# $\Lambda(1800)\ S_{01}$

$I(J^P) = 0(\frac{1}{2}^-)$ Status: ∗∗∗

This is the second resonance in the $S_{01}$ wave, the first being the $\Lambda(1670)$.

## $\Lambda(1800)$ MASS

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **1720 to 1850 (≈ 1800) OUR ESTIMATE** | | | | |
| 1841±10 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 1725±20 | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 1825±20 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 1830±20 | LANGBEIN | 72 | IPWA | $\overline{K}N$ multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 1767 or 1842 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |
| 1780 | KIM | 71 | DPWA | K-matrix analysis |
| 1872±10 | BRICMAN | 70B | DPWA | $\overline{K}N \to \overline{K}N$ |

## $\Lambda(1800)$ WIDTH

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **200 to 400 (≈ 300) OUR ESTIMATE** | | | | |
| 228±20 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 185±20 | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 230±20 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 70±15 | LANGBEIN | 72 | IPWA | $\overline{K}N$ multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 435 or 473 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |
| 40 | KIM | 71 | DPWA | K-matrix analysis |
| 100±20 | BRICMAN | 70B | DPWA | $\overline{K}N \to \overline{K}N$ |

## $\Lambda(1800)$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $N\overline{K}$ | 25–40 % |
| $\Gamma_2$ | $\Sigma\pi$ | seen |
| $\Gamma_3$ | $\Sigma(1385)\pi$ | seen |
| $\Gamma_4$ | $N\overline{K}^*(892)$ | seen |
| $\Gamma_5$ | $N\overline{K}^*(892)$, $S$=1/2, $S$-wave | |
| $\Gamma_6$ | $N\overline{K}^*(892)$, $S$=3/2, $D$-wave | |

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

## $\Lambda(1800)$ BRANCHING RATIOS

See "Sign conventions for resonance couplings" in the Note on $\Lambda$ and $\Sigma$ Resonances.

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

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **0.25 to 0.40 OUR ESTIMATE** | | | | |
| $0.36\pm0.04$ | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| $0.28\pm0.05$ | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| $0.35\pm0.15$ | LANGBEIN | 72 | IPWA | $\overline{K}N$ multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $0.37\pm0.05$ | GOPAL | 77 | DPWA | See GOPAL 80 |
| 1.21 or 0.70 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |
| 0.80 | KIM | 71 | DPWA | K-matrix analysis |
| $0.18\pm0.02$ | BRICMAN | 70B | DPWA | $\overline{K}N \to \overline{K}N$ |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1800) \to \Sigma\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $-0.08\pm0.05$ | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $-0.74$ or $-0.43$ | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |
| 0.24 | KIM | 71 | DPWA | K-matrix analysis |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1800) \to \Sigma(1385)\pi$ — $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $+0.056\pm0.028$ | [2] CAMERON | 78 | DPWA | $K^- p \to \Sigma(1385)\pi$ |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1800) \to N\overline{K}^*(892)$, $S$=1/2, $S$-wave — $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $-0.17\pm0.03$ | [2] CAMERON | 78B | DPWA | $K^- p \to N\overline{K}^*$ |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1800) \to N\overline{K}^*(892)$, $S$=3/2, $D$-wave — $(\Gamma_1\Gamma_6)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $-0.13\pm0.04$ | CAMERON | 78B | DPWA | $K^- p \to N\overline{K}^*$ |

## $\Lambda(1800)$ FOOTNOTES

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
[2] The published sign has been changed to be in accord with the baryon-first convention.

# $\Lambda(1800)$ REFERENCES


| | | | | |
|---|---|---|---|---|
| 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 |
| CAMERON | 78B | NP B146 327 | +Franek, Gopal, Kalmus, McPherson+ | (RHEL, LOIC) 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 |
| LANGBEIN | 72 | NP B47 477 | +Wagner | (MPIM) IJP |
| KIM | 71 | PRL 27 356 | | (HARV) IJP |
| Also | 70 | Duke Conf. 161 | Kim | (HARV) IJP |
| BRICMAN | 70B | PL 33B 511 | +Ferro-Luzzi, Lagnaux | (CERN) IJP |