon+ | (CERN, HEID, SACL) I |