

$\Lambda(1800) \ 1/2^-$  $I(J^P) = 0(\frac{1}{2}^-)$  Status: \*\*\* **$\Lambda(1800)$  POLE POSITION****REAL PART**

| VALUE (MeV)                                                                   | DOCUMENT ID  | TECN | COMMENT                 |
|-------------------------------------------------------------------------------|--------------|------|-------------------------|
| <b><math>1809 \pm 9</math></b>                                                | SARANTSEV 19 | DPWA | $\bar{K}N$ multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |              |      |                         |
| 1729                                                                          | ZHANG 13A    | DPWA | Multichannel            |

**−2×IMAGINARY PART**

| VALUE (MeV)                                                                   | DOCUMENT ID  | TECN | COMMENT                 |
|-------------------------------------------------------------------------------|--------------|------|-------------------------|
| <b><math>205 \pm 16</math></b>                                                | SARANTSEV 19 | DPWA | $\bar{K}N$ multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |              |      |                         |
| 198                                                                           | ZHANG 13A    | DPWA | Multichannel            |

 **$\Lambda(1800)$  POLE RESIDUES**The normalized residue is the residue divided by  $\Gamma_{pole}/2$ .**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1800) \rightarrow N\bar{K}$** 

| MODULUS                           | PHASE (°)                     | DOCUMENT ID  | TECN | COMMENT                 |
|-----------------------------------|-------------------------------|--------------|------|-------------------------|
| <b><math>0.34 \pm 0.07</math></b> | <b><math>103 \pm 8</math></b> | SARANTSEV 19 | DPWA | $\bar{K}N$ multichannel |

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1800) \rightarrow \Sigma\pi$** 

| MODULUS                           | PHASE (°)                      | DOCUMENT ID  | TECN | COMMENT                 |
|-----------------------------------|--------------------------------|--------------|------|-------------------------|
| <b><math>0.30 \pm 0.06</math></b> | <b><math>-123 \pm 8</math></b> | SARANTSEV 19 | DPWA | $\bar{K}N$ multichannel |

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1800) \rightarrow \Lambda\eta$** 

| MODULUS                           | PHASE (°)                     | DOCUMENT ID  | TECN | COMMENT                 |
|-----------------------------------|-------------------------------|--------------|------|-------------------------|
| <b><math>0.06 \pm 0.03</math></b> | <b><math>75 \pm 10</math></b> | SARANTSEV 19 | DPWA | $\bar{K}N$ multichannel |

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1800) \rightarrow \Lambda\sigma$** 

| MODULUS                           | PHASE (°)                     | DOCUMENT ID  | TECN | COMMENT                 |
|-----------------------------------|-------------------------------|--------------|------|-------------------------|
| <b><math>0.24 \pm 0.05</math></b> | <b><math>25 \pm 10</math></b> | SARANTSEV 19 | DPWA | $\bar{K}N$ multichannel |

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1800) \rightarrow \Lambda\omega, S=1/2, S\text{-wave}$** 

| MODULUS                           | PHASE (°)                       | DOCUMENT ID  | TECN | COMMENT                 |
|-----------------------------------|---------------------------------|--------------|------|-------------------------|
| <b><math>0.12 \pm 0.04</math></b> | <b><math>-114 \pm 30</math></b> | SARANTSEV 19 | DPWA | $\bar{K}N$ multichannel |

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1800) \rightarrow \Lambda\omega, S=3/2, D\text{-wave}$** 

| MODULUS                           | PHASE (°)                      | DOCUMENT ID  | TECN | COMMENT                 |
|-----------------------------------|--------------------------------|--------------|------|-------------------------|
| <b><math>0.08 \pm 0.03</math></b> | <b><math>-90 \pm 17</math></b> | SARANTSEV 19 | DPWA | $\bar{K}N$ multichannel |

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1800) \rightarrow \Sigma(1385)\pi$** 

| MODULUS                           | PHASE (°)                       | DOCUMENT ID  | TECN | COMMENT                 |
|-----------------------------------|---------------------------------|--------------|------|-------------------------|
| <b><math>0.16 \pm 0.06</math></b> | <b><math>-140 \pm 35</math></b> | SARANTSEV 19 | DPWA | $\bar{K}N$ multichannel |

