\[ \Lambda(1600) \] \( \frac{1}{2}^+ \quad I(J^P) = 0(\frac{1}{2}^+) \quad \text{Status: } \begin{array}{c} \ast \ast \ast \ast \end{array} \]

\[ \Lambda(1600) \text{ POLE POSITION} \]

**REAL PART**

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1540 to 1560 (≈ 1550) OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1546 ± 6 OUR AVERAGE</td>
<td>Error includes scale factor of 2.1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1562 ± 8</td>
<td>SARANTSEV 19</td>
<td>DPWA ( \bar{K}N ) multichannel</td>
<td></td>
</tr>
<tr>
<td>1544 ± 3</td>
<td>1 KAMANO 15</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
<tr>
<td>1572</td>
<td>ZHANG 13A</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

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

\[ \frac{-2 \times}{\text{IMAGINARY PART}} \]

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 to 240 (≈ 180) OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>159 ± 60</td>
<td>SARANTSEV 19</td>
<td>DPWA ( \bar{K}N ) multichannel</td>
<td></td>
</tr>
<tr>
<td>112 ± 12</td>
<td>1 KAMANO 15</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

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

\[ \frac{-2 \times}{\text{IMAGINARY PART}} \]

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>138</td>
<td>ZHANG 13A</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15.

\[ \Lambda(1600) \text{ POLE RESIDUES} \]

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

**Normalized residue in \( \bar{N}K \rightarrow \Lambda(1600) \rightarrow N\bar{K} \)**

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.36 ± 0.07</td>
<td>63 ± 10</td>
<td>SARANTSEV 19</td>
<td>DPWA ( \bar{K}N ) multichannel</td>
<td></td>
</tr>
</tbody>
</table>

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

| | | | |
| 0.105 | − 80 | 1 KAMANO 15 | DPWA Multichannel |

1 From the preferred solution A in KAMANO 15.

**Normalized residue in \( \bar{N}K \rightarrow \Lambda(1600) \rightarrow \Sigma\pi \)**

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.39 ± 0.08</td>
<td>148 ± 10</td>
<td>SARANTSEV 19</td>
<td>DPWA ( \bar{K}N ) multichannel</td>
<td></td>
</tr>
</tbody>
</table>

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

| | | | |
| 0.232 | 108 | 1 KAMANO 15 | DPWA Multichannel |

1 From the preferred solution A in KAMANO 15.
Normalized residue in $N\Sigma \rightarrow \Lambda(1600) \rightarrow \Lambda\eta$

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.22±0.13</td>
<td>180 ± 20</td>
<td>SARANTSEV 19</td>
<td>DPWA</td>
<td>$\bar{K}N$ multichannel</td>
</tr>
</tbody>
</table>

Normalized residue in $N\Sigma \rightarrow \Lambda(1600) \rightarrow \Lambda\sigma$

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.30±0.06</td>
<td>−70 ± 10</td>
<td>SARANTSEV 19</td>
<td>DPWA</td>
<td>$\bar{K}N$ multichannel</td>
</tr>
</tbody>
</table>

Normalized residue in $N\Sigma \rightarrow \Lambda(1600) \rightarrow \Sigma(1385)\pi$

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.37±0.07</td>
<td>103 ± 12</td>
<td>SARANTSEV 19</td>
<td>DPWA</td>
<td>$\bar{K}N$ multichannel</td>
</tr>
</tbody>
</table>

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

0.183 77 1 KAMANO 15 DPWA Multichannel

1 From the preferred solution A in KAMANO 15.

Normalized residue in $N\Sigma \rightarrow \Lambda(1600) \rightarrow N\Sigma^*(892), S=1/2, P$-wave

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.02±0.01</td>
<td>126 ± 45</td>
<td>SARANTSEV 19</td>
<td>DPWA</td>
<td>$\bar{K}N$ multichannel</td>
</tr>
</tbody>
</table>

Normalized residue in $N\Sigma \rightarrow \Lambda(1600) \rightarrow N\Sigma^*(892), S=3/2, P$-wave

