# $\Lambda(1830)$ $5/2^-$

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

For results published before 1973 (they are now obsolete), see our 1982 edition Physics Letters **111B** 1 (1982).

The best evidence for this resonance is in the $\Sigma\pi$ channel.

## $\Lambda(1830)$ POLE POSITION

### REAL PART

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $\mathbf{1899^{+35}_{-37}}$ | [1] KAMANO | 15 | DPWA | Multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $1766^{+37}_{-34}$ | [2] KAMANO | 15 | DPWA | Multichannel |
| 1809 | ZHANG | 13A | DPWA | Multichannel |

[1] The preferred solution A in KAMANO 15 reports two poles. This entry is from the preferred solution A.
[2] From the preferred solution A in KAMANO 15. Not seen in solution B.

### −2×IMAGINARY PART

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $\mathbf{80^{+100}_{-34}}$ | [1] KAMANO | 15 | DPWA | Multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $212^{+94}_{-62}$ | [2] KAMANO | 15 | DPWA | Multichannel |
| 109 | ZHANG | 13A | DPWA | Multichannel |

[1] The preferred solution A in KAMANO 15 reports two poles. This entry is from the preferred solution A.
[2] From the preferred solution A in KAMANO 15. Not seen in solution B.

## $\Lambda(1830)$ POLE RESIDUES

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

### Normalized residue in $N\overline{K} \to \Lambda(1830) \to N\overline{K}$

| MODULUS | PHASE (°) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 0.00502 | −80 | [1] KAMANO | 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### Normalized residue in $N\overline{K} \to \Lambda(1830) \to \Sigma\pi$

| MODULUS | PHASE (°) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 0.00581 | 179 | [1] KAMANO | 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### Normalized residue in $N\overline{K} \rightarrow \Lambda(1830) \rightarrow \Lambda\eta$

| MODULUS | PHASE (°) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.00941 | −65 | [1] KAMANO 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### Normalized residue in $N\overline{K} \rightarrow \Lambda(1830) \rightarrow \Xi K$

| MODULUS | PHASE (°) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.0477 | 94 | [1] KAMANO 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### Normalized residue in $N\overline{K} \rightarrow \Lambda(1830) \rightarrow \Sigma(1385)\pi$, $D$-wave

| MODULUS | PHASE (°) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.0237 | 113 | [1] KAMANO 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### Normalized residue in $N\overline{K} \rightarrow \Lambda(1830) \rightarrow \Sigma(1385)\pi$, $G$-wave

| MODULUS | PHASE (°) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.000726 | 127 | [1] KAMANO 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### Normalized residue in $N\overline{K} \rightarrow \Lambda(1830) \rightarrow N\overline{K}^*(892)$, $S$=1/2 , $D$-wave

| MODULUS | PHASE (°) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.0278 | −177 | [1] KAMANO 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### Normalized residue in $N\overline{K} \rightarrow \Lambda(1830) \rightarrow N\overline{K}^*(892)$, $S$=3/2 , $D$-wave

| MODULUS | PHASE (°) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.0255 | 3 | [1] KAMANO 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### Normalized residue in $N\overline{K} \rightarrow \Lambda(1830) \rightarrow N\overline{K}^*(892)$, $S$=3/2 , $G$-wave

| MODULUS | PHASE (°) | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.00773 | −17 | [1] KAMANO 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

## $\Lambda(1830)$ MASS

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **1810 to 1830 (≈ 1830) OUR ESTIMATE** | | | | |
| 1820± 4 | ZHANG | 13A | DPWA | Multichannel |
| 1831±10 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 1825±10 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 1825± 1 | KANE | 74 | DPWA | $K^- p \to \Sigma\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 1817 or 1818 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

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

## $\Lambda(1830)$ WIDTH

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **60 to 110 (≈ 95) OUR ESTIMATE** | | | | |
| 114±10 | ZHANG | 13A | DPWA | Multichannel |
| 100±10 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 94±10 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 119± 3 | KANE | 74 | DPWA | $K^- p \to \Sigma\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 56 or 56 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