Normalized residue in  $N\bar{K} \rightarrow \Lambda(1800) \rightarrow N\bar{K}^*(892)$ ,  $S=1/2$ ,  $S$ -wave

| <i>MODULUS</i>   | <i>PHASE (°)</i> | <i>DOCUMENT ID</i> | <i>TECN</i> | <i>COMMENT</i>               |
|------------------|------------------|--------------------|-------------|------------------------------|
| <b>0.18±0.06</b> | <b>65 ± 40</b>   | SARANTSEV          | 19          | DPWA $\bar{K}N$ multichannel |

Normalized residue in  $N\bar{K} \rightarrow \Lambda(1800) \rightarrow N\bar{K}^*(892)$ ,  $S=3/2$ ,  $D$ -wave

| <i>MODULUS</i>   | <i>PHASE (°)</i> | <i>DOCUMENT ID</i> | <i>TECN</i> | <i>COMMENT</i>               |
|------------------|------------------|--------------------|-------------|------------------------------|
| <b>0.09±0.07</b> |                  | SARANTSEV          | 19          | DPWA $\bar{K}N$ multichannel |

$\Lambda(1800)$  MASS

| <i>VALUE (MeV)</i>                                                            | <i>DOCUMENT ID</i>  | <i>TECN</i> | <i>COMMENT</i>                       |
|-------------------------------------------------------------------------------|---------------------|-------------|--------------------------------------|
| <b>1750 to 1850 (<math>\approx 1800</math>) OUR ESTIMATE</b>                  |                     |             |                                      |
| 1811±10                                                                       | SARANTSEV           | 19          | DPWA $\bar{K}N$ multichannel         |
| 1783±19                                                                       | ZHANG               | 13A         | DPWA $\bar{K}N$ multichannel         |
| 1841±10                                                                       | GOPAL               | 80          | DPWA $\bar{K}N \rightarrow \bar{K}N$ |
| 1725±20                                                                       | ALSTON-...          | 78          | DPWA $\bar{K}N \rightarrow \bar{K}N$ |
| 1830±20                                                                       | LANGBEIN            | 72          | IPWA $\bar{K}N$ multichannel         |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                     |             |                                      |
| 1845±10                                                                       | MANLEY              | 02          | DPWA $\bar{K}N$ multichannel         |
| 1825±20                                                                       | GOPAL               | 77          | DPWA $\bar{K}N$ multichannel         |
| 1767 or 1842                                                                  | <sup>1</sup> MARTIN | 77          | DPWA $\bar{K}N$ multichannel         |
| 1780                                                                          | KIM                 | 71          | DPWA K-matrix analysis               |
| 1872±10                                                                       | BRICMAN             | 70B         | DPWA $\bar{K}N \rightarrow \bar{K}N$ |

$\Lambda(1800)$  WIDTH

| <i>VALUE (MeV)</i>                                                            | <i>DOCUMENT ID</i>  | <i>TECN</i> | <i>COMMENT</i>                       |
|-------------------------------------------------------------------------------|---------------------|-------------|--------------------------------------|
| <b>150 to 250 (<math>\approx 200</math>) OUR ESTIMATE</b>                     |                     |             |                                      |
| 209±18                                                                        | SARANTSEV           | 19          | DPWA $\bar{K}N$ multichannel         |
| 256±35                                                                        | ZHANG               | 13A         | DPWA $\bar{K}N$ multichannel         |
| 228±20                                                                        | GOPAL               | 80          | DPWA $\bar{K}N \rightarrow \bar{K}N$ |
| 185±20                                                                        | ALSTON-...          | 78          | DPWA $\bar{K}N \rightarrow \bar{K}N$ |
| 70±15                                                                         | LANGBEIN            | 72          | IPWA $\bar{K}N$ multichannel         |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                     |             |                                      |
| 518±84                                                                        | MANLEY              | 02          | DPWA $\bar{K}N$ multichannel         |
| 230±20                                                                        | GOPAL               | 77          | DPWA $\bar{K}N$ multichannel         |
| 435 or 473                                                                    | <sup>1</sup> MARTIN | 77          | DPWA $\bar{K}N$ multichannel         |
| 40                                                                            | KIM                 | 71          | DPWA K-matrix analysis               |
| 100±20                                                                        | BRICMAN             | 70B         | DPWA $\bar{K}N \rightarrow \bar{K}N$ |