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.02±0.01</td>
<td>−135 ± 45</td>
<td>SARANTSEV 19</td>
<td>DPWA</td>
<td>$\bar{K}N$ multichannel</td>
</tr>
</tbody>
</table>

$\Lambda(1600)$ MASS

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1570 to 1630 ($\approx 1600$) OUR ESTIMATE</td>
<td>1605± 8</td>
<td>SARANTSEV 19</td>
<td>DPWA</td>
</tr>
<tr>
<td>1592± 10</td>
<td>ZHANG 13A</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>1568± 20</td>
<td>GOPAL 80</td>
<td>DPWA</td>
<td>$\bar{K}N \rightarrow \bar{K}N$</td>
</tr>
<tr>
<td>1703±100</td>
<td>ALSTON-... 78</td>
<td>DPWA</td>
<td>$\bar{K}N \rightarrow \bar{K}N$</td>
</tr>
<tr>
<td>1573± 25</td>
<td>GOPAL 77</td>
<td>DPWA</td>
<td>$\bar{K}N$ multichannel</td>
</tr>
<tr>
<td>1596± 6</td>
<td>KANE 74</td>
<td>DPWA</td>
<td>$K^- p \rightarrow \Sigma\pi$</td>
</tr>
<tr>
<td>1620±10</td>
<td>LANGBEIN 72</td>
<td>IPWA</td>
<td>$\bar{K}N$ multichannel</td>
</tr>
</tbody>
</table>

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

1572 or 1617 1 MARTIN 77 DPWA $\bar{K}N$ multichannel

1646± 7 2 CARROLL 76 DPWA Isospin-0 total $\sigma$

1570 1 MARTIN 77 DPWA $\bar{K}N$ multichannel

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

2 A total cross-section bump with $(J+1/2) \Gamma_{\text{e1}} / \Gamma_{\text{total}} = 0.04$.

$\Lambda(1600)$ WIDTH

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 to 250 ($\approx 200$) OUR ESTIMATE</td>
<td>245± 15</td>
<td>SARANTSEV 19</td>
<td>DPWA</td>
</tr>
<tr>
<td>150± 28</td>
<td>ZHANG 13A</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>116± 20</td>
<td>GOPAL 80</td>
<td>DPWA</td>
<td>$\bar{K}N \rightarrow \bar{K}N$</td>
</tr>
<tr>
<td>593±200</td>
<td>ALSTON-... 78</td>
<td>DPWA</td>
<td>$\bar{K}N \rightarrow \bar{K}N$</td>
</tr>
</tbody>
</table>

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147 ± 50 GOPAL 77 DPWA $\bar{K}N$ multichannel
175 ± 20 KANE 74 DPWA $K^- p \rightarrow \Sigma \pi$
60 ± 10 LANGBEIN 72 IPWA $\bar{K}N$ multichannel

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

247 or 271 1 MARTIN 77 DPWA $\bar{K}N$ multichannel
20 2 CARROLL 76 DPWA Isospin-0 total $\sigma$
50 KIM 71 DPWA K-matrix analysis

1 The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
2 A total cross-section bump with $\frac{(J+1/2) \Gamma_{el}}{\Gamma_{total}} = 0.04$.

$\Lambda(1600)$ DECAY MODES

<table>
<thead>
<tr>
<th>Mode</th>
<th>Fraction ($\Gamma_i/\Gamma$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Gamma_1$ $N\bar{K}$</td>
<td>15–30 %</td>
</tr>
<tr>
<td>$\Gamma_2$ $\Sigma\pi$</td>
<td>10–60 %</td>
</tr>
<tr>
<td>$\Gamma_3$ $\Lambda\sigma$</td>
<td>(19±4) %</td>
</tr>
<tr>
<td>$\Gamma_4$ $\Sigma(1385)\pi$</td>
<td>(9±4) %</td>
</tr>
</tbody>
</table>