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

## $\Lambda(1830)$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $N\overline{K}$ | 3–10 % |
| $\Gamma_2$ | $\Sigma\pi$ | 35–75 % |
| $\Gamma_3$ | $\Xi K$ | |
| $\Gamma_4$ | $\Sigma(1385)\pi$ | >15 % |
| $\Gamma_5$ | $\Sigma(1385)\pi$, $D$-wave | (52±6) % |
| $\Gamma_6$ | $\Sigma(1385)\pi$, $G$-wave | |
| $\Gamma_7$ | $\Lambda\eta$ | |
| $\Gamma_8$ | $N\overline{K}^*(892)$, $S$=1/2, $D$-wave | |
| $\Gamma_9$ | $N\overline{K}^*(892)$, $S$=3/2, $D$-wave | |
| $\Gamma_{10}$ | $N\overline{K}^*(892)$, $S$=3/2, $G$-wave | |

## $\Lambda(1830)$ 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 |
|---|---|---|---|---|
| **0.03 to 0.10 OUR ESTIMATE** | | | | |
| 0.041±0.005 | ZHANG | 13A | DPWA | Multichannel |
| 0.08 ±0.03 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 0.02 ±0.02 | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |

• • • We do not use the following data for averages, fits, limits, etc. • • •

| | | | | |
|---|---|---|---|---|
| 0.006 | [1] KAMANO | 15 | DPWA | Multichannel |
| 0.04 ±0.03 | GOPAL | 77 | DPWA | See GOPAL 80 |
| 0.04 or 0.04 | [2] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

[1] From the preferred solution A in KAMANO 15.
[2] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

## $\Gamma(\Sigma\pi)/\Gamma_{total}$ $\Gamma_2/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.017 | [1] KAMANO | 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

## $\Gamma(\Xi K)/\Gamma_{total}$ $\Gamma_3/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.562 | [1] KAMANO | 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

## $\Gamma(\Sigma(1385)\pi, D\text{-wave})/\Gamma_{total}$ $\Gamma_5/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **0.52 ±0.06** | ZHANG | 13A | DPWA | Multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.134 | [1] KAMANO | 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

## $\Gamma(\Lambda\eta)/\Gamma_{total}$ $\Gamma_7/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.024 | [1] KAMANO | 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

## $\Gamma(N\overline{K}^*(892), S=1/2, D\text{-wave})/\Gamma_{total}$ $\Gamma_8/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.134 | [1] KAMANO | 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

## $\Gamma(N\overline{K}^*(892), S=3/2, D\text{-wave})/\Gamma_{total}$ $\Gamma_9/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.115 | [1] KAMANO | 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### $\Gamma(N\overline{K}^*(892), S{=}3/2, G\text{-wave})/\Gamma_{total}$ — $\Gamma_{10}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.009 | [1] KAMANO | 15 | DPWA | Multichannel |

[1] From the preferred solution A in KAMANO 15.

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1830) \to \Sigma\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $-0.13\pm0.01$ | ZHANG | 13A | DPWA | Multichannel |
| $-0.17\pm0.03$ | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| $-0.15\pm0.01$ | KANE | 74 | DPWA | $K^- p \to \Sigma\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $-0.17$ or $-0.17$ | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

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

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1830) \to \Sigma(1385)\pi$ — $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $+0.141\pm0.014$ | [1] CAMERON | 78 | DPWA | $K^- p \to \Sigma(1385)\pi$ |
| $+0.13\ \pm0.03$ | PREVOST | 74 | DPWA | $K^- N \to \Sigma(1385)\pi$ |

[1] The CAMERON 78 upper limit on G-wave decay is 0.03. The published sign has been changed to be in accord with the baryon-first convention.

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1830) \to \Lambda\eta$ — $(\Gamma_1\Gamma_7)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN |
|---|---|---|---|
| $-0.044\pm0.020$ | RADER | 73 | MPWA |

## Λ(1830) REFERENCES


| | | | | |
|---|---|---|---|---|
| KAMANO | 15 | PR C92 025205 | H. Kamano et al. | (ANL, OSAK) |
| 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 |
| 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+) |