$\Lambda(1800)$  DECAY MODES

| Mode                         | Fraction ( $\Gamma_i/\Gamma$ ) |
|------------------------------|--------------------------------|
| $\Gamma_1$ $N\bar{K}$        | 25–40 %                        |
| $\Gamma_2$ $\Sigma\pi$       | (27 ±6) %                      |
| $\Gamma_3$ $\Lambda\sigma$   | (15 ±4) %                      |
| $\Gamma_4$ $\Sigma(1385)\pi$ | ( 9 ±4) %                      |

|            |                                         |              |
|------------|-----------------------------------------|--------------|
| $\Gamma_5$ | $\Lambda\eta$                           | 0.01 to 0.10 |
| $\Gamma_6$ | $N\bar{K}^*(892)$                       | seen         |
| $\Gamma_7$ | $N\bar{K}^*(892), S=1/2, S\text{-wave}$ |              |
| $\Gamma_8$ | $N\bar{K}^*(892), S=3/2, D\text{-wave}$ |              |

**$\Lambda(1800)$  BRANCHING RATIOS**

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

| $\Gamma(N\bar{K})/\Gamma_{\text{total}}$                                                                       |                        |      |                                 | $\Gamma_1/\Gamma$                 |
|----------------------------------------------------------------------------------------------------------------|------------------------|------|---------------------------------|-----------------------------------|
| VALUE                                                                                                          | DOCUMENT ID            | TECN | COMMENT                         |                                   |
| <b>0.25 to 0.40 OUR ESTIMATE</b>                                                                               |                        |      |                                 |                                   |
| $0.35\pm0.07$                                                                                                  | SARANTSEV 19           | DPWA | $\bar{K}N$ multichannel         |                                   |
| $0.13\pm0.06$                                                                                                  | ZHANG 13A              | DPWA | $\bar{K}N$ multichannel         |                                   |
| $0.36\pm0.04$                                                                                                  | GOPAL 80               | DPWA | $\bar{K}N \rightarrow \bar{K}N$ |                                   |
| $0.28\pm0.05$                                                                                                  | ALSTON-... 78          | DPWA | $\bar{K}N \rightarrow \bar{K}N$ |                                   |
| $0.35\pm0.15$                                                                                                  | LANGBEIN 72            | IPWA | $\bar{K}N$ multichannel         |                                   |
| • • • We do not use the following data for averages, fits, limits, etc. • • •                                  |                        |      |                                 |                                   |
| $0.24\pm0.10$                                                                                                  | MANLEY 02              | DPWA | $\bar{K}N$ multichannel         |                                   |
| $0.37\pm0.05$                                                                                                  | GOPAL 77               | DPWA | See GOPAL 80                    |                                   |
| $1.21$ or $0.70$                                                                                               | <sup>1</sup> MARTIN 77 | DPWA | $\bar{K}N$ multichannel         |                                   |
| $0.80$                                                                                                         | KIM 71                 | DPWA | K-matrix analysis               |                                   |
| $0.18\pm0.02$                                                                                                  | BRICMAN 70B            | DPWA | $\bar{K}N \rightarrow \bar{K}N$ |                                   |
| $\Gamma(\Sigma\pi)/\Gamma_{\text{total}}$                                                                      |                        |      |                                 | $\Gamma_2/\Gamma$                 |
| VALUE                                                                                                          | DOCUMENT ID            | TECN | COMMENT                         |                                   |
| <b>0.27±0.06</b>                                                                                               | SARANTSEV 19           | DPWA | $\bar{K}N$ multichannel         |                                   |
| $\Gamma(\Lambda\sigma)/\Gamma_{\text{total}}$                                                                  |                        |      |                                 | $\Gamma_3/\Gamma$                 |
| VALUE                                                                                                          | DOCUMENT ID            | TECN | COMMENT                         |                                   |
| <b>0.15±0.04</b>                                                                                               | SARANTSEV 19           | DPWA | $\bar{K}N$ multichannel         |                                   |
| $\Gamma(\Sigma(1385)\pi)/\Gamma_{\text{total}}$                                                                |                        |      |                                 | $\Gamma_4/\Gamma$                 |
| VALUE                                                                                                          | DOCUMENT ID            | TECN | COMMENT                         |                                   |
| <b>0.09±0.04</b>                                                                                               | SARANTSEV 19           | DPWA | $\bar{K}N$ multichannel         |                                   |
| $\Gamma(\Lambda\eta)/\Gamma_{\text{total}}$                                                                    |                        |      |                                 | $\Gamma_5/\Gamma$                 |
| VALUE                                                                                                          | DOCUMENT ID            | TECN | COMMENT                         |                                   |
| <b>0.01 to 0.10 OUR ESTIMATE</b>                                                                               |                        |      |                                 |                                   |
| $0.010\pm0.005$                                                                                                | SARANTSEV 19           | DPWA | $\bar{K}N$ multichannel         |                                   |
| $0.06 \pm 0.05$                                                                                                | ZHANG 13A              | DPWA | Multichannel                    |                                   |
| $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1800) \rightarrow \Sigma\pi$ |                        |      |                                 | $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$ |
| VALUE                                                                                                          | DOCUMENT ID            | TECN | COMMENT                         |                                   |
| $-0.07\pm0.02$                                                                                                 | ZHANG 13A              | DPWA | Multichannel                    |                                   |
| $-0.08\pm0.05$                                                                                                 | GOPAL 77               | DPWA | $\bar{K}N$ multichannel         |                                   |
| • • • We do not use the following data for averages, fits, limits, etc. • • •                                  |                        |      |                                 |                                   |
| $-0.74$ or $-0.43$                                                                                             | <sup>1</sup> MARTIN 77 | DPWA | $\bar{K}N$ multichannel         |                                   |
| $0.24$                                                                                                         | KIM 71                 | DPWA | K-matrix analysis               |                                   |