$\Lambda(1600)$ BRANCHING RATIOS

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

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.14  to 0.28 OUR ESTIMATE</td>
<td>SARANTSEV 19</td>
<td>DPWA $\bar{K}N$ multichannel</td>
<td></td>
</tr>
<tr>
<td>0.29 ± 0.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.14 ± 0.04</td>
<td>ZHANG 13A</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
<tr>
<td>0.23 ± 0.04</td>
<td>GOPAL 80</td>
<td>DPWA $\bar{K}N \rightarrow \bar{K}N$</td>
<td></td>
</tr>
<tr>
<td>0.14 ± 0.05</td>
<td>ALSTON-... 78</td>
<td>DPWA $\bar{K}N \rightarrow \bar{K}N$</td>
<td></td>
</tr>
<tr>
<td>0.25 ± 0.15</td>
<td>LANGBEIN 72</td>
<td>IPWA $\bar{K}N$ multichannel</td>
<td></td>
</tr>
</tbody>
</table>

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

0.064 1 KAMANO 15 DPWA Multichannel
0.24 ± 0.04 GOPAL 77 DPWA See GOPAL 80
0.30 or 0.29 2 MARTIN 77 DPWA $\bar{K}N$ 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.

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.37 ± 0.07</td>
<td>SARANTSEV 19</td>
<td>DPWA $\bar{K}N$ multichannel</td>
<td></td>
</tr>
</tbody>
</table>

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

0.851 1 KAMANO 15 DPWA Multichannel

1 From the preferred solution A in KAMANO 15.

$\Gamma(\Lambda\sigma)/\Gamma_{total}$ $\Gamma_3/\Gamma$

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.19±0.04</td>
<td>SARANTSEV 19</td>
<td>DPWA $\bar{K}N$ multichannel</td>
<td></td>
</tr>
</tbody>
</table>
\[ \Gamma(\Sigma(1385)\pi)/\Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.09 ±0.04</td>
<td>SARANTSEV 19</td>
<td>DPWA</td>
<td>K N multichannel</td>
</tr>
<tr>
<td>0.085</td>
<td>KAMANO 15</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
</tbody>
</table>

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

\[ \frac{(\Gamma_i;\Gamma_f)^{1/2}/\Gamma_{\text{total}}}{N^K \to \Lambda(1600) \to \Sigma \pi} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−0.23±0.03</td>
<td>ZHANG 13A</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>−0.16±0.04</td>
<td>GOPAL 77</td>
<td>DPWA</td>
<td>K N multichannel</td>
</tr>
<tr>
<td>−0.33±0.11</td>
<td>KANE 74</td>
<td>DPWA</td>
<td>K N multichannel</td>
</tr>
<tr>
<td>0.28±0.09</td>
<td>LANGBEIN 72</td>
<td>IPWA</td>
<td>K N multichannel</td>
</tr>
</tbody>
</table>

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

−0.39 or −0.39 1 MARTIN 77 | DPWA | K N multichannel |
| not seen | HEPP 76B   | DPWA | K N multichannel |

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

\[ \frac{(\Gamma_1;\Gamma_2)^{1/2}/\Gamma_{\text{total}}}{N^K \to \Lambda(1600) \to \Sigma \pi} \]

\[ \Lambda(1600) \] REFERENCES

SARANTSEV 19 | EPJ A55 180 | A.V. Sarantsev et al. | (BONN, PNPI)
KAMANO 15 | PR C92 025205 | H. Kamano et al. | (ANL, OSAK)
ZHANG 13A | PR C88 035205 | H. Zhang et al. | (KSU)
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
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) IJP
Also | NP B126 285 | B.R. Martin, M.K. Pidcock | (LOUC) IJP
CARROLL 76 | PRL 37 806 | A.S. Carroll et al. | (BNL) IJP
HEPP 76B | PL 65B 487 | V. Hepp et al. | (CERN, HEIDH, MPIM) IJP
KANE 74 | LBL-2452 | D.F. Kane | (LBL) IJP
LANGBEIN 72 | NP B47 477 | W. Langbein, F. Wagner | (MPIM) IJP
KIM 71 | PRL 27 356 | J.K. Kim | (HARV) IJP

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