| $(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1800) \rightarrow \Sigma(1385)\pi$ |                      |      |         | $(\Gamma_1 \Gamma_4)^{1/2} / \Gamma$ |  |
|-------------------------------------------------------------------------------------------------------------------------|----------------------|------|---------|--------------------------------------|--|
| VALUE                                                                                                                   | DOCUMENT ID          | TECN | COMMENT |                                      |  |
| $-0.09 \pm 0.05$                                                                                                        | ZHANG                | 13A  | DPWA    | Multichannel                         |  |
| $+0.056 \pm 0.028$                                                                                                      | <sup>2</sup> CAMERON | 78   | DPWA    | $K^- p \rightarrow \Sigma(1385)\pi$  |  |

  

| $(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1800) \rightarrow N\bar{K}^*(892), S=1/2, S\text{-wave}$ |                      |      |         | $(\Gamma_1 \Gamma_7)^{1/2} / \Gamma$ |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------|---------|--------------------------------------|--|
| VALUE                                                                                                                                         | DOCUMENT ID          | TECN | COMMENT |                                      |  |
| $-0.13 \pm 0.02$                                                                                                                              | ZHANG                | 13A  | DPWA    | Multichannel                         |  |
| $-0.17 \pm 0.03$                                                                                                                              | <sup>2</sup> CAMERON | 78B  | DPWA    | $K^- p \rightarrow N\bar{K}^*$       |  |

  

| $(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1800) \rightarrow N\bar{K}^*(892), S=3/2, D\text{-wave}$ |             |      |         | $(\Gamma_1 \Gamma_8)^{1/2} / \Gamma$ |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------|------|---------|--------------------------------------|--|
| VALUE                                                                                                                                         | DOCUMENT ID | TECN | COMMENT |                                      |  |
| $-0.13 \pm 0.04$                                                                                                                              | CAMERON     | 78B  | DPWA    | $K^- p \rightarrow N\bar{K}^*$       |  |

**$\Lambda(1800)$  FOOTNOTES**

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

**$\Lambda(1800)$  REFERENCES**

|                     |     |                   |                                           |                            |
|---------------------|-----|-------------------|-------------------------------------------|----------------------------|
| SARANTSEV           | 19  | EPJ A55 180       | A.V. Sarantsev <i>et al.</i>              | (BONN, PNPI)               |
| ZHANG               | 13A | PR C88 035205     | H. Zhang <i>et al.</i>                    | (KSU)                      |
| MANLEY              | 02  | PRL 88 012002     | D.M. Manley <i>et al.</i>                 | (BNL Crystal Ball Collab.) |
| 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                |     | 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           |
| CAMERON             | 78B | NP B146 327       | W. Cameron <i>et al.</i>                  | (RHEL, LOIC) 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                |     | NP B126 266       | B.R. Martin, M.K. Pidcock                 | (LOUC)                     |
| Also                |     | NP B126 285       | B.R. Martin, M.K. Pidcock                 | (LOUC) IJP                 |
| LANGBEIN            | 72  | NP B47 477        | W. Langbein, F. Wagner                    | (MPIM) IJP                 |
| KIM                 | 71  | PRL 27 356        | J.K. Kim                                  | (HARV) IJP                 |
| Also                |     | Duke Conf. 161    | J.K. Kim                                  | (HARV) IJP                 |
| Hyperon Resonances, |     | 1970              |                                           |                            |
| BRICMAN             | 70B | PL 33B 511        | C. Bricman, M. Ferro-Luzzi, J.P. Lagnaux  | (CERN) IJP                